



TRANSACTIONS
OF THE
ENTOMOLOGICAL SOCIETY
OF
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THE

TRANSACTIONS

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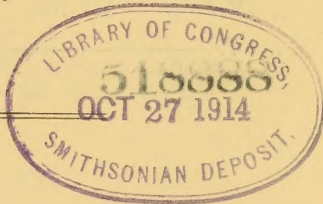
ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR

1913.



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List of Fellows

OF THE

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1894 FOREL, Professor Auguste, M.D., *Chigny, près Morges, Switzerland*.
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1908 OBERTHÜR, Charles, *Rennes, Ille-et-Vilaine, France*.
1906 * REUTER, Professor Odo Morannal, *The University, Helsingfors, Finland*.
1913 TIAN-SHANSKI, A. P. Semenoff, *Vassili Ostrov, 8 lin., 39, St. Petersburg, Russia*.
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1893 WATTENWYL, Hoffrath Carl Brunner von, *Schönburgstrasse 3, Vienna*.
1898 WEISMANN, Dr. August, *Freiburg, Baden*.
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FELLOWS.

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Election.

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- 1885 ADKIN, Robert, (COUNCIL, 1911-), *Wellfield, Lingards-road, Lewisham, S.E.*
- 1904 AGAR, E. A., *La Haut, Dominica, B. W. Indies.*
- 1912 ALLEN, T. W., M.A., 266, *Willesden-lane, London, N.W.*
- 1911 ANDERSON, T. J., Entomologist, Dept. of Agriculture, *Nairobi, British East Africa.*
- 1910 † ANDREWES, H. E., 8, *North Grove, Highgate, N.*
- 1899 ANDREWS, Henry W., *Shirley, Welling S.O., Kent.*
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- 1908 † ANTRAM, Charles B., *Somerdale Estate, Ootacamund, Nilgiri Hills, S. India.*
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- 1907 ARNOLD, G., M.Sc., A.R.C.S., Curator, *Rhodesia Museum, Bulawayo, S. Africa.*
- 1899 † ARROW, Gilbert J., (COUNCIL, 1905-7), 87, *Union-grove, Clapham, S.W.*; and *British Museum (Natural History), Cromwell-road, S.W.*
- 1911 ASHBY, Edward Bernard, *Brooklands, 38, Bulstrode-road, Hounslow, Middlesex.*
- 1907 † ASHBY, Sydney R., 119, *Greenvale-road, Eltham-park, Kent.*
- 1886 ATMORE, E. A., 48, *High-street, King's Lynn.*
- 1850 * AVEBURY, The Right Honble. Lord, D.C.L., F.R.S., F.L.S., F.G.S., etc., (PRES., 1866-7, 1879-80; V.-PRES., 1862, 1868, 1876, 1881, 1888; COUNCIL, 1855-7, 1859-61), *High Elms, Farnborough, Kent.*
- 1913 AVINOFF, André, *Liteyny, 12, St. Petersburg, Russia.*
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- 1912 BALLARD, Edward, Govt. Entomologist, *Agricultural College and Research Institute, Coimbatore, Madras, S. India.*
- 1886 BANKES, Eustace R., M.A.
- 1890 BARCLAY, Francis H., F.G.S., *The Warren, Cromer.*
- 1886 BARGAGLI, Marchese Piero, *Piazza S. Maria, Palazzo Tempi No. 1, Florence, Italy.*
- 1895 BARKER, Cecil W., *The Bungalow, Escombe, Natal, South Africa.*
- 1902 BARRAUD, Philip J., *Chester Cottage, Benhill-road, Sutton, Surrey.*
- 1911 BARRETT, J. Platt, *Westcroft, South-road, Forest Hill, S.E.*
- 1907 BARTLETT, H. Frederick D., 1, *Myrtle-road, Bournemouth.*
- 1894 † BATESON, Prof. William, M.A., F.R.S., Fellow of St. John's College, Cambridge, *The Manor House, Merton, Surrey.*
- 1908 BAYFORD, E. G., 2, *Rockingham-street, Barnsley.*
- 1904 BAYNE, Arthur F., c/o Messrs. Freeman, *Castle-street, Framlingham, Suffolk.*

- 1912 BAYNES, Edward Stuart Augustus, 120, *Warwick-street, Eccleston-square, S.W.*
- 1896 † BEARE, Prof. T. Hudson, B.Sc., F.R.S.E., (V.-PRES., 1910 ; COUNCIL, 1909-11), 10, *Regent Terrace, Edinburgh.*
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- 1908 BECK, Richard, *Red Lodge, Porchester-road, Bournemouth.*
- 1905 BEDFORD, The Duke of, K.G., Pres. Z.S., etc., *Woburn Abbey, Beds.*
- 1912 BEDFORD, Gerald, Entomologist to the Union of South Africa, Veterinary Bacteriological Laboratory, *Ondestepoort, Pretoria, Transvaal.*
- 1913 BEDFORD, Hugh Warren, *Church Felles, Horley.*
- 1899 BEDWELL, Ernest C., *Bruggen, Brighton-road, Coulsdon, Surrey.*
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- 1906 BENTALL, E. E., *The Towers, Heybridge, Essex.*
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- 1870 BRIGGS, Thomas Henry, M.A., *Rock House, Lynnmouth S.O. N. Devon.*
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- 1902 CHEESMAN, E. M., c/o Mr. John Garson, 150, *Umbilo-road, Durban.*
- 1908 CHETTY, B. Chourappa, *The Government Museum, Bangalore, India.*
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- 1909 CHUBB, Ernest C., Curator, *Durban Museum, Natal, South Africa.*
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- 1899 COLLIN, James E., F.Z.S., VICE-PRESIDENT, (COUNCIL, 1904-6), *Sussex Lodge, Newmarket.*
- 1906 COLLINGE, Walter E., M.Sc., F.L.S., 8, *Newhall-street, Birmingham.*
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- 1913 COWARD, Thomas Alfred, F.Z.S., 36, *George-street, Manchester.*
- 1867 COX, Herbert Ed., *Claremont, Jamaica.*
- 1895 CRABTREE, Benjamin Hill, *The Oaklands, Levenshulme, Manchester*

- 1913 CRAGG, Capt. F. W., M.D., I.M.S., *King Institute of Preventive Medicine, Saidapet, Madras, India.*
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- 1901 DADD, Edward Martin, *Hohenzollernstrasse 18, Zehlendorf, bei Berlin.*
- 1900 DALGLISH, Andrew Adie, 7, *Keir-street, Pollokshields, Glasgow.*
- 1907 DAMES, Felix L., 10, *Lortzingstrasse, Berlin-Lichterfelde.*
- 1886 DANNATT, Walter, 45, *Manor Park, Lee, S.E.*
- 1911 DAVEY, H. W., Inspector of Department of Agriculture, *Geelong, Victoria, Australia.*
- 1913 DAVIDSON, James, M.Sc., *Imperial College of Science and Technology, South Kensington, S.W.*
- 1905 DAVIDSON, James D., 32, *Drumsheugh Gardens, Edinburgh.*
- 1912 DAVIS, Frederick Lionel, J.P., M.R.C.S., L.R.C.P., *Belize, British Honduras.*
- 1910 DAWSON, William George, *Manor House, Upper Wick, Worcester.*
- 1903 DAY, F. H., 26, *Currock-terrace, Carlisle.*
- 1898 DAY, G. O., *Sahlatston, Duncan's Station, Vancouver Island, British Columbia.*
- 1912 DEWITZ, Dr. John, Director German Govt. Experimental Station, *Devant-les-Ponts, Metz, Lorraine.*
- 1913 DICKINSON, Barnard Ormiston, B.A., 57, *Castelnau, Barnes, S.W.*
- 1875 DISTANT, William Lucas, (V.-PRES., 1881, 1900; SEC., 1878-80; COUNCIL, 1900-2), *Glenside, 170, Birchanger-road, South Norwood, S.E.*
- 1887 DIXEY, Frederick Augustus, M.A., M.D., F.R.S., Fellow and Bursar of Wadham College, (PRES., 1909-10; V.-PRES., 1904-5, 1911; COUNCIL, 1895, 1904-6), *Wadham College, Oxford.*
- 1895 DOBSON, H. T., *Ivy House, Accacia Grove, New Malden S.O., Surrey.*
- 1909 † DOBSON, Thomas, 1, *Grant-street, Farnworth, Bolton.*
- 1905 DODD, Frederick P., *Kuranda, viâ Cairns, Queensland.*
- 1912 DOIG, Capt. Kenneth Alan Crawford, R.A.M.C., M.R.C.S., L.R.C.P., c/o Messrs. Holt & Co., 3, *Whitehall-place, London, S.W.*
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- 1903 DOLLMAN, J. C., *Hove House, Newton-grove, Bedford-park, W.*
- 1906 DONCASTER, Leonard, M.A., *The University Museum of Zoology, Cambridge.*
- 1891 DONISTHORPE, Horace St. John K., F.Z.S., (V.-PRES., 1911; COUNCIL, 1899-1901, 1910-12), 58, *Kensington-mansions, South Kensington, S.W.*
- 1913 DOW, Walter James, *The Cottage, Lynwood-avenue, Epsom.*
- 1910 DOWNES-SHAW, Rev. Archibald, *Gt. Horton Vicarage, Bradford.*

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- 1867 * DRUCE, Herbert, F.L.S., F.Z.S., (COUNCIL, 1885, 1892).
- 1900 DRURY, W. D., *Rocquaine, West Hill Park, Woking.*
- 1894 DUDGEON, G. C., Director General of the Dept. of Agriculture, *Mead, Cairo.*
- 1913 DUFFIELD, Charles Alban William, *Stowting Rectory, Hythe, and Wye College, Kent.*
- 1906 DUKINFIELD JONES, E., *Castro, Reigate.*
- 1883 DURRANT, John Hartley, VICE-PRESIDENT, (COUNCIL, 1911-), *Merton, 17, Burstock-road, Putney, S.W., and British Museum (Natural History), Cromwell-road, South Kensington, S.W.*
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- 1865 EATON, The Rev. Alfred Edwin, M.A., (COUNCIL, 1877-9), *Richmond Villa, Northam S.O., N. Devon.*
- 1904 ECKFORD, George, F.Z.S., c/o Sir Morgan Tuite, Bart., *Kilruane, Nenagh, Co. Tipperary, Ireland.*
- 1902 EDELSTEN, Hubert M., *The Elms, Forty Hill, Enfield, Middlesex.*
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- 1886 EDWARDS, James, *Colesborne, Cheltenham.*
- 1884 EDWARDS, Stanley, F.L.S., F.Z.S., (COUNCIL, 1912-), 15, *St. Germans-place, Blackheath, S.E.*
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- 1903 ETHERIDGE, Robert, *Curator, Australian Museum, Sydney, N.S.W.*
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- 1898 FOUNTAINE, Miss Margaret.
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- 1865 † GODMAN, Frederick Du Cane, D.C.L., F.R.S., F.L.S., F.Z.S., (PRES., 1891-2 ; V.-PRES., 1882-3, 1886, 1889-90, 1902 ; COUNCIL, 1880-1, 1900), *South Lodge, Lower Beeding, Horsham ; and 45, Pont-street, S.W.*
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- 1894 GRIMSHAW, Percy H., *Royal Scottish Museum, Edinburgh.*
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- 1910 GURNEY, William B., Asst. Govt. Entomologist, *Department of Agriculture, Sydney, Australia.*
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- 1885 HALL, Thomas William, *Stanhope, The Crescent, Croydon.*
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- 1913 † HAWKSHAW, Oliver, 3, *Hill-street, Mayfair, W.*
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- 1910 HENDERSON, J., c/o Messrs. Osborne & Chappel, *Ipoh, Perak, F.M.S.*
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- 1903 HERROD, William, *W.B.C. Apiary, Old Bedford-road, Luton, Beds.*
- 1908 HEWITT, C. Gordon, D.Sc., *Central Experimental Farm, Dept. of Agriculture, Ottawa, Canada.*
- 1913 HEWITT, John, B.A., Director, *Albany Museum, Grahamstown, S. Africa.*
- 1913 HILL, Gerald F., Govt. Entomologist, *Port Darwin, Northern Territory, South Australia.*
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- 1907 HOAR, Thomas Frank Partridge, *Mercia, Albany-road, Leighton Buzzard.*
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- 1902 HOLE, R. S., c/o Messrs. King and Co., *Bombay.*
- 1910 HOLFORD, H. Oliver, *Elstead Lodge, Godalming, Surrey.*
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- 1901 HOPSON, Montagu F., L.D.S., R.C.S.Eng., F.L.S., 64, *Harley-street, W.*
- 1897 HORNE, Arthur, 60, *Gladstone-place, Aberdeen.*
- 1903 HOUGHTON, J. T., 1, *Portland-place, Worksop.*
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- 1900 HOWES, W. George, 432, *George-street, Dunedin, New Zealand.*
- 1907 HOWLETT, Frank M., M.A., *Wymondham, Norfolk.*
- 1865 † HUDD, A. E., 108, *Pembroke-road, Clifton, Bristol.*
- 1888 HUDSON, George Vernon, *Hill View, Karori, Wellington, New Zealand.*
- 1907 HUGHES, C. N., 3, *Wyndham Place, Bryanston-square, W.*
- 1912 HUIE, Miss Lily, *Hollywood, Colinton-road, Edinburgh.*

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- 1912 † IMMS, A. D., D.Sc., B.A., F.L.S., *Entomological Dept., The University, Manchester.*
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- 1907 JACK, Rupert Wellstood, Government Entomologist, Department of Agriculture, *Salisbury, Rhodesia.*
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- 1869 JANSON, Oliver E., *Cestria, Claremont-road, Highgate, N.; and 44, Great Russell-street, Bloomsbury, W.C.*
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- 1912 JARDINE, Nigel K., *Le Syndicat des Fabricants de Sucre, L'Isle de Réunion.*
- 1912 JEMMETT, C., *Ashford, Kent; and Agricultural College, Wye, Kent.*
- 1886 JENNER, James Herbert Augustus, *East Gate House, Lewes.*
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- 1908 JOICEY, James J., *The Hill, Witley, Surrey.*
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- 1910 JOSEPH, E. G., 23, *Clanricarde-gardens, W.*
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- 1896 † KAYE, William James, (COUNCIL, 1906-8), *Caracas, Ditton Hill, Surbiton.*
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- 1905 MERRY, Rev. W. Mansell, M.A., *St. Michael's, Oxford.*
- 1912 METCALFE, Rev. J. W., *The Vicarage, Ottery St. Mary, Devon.*
- 1888 * MEYER-PACINI, G., 5, *Viale Poggio Imperiale, Florence.*
- 1880 MEYRICK, Edward, B.A., F.R.S., F.Z.S., *Thornhanger, Marlborough.*
- 1894 MIALI, Louis Compton, F.R.S., (COUNCIL, 1903, 1908), *Norton Way N., Letchworth.*
- 1908 MIDDLETON, Ivan E., *Plevna House, Mussoorie, U. P., India.*
- 1883 MILES, W. H., c/o E. Step, Esq., *Oakwood House, Ashstead, Surrey.*
- 1913 MILLER, F. V. Bruce, *Livingston, N. Rhodesia, Africa.*
- 1906 MITCHELL-HEDGES, Frederic Albert.
- 1905 MITFORD, Robert Sidney, C.B., 35, *Redcliffe-square, S.W.*
- 1879 MONTEIRO, Dr. Antonio Augusto de Carvalho, 70, *Rua do Alecrinar, Lisbon.*
- 1902 MONTGOMERY, Arthur Meadows, 34, *Shalimar Gardens, Pembridge-road, North Acton, W.*
- 1899 MOORE, Harry, 12, *Lower-road, Rotherhithe.*
- 1907 MOORE, Mrs. Catharine Maria, *Holmefield, Oakholme-road, Sheffield.*
- 1886 MORGAN, A. C. F., F.L.S., 135, *Oakwood-court, Kensington, W.*
- 1889 † MORICE, The Rev. F. D., M.A., Fellow of Queen's College, Oxford, VICE-PRESIDENT, (PRES., 1911, 1912, V.-PRES., 1902, 1904; COUNCIL, 1902-4), *Brunswick, Mount Hermon, Woking.*
- 1895 † MORLEY, Claude, F.Z.S., *Monk Soham House, Suffolk.*
- 1912 MORRELL, R. D'A., *Authors' Club, 1, Whitehall-court, S.W.*
- 1907 MORTIMER, Charles H., *Royton Chase, Byfleet, Surrey.*
- 1893 MORTON, Kenneth J., 13, *Blackford-road, Edinburgh.*
- 1910 MOSELY, Martin E., 21, *Alexandra-court, Queen's-gate, S.W.*
- 1900 MOSER, Julius, 59, *Bulow-strasse, Berlin.*
- 1882 MOSLEY, S. L., *The Museum and Technical College, Huddersfield.*

- 1911 MOSS, Rev. A. Miles, *Helm, Windermere.*
 1907 † MOULTON, John C., *Sarawak Museum, Sarawak.*
 1911 MOUNSEY, J. Jackson, 24, *Glencairn-crescent, Edinburgh.*
 1901 † MUIR, Frederick, *H.S.P.A. Experiment Station, Honolulu, Oahu, H.T.*
 1912 † MULLAN, Jal Phirozshah, M.A., F.L.S., F.Z.S., Assistant Professor of Biology, *Lamington-road, Bombay, India.*
 1869 † MÜLLER, Albert, F.R.G.S., (COUNCIL, 1872-3), c/o Herr A. Müller-Mechel, *Grenzacherstrasse 60, Basle, Switzerland.*
 1906 MUSCHAMP, Percy A. H., *Institut, Stäfa, nr. Zurich, Switzerland.*
 1909 MUSHAM, John F., 48, *Brook-street, Selby, Yorks.*
- 1903 NEAVE, S. A., B.A., *Mill Green Park, Ingatestone.*
 1901 NEVINSON, E. B., *Morland, Cobham, Surrey.*
 1907 NEWMAN, Leonard Woods, *Bexley, Kent.*
 1913 NEWMAN, Leslie John William, *Dept. of Agriculture, Perth, W. Australia.*
 1909 NEWSTEAD, Alfred, *The Grosvenor Museum, Chester.*
 1890 NEWSTEAD, Robert, M.Sc., A.L.S., Hon. F.R.H.S., Dutton Memorial Professor of Entomology, *The School of Tropical Medicine, University of Liverpool.*
 1909 NICHOLSON, Gilbert W., M.A., M.D., (COUNCIL, 1913-), *Oxford and Cambridge Club, Pall Mall, S.W.*
 1886 NICHOLSON, William E., *School Hill, Lewes.*
 1906 NIX, John Ashburner, *Tilgate, Crawley, Sussex.*
 1912 NOAKES, Alfred, *The Hill, Witley, Surrey.*
 1878 NOTTIDGE, Thomas, *Ashford, Kent.*
 1895 NURSE, Lt.-Colonel C. G., *Timworth Hall, Bury St. Edmunds.*
 1908 NURSE, H. A., *Education Department, Trinidad, B.W.I.*
- 1877 OBERTHÜR, René, *Rennes (Ille-et-Vilaine), France.*
 1893 † OGLE, Bertram S., *Steeple Aston, Oxfordshire.*
 1910 OLDAKER, Francis A., M.A., *The Red House, Haslemere.*
 1873 OLIVIER, Ernest, *Ramillons, près Moulins (Allier), France.*
 1913 ORMISTON, Walter, *Kakupahani, Haldumille, Ceylon.*
- 1895 PAGE, Herbert E., *Bertrose, Gellatly-road, St. Catherine's Park, S.E.*
 1912 PATERSON, Edward J., *Fairholme, Crowborough.*
 1913 PEACOCK, Alexander David, 137, *Wingrove-gardens, and Armstrong College, Newcastle-on-Tyne.*
 1907 PEAD, Clement H., *Box 252, Bulawayo, South Africa.*
 1911 PEARSON, Douglas, *Chilwell House, Chilwell, Notts.*
 1883 PÉRINGUEY, Louis, D.Sc., F.Z.S., Director, *South African Museum, Cape Town, South Africa.*
 1903 † PERKINS, R. C. L., M.A., D.Sc., F.Z.S., *Park Hill House, Paignton, Devon*, and Board of Agriculture, Division of Entomology, *Honolulu, Hawaii.*
 1879 PERKINS, Vincent Robert, *Wotton-under-Edge.*

- 1907 † PERRINS, J. A. D., 3rd Seaforth Highlanders, *Davenham, Malvern*.
- 1897 PHILLIPS, Hubert C., M.R.C.S., L.S.A., 262, *Gloucester-terrace, Hyde-park, W.*
- 1903 † PHILLIPS, Montagu A., F.R.G.S., F.Z.S., 22, *Petherton-road, High-bury New Park, N.*
- 1891 PIERCE, Frank Nelson, 1, *The Elms, Dingle, Liverpool*.
- 1903 PILCHER, Colonel Jesse George, I.M.S., F.R.C.S., 133, *Gloucester-road, Kensington, S.W.*
- 1910 PILLAI, A. Raman, *University Union, Edinburgh, and Trivandrum, India*.
- 1913 PLATT, Ernest Edward, 403, *Essenwood-road, Durban, Natal*.
- 1885 POLL, J. R. H. Neerwort van der, *Driebergen, Netherlands*.
- 1870 † PORRITT, Geo. T., F.L.S., (COUNCIL, 1887), *Elm Lea, Dalton, Huddersfield*.
- 1913 PORTER, Prof. Carlos, C.M.Z.S., Professor of Zoology, *Agricultural Institute, Santiago, Chile*.
- 1884 † POULTON, Professor Edward B., D.Sc., M.A., F.R.S., F.L.S., F.G.S., F.Z.S., Hope Professor of Zoology in the University of Oxford, (PRES., 1903-4; V.-PRES., 1894-5, 1902, 1905; COUNCIL, 1886-8, 1892, 1896, 1905-7), *Wykeham House, Banbury-road, Oxford*.
- 1905 POWELL, Harold, 7, *Rue Mireille, Hyères (Var), France*.
- 1906 PRATT, H. C., Government Entomologist, Federated Malay States, *Kuala Lumpur, Malay States*.
- 1908 PRATT, William B., 10, *Lion Gate Gardens, Richmond, Surrey*.
- 1878 PRICE, David, 48, *West-street, Horsham*.
- 1908 PRIDEAUX, Robert M., *Woodlands, Brasted Chart, Sevenoaks*.
- 1904 PRISKE, Richard A. R., 9, *Melbourne Avenue, West Ealing*.
- 1893 PROUT, Louis Beethoven, (COUNCIL, 1905-7), 84, *Albert-road, Dalston, N.E.*
- 1910 PUNNETT, Professor Reginald Crundall, M.A., *Caius College, Cambridge*.
- 1912 QUERCI, Orazio, *Macerata, Marche, Italy*.
- 1900 RAINBOW, William J., *The Australian Museum, Sydney, N.S.W.*
- 1912 RAIT-SMITH, W., 86, *Gladstone-street, Abertillery, Monmouthshire*.
- 1913 RAO, H. Ananthaswamy, *Curator of the Government Museum, Bangalore, India*.
- 1907 RAYWARD, Arthur Leslie, *Rockford, Beechwood-road, Sanderstead*.
- 1893 REID, Captain Savile G., late R.E., *The Elms, Yalding, Maidstone*.
- 1898 RELTON, R. H., c/o Perkins and Co., Ltd., *Brisbane, Queensland*.
- 1898 REUTER, Professor Enzo, *Helsingfors, Finland*.
- 1910 DE RHÉ-PHILIPPE, G. W. V., c/o Grindlay & Co., *Hastings-street, Calcutta*.
- 1912 RILEY, Norman Denbigh, 94, *Drakefield-road, Upper Tooting, S.W.*, and *British Museum (Natural History), S. Kensington, S.W.*
- 1908 RIPPON, Claude, M.A., 28, *Walton-street, Oxford*.

- 1905 ROBINSON, Herbert C., *Curator of State Museum, Kuala Lumpur, Selangor.*
- 1904 ROBINSON, Lady, *Workshop Manor, Notts.*
- 1892 ROBINSON, Sydney C., 10, *Inchmory-road, Catford, S.E.*
- 1869 † ROBINSON-DOUGLAS, William Douglas, M.A., F.L.S., F.R.G.S., *Orchardton, Castle Douglas.*
- 1908 ROGERS, The Rev. K. St. Aubyn, M.A., Church Missionary Society, *Mombasa, British East Africa.*
- 1886 ROSE, Arthur J., 1, *Harewood-road, S. Croydon.*
- 1912 ROSEN, Kurt, Baron, *Zoologische Staatssammlung, Munich.*
- 1907 ROSENBERG, W. F. H., 57, *Haverstock-hill, N.W.*
- 1868 ROTHNEY, George Alexander James, *Pembury, Tudor-road, Upper Norwood, S.E.*
- 1894 † ROTHSCHILD, The Honble. Nathaniel Charles, M.A., F.L.S., F.Z.S., (COUNCIL, 1904, 1913-), *Arundel-house, Kensington Palace Gardens, W.*
- 1888 † ROTHSCHILD, The Honble. Walter, D.Sc., F.R.S., F.L.S., F.Z.S., (COUNCIL, 1900), *Zoological Museum, Tring.*
- 1890 ROUTLEDGE, G. B., *Turn Lodge, Heads Nook, Carlisle.*
- 1913 ROWDEN, Alfred Oliver, 3, *Archibald-road, Exeter.*
- 1887 ROWLAND-BROWN, Henry, M.A., (V.-PRES., 1908, 1910; SEC., 1900-10), *Oxhey-grove, Harrow Weald.*
- 1910 RUDGE, Charles Henry, 10, *Norfolk-road, St. John's Wood, N.W.*
- 1898 RUSSELL, A., *Wilverley, Dale-road, Purley.*
- 1892 RUSSELL, S. G. C., 19, *Lombard-street, E.C.*
- 1905 ST. QUINTIN, W. H., *Scampton Hall, Rillington, York.*
- 1906 SAMPSON, Lt.-Colonel F. Winn, 74, *Vineyard Hill-road, Wimbledon Park.*
- 1910 SAUNDERS, H. A., *Brookfield-house, Swanage.*
- 1901 SCHAUS, W., F.Z.S., *U.S. National Museum, Washington, D.C., U.S.A.*
- 1907 SCHMASSMANN, W., *Beulah Lodge, London-road, Enfield, N.*
- 1912 SCHUNCK, Charles A., *Ewelme, Wallingford.*
- 1881 SCOLICK, A. J., 8, *Elmswood, Malden-road, New Malden.*
- 1911 SCORER, Alfred George, *Hill Crest, Chilworth, Guildford.*
- 1909 SCOTT, Hugh, B.A., *University Museum of Zoology, Cambridge.*
- 1911 SCOTT, Percy William Affleck, Chinese Imperial Customs Service, *Hangchow, China.*
- 1912 SEITZ, Dr. Adalbert, 59, *Bismarckstrasse, Darmstadt, Germany.*
- 1911 SELOUS, Cuthbert F., M.D., M.R.C.S., L.R.C.P., *Agra, Barton-on-Sea, New Milton, Hants.*
- 1911 † SENNETT, Noel Stanton, 32, *Bolton-gardens, S. Kensington, S.W.*
- 1862 SHARP, David, M.A., M.B., F.R.S., F.L.S., F.Z.S., (PRES., 1887-8; V.-PRES., 1889, 1891-2, 1896, 1902-3; SEC., 1867; COUNCIL, 1893-5, 1902-4), *Lawnside, Brockenhurst, Hants.*
- 1902 SHARP, W. E., (COUNCIL, 1912-), *Charterlea, Wokingham-road, Crowthorne, Berks.*

- 1886 SHAW, George T. (Librarian of the Liverpool Free Public Library),
William Brown-street, Liverpool.
- 1905 SHELDON, W. George, *Youlgreave, South Croydon.*
- 1900 † SHEPHEARD-WALWYN, H. W., M.A., *Dalwhinnie, Kenley, Surrey.*
- 1887 † SICH, Alfred, (COUNCIL, 1910-12), *Corney House, Chiswick, W.*
- 1911 SIMES, James A., *Mon Repos, Monkham's-lane, Woodford-green, Essex.*
- 1904 SIMMONDS, Hubert W., *Sussex View, Cumberland-gardens, Tunbridge Wells, Kent.*
- 1913 SITWELL, Capt. F., *Wooler, Northumberland.*
- 1902 SLADEN, Frederick William Lambart, *Dept. of Agriculture, Central Experimental Farm, Ottawa, Canada.*
- 1902 SLOPER, Gerard Orby, F.Z.S., J.P., *Badminton Club, Piccadilly, W.*
- 1907 SLY, Harold Baker, *Mapledean, Ringley-avenue, Horley.*
- 1906 SMALLMAN, Raleigh S., *Eliot Lodge, Albemarle-road, Beckenham, Kent.*
- 1901 SMITH, Arthur, *County Museum, Lincoln.*
- 1911 SMITH, B. H., B.A., *Edgehill, Warlingham, Surrey.*
- 1912 SMITH, Roland T., 131, *Queen's-road, Wimbledon, S.W.*
- 1898 SOPP, Erasmus John Burgess, F.R.Met.S., 16, *Irving-road, Bourne-mouth.*
- 1885 SOUTH, Richard, (COUNCIL, 1890-1), 4, *Mapesbury Court, Shoot-up Hill, Brondesbury, N.W.*
- 1908 SPEYER, Edward R., *Ridgehurst, Shenley, Herts.*
- 1889 STANDEN, Richard S., F.L.S., (COUNCIL, 1906), *Newlyn, Romsey, Hants.*
- 1910 STANLEY, The Rev. Hubert George, *Marshfield Vicarage, Cardiff.*
- 1898 STARES, C. L. B., M.R.C.S., L.R.C.P., *The Limes, Swanley Junction, Kent.*
- 1898 STEBBING, Henry, *Chasewood, Round Oak Wood, Weybridge.*
- 1910 STENTON, Rupert, *St. Edward's, St. Mary Church, Torquay.*
- 1910 STONEHAM, Hugh Frederick, Lieut. E. Surrey Regt., *Wellington Barracks, Dublin.*
- 1913 STOREY, Gilbert, *Dept. of Agriculture, Cairo, Egypt.*
- 1896 STRICKLAND, T. A. Gerald, *Southcott, Poulton, Fairford.*
- 1900 STUDD, E. A. C., *P.O. Box 906, Vancouver, British Columbia.*
- 1895 STUDD, E. F., M.A., B.C.L., *Oxton, Exeter.*
- 1882 SWANZY, Francis, *The Quarry, Serenoaks.*
- 1908 SWIERSTRA, Corn. J., 1st Assistant, *Transvaal Museum, Pretoria.*
- 1884 SWINHOE, Colonel Charles, M.A., F.L.S., F.Z.S., (V.-PRES., 1894 ;
COUNCIL, 1891-3 ; 1902-4), 6, *Gunterstone-road, Kensington, W.*
- 1894 SWINHOE, Ernest, 6, *Gunterstone-road, Kensington, W.*
- 1876 SWINTON, A. H., *Oak Villa, Braishfield, Romsey, Hants.*
- 1911 SWYNNERTON, C. F. M., *Gungunyana, Melsetter, S.-E. Rhodesia.*
- 1910 TAIT, Robt., junr., *Roseneath, Harborough-road, Ashton-on-Mersey.*
- 1908 TALBOT, G., 17, *Steeles-road, Haverstock-hill, N.W.*

- 1911 TAUTZ, P. H., *Cranleigh, Pinner, Middlesex.*
- 1893 TAYLOR, Charles B., *Gap, Lancaster County, Penn., U.S.A.*
- 1911 TAYLOR, Frank H., Australian Institute of Tropical Medicine,
Townsville, Queensland.
- 1903 TAYLOR, Thomas Harold, M.A., *Yorkshire College, Leeds.*
- 1909 TETLEY, Alfred, M.A., 22, *Avenue-road, Scarborough.*
- 1910 THEOBALD, Prof. F. V., M.A., *Wye Court, Wye.*
- 1901 THOMPSON, Matthew Lawson, 40, *Gosford-street, Middlesbrough.*
- 1892 THORNLEY, The Rev. A., M.A., F.L.S., "*Hughenden*," *Coppice-road, Nottingham.*
- 1907 TILLYARD, R. J., B.A., *Kuranda, Mount Errington, Hornsby, New South Wales.*
- 1911 TODD, R. G., *The Limes, Hadley Green, N.*
- 1897 TOMLIN, J. R. le B., M.A., (COUNCIL 1911-), *Lakefoot, Hamilton-road, Reading.*
- 1907 TONGE, Alfred Ernest, *Aincroft, Reigate, Surrey.*
- 1907 TRAGARDH, Dr. Ivar, *The University, Upsala, Sweden.*
- 1859 † TRIMEN, Roland, M.A., F.R.S., F.L.S., (PRES., 1897-8 ; V.-PRES., 1896, 1899 ; COUNCIL, 1868, 1881, 1890), *Oak Meadows, Park-road, Woking.*
- 1906 TRYHANE, George E., *Pedro Miguel Canal Zone, Panama.*
- 1906 TULLOCH, Major James Bruce Gregorie, *The King's Own Yorkshire Light Infantry, Portobello Barracks, Dublin.*
- 1895 TUNALEY, Henry, 13, *Begmead-avenue, Streatham, S.W.*
- 1910 TURATI, Conte Emilio, 4, *Piazza S. Alessandro, Milan, Italy.*
- 1898 TURNER, A. J., M.D., *Wickham Terrace, Brisbane, Australia.*
- 1893 TURNER, Henry Jerome, (COUNCIL, 1910-12), 98, *Drakefell-road, St. Catherine's Park, Hatcham, S.E.*
- 1906 TURNER, Rowland E., (COUNCIL, 1909-10).
- 1893 URICH, Frederick William, C.M.Z.S., *Port of Spain, Trinidad, British West Indies.*
- 1904 † VAUGHAN, W., *The Old Rectory, Beckington, Bath.*
- 1909 VIDLER, Leopold A., *The Carmelite Stone House, Rye, Sussex.*
- 1911 VITALIS DE SALVAZA, R., *Villa Belle-Rive, Sully-sur-Loire, Loiret France.*
- 1895 WACHER, Sidney, F.R.C.S., *Dane John, Canterbury.*
- 1897 WAINWRIGHT, Colbran J., (COUNCIL, 1901, 1912-), 45, *Handsworth Wood-road, Handsworth, Birmingham.*
- 1878 WALKER, James J., M.A., R.N., F.L.S., (COUNCIL, 1894 ; SECRETARY, 1899, 1905-), *Aorangi, Lonsdale-road, Summertown, Oxford.*
- 1863 * WALLACE, Alfred Russel, O.M., D.C.L. Oxon., F.R.S., F.L.S., F.Z.S., (PRES., 1870-1 ; V.-PRES., 1864, 1869 ; COUNCIL, 1866, 1872), *Broadstone, Wimborne, Dorset.*
- 1912 WALLACE, Henry S., 17, *Kingsley-place, Heaton-on-Tyne.*

- 1866 † WALSINGHAM, The Right Honble. Lord, (PRES., 1889-90; V.-PRES., 1882, 1888, 1891-2, 1894-5; COUNCIL, 1896), *British Museum (Natural History)*, *Cromwell-road*, S.W.
- 1910 WARD, John J., *Rusinurbe House*, *Somerset-road*, *Coventry*.
- 1908 WARREN, Brisbane C. S., *Villa Romaine*, *sur Clarens*, *Switzerland*.
- 1886 WARREN, Wm., M.A., *East Croft*, *Langdon-street*, *Tring*, *Herts*.
- 1912 WATERFIELD, Mrs. Ellen N., c/o. W. M. Crowfoot, Esq., *Blyburgate House*, *Beccles*, and *The Hospital*, *Port Sudan*.
- 1869 WATERHOUSE, Charles O., I.S.O., (PRES., 1907-8; V.-PRES., 1900, 1909; COUNCIL, 1873, 1882-3; 1898-1900), *Ingleside*, *Avenue-gardens*, *Acton*, W.
- 1901 † WATERHOUSE, Gustavus A., B.Sc., F.C.S., *Allonrie*, *Stanhope-road*, *Killara*, *New South Wales*, *Australia*.
- 1893 WEBB, John Cooper, 218, *Upland-road*, *Dulwich*, S.E.
- 1908 WELLMAN, F. Creighton, M.D., *School of Tropical Medicine*, *Tulane University*, *P.O. Drawer 251*, *New Orleans*, *Louisiana*, *U.S.A.*
- 1876 † WESTERN, E. Young, 27, *Pembridge-square*, *Notting Hill Gate*, W.
- 1906 WHEELER, The Rev. George, M.A., F.Z.S., (SECRETARY, 1911-), 37, *Gloucester-place*, W.
- 1910 WHITE, Edward Barton, M.R.C.S., *Cardiff City Mental Hospital*, *Cardiff*.
- 1907 WHITE, Harold J., 42, *Nevern-square*, *Kensington*, S.W.
- 1911 WHITEHOUSE, H. Beckwith, M.S., F.R.C.S., 52, *Newhall-street*, *Birmingham*.
- 1913 † WHITLEY, Percival N., *New College*, *Oxford*, and *Brankwoods*, *Halifax*.
- 1913 † WHITTAKER, Oscar, *Ormiddle*, *Ashlands*, *Ashton-upon-Mersey*.
- 1911 WHITTINGHAM, Rev. W. G., *Knighton Rectory*, *Leicester*.
- 1906 WICKWAR, Oswin S., *Charlemont*, *Gregory-road*, *Colombo*, *Ceylon*.
- 1903 WIGGINS, Clare A., M.R.C.S., *Entebbe*, *Uganda*.
- 1896 WILEMAN, A. E.
- 1910 WILLCOCKS, Frank C., Entomologist to the Khedivial Agricultural Society, *Cairo*, *Egypt*.
- 1911 WILLIAMS, C. B., *The John Innes Horticultural Institute*, *Mostyn-road*, *Merton*, *Surrey*.
- 1894 WOLLEY-DOD, F. H., *Millarville P. O.*, *Alberta*, *N.W.T.*, *Canada*.
- 1900 WOOD, H., *Kennington*, *near Ashford*, *Kent*.
- 1881 WOOD, The Rev. Theodore, *The Vicarage*, *Lyford-road*, *Wandswoth Common*, S.W.
- 1905 WOODBRIDGE, Francis Charles, *The Briars*, *Gerrard's Cross*, *S.O.*, *Bucks*.
- 1912 WOODRUFFE-PEACOCK, Rev. E. Adrian, F.L.S., F.G.S., *Cadney Vicarage*, *Brigg*, *Lincolnshire*.
- 1888 YERBURY, Colonel John W., late R.A., F.Z.S., (COUNCIL, 1896, 1903-5), 2, *Ryder-street*, *St. James's*, S.W.
- 1892 YODALE, William Henry, F.R.M.S., 21, *Belle-Isle-street*, *Workington*.

ADDITIONS TO THE LIBRARY

DURING THE YEAR 1913.

- ABSALON (K.). Über *Antrophilon primitivum*, nov. gen., nov. sp., eine blinde Bathysciine (Coleoptera cavernicola, Silphidae) aus dem südillyrischen Faunengebiete.
Coleopt. Rundschau, [1913.]
- Über *Scotoplanetes arenstorffianus*, nov. subg., nov. spec., eine neue Anophthalmen type (Coleoptera, Carabidae) aus dem Ponor-Gebiete der Trebinjica in Südosthercegovina.
[Coleopt. Rundschau, 1913.] *The Author.*
- ALEXANDER (C. P.). A revision of the South American Dipterous insects of the family Ptychopteridae.
[Proc. U. S. Nat. Mus., Vol. XLIV, 1913.]
- A Synopsis of part of the Neotropical crane-flies of the sub-family Limnobiinae.
[Proc. U. S. Nat. Mus., Vol. XLIV, 1913.]
The Smithsonian Institution.
- AURIVILLIUS (Chr.). Svensk Insektfauna. 13. Steklar, Hymenoptera. 2. Guldsteklar, Tubulifera. Uppsala, 1911.
- Neue oder wenig bekannte Coleoptera Longicornia. 12.
[Arkiv för Zool., Band 7, No. 19, 1911.]
- Collections recueillies par M. Maurice de Rothschild en Abyssinie et dans l'Afrique orientale.
[Bull. Mus. d'Hist. Nat., 1912.]
- Neue oder wenig bekannte Coleoptera Longicornia. 13.
[Arkiv för Zool., Band 8, No. 22, 1913.]
- Curculioniden und Cerambyciden gesammelt während der schwedischen zoologischen expedition nach British Ostafrika.
[Arkiv för Zool., Band 8, No. 21, 1913.]
- New Species of Longicorns from Borneo.
[Journ. Sarawak Mus., I, 1913.] *The Author.*
- , BERNHAUER (Max), GEBIEN (H.), HELLER (K. M.), SCHMIDT (Adolf), and STROHMAYER (H.). Botanische und Zoologische Ergebnisse einer Wissenschaftlichen forschungsreise nach den Samoa-Inseln, dem Neuguinea-Archipel und Salomonsinseln von März bis Dezember 1905. VIII. Beiträge zur kenntnis der Coleopterenfauna der Samoainseln.
[Denkschr. Math.-Naturw. K. Akad. Wiss., LXXXIX, 1913.]
The Authors.
- AUSTEN (E. E.). The House-fly as a danger to health, its life-history and how to deal with it.
[Brit. Mus. (Nat. Hist.), Econ. Series, No. 1, 1913.]
Trustees Brit. Mus.
- BACOT (A. W.). On the survival of bacteria in the alimentary canal of fleas during metamorphosis from larva to adult.
[Journ. Hygiene, Plague Suppl. III, Jan. 1914.] *The Author.*
- BAGNALL (R. S.). [See SLADEN (F. W. L.)]

- BAKER (A. C.). [See QUAINANCE (A. L.).]
- BARBER (T. C.). [See NEWELL (Wilmon).]
- BERICHT über die wissenschaftlichen Leistungen im Gebiete der Entomologie während des Jahres 1911, Heft 2-5. Published in 1913.
[By R. Lucas, K. Grünberg, H. Schouteden, and W. La Barme.]
Purchased.
- BERNHAEUER (Max). [See AURIVILLIUS (Chr.).]
- BEVERIDGE (W. W. O.). [See DURRANT (J. Hartley).]
- BISCHOFF (H.). [See WYTSMAN'S Genera Insectorum.]
- BISHOPP (F. C.). The fowl tick (*Argas miniatus*, Koch).
[U. S. Dept. Agric., Bureau Entom., Circular No. 170, 1913.]
U. S. Dept. Agric.
- BOYD (Thomas). Memorial Notices from Entomological periodicals, with portrait. Llanfairfechan, 1913. *Willoughby Gardner.*
- BRANTS (A.). Neerlandische Vlinders. Beschreven en Afgebeeld. Derde Serie van Sepp's Nederlandsche Insecten. Pts. V-VIII [1908-1912?].
Purchased.
- BRETHES (Jean). Description d'un Coléoptère argentin nouveau [*Eustilbus gossypii*].
[Boletín de la Sociedad Physis para el cultivo y difusión de las ciencias naturales en la Argentina, Tomo I, No. 2, 1912.]
- Trabajos entomológicos publicados en los Nos. 1-2 del Tomo XVII (1913) de la Revista Chilena de Historia Natural. [*Pseudhydrobaenus porteri*, n.sp., *Aphidius chilensis*, n.sp., and *Pentarthrum porteri*, n.sp.]
[Reprinted from the Revista Chilena Hist. Nat., Año XVII, 1913.]
- Description d'un nouvel Hyménoptère.
[Rev. Chil. Hist. Nat., Año XVII, 1913.]
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TRANSACTIONS
OF THE
ENTOMOLOGICAL SOCIETY
OF
LONDON
FOR THE YEAR 1913.

I. *A few Observations in Mimicry.* By W. J. KAYE.

[Read October 16th, 1912.]

PLATE I.

AT the present time, when so much doubt is being cast on the theories of Bates and Fritz Müller concerning Mimicry, it would be as well to put on record some observations that have come under the notice of the writer, and to illustrate the insects concerned with a plate of figures. The drawing of the latter has been done by Mr. Horace Knight, and it is largely to his skill that many who cannot possibly see the specimens will be able to form an idea of some of the extraordinary resemblances. But the object of the present paper is primarily to record the habits of the mimicking insects, and to point out that they are quite abnormal in the family to which they belong, and must have been developed for a specific purpose. All the mimics are members of the family *Syntomidae*, while the models consist chiefly of *Hymenoptera aculeata*, but also *Coleoptera*, *Hymenoptera terebrantia*, and in a single case to another lepidopteron. There are many who, while disbelieving in mimicry generally, yet half believe the action of mimicry when between such widely differing insects as those of the *Hymenoptera aculeata* and the *Lepidoptera*. The theory of Bates then seems as if it might be true, for it is obvious that a stinging wasp must be unpalatable, while by comparison a small moth might well be palatable

and escape under the guise of the model. To those naturalists who have lived in tropical or subtropical S. America, instances of mimicry between the Syntomidae and Hymenoptera, Coleoptera, Diptera and others, are constantly coming to notice. But very few cases have been figured of the models with their mimics. It is to be hoped, therefore, that the present small collection of cases will be useful as well as interesting to those who are interested in these extraordinary resemblances and the reasons that cause them.

The altered habits of some of the *Syntomidae* are most striking, for when we remember the very different ends to be obtained by a ♀ wasp and a ♀ moth there can be nothing really in common. The wasp is predatory and kills all sorts of insects to provide food for the resultant larvae from the eggs she lays, but the female moth merely lays her eggs on a suitable plant or shrub. Any habits, then, that the moth has that are wasp-like are certainly not directly useful to the species concerned except in the way of imitation which quite conceivably deceives its enemies. That there is a reason for these resemblances is universally admitted, and in the cases of moths being like various species of the *Hymenoptera aculeata* it is impossible to argue that the same environment and general conditions can produce habits in moths which are of no use whatever to them except as a disguise. But if the moths themselves were not like the wasps one might argue that it was accidental that the habits were so alike, but the general appearance and structure are in conjunction with the habits so alike that in the species of *Pseudosphex* it is impossible to distinguish moth from wasp on the flower-heads of *Ageratum conyzoides* unless one is within eighteen inches or so, while on the wing at any distance it is quite impossible to distinguish them. But while the species of *Pseudosphex* are mimics of the highest degree, vast numbers of other *Syntomidae* are only very slightly less perfect in their resemblances and habits. Species of the genus *Macrocneme*, although always distinguishable to an entomologist, are wonderfully like members of the genera *Salix* and *Pepsis* of Pompilid or fossorial wasps. The rapid vibrating of the wings, and the waving of the antennae when alighted on a leaf or on the ground, is a most noticeable habit in a moth, which at once recalls the motions of the Pompilids. It should be mentioned also that species of *Macrocneme* do

not often settle on flowers, but like the fossorial wasps settle on the ground, on a bank, or on a leaf, places identical with where the Pompilid wasp settles. As to whether such cases of mimicry are Batesian or Müllerian in their origin is probably not difficult of solution. It seems reasonable to suppose that the former is the explanation, for a powerful stinging wasp is not only unpalatable, but is actually dangerous to an attacking enemy, while the moth is harmless and must by comparison be even palatable. But Müllerian mimicry for its working presupposes experimental attack on model and mimic alike. In such a case as a stinging hymenopteron for a model it is unlikely that experimental attacks could be numerous enough, if they occurred at all, to affect to any appreciable extent its numbers. As soon as the young bird was old enough and able to catch insects and feed itself would it not instinctively leave wasps alone, seeing that all wasps can sting and to that extent at least be unpleasant? Instinct is a real thing, which Lloyd Morgan has so pithily expressed as follows: "Instinct depends on how the nervous system is built through heredity." Now, with the lepidoptera as food for birds, instinct as to which are good and which are bad probably does not count to any appreciable extent. Experiences are varied and the nervous system is probably affected in a very complex fashion, so that anything definite is not transmitted by heredity, such as must be concerning the edibility of wasps.

DETAILS OF THE INSECTS FIGURED.

Fig. 1 represents *Trichura grandis*. This fine species was described by me after I had observed and taken it near Santos in February 1910. It flew and alighted just like a large wasp. The only specimen that I was able to catch was flying along a path in the forest, and several times I noted it settling on the ground, and finally it was observed settled on a leaf vibrating its wings when it was taken. Unfortunately no wasp was taken that could be claimed to be its model, but at that time (Feb. 27th) the species was only just beginning to appear, as Mr. Dukinfield Jones took a series later on, but did not specially look for a model. The habits of several species of *Trichura* are identical in the manner of flying low down along a path and settling on the ground. At the same time and place *T. dixanthia* was so observed, and the remarkable tail to the abdomen

was quite conspicuous. This remarkable structure recalls the ovipositor of a parasitic hymenopteron, but no such possible model was observed.

Fig. 4 is *Pseudosphex noverca*, Schs., and fig. 4a is the model *Polybia nigra*, Sauss., a Vespid wasp. This Vespid was not taken by me with the *Pseudosphex*, but Mr. C. Schrottky has taken the two together on *Ageratum conyzoides* in Paraguay. This same plant, which is very abundant in S. Brazil and Paraguay, always attracts a large number of Syntomidae, as well as wasps of both the families *Vespidae* and *Eumenidae*. It was on this same plant that the *Pseudosphex* was taken together with a Eumenid wasp, *Zethus binodis*. The mimicry of these two is remarkable even when they are sitting together as I found them, but the Vespid species *Polybia nigra* is even better, and it is most probable that it also occurs where I took the Eumenid at Fernandez, for it has a wide range. The wonderful special development of the *Pseudosphex* is first of all worth describing. First there are the antennae, which in the stout pectinated portion are just about the length of the wasp's antennae. The fine thread-like tip to the antenna of the Syntomid is hardly visible except one is looking very close. In the figure the pectinations end too gradually, the specimens showing that the pectinations end rather abruptly, giving the antenna at a short distance the exact build of a wasp's. This characteristic is shown better in fig. 5 of *Pseudosphex jonesi*, but even then the thread-like end is not fine enough. The very marked constriction of the basal segments, the very smooth scaling of the head, thorax and abdomen and the colouring of both wings, thorax and abdomen altogether makes these moths most wasp-like. In all of them, also, the profile view of the head is remarkable, for the palpi are densely scaled on the first and second joints, so that the strong jaws of the wasp are most completely imitated. In profile the general resemblance is most complete, for in every way there is imitation of the wasp. When viewed above only, is the larger head of the wasp distinctive.

The habits of the species of *Pseudosphex* are equally remarkable with their structure. Of the four species figured no less than three, *P. novercida*, *P. noverca* and *P. polybioides* (figs. 3, 4 and 6), occurred together at Fernandez, while the fourth, *P. jonesi* (fig. 5), was found at Alto da Serra. All the species were found to visit the flowers of

Ageratum in the early morning sunshine before the sun had gained much heat. They then alighted with wings held back over the abdomen and then slightly lowered them downwards and outwards; but to complete the resemblance on the flower-heads these several species of *Pseudosphex* greatly curve their fore-wings while the hind-wing is folded up, so that the wings appear to be as narrow as the completely folded wings of the *Vespidæ* and *Eumenidæ*. A further habit that was observed by Mr. Dukinfield Jones when with me was that in the case of *Pseudosphex jonesi* he saw that species move its abdomen in and out in just the way that a wasp does, especially when about to use its sting. The several species of this remarkable genus when disturbed flew off the flowers rapidly, and it was impossible for one to follow the flight. The several figures of these moths and wasps with folded wings are unfortunately not quite shown correctly. The artist has drawn them all to show the complete wings, whereas all the specimens show the strong curving of the fore-wing in the case of the moths and folding in the case of the wasps. Figs. 3 and 3a represent an undescribed species of *Pseudosphex* which I propose to call *Pseudosphex novercida*. In the Entomologist for 1911, p. 142, I described a species as *P. polybia* which by an error was the already described *Pseudosphex noverca*, Schs.

Pseudosphex novercida, nov.

Very close to *Pseudosphex noverca*, Schs., but differs in the following respects. It has vein 2 of the fore-wing from close to cell while *noverca* has it from long before the end. The white-edged valve on the underside of abdomen is followed by a white band, which is not present in *noverca*. Above, the wings are darker and more sooty in appearance, but the dark scaling does not extend beyond the cell as in *noverca*. In the hind-wing the cell is completely occupied with smooth dark scales while in the case of *noverca* it is only the upper part of the cell that is so scaled. In shape rather less rounded in outline with both fore- and hind-wing slightly narrower. The femur of the front pair of legs is black while *noverca* is white.

Habitat. FERNANDEZ PINHEIRO, 12. iv. 10. (*W. J. Kaye*), Castro (*E. Dukinfield Jones*).

Fig. 2 is another new species closely allied to the common *Sphecosoma melissa*, Schs., but abundantly distinct in many ways. I propose calling it

Sphecosoma melissina, nov.

Palpi orange. Frons white. Collar orange. Thorax black and orange striped. Abdomen with the first three segments like the thorax; 4th segment almost wholly black; 5th, 6th and 7th segments darker orange with a central black line: anal segment black. First and second pair of legs with the tarsal joints blackish below. Hind-legs wholly orange above and below. Antennae black. Forewing yellowish hyaline with the costa slightly and with the inner margin broadly at base orange. Costa beyond middle of cell narrowly black. Apex black. Inner margin narrowly black slightly widened at vein 2. Hind-wing yellowish hyaline. The cell with some orange scaling and anal angle with some black scaling up to the basal vein.

Exp. 23 mm.

Habitat. S. BRAZIL: Guaruja, Santos, 27. ii. 10, several specimens (*W. J. Kaye*).

Fig. 7 represents a *Correbidia*, while fig. 7a is its model *Calopteron braziliense*. Both insects were caught together on a very dwarf-growing species of *Ageratum* with small white flowers on 27th Feb. '10. The specimen figured of the Coleopteron is not the specimen that was taken, but is a specimen of the same species from Rio Janeiro. The species is very variable, and if one had taken a number of the insects at Guaruja it is highly probable that one would have secured a specimen exactly like the moth. The difference in the specimen figured of the *Calopteron* and the single example taken is that the Rio specimen has more black on the base of the elytra. It has been figured in preference also because it is in a perfectly natural position and so corresponds with the Syntomid, which also is in a perfectly natural position of rest.

The similarity of these Lycid beetles with Syntomid moths has been noticed by several writers. The heavily pectinated antennae with the pectinations carried to the tip strongly suggest the stout-jointed antennae of the beetle. The abdomen is rather flattened like the beetle, while the shape, colour and manner of folding of the wings is most suggestive of the beetle, while finally the legs are short and correspond with the legs of the Lycid. The habits of these two totally different insects are extraordinarily alike. They both sit on flowers in the early morning, and both drop off if alarmed and draw the legs in. At such times (early

morning) neither show a disposition to fly, but are extremely sluggish.

Fig. 12 of *Pterygopterus caeruleus* with fig. 12a of the Pompilid wasp *Salix kirbyi* affords a striking case of Batesian mimicry. The very dark blue-black wings with the smallest amount of lustre, the conspicuous yellow antennae and the long hind-legs of the fossor are most completely copied in the ♀ Syntomid moth. Both fly together in the forest near the Potaro River above the Tumatumari cataract in Central British Guiana. The wasp is common and flies heavily, carrying its antennae and hind-legs almost as shown in the figure. The first and second pairs of legs are carried more folded to the abdomen. The moth is a rare species, and only the one specimen was taken by Mr. C. B. Roberts, who was collecting in the same locality for six years. I am unable to say anything as to its habits, but it is highly probable that it carries its long hind-legs stretched out behind in the way the wasp does, in the same way as members of the genus *Macrocneme* do, and as is shown in the case figured of *Macrocneme adonis* (fig. 13).

Figs. 13 and 13a is another case of a Syntomid moth mimicking a Pompilid wasp. In this instance the two insects, *Macrocneme adonis* (fig. 13), *Pepsis* (fig. 13a), occur together towards the end of May in the wooded ravines at about 3,500 ft. on the coast range of mountains at Caracas, Venezuela. Flying at the same time is another species of Syntomid *Macrocneme lades* (fig. 14). In some lights this species looks very much like the *Salix* even in the cabinet drawer, while in flight it is almost as much like the wasp as *M. adonis*. When the sunlight falls on the wings of the wasp *M. adonis* is the better mimic, but in shade *Macrocneme lades* and *Macrocneme adonis* are hardly distinguishable, and both are equally good mimics. The habits of these *Macrocneme* species are extremely interesting. They carry their hind-legs extended in imitation of the wasp. They alight on leaves or settle on the ground, and do not frequent flowers. When settled on a leaf they vibrate their wings while in the position as is shown in fig. 14. They also wave their antennae, all of which are characters of the "marabunta" as these wasps of the genus *Salix* are invariably called locally. Fig. 14 is a specimen of *M. lades* from S. Brazil, and it was drawn purposely to show the position in which the species alights with the wide

space between the wings. In the specimens of the same species from Caracas the white spots at the base of the abdomen are very greatly reduced, and in one ♀ hardly traceable at all. In S. Brazil, at Castro in Parana, I found *M. lades* (= *leucostigma*) commonly, yet wasps of the genus *Salix* did not appear to be present. This was in March and early April. But Mr. E. Dukinfield Jones, who resided for many years at Castro, informs me that these fossors are quite common at different times of the year, only they usually occur but singly.

Figs. 10 and 10a represent a most interesting case of mimicry from the Potaro River in British Guiana. Fig. 10 is of the Syntomid moth, *Sphecosoma testacea*, and fig. 10a is of a small Pompilid or fossorial wasp, *Balazonus polistoides*. Neither of these species I have seen alive. Mr. C. B. Roberts, who collected for some years for me after I left the Potaro district, sent the wasp as a Syntomid moth along with several of the *Sphecosoma testacea* and with a still greater number of a closely allied species (but not figured on the plate) *Sphecosoma angustatum*. Although the latter is considerably the commoner species, *Sphecosoma testacea* is more like the wasp as it shows the darkening of the costal area, which is a character agreeing with the wasp, while the commoner *S. angustatum* does not exhibit this character at all. The wasp was sent on 25. iii. 05, and specimens of *S. testacea* were sent in January, April, May and June. Examples of *S. angustatum* were sent in March, April, May and June. Two specimens of the very similar *Pseudosphex polistes* were also sent in April and May 1904.

Fig. 8 of *Rhyncopyga braconida* and fig. 8a of a species of *Braconidae* are figured together to show many points of remarkable similarity. The two insects were not caught together, but at approximately the same time of year and at the same elevation, and it is possible and quite probable that they could be netted together. The moth *R. braconida* I took on March 6th, 1910, at Alto da Serra above Santos at 2,500 ft. The Braconid I netted on 4th April, 1910, at Castro at 2,900 ft. At Castro, however, on 14th April I took another species of *Rhyncopyga*, viz. *meisteri*, which is very similar but has the first four basal segments red below, while the species figured has the two basal segments banded red. Either species forms almost an equally good mimic, but as the one illustrated is new it seems more desirable to figure it than the commoner and better known *meisteri*.

In the case of the species figured, attention should be drawn to the long thread-like antennae; the long black legs and the colouring and markings of the wings, which all suggest the Braconid, while on the wing one is deceived, without previous experience, by the very similar flight and attitudes. I myself caught the Braconid on a flower, where its ovipositor was concealed, thinking it was a species of the Syntomid genus *Rhyncopyga*. It is quite possible that this Braconid might be parasitic on the *Rhyncopyga* except that in size it is rather too large.

Fig. 11 of *Callopepla inachia* ♀, a Syntomid, with fig. 11a of *Scea auriflamma*, an Oenochromid, represents a remarkable and very interesting instance of convergence. As will be seen from the figures the two moths are very much alike in colouring and scheme of markings. The ♀ Syntomid must have been influenced by the Oenochromid, because the ♂ of *C. inachia* is quite different, with a brilliant blue hind-wing and fore-wing, with red apical band and basal streaks. The ♀♀ vary greatly from having a reddish orange band on fore-wing with orange basal streaks and hind-wing with shot-blue scaling at the base, to the form which is figured with an extension of a yellow band inwards to the base and the hind-wing with but a trace of blue scaling. The habits of these two insects are, however, quite divergent; the Syntomid flies briskly in the early morning sunshine and is fond of settling on various compositae, such as Eupatorium and Ageratum, while *S. auriflamma* haunts shady woods and flies quite slowly. Both insects when at rest fold their wings flat over the abdomen, the Syntomid scarcely making the inner margins of the fore-wing meet, while the Oenochromid makes them meet closely. In relative abundance the *S. auriflamma* is by far the most abundant and is also more generally distributed. We found it on the Corcovado at 1,000 ft. at Rio, where *C. inachia* was absent. We also found it at Alto da Serra, where also *C. inachia* was absent. But at Castro and Fernandez Pinheiro we found both in the months of March and April, but always in their own special haunts.

The last case of figs. 9 and 9a will have puzzled those who looked at the plate to see the resemblance. Fig. 9 is of the common Syntomid *Paraethria triseriata*, and 9a is of the Coleopteron *Astylus antis*. On March 11th, 1910, at Castro in S. Brazil, I came on a bush in flower which had myriads of the coleopteron flying round it. The sight

was so unusual that I stood gazing at it for a few minutes, when I suspected two of the beetles of being moths. After a little manœuvring I netted these two strangers, and they turned out to be *Paraethria triseriata*. That there was a very real resemblance when these insects were flying together in the sunshine must be taken on trust, for from the figures of the dead specimens it seems almost impossible that any real resemblance could exist. The figure of the moth, however, is unable to show the shot metallic green abdomen which can be most obviously seen by holding the specimen in strong sunlight. The light-yellowish costa of the hind-wing, which shows through the fore-wing as the specimen is illustrated, can but be imagined to give the banded appearance that the beetle has got. The white spots on the abdomen certainly did not present themselves in rapid flight, and the wings in some lights, like so many of the *Ithomiinae*, are a strong blue. Confirmation of this observation is much to be desired, for it is furthest from the writer's wishes to be considered an extremist.

EXPLANATION OF PLATE I.

[See Explanation facing the PLATE.]

EXPLANATION OF PLATE I.

- | | | | |
|------|---|---|---------------|
| FIG. | 1. <i>Trichura grandis</i> , Kaye | | |
| | 2. <i>Sphecosoma melissina</i> , Kaye | } | Syntomidae. |
| | 3. <i>Pseudosphex novercida</i> , Kaye | | |
| | 3a. " " " | | |
| | 4. <i>Pseudosphex noverca</i> , Schs. | } | Vespidae. |
| | 4a. <i>Polybia nigra</i> , Sauss. | | |
| | 5. <i>Pseudosphex jonesi</i> , Kaye | } | Syntomidae. |
| | 5a. " " " | | |
| | 5aa. " " " enlarged profile. | | |
| | 5b. <i>Zethus binodis</i> , Fab. | } | Eumenidae. |
| | 5bb. " " " enlarged profile. | | |
| | 6. <i>Pseudosphex polybioides</i> , Burm. | | Syntomidae. |
| | 6a. " " " | | |
| | 6b. <i>Eumenes callimorpha</i> , Sauss. | | Eumenidae. |
| | 7. <i>Correbidia calopteridia</i> , Butl., var. ? | | Syntomidae. |
| | 7a. <i>Calopteron brasiliense</i> , Lap. | | Lycidae. |
| | 8. <i>Rhyncopyga braconida</i> , Kaye | | Syntomidae. |
| | 8a. <i>Iphiaulax rufoplagiatum</i> , Cam. | | Braconidae. |
| | 9. <i>Paraethria triseriata</i> , H. S. | | Syntomidae. |
| | 9a. <i>Astylus antis</i> , Perty. | | Melyridae. |
| | 10. <i>Sphecosoma testacea</i> , Wlk. | | Syntomidae. |
| | 10a. <i>Batazonus polistoides</i> , Smith | | Pompilidae. |
| | 11. <i>Callopepla inachia</i> ♀, Schs. | | Syntomidae. |
| | 11a. <i>Scea auriflamma</i> , Hübn. | | Geometridae ? |
| | 12. <i>Pterygopterus caeruleus</i> , Hmps. | | Syntomidae. |
| | 12a. <i>Salix kirbyi</i> , Bingh. | | Pompilidae. |
| | 13. <i>Macrocneme adonis</i> , Druce | | Syntomidae. |
| | 13a. <i>Pepsis venezuelae</i> , nov. | | Pompilidae. |
| | 14. <i>Macrocneme lades</i> , Cram. | | Syntomidae. |

II. *The Butterflies of the White Nile: a study in Geographical Distribution.* By G. B. LONGSTAFF, M.A., M.D., F.E.S.

[Read November 20th, 1912.]

PLATE II.

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25. WALKER, F. A List of the Butterflies collected by J. H. Lord, Esq., in Egypt, along the African Shore of the Red Sea, and in Arabia, with descriptions of the Species new to Science. Entomologist, vol. v, pp. 48-57 (1870).
(It is said that the types were claimed by the then Khedive and placed by him in the museum attached to the School of Medicine at Cairo, where they perished owing to neglect. This paper promised to be interesting; but Walker's statement that such conspicuous butterflies as *Teracolus protomedia*, *T. eupompe* and *T. halimede* were taken by Lord in the Cairo district, convinces me that either he or Lord had muddled up the localities of the insects dealt with, since the butterflies named are not known to occur within several hundred miles of Cairo. The paper therefore is worthless for my purpose.)
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The Area dealt with.

Strictly speaking the name White Nile should be confined to that part of the river (Bahr al-Abyad) between the mouth of the Blue Nile (Bahr al-Azrak) opposite to Omdurman and nearly two miles below Khartûm, and Lake Nô, where the Bahr al-Ghazâl joins the Bahr al-

Gebel. In practice, however, the name is usually held to include the Bahr al-Gebel from Gondokoro or Rejâf, the head of navigation [Lat. $4^{\circ} 45' N.$], down to Lake Nô, and this is the sense in which the name is here used. Moreover the Bahr al-Zarâfa, which is practically a loop of the Bahr al-Gebel, running more or less parallel to it for about $2\frac{1}{2}^{\circ}$ of latitude, and never more than forty miles distant, will here be treated as part of the same district. Khartûm again, though strictly speaking it stands upon the Blue Nile, is included for reasons of convenience, being the port of entry into the region.

On the other hand the Bahr al-Ghazâl, draining as it does the large area between the Bahr al-Gebel and the Congo basin, is *not* dealt with here. From what is known of its fauna it would appear to comprise more insects characteristic of Central and Southern Africa, than the fauna we are here considering.

The region thus defined lends itself to treatment as a unit, both from the fact that it is served by the convenient Government steamers and by the fact that it is throughout fairly uniform in character. At Gebel Auli and at Gebel Ên are small hills of igneous rock, while many similar hills occur at Lâdô and above, but with these exceptions the country is level.

Between Khartûm and Abba Island the country is for the most part bare and open. A few *Acacia* (commonly called *Mimosa*) trees or shrubs are here conspicuous by their rarity. Another small tree or shrub commonly met with on the desert is the "Nabbak," a species of Buckthorn, *Zizyphus mucronata*, Wild [Nat. Ord. *Rhamnaceae*],—a rather graceful tree whose white stems give it a Birch-like character, but it is defended by a peculiarly malicious scheme of thorns, which are arranged in pairs, one straight, the other curved. The *Acacias* extend right up to Gondokoro. Among the shrubs especially interesting to the Entomologist, are various *Capers* and other members of the order *Capparidaceae*. They are closely associated with *Pierinae*, whose larvae feed upon them. Another shrub, especially common on and near Abba Island, is *Salvadora persica*, Linn., also much frequented by *Pierines*; it has numerous insignificant green flowers. A remarkable plant with a wide range in the district is *Vitis* (*Cissus*) *quadrangularis*, Wallich [Nat. Ord. *Ampelidae*], a succulent jointed creeper, suggesting a *Cactus*. At the time of my

visit its snake-like branches were leafless and flowerless. Several days out of our twenty-four were spent in the Sadd.* Here the mass of the vegetation for many miles at a stretch was made up of the dark green *Papyrus* (*Cyperus*) *antiquorum* with its beautiful umbels six feet across, and of "ûm sûf," or "mother of wool"—*Vossia procera*—a reed-like plant, together with the more familiar *Phragmites communis*. Of smaller plants growing beneath the *Papyrus* at the water's edge a yellow composite and a blue-purple *Convolvulus* or *Ipomaea* were the commonest. The first "Candelabra" *Euphorbia*, striking trees nearly twenty feet high, were seen on the island of Hillet al-Nuwêr [Lat. 8° 13' N.]. At Bôr [Lat. 6° 13' N.], my attention was called to the singular *Kigelia aethiopica*, Decr., a tree belonging to the Nat. Ord. *Bignoniaceae*, which has flowerstalks many feet in length from which hang the large rich brown-purple flowers and cucumber-like fruits, the latter a foot long. At Rejâf [Lat. 4° 45' N.] a yet more tropical-looking plant was the *Adenium coetaneum*, Stapf. [Nat. Ord. *Apocynaceae*], with its absurdly thick stems, fleshy emarginate leaves, and clusters of showy bright-red waxy flowers. Palms were rarely seen. Doubtless this somewhat monotonous vegetation largely explains the restricted Butterfly Fauna.

The practice of burning the rank vegetation of the Sadd, must have a very destructive effect upon insect life. The numerous semi-calcined shells of such Gasteropods as *Burtoa* and *Limicolaria*—genera frequenting trees or bushes—which are seen in many localities, prove that these fires carry their destruction beyond the grassy areas on which antelopes, giraffes and elephants still roam even within sight of the steamer.

The circumstance that nearly every tree and shrub met with is more or less prickly tends greatly to protect butterflies from the collector's net. Near Ad-Duwêm I came across a grass even worse than the Indian "spear-grass," for its prickly awns at a touch converted the net into a tangled mass, which required some minutes to unravel. Fortunately its distribution appears to be restricted to a very small area.

Shortly, the district to be dealt with includes Khartûm [Lat. 15° 37' N., Long. 32° 31' E.] and the country adjacent to the banks of the White Nile to Lake Nô [Lat. 9° 30' N.];

* The correct spelling : pronounced Sudd.

the Bahr al-Zarâfa throughout its length; also the Bahr al-Gebel up to Gondokoro and Rejâf.

Gondokoro [Lat. $4^{\circ} 54' N.$, Long. $31^{\circ} 41' E.$], situated on the right or eastern bank of the Bahr al-Gebel, is the most northerly station in Uganda. Rejâf, about eight miles south of Gondokoro, but on the left bank, is in that part of the Anglo-Egyptian Sûdân which, under the name of the Lâdô Enclave, was leased to the late King of the Belgians.

The Bahr al-Gebel in the Sadd region, some forty miles south of Lake Nô, reaches its most westerly point in Long. $30^{\circ} 8' E.$ From these data it will be seen that the region treated of is included within $2\frac{1}{2}^{\circ}$ of longitude, but extends over 11° of latitude—say a strip of 650 miles by 140 miles—though the distance by river is said to be 1,128 miles. Probably most of the butterflies sent to Europe have been taken within a very few miles of the river banks.

Since the place-names given are for the most part those of small native villages, or of "wooding" stations, there is no reason to expect that they will be permanent in a country where even Government posts are from time to time moved for administrative convenience, or more often from the proved unhealthiness of their sites; since, moreover, whether permanent or not, many of these names are not to be found even in the best atlases, it has been thought well to give the approximate latitude of each locality. Of course the latitude is not of much service in the case of places situated on the part of the river running nearly due east from Lake Nô to Kôdôk (Fâshôda).

Entomologically this district is but little known, so, having visited it myself twice, in February 1909 and again in February 1912, it seemed worth while to gather together the stray notes of travellers and sportsmen, to form the basis of a local list. I have been confirmed in this resolve by the discovery that my captures would appear to exceed alike in numbers of species and specimens those of my predecessors. But it must not be forgotten that the district has not been systematically worked, and especially must it be kept in mind that little is known of the wet-season fauna.

Family NYMPHALIDAE.

Sub-family DANAINAE.

1. *Danaida chrysippus*, Linn.

The Sûdân is an interesting region in which to study this very widely distributed species, since all its forms are met with, often all together.

α. The typical, or *chrysippus* form. This varies much in the depth of the ground-colour, moreover a large number of the specimens met with in this part of Africa have the veins of the hind-wings more or less dusted with white scales.

Dunn took it on the Bahr al-Zarâfa.* Loat took four males near Kâkâ, also a number of males and one female at Gondokoro. Dr. Dixey notes that several of Loat's specimens had "a slight white powdering round the gland patch." The Swedes took it both at Khartûm and at Kâkâ.

In 1909 I took a male at Gebel Ên, another at Kosti, and a third on Abba Island. At Khartûm, where the species was common, somewhat more than one-fourth of all the specimens observed were of the *chrysippus* form. In 1912 though I saw a few *D. chrysippus* at Khartûm I did not pay much attention to them, but a typical female was captured at Kanîsa [Lat. 6° 50' N.] and two at Rejâf, my most southerly point. It may accordingly be said to occur throughout the White Nile region.

The wide distribution of *D. chrysippus* throughout Africa and the Oriental region is well known, but attention may be called to the curious fact that Dr. Dixey did not find a single typical example among Peel's twenty-two specimens from Somâliland. Two specimens taken by Bennett in Sokotra have the veins of the hind-wings white. On the other hand, there is no trace of such white on the hind-wings of any of my Egyptian specimens ranging from Cairo to Aswân. The specimens taken by the Rothschild party on the Atbara were typical.

β. Form *alcippus*, Cram., including *alcippoides*, Moore. Under this I include all individuals with more or less white hind-wings.

Taken by Capt. Dunn on the Bahr al-Zarâfa, also by

* So far as I can make out Capt. Dunn's insects must have been taken in about Latitude 9° N.

Loat near Kâkâ and at Gondokoro. The Swedes took it at Khartûm, also near Kâkâ.

In 1909 I met with it commonly at Khartûm, where I estimated that more than half the *chrysippus* were of this form: I also took a male of the extreme *alcippus* form at Ad-Duwêm.

In 1912 I took one at Khartûm, another on the battle-field of Kerreri (about nine miles N.W. of Khartûm), and saw others at both places. I also captured single individuals at Abba Island, Shambî and Gondokoro.

From these records it may be fairly said that the distribution of *alcippus* covers the whole White Nile district.

Rothschild does not record it from the Atbara. Though it is common at Port Sûdân and at Aden, no specimens were found in the Peel collection from Somâliland, nor in the Bennett collection from Sokotra.

γ. Form *dorippus*, Klug [called by some authors *klugii*, Butler]. This lacks the transverse white band across the fore-wing near the tip, but normally has the hind-wings, on the upper surface, of the ground-colour. Aurivillius (3. p. 72) considers this a distinct species, a view in which probably he now stands alone.

Capt. Dunn took it on the Bahr al-Zarâfa. Loat met with it both at Kâkâ and Gondokoro. It was taken by the Swedes at Khartûm. The Rothschild party took it on the Atbara, as well as at Khartûm.

Personally I did not come across this form in 1909, but in 1912 took a single example at Khartûm.

It is a common insect both at Port Sûdân, and at Aden. Cholmley met with it to the north of Suâkin, while Peel found it the dominant form in Somâliland.

δ. Form *albinus*, Lanzknecht [called by some authors *dorippus*, Klug]. This, which may be said to combine in one the two deviations from the type, in that while lacking the white bar on the fore-wings, it has the hind-wings more or less white, would appear to be by far the scarcest form of *chrysippus*. Aurivillius (3. p. 72) regards *albinus* as an aberration of *dorippus*.

Capt. Dunn found it on the Bahr al-Zarâfa. Loat took a specimen near Kâkâ and four at Gondokoro. In 1909 I took a single specimen at Khartûm.

It occurs at Port Sûdân, also at Aden. It seems fair to assume, though the data are imperfect, that *dorippus* and *albinus* occur throughout the White Nile district.

2. *Tirumala petiverana*, Doubleday and Hewitson.

This was taken by Dunn on the Bahr al-Zarâfa, but I did not meet with it myself, and I have no other record from the district.

It is found in Abyssinia and Somâliland, and has a wide range in tropical Africa from East to West.

Sub-family SATYRINAE.

3. *Ypthima asterope*, Klug. The types came from Syria and Arabia.

The sole record that I possess of this butterfly—the only White Nile Satyrine known to me—occurring within the area under consideration, is that of a single example being found upon our steamer near Kanîsa [Lat. 6° 50' N.] on February 17th, 1912.

Selous took a male in 1911 on the Southern Bahr al-Ghazâl. It is not uncommon at Port Sûdân, and Col. Yerbury found it in some numbers at Aden. Dr. Dixey and I took it in Natal and Rhodesia; it is indeed a common and widely distributed African species. The Hope collection contains specimens from British East Africa, Lake Nyassa, Somâliland, and Lagos.

Sub-family NYMPHALINAE.

4. *Pyrameis cardui*, Linn.

This cosmopolitan species was taken by Capt. Dunn on the Bahr al-Zarâfa, also by Loat—a single female at Kâkâ. The Swedes took two males at Ad-Duwêm.

Though in 1909 I found *cardui* common near the point of junction of the Blue and White Niles, and saw it at the same place in 1912, it is remarkable that I have no record of having even *seen* it on either of my voyages up the White Nile. It may reasonably be inferred that it is not very common in that district, at all events during the month of February.

The Rothschild party took one on the Atbara; Yerbury found it commonly at Aden; Peel did not take it in Somâliland, but Bennett found it "common everywhere" in Sokotra. Personally I have found it common enough in Algeria, Cairo, Aswân, Natal and Cape Colony.

5. *Precis cebrene*, Trimen.

Dunn took this species on the Bahr al-Zarâfa, and Loat took two near Kosti [Lat. 13° 10' N.].

In 1912 I distinctly saw this butterfly on a thorny bush at Ad-Duwêm [Lat. 14° N.], also near Kanîsa [Lat. 6° 50' N.].

Cholmley took a few at Ambaia Erba; Yerbury found it common at Aden; Grant in Sokotra, and Peel in Somâli-land; it occurs also in Abyssinia.

It is an abundant African species, being found throughout the whole of South Africa and at Lagos on the West Coast.

The closely allied *P. oenone*, Hübner, takes its place in the Oriental region.

6. *Precis delia*, Cramer.

Taken by Dunn on the Bahr al-Zarâfa and by Loat at Gondokoro.

In 1912 I took single specimens at Hillet al-Nuwêr [Lat. 8° 13'], Gondoroko and Rejâf.

Peel took it in Somâliland; Yerbury took one specimen at Aden, while Bennett reported it as very common in the mountains of Sokotra.

It is found throughout Central and South Africa as well as on the West Coast.

7. *Precis boopis*, Trimen (= *madagascariensis*, Guenée).

This was taken by Dunn on the Bahr al-Zarâfa. In 1912 I took a single example at Mongalla [Lat. 5° 12' N.].

Though ranging over Central and South Africa this species is not so widely distributed as the two preceding.

8. *Hypolimnas misippus*, Linné.

Mr. H. H. King assured me that this interesting and widely-distributed species was not uncommon at Khartûm; it was also in a collection that he had received from the Bahr al-Ghazâl. Dunn took it on the Bahr al-Zarâfa. It is, however, quite certain that I did not see this very conspicuous insect during either of my visits to Khartûm, or the White Nile.

The Rothschild party did not see it, but Cholmley met with it at Ambaia Erba, and Yerbury found it commonly at Aden, noting that: "The females of this butterfly mimic all the forms of *chrysipus*."

At Sallom Junction, on the railway between Port Sûdân and Khartûm, a native boy brought me a male *misippus* in his fingers. Some weeks later I found both sexes fairly common at Port Sûdân, where I took typical females as well as females of the form *inaria*, Cram. (mimicking the *dorippus* form of *chrysippus*). Specimens of both these forms had traces of white on the upper surface of the hind-wings.

It is notable that the Cairo collectors know of but two specimens having occurred in that district during many years; in fact, they look upon it as a great rarity.

This familiar butterfly ranges over all tropical and South Africa as well as India, Ceylon and the Malay Archipelago.

In two females I detected a slight treacly odour.

9. *Hamanumida daedalus*, Fabr.

This characteristic African butterfly is known to occur on the Bahr al-Ghazâl, where it has been taken by Selous and others, and I am practically certain that I saw a specimen on February 15th, 1912, at Mongalla [Lat. 5° 12' N.].

Col. Yerbury took a single example at Aden; it has been reported from Abyssinia and Somâliland. It is found throughout tropical Africa, but stops short of Cape Colony.

10. *Neptis agatha*, Cram.

Loat took two specimens at Gondokoro.

On February 12th, 1912, a short distance below Kîrô [Lat. 5° 22' N.] I had a clear unmistakable view from the steamer of a *Neptis* of the size of *agatha* skimming over the herbage at the water's edge.

This species has been taken at Shoa, in Abyssinia [*circa* Lat. 10° N.]—perhaps the northern limit of the genus in East Africa—and has a wide range in Central, East, West, and South Africa.

11. *Byblia ilithyia*, Drury.

Taken by Dunn on the Bahr al-Zarâfa. Loat took a female near Kâkâ [Lat. 10° 40' N.], where the Swedish expedition also took a female.

In 1912 I took in all five specimens, viz.—a female at Melût [Lat. 10° 27' N.], a male and two females at Tawfikîyâ [Lat. 9° 25' N.], and a female at Kanîsa [Lat. 6° 50' N.].

These records point to a northern limit on the White Nile somewhere about 11° N.

Yerbury found this species at Aden and Peel found it in Somâliland.

It occurs also in Abyssinia, East, West and South Africa, as well as in India and Ceylon.

In a male I detected a sweet aromatic scent, compared to that of scented tobacco; a female had a similar scent, but less strong; in another female the scent was compared to chocolate, in a third to that of *Teracolus protomeidia*. (Compare Longstaff, 16. pp. 501, 502.)

12. *Byblia goetzius*, Herbst. This species includes *B. acheloia*, Wallengren, *B. castanea*, Butler, and *B. vulgaris*, Staudinger.

Capt. Dunn took it on the Bahr al-Zarâfa. In one or other of the above forms it is found in Aden, Abyssinia, Somâliland, East Africa, Nyassaland, Transvaal, Natal and Cape Colony; but its distribution is especially distinguished by a wider range than that of the preceding species on the West coast and a less wide range on the East.

In Sokotra it is replaced by the nearly allied *B. boydi*, Dixey.

The distribution of the two species has been discussed in great detail by Dr. Dixey (11. pp. 376-379).

13. *Atella phalantha*, Drury.

Capt. Dunn took this on the Bahr al-Zarâfa.

It has been taken in Abyssinia, and, I believe, on the Bahr al-Ghazâl.

The species is widely distributed in Africa south of the Sahara, it occurs in Madagascar and Mauritius, also in India, Burma, Ceylon, Malaya, China and Japan, but it is not in Col. Yerbury's Aden list.

Sub-family ACRAEINAE.

14. *Acraea acerata*, Hewitson, form *vinidia*, Hew.

Taken in abundance by Loat at Gondokoro, January 12th, 1902 [Lat. 4° 54' N.]. A solitary male was taken by the Swedes at Gebel Ên, February 18th, 1901 [Lat. 12° 37' N.].

In 1912 the engineer of our steamer took a male on board near Lâdô, February 13th, 1912 [Lat. $5^{\circ} 5' N.$].

Mr. Eltringham tells me that this species is found through practically the whole of Africa south of the Sahara.

15. *Acraea terpsichore*, Linné, form *rougeti*, Guérin.

I took a single specimen, February 12th, 1912, at Mongalla [Lat. $5^{\circ} 12' N.$].

Mr. Eltringham tells me that this species is even more widely distributed than the last, extending to the Islands.

16. *Acraea natalica*, Boisduval.

Taken by Capt. Dunn on the Bahr al-Zarâfa.

Widely distributed in South and East Africa: the nearest locality to the White Nile given by Mr. Eltringham (13. p. 192) is Kibwezi in British East Africa.

17. *Acraea encedon*, Linné.

Loat took a male at Gondokoro which was intermediate between the typical form and *A. दौरa*, Godman and Salvin. The Swedish expedition took a male of the form *dौरa* at Renk [Lat. $11^{\circ} 45' N.$], and Selous took three males at the same place, as well as two males at Tawfikîyâ [Lat. $9^{\circ} 25' N.$]; Mr. Trimen says these are all small and pale, and more or less inclining to the form *dौरa*.

In 1912 I took a male at Tawfikîyâ which approached the form *infuscata*, Staudinger, and another near Dûlêb Hill [Lat. $9^{\circ} 22' N.$] of the form *lycia*, Wallengren, with much white about it.

Thus it will be seen that this species, in several forms, ranges in the White Nile district over at least 7° of latitude.

Mr. Eltringham (13. p. 210) gives its distribution as from Sierra Leone to the East Coast and from the Cape to Upper Egypt, also to the Islands.

Its larva feeds on *Commelina*.

18. *Acraea abdera*, Hewitson (= *cepheus*, Linné).

Taken by Capt. Dunn on the Bahr al-Zarâfa.

Mr. Eltringham (13. p. 112) gives its range as including the Bahr al-Ghazâl, the Congo basin, Angola, Gold Coast and Gaboon.

Family LYCAENIDAE.

19. *Polyommatus baeticus*, Linné.

Taken by Dunn on the Bahr al-Zarâfa; by Loat near Kâkâ, and at Gondokoro; by Selous near Tawîla, and by the Swedish expedition at Khartûm, Ad-Duwêm, and Mohadan Zarâfa.

I found it in abundance at Khartûm in 1909, and also met with it at Ad-Duwêm. In 1912 I found it again at the last-named place, and also at Rejâf.

This, probably the most widely-distributed of all the "Blues," may be said to occur throughout our district, but it would not appear to be plentiful except at Khartûm. Rothschild speaks of it as "common in Egypt from Cairo to Khartûm." He also took it at Al-Nakhîla, on the Atbara River. I have myself taken a few specimens near Cairo and have seen it in some numbers at Aswân.

It is common at Aden and it has been recorded from Abyssinia and Somâliland, and has a wide range in South Africa, as well as in Europe, Asia and Australia.

20. *Lachnocnema bibulus*, Fabricius.

The Swedes took two very dwarfed males on Abba Island [Lat. 13° 22' N.].

This species has a wide distribution in South, Central, East, and West Africa, but I have no other record for the White Nile.

21. *Tarucus theophrastus*, Fabricius.

Loat met with this common and widely-distributed insect at Kâkâ, Mongalla and Gondokoro. The Swedes took it at Khartûm, Abba Island, Renk and Kâkâ.

In 1909, besides seeing it in abundance at Khartûm, I took it at Sôba (on the Blue Nile), at Ad-Duwêm and at Tawîla. In 1912 it was again abundant near Khartûm as well as near Sôba station, and on the battlefield of Kerreri. Up the White Nile it occurred at Ad-Duwêm (commonly), Dûlêb, Shambî (several), Tombê, Kîrô, Mongalla, Gondokoro and Rejâf, as well as on the Bahr al-Zarâfa.

Mr. Rothschild took it commonly at Al-Nakhîla and at Shendî, but found it rare at Khartûm. In 1909 I took one at Wâd Ben Nâga station, about twenty miles south of Shendî, as well as at Aswân and Luxor.

Shortly, it may be said that the range of this butterfly in North East Africa extends from Luxor to Gondokoro.

It is common at Aden, and Bennett took a specimen in Sokotra. Thrupp took it in Somâliland. It also occurs in Senegal.

According to Bingham (4. vol. ii, p. 419) it occurs in Persia and Balûchistân as well as throughout India and in Ceylon. This and the next species reach Europe.

22. *Tarucus telicanus*, Lang (= *plinius*, Fabr. = *pulcher*, Murray).

Loat took a male near Kâkâ [Lat. 10° 40' N.]. In 1912 I took a male at Hillet al-Nuwêr [Lat. 8° 13' N.] and in the same year took two specimens at Port Sûdân.

In 1909 I took one at Aswân, two at Luxor, and another as far north as Tel al-Amarna [Lat. 27° 37' N.]; but though ranging in the Nile Valley from that latitude down to 8° 13' N., it would not appear to be common at any of the places named.

Though the species is well known in Central and South Africa as well as at Aden, and is found in Northern India, I have no record from Somâliland or Sokotra.

23. *Castalius usemia*, Neave.

Mr. Neave's types of this neatly marked little butterfly were taken in the Victoria Nyanza district.

I was fortunate in securing a single example at the Rejâf wooding station [Lat. 4° 50' N.].

24. *Cupido cretosus*, Butler.

A female was brought home by the Swedish expedition from Renk [Lat. 11° 45' N.]; concerning this Aurivillius remarks: "This rare species was hitherto only recorded from Senegal and from Abyssinia." The variety *C. lacinatus*, Butler, has been met with in Somâliland.

25. *Catochrysops eleusis*, Demaison.

This little-known but very distinct "Blue" was taken by the Rothschild party at Aswân, Wâdi Halfa, and at Nakhîla on the Atbara. I have myself met with it at Aswân, Abû Simbel, and Khartûm, but not south of the latter place. The Swedish expedition also found it at Khartûm. Its range in latitude would therefore appear

to be from 24° — $15\frac{1}{2}^{\circ}$ N. It is usually common where it occurs, and at Aswân it appeared to be attached to the pink-flowered *Lotus arabicus*, Linn.

26. *Catochrysops malathana*, Boisduval, var. *nilotica*, Aurivillius.

Two males were taken by the Swedes to the South of Kâkâ [Lat. $10^{\circ} 40'$ N.].

I have no other record in the Sûdân of this common Central and South African butterfly, which has also been reported from Lagos and Madagascar, as well as from Lahej in Southern Arabia.

27. *Zizera lysimon*, Hübner. This includes *Z. karsandra*, Moore, and, according to De Nicéville, also *Z. knysna*, Trimen.

In 1909 I took this fairly commonly at Khartûm, also a single example at Kosti [Lat. $13^{\circ} 10'$ N.] and another at Luxor.

In 1912 I took two on Abba Island, one at Kôdôk, also one at Tawfikîyâ [Lat. $9^{\circ} 25'$ N.], as well as one at Port Sûdân.

Rothschild took one at Nakhîla (f. *karsandra*); Bennett found it plentiful in Sokotra, and Yerbury took it at Aden (f. *knysna*).

This species is common in Central and South Africa, but I have no record of it on the White Nile south of $9^{\circ} 25'$ N.

According to Bingham (4. vol. ii, p. 358) it extends northwards to Southern Europe, Central and Western Asia; eastwards to India and Ceylon; southwards to Malaya and Australia.

28. *Chilades trochilus*, Freyer.

Loat took three at Kâkâ [Lat. $10^{\circ} 40'$ N.].

In 1909 I took one at Aswân, and another at Khartûm. In 1912 I took three at Port Sûdân. Cholmley took it north of Suâkin; Yerbury at Aden; also Peel in Somâliland.

It occurs also in the Victoria Nyanza district, British East Africa, Portuguese East Africa, Rhodesia, and also at Lagos. To these Bingham (4. vol. ii, p. 368) adds South Eastern Europe, Central Asia, India, Ceylon, Burma, Malaya, and Australia.

29. *Lycaenesthes amarah*, Guérin.

Taken by Capt. Dunn on the Bahr al-Zarâfa, and by Loat at Mongalla [Lat. 5° 12' N.].

In 1912 I took a male at Lûl [Lat. 9° 47' N.], also one of each sex at Kanîsa [Lat. 6° 50' N.] and a male at Gondokoro.

Its northern limit on the White Nile would appear, so far at least as the above records go, to be about 10° N.

Cholmley met with it north of Suâkin, and Yerbury at Aden, where it is common. It also occurs in Somâliland, in Central and East Africa and southwards down to Rhodesia and Natal.

30. *Lycaenesthes otacilia*, Trimen.

I took a male on January 8th, 1912, near Sôba station, on the Blue Nile, about ten miles above Khartûm, but have no other records for this part of Africa.

It is met with in Somâliland, British East Africa, Rhodesia, Natal and Cape Colony.

31. *Azanus jesous*, Guérin.

Bingham (4. vol. ii, p. 363) considers this as the same species as *gamra*, Lederer, and *crameri*, Moore: De Nicéville considers the two latter as synonyms of *sigillata*, Butler. Loat took a male at Mongalla [Lat. 5° 12' N.], but I have not myself met with this butterfly nearer to the White Nile than Port Sûdân. Mr. Peel took several in Somâliland. It occurs in the Victoria Nyanza district, in British East Africa, British Central Africa, Rhodesia and Natal. Bingham (4. vol. ii, p. 364) adds Arabia, (Yerbury gives *sigillata*), Balûchistân, a great part of India, Burma and Ceylon.

32. *Azanus ubaldus*, Cramer (*A. zena*, Moore; *A. thebana* Staudinger).

The Swedish expedition took it at Khartûm and on Abba Island [Lat. 13° 22' N.].

In 1909 I found it fairly common at Khartûm, and also took single specimens at Ad-Duwêm and Hillet Abbâs [Lat. 13° 7' N.] as well as at Amâda, in Nubia [Lat. 22° 45' N.].

In 1912 I again took it at Khartûm and Ad-Duwêm,

also at Melût [Lat. $10^{\circ} 27' N.$], Dûlêb [Lat. $9^{\circ} 22' N.$], Shambî [Lat. $7^{\circ} 0' N.$] and Mongalla [Lat. $5^{\circ} 12' N.$].

Mr. N. C. Rothschild took it near Shendî [Lat. $16^{\circ} 42' N.$] as well as at Nakhîla [Lat. $17^{\circ} 25' N.$], but did not find it common at either place.

Thus it would appear to range along the Nile Valley from the Tropic of Cancer, almost to Uganda.

Yerbury found it (*zena*) to be "generally distributed" at Aden; Peel took it (*thebana*) in Sokotra, while Col. Manders met with it at Suâkin (*zena*). It has also been taken in Somâliland and Natal.

Bingham (4. vol. ii, p. 363) gives Balûchistân, India, Ceylon and Burma.

33. *Deudorix livia*, Klug.

The type was taken "inter Kinch et Assuan Novembre," i. e. circa Lat. $25^{\circ} N.$

The Swedes took two females on Abba Island [Lat. $13^{\circ} 22' N.$].

Personally I know it as a native of Port Sûdân only. Prof. Poulton took a specimen near the Great Pyramid.

Col. Yerbury used to take it at Aden and remarks on the similarity of the female to that of the next species. Aurivillius gives Somâliland as a locality, also Nubia and British East Africa.

34. *Virachola antalus*, Hopffer.

I took three at Tawîla in 1909 [Lat. $13^{\circ} 10' N.$], and one at Port Sûdân in 1912.

It is found practically throughout tropical and South Africa as well as in Madagascar.

35. *Hypolycaena philippus*, Fabricius.

On February 22nd, 1912, I took one specimen at Tawîla [Lat. $13^{\circ} 16' N.$], but have no other White Nile records for this butterfly.

It occurs in Somâliland, in Uganda, and has a wide distribution in tropical Africa, occurring also in Natal.

Family PAPILIONIDAE.

Sub-family PIERINAE.

36. *Herpaenia eriphia*, Godart (= *melanarge*, Butler), f. *lacteipennis*, Butler; the extreme dry-season form is termed by Aurivillius *straminea*.

Found by Dunn on the Bahr al-Zarâfa. A very small example ($1'' 3\frac{1}{2}''' =$ say 33 mm.) of the extreme "dry" form was taken by Selous at Tawîla [Lat. $13^{\circ} 16' N.$]. The Swedes took two males of the form *straminea* at Gebel Ên and Kâkâ respectively: the alar expanse of these was 31 mm. and 38 mm.

I took a very small example of each sex at Tawîla in 1909. In 1912 I took another at the same place, as well as three on Masran Island [Lat. $12^{\circ} 45' N.$] and three more at Renk [Lat. $11^{\circ} 45' N.$]: these were all small.

Klug's specimens of *Pontia tritogenia*, which is not distinguishable from *eriphia*, were taken at Ambukôl in July and August. There is a specimen in the Coll. Hope labelled "Nubia."

On the White Nile, however, the above records indicate a distribution limited by the latitudes $13^{\circ} 16'$ and $10^{\circ} 40' N.$

This insect is found all along the eastern side of Africa, in Madagascar, throughout South Africa, and it has been recorded from Senegal.

Yerbury records *H. iterata*, Butler, for Aden: Aurivillius (3. p. 31) seems to doubt whether it is specifically distinct. This form is also recorded for Somâliland, as well as for German East Africa, and British East Africa.

37. *Belenois gidica*, Godart, including f. *abyssinica*, Lucas (Northern form), and f. *westwoodi*, Wallengren.

Capt. Dunn took the form *abyssinica* on the Bahr al-Zarâfa, and Loat took several of the same form near Kâkâ, as well as two at Gondokoro. The Swedes took a male of f. *westwoodi* at Gebel Ên [Lat. $12^{\circ} 37' N.$], and two males of the form *abyssinica* at Renk.

In 1912 I found it common at Gebel Ahmed Agha [Lat. $11^{\circ} 0' N.$], and took a few specimens at Kâkâ, Kanîsa, Mongalla, Lâdô, Gondokoro, and Rejâf.

It will be seen that I have no record of this common

South African "White," north of Lat. $12^{\circ} 37' N.$, *i. e.* three degrees above Khartûm.

This species is found in Abyssinia and throughout South and East Africa, and in one or two districts in West Africa.

A female had a faint scent. (Compare Longstaff, 16. p. 512.)

38. *Belenois severina*, Cramer.

Both Aurivillius and Dixey regard *leucogyne*, Butler, and *boguensis*, Felder, as races of *severina*, and transitional forms are common.

Dunn found typical specimens as well as *boguensis* on the Bahr al-Zarâfa. Loat took both forms at Mongalla [Lat. $5^{\circ} 12' N.$] and the typical form at Gondokoro.

In 1912 I met with the typical form at Gebel Ahmed Agha [Lat. $11^{\circ} 0' N.$], Dûlêb, Hillet al-Nuwêr, Shambî, Kanîsa, Tombê [Lat. $5^{\circ} 43' N.$], and Rejâf. The same year I took the form *boguensis* at Melût [Lat. $10^{\circ} 27'$], Dûlêb, Shambî and Kanîsa [Lat. $6^{\circ} 50' N.$].

These records give a very similar distribution for typical *severina* and for the f. *boguensis*; moreover the latter is common in the Victoria Nyanza country, and Selous took it on the Bahr al-Ghazâl.

B. severina is the "Common White" of South Africa, covering the whole continent south of the Sahara, passing over into Madagascar, while Col. Yerbury records it from Aden (under the name of *leucogyne*), but it does not enter the Oriental province.

39. *Belenois mesentina*, Cramer (= *lordaca*, Walker).

Taken by Dunn on the Bahr al-Zarâfa. It was found commonly by Loat at Kâkâ [Lat. $10^{\circ} 40' N.$], Mongalla [Lat. $5^{\circ} 12' N.$] and Gondokoro. The Swedes took it at Mohadan Zarâfa, and at Kâkâ; the specimens, more especially the males, being very small.

In 1909 I found it in abundance at Khartûm, and took three at Sôba. It was common at Ad-Duwêm and I took a solitary male at Tawîla. In 1912 I took several in the Khartûm district, including Kaderû and Kerreri. On the White Nile it occurred at Tawîla, Renk, Meshra Zarâfa, Kâkâ (common), Melût (common), Lûl, Tawfikiyâ, Dûlêb (common, but all the specimens taken were remarkably small), lower Bahr al-Zarâfa (common), Shambî, Kanîsa,

Bôr, Malêk, Tombê, Kirô, Mongalla (females abundant, males scarce), Lâdô, Gondokoro and Rejâf—in fact, throughout the district.

Rothschild took several on the Atbara; it is common at Port Sûdân and at Aden [under the name of *lordaca*]. It also occurs in Somâliland. *B. mesentina* has by far the widest distribution of the genus, extending as it does over the greater part of Africa, Madagascar, Persia, Afghanistan, India and Ceylon.

Yerbury notes its attachment to a species of *Capparis* on which the larva feeds.

I found the males to have a slight scent, variously suggesting the adjectives "musky," "aromatic," "flowery."

40. *Pinacopteryx venata*, Butler.

[Plate II, figs. 1 ♂, 2 ♀, 3 u. s.]

The type of this little-known butterfly, a female, was captured by Petherick somewhere on the White Nile.* Another female was taken by Capt. H. W. Dunn on the Bahr al-Zarâfa in 1900.

On March 8th, 1902, Mr. Loat took a male at Gondokoro, which was described by Dixey (12. p. 141).

Meanwhile the authorities at the British Museum had identified this species with *P. doxo*, Godart, but Messrs. Trimen and Dixey, who have both carefully examined Godart's type at Edinburgh, are satisfied that this identification is wrong. Godart's insect appears to come nearest to *P. simana*, Hopffer.†

In February 1912 I was fortunate enough to capture twelve specimens of this distinct, though not very attractive "White," viz. a male and three females at Shambî [Lat. 7° 0' N.], a male and two females at Malêk [Lat. 6° 7' N.], and three males and two females at Gondokoro [Lat. 4° 54' N.].

Mr. Loat's specimens and my own were all found between Lat. 7° 0' N. and Lat. 4° 54' N., but Capt. Dunn's specimen must have come from further North, probably 8° 30' N., or even 9° N., and the precise locality of Petherick's specimen is also unknown.

* "Descriptions of a New Genus and six New Species of Pierinae," by A. G. Butler, F.L.S., etc. (There called *Ixias venatus*.) Trans. Ent. Soc. Lond., 1871, p. 169, Plate VII, fig. 7.

† Dixey, Proc. Ent. Soc. London (1912), pp. xlii, cxiii.

[*Synchlœ glauconome*, Klug.]

The type is said to have come from "Arabia deserta, in Monte Sinai ad *Erigeron denticulatum*."

Rothschild took it at Aswân and at Shendî [Lat. 16° 42' N.]. Cholmley found it north of Suâkin. Col. Yerbury reported it as common and generally distributed in the Aden district, the larva feeding upon *Cleome paradoxa* [Nat. Ord. *Capparidaceae*].

I have taken it near Cairo, and found it commonly at Port Sûdân, but have no record for Khartûm, or the White Nile.

Bingham states that it occurs in Persia, Balûchistân, the Pamirs and the Panjâb. The Hon. Walter Rothschild tells me that it occurs on the Sahara.

Aurivillius (l. p. 414) gives Somâliland on the authority of Miss E. M. Sharpe (20. p. 528). In the same work (p. 497) he indicates this as one of three Ethiopian species (the other two being *Acræa doubledayi*, Guér., and *Teracolus chrysonome*, Klug) which extend northward into the Palæarctic province. However, I should regard *glauconome* as a Palæarctic species which just enters the north of the Ethiopian province.

Three males yielded a distinct sweet scent like that of *Freesia*.]

41. *Calopieris eulimene*, Klug.

The types (both sexes) of this beautiful local and singular butterfly came from Ambukôl, a place in the Dongôla district, situated on the Nile just below Korti in Lat. 18° 4' N.

In 1909 I took a single specimen, a male, at Burri, the eastern suburb of Khartûm, also seven other males at Sôba on the Blue Nile about twelve miles above Khartûm. In 1912 I took a female a little to the north of Sôba station on the east bank of the Blue Nile, and, a week later, took three males and two females between that spot and Khartûm. These were for the most part in poor condition.

Mr. N. C. Rothschild took a single specimen at Shendî. Mr. A. J. Cholmley took five in 1896 at Ambaia Erba, north of Suâkin.

Mrs. Waterfield took several at Port Sûdân during the latter part of 1911 and the beginning of 1912, and I myself during the last days of February and first days of March

secured no less than eighteen males and nine females. My Port Sûdân specimens may be distinguished from those taken near Khartûm by the greater development of the black markings, and more especially by the orange veins on the undersides of the hind-wings being edged with black. I associate this greater strength of coloration [not present in Klug's types] with spring rains reported by Mrs. Waterfield as having fallen at Port Sûdân, but which did not occur at Khartûm.

The above are all the records that I have come across. Boisduval [Sp. Gén. der Lepid., vol. i, sp. 581] only quotes Klug.

I have little doubt that this butterfly is attached to the Desert Caper, *Capparis aphylla*, Roth., a leafless bush with bluish-green stems and inconspicuous flowers with red stamens.

Three males appeared to have a faint sweet scent, suggesting in one case Gorse.

42. *Teracolus calais*, Cramer (= *dynamene*, Klug, = *carnifer*, Butler).

Klug's types came from Ambukôl, and from "Arabia deserta."

Dunn took it on the Bahr al-Zarâfa.

In 1909 I took two at Tawîla, and in 1912 I captured in all twelve specimens at various points on the White Nile from Tawîla in Lat. 13° 16' N., up to Kanîsa in Lat. 6° 50' N., half my specimens coming from the latter place.

Col. Yerbury found it one of the commonest butterflies at Aden, where its larva feeds on the *Salvadora persica*, Linn. [Nat. Ord. *Salvadoraceae*].

It has a wide range in Africa—Abyssinia, Somâliland, Victoria Nyanza district, British East Africa, German East Africa, the Congo, Damaraland, Angola; in Asia it is found in Arabia, Persia, Sind and North-west India; but in Southern India it gives place to *T. amatus*, Fabricius.

43. *Teracolus phisadia*, Godart (= *arne*, Klug).

Klug recorded this from Ambukôl as well as from "Arabia deserta."

Capt. Dunn took it on the Bahr al-Zarâfa. Loat took five males and two females near Kâkâ. Selous took two males at Tawîla. The Swedes took four males and a

female on Abba Island [Lat. $13^{\circ} 22'$ N.] and at Renk [Lat. $11^{\circ} 45'$ N.].

In 1909 I took six males and six females at Tawila [Lat. $13^{\circ} 16'$ N.]. In 1912 I took in all fifteen males and sixteen females, the distribution of which was remarkable. A solitary female occurred at "the Mahdi's place" on Abba Island [Lat. $13^{\circ} 22'$ N.]. Thirteen specimens were brought home from Tawila, some half-a-dozen miles to the south of the last-named locality, where it was as common as on the occasion of my first visit. Fifteen were taken on Masran Island [Lat. $12^{\circ} 45'$ N.] and a solitary male at Mashra Zarâfa [Lat. $10^{\circ} 50'$ N.].

I have not been able to determine the precise latitude of Capt. Dunn's locality, but it must have been somewhere between $9^{\circ} 30'$ and $7^{\circ} 0'$ N., or considerably south of my localities, which all lie between $13^{\circ} 22'$ N. and $10^{\circ} 50'$ N., the great majority of the specimens occurring a little to the north or south of the 13th parallel.

Cholmley saw but one example, at Wâdi Gabait. Nurse and Yerbury found it abundant and variable at Aden; its larva feeding on *Salvadora persica*, Linn. It is also recorded from the Lebanon, Somâliland, Abyssinia, British East Africa and Senegal.

My impression is that of a very local butterfly, abundant where it occurs, somewhat sluggish in habit and easily caught.

44. *Teracolus castalis*, Staudinger.

The only record on the White Nile that I know of is my capture of two males at Kanîsa [Lat. $6^{\circ} 50'$ N.] on February 17th, 1912.

It occurs in British East Africa, both in the Victoria Nyanza Country and at Mombâsa, also in Somâliland.

45. *Teracolus chrysonome*, Klug.

The type came from Ambukôl. *T. helvolus*, Butler, is the dry-season form.

Rothschild found it common at Gebel Margel, near Shendî. I took a female near Mogran (on the Western, or White Nile, side of Khartûm) on February 8th, 1909. Cholmley found it very common in January and February about Halaib on the Red Sea. Peel took it in Somâliland (f. *helvolus*, Butl.).

Mrs. Waterfield and I found it in numbers, though local, in the scrub on the landward side of Port Sûdân, males preponderating largely. It did not turn up in the Park.

I have not come across any records from the White Nile district south of Khartûm, but it has a wide range further south, being found in Uganda, British East Africa, German East Africa, Portuguese East Africa, Congo, Rhodesia and Angola. Aurivillius (3. p. 51) adds Arabia and Northern Nigeria.

The sexes are distinct enough, but it is not so strikingly dimorphic as most species of the genus, nor does it seem to be variable.

46. *Teracolus vesta*, Reiche.

The type came from Abyssinia.

I took a solitary specimen at Rejâf [Lat. 4° 45' N.], on February 14th, 1912, and have no other records from this part of Africa although its range includes Mombâsa, Natal, Mashonaland, the Transvaal, Delagoa Bay, Damaraland and Angola.

47. *Teracolus amelia*, Lucas.

The type came from British East Africa.

Aurivillius (3. p. 52) says that this species, which extends from Senegal to Nubia, is very likely a local race of the preceding, but Dixey considers them quite distinct.

Loat took a solitary female, of the dry-season form, near Kâkâ; the Swedish expedition took another specimen, also a female, at the same place [Lat. 10° 40' N.].

I did not come across this species and have no other records from that part of the world, but there is a specimen in the Hope collection from Abyssinia (River Atbara).

48. *Teracolus protomeia*, Klug.

Klug says: "ex Arabia felici, Ambukohl: mensibus Julio et Augusto."

Petherick took both sexes on the White Nile. Dunn took it on the Bahr al-Zarâfa. Loat took five females near Kâkâ. Selous took two of each sex near Tawfikîyâ, one of the males being very small. The Swedish expedition took six males and three females all to the south of Kâkâ, the specimens being all of normal size and coloration.

In 1909 I took a solitary female at Khartûm, and subsequently ten males and one female at Ad-Duwêm, also one

of each sex at Tawîla. In 1912 it was quite common in gardens at Khartûm and I saw several at Kadarû, ten miles to the north. Moreover I either took, or saw, it at almost every stopping-place on the White Nile, right up to Rejâf.

The Rothschild party took eight at Nakhîla. Cholmley took it commonly north of Suâkin. I saw several at Port Sûdân, while Yerbury found it at Aden. Peel took a male at Sibî, West Somâliland, in 1895. It occurs also in Uganda, at Mombâsa, in German East Africa, and at Yola in Nigeria. It is thus evident that this large handsome swiftly-flying butterfly has a wide distribution.

Butler remarks that specimens of this species almost invariably arrive in a more or less broken condition. It has a strong flight and is, I should imagine, long lived.

The sexes are not remarkably different in appearance, and the insect does not appear to vary otherwise than in size.

In six males I have detected a slight scent, not easy to describe. The words "dusty," "stuffy," "musky," "peculiar," "like wood," and "very faint Freesia" have been applied to it. (Compare 16. p. 510.)

49. *Teracobus halimede*, Klug.

This includes Klug's *acaste*, from Ambukôl. Butler's *leo* is a form or race of this species, but no marked line can be drawn between it and the type; *coelestis*, Swinhoe, is not specifically distinct.

Klug's types came from Ambukôl, as well as from "Arabia felix and Arabia deserta." Consul Petherick sent it home from the White Nile. Loat took a male and two females near Kâkâ. Selous found it common at Tawîla and took a female opposite Renk; all his specimens would appear to have been of the form *leo*. The Swedes took one of each sex on Abba Island; these were assigned by Aurivillius to var. *acaste*, Klug.

In 1909 I took a number from Ad-Duwêm [Lat. 14° 0' N.] to Gebel Ên [Lat. 12° 37' N.].

In 1912 I took in all twenty-two (many of the form *leo*) on the White Nile, namely: on Abba Island five, at Tawîla nine, on Masran Island five, at Gebel Ên two, and at Kâkâ one [Lat. 10° 40' N.].

So far as my information goes its limits on the White Nile are Lat. 14° 0' N. and Lat. 10° 40' N., with headquarters at Tawîla [Lat. 13° 16' N.]. It is an insect not easily overlooked.

Cholmley took two of the form *leo* north of Suâkin, and Yerbury took it at Aden [given under the names *acaste*, Klug, and *coelestis*, Swinhoe]. The food-plant of the larva is *Cadaba glandulosa*.

It is a common butterfly at Port Sûdân and not as local as the next species. I found many females extremely worn, suggesting prolonged life.

This variable insect ranges over Abyssinia, Somâliland, British East Africa and German East Africa.

A male had a distinct musky odour. (Compare 16. p. 510.)

50. *Teracolus pleione*, Klug (= *miriam*, Felder).

The type came: "ex Arabia felici."

Petherick took it somewhere on the White Nile, and Loat took a female near Kâkâ [Lat. 10° 40' N.].

On February 5th, 1912, I captured two females at Kâkâ, both of the form with an orange flush, approaching the male colouring. I know of no other specimens from the White Nile.

At Port Sûdân this butterfly is extremely local; in certain spots in the Park it is very abundant, I took also a few specimens to the north of the harbour. The males had little or no orange flush.

Col. Yerbury took it in abundance at Aden, where he and Col. Nurse noted that it attached itself closely to a certain shrub, *Cadaba glandulosa* [Nat. Ord. *Capparidaceae*], on which the larva feeds. I can confirm this, though I did not identify the shrub. Late in the afternoon I have beaten the butterflies out of these shrubs in such numbers that on several occasions I have had five or six in my net at once.

Col. Yerbury tells me that most of his specimens were of a darker yellow than mine, also that in the Aden district about one out of every four females has the yellow flush.

This butterfly has also been found in Abyssinia.

A male had a scent like Freesia.

51. *Teracolus eris*, Klug.

The type came from Ambukôl.

The only northern record that I have of this widely-spread species is the capture of a solitary male at Masrân Island [Lat. 12° 45'] in 1912. I think, however, that Mrs. Waterfield has taken it at Port Sûdân.

Dr. Dixey and I took a few specimens in South Africa, at Ladysmith and the Victoria Falls, but it is a very rapid flyer, so that a small proportion only of those seen is actually secured.

Its area of distribution includes Abyssinia, Somâliland, the Victoria Nyanza, German East Africa, Rhodesia, Matabeleland, Natal and Angola.

52. *Teracolus hetaera*, Gerstaecker.

Mr. Loat took a female of this species near Kâkâ [Lat. 10° 40' N.], which was at first thought by Dr. Dixey (l. c. p. 146) to be a yellow form of the female of *T. phlegyas*. I have no other record for the White Nile.

Its range extends from the Victoria Nyanza to Mombâsa.

53. *Teracolus phlegyas*, Butler.

The synonymy of this species is puzzling. Butler called its dry-season form *jalone*, and the male of the same *coliagenes*. Again *T. imperator*, Butler, is indistinguishable from *phlegyas*. According to Trimen *phlegyas* is *ione*, Godart, in spite of the fact that Godart's description of *ione* agrees closely with the Natal insect. Trimen lays stress on the fact that Natal was not known to white men in Godart's day. [He died in 1823.] Dixey, however, considers the Natal insect to be *speciosus*, Wallengren [= *erone*, Angas], of which the dry-season form is *jobina*, Butler, the wet-season form *ione*, Godart.

The female is very variable and extremely different from the male. The types were taken by Petherick on the White Nile. Capt. Dunn met with it on the Bahr al-Zarâfa. Loat took a typical male near Kâkâ [Lat. 10° 40' N.]. Selous took two females and a male at Tawfikiyâ [Lat. 9° 25' N.]. The Swedes took a male on Abba Island [Lat. 13° 22' N.], also a female near Kâkâ.

In 1912 I took in all ten specimens, viz. two males at Kirô [Lat. 5° 22' N.], two males at Mongalla [Lat. 5° 12' N.], two males and a female at Gondokoro, and three males at Rejâf wooding station.

Thus *T. phlegyas*, while it ranges over 8½° of latitude along the White Nile, would appear to be commonest high up the river, above the Sadd.

Outside our limits this lovely butterfly is met with in Abyssinia, British East Africa, German East Africa, Rhodesia, Matabeleland, Natal, Damaraland and Senegal.

This species, and the remark is even more true of *T. eupompe*, is easily taken late in the afternoon when disturbed from the coarse grass in which the butterflies sleep; otherwise I quite agree with Messrs. Marshall* and Loat (13. p. 146) as to the wildness of their flight. It is remarkable that the purple-tip is rarely caught sight of during flight, and even the crimson-tip of *eupompe* is not nearly so conspicuous as might be supposed, but both butterflies have a peculiar bluish-white look when on the wing.

54. *Teracolus eupompe*, Klug.

This species is both sexually dimorphic and variable, and has consequently been split up by authors into, *e. g. pseudacaste*, Butler; *theopompe*, Felder, and *dedecora*, Felder. It would appear also to be conspecific with *miles*, Butler (26. p. 10).

Klug says: "Habitat in Arabia deserta, in Sinai monte, in Dongola et Habessinia." Capt. Dunn took it on the Bahr al-Zarâfa. Petherick took it on the White Nile. Loat took both sexes at Kâkâ and near Mongalla, as well as at Gondokoro. Selous took a male at Tawîla, and both sexes at Tawfikîyâ. The Swedish expedition took nine males and one female at Renk, Gebel Ên, and Kâkâ; these included the forms *theopompe*, Feld., and *dedecora*, Feld.

In 1909 I took two females at Gebel Ên; seven males and a female at Tawîla, and an aberrant female at "the Mahdi's place" on Abba Island.

In 1912 I met with it in considerable numbers, finding it at nearly every landing-place from Ad-Duwêm to Rejâf. It was very common at Gebel Ahmed Agha, Kanîsa and Mongalla, but might be described as abundant at Rejâf.

This species varies greatly in size. In a very few examples there is a purple glance or sheen on the crimson-tip. Many of the females were much worn. The great beauty of the males so fascinated me that I could not resist taking a considerable number, hence my collection gives the wrong impression that this species was commoner on the White Nile than, say, *T. evarne*, which is less attractive.

The Rothschild party took it commonly (*pseudacaste*) at Al-Nakhîla in 1904, but I have no record from Khar-tûm. Mr. Cholmley took it commonly north of Suâkin, and Peel found it in Somâliland. It is common enough at Port Sûdân; Col. Yerbury took two specimens at Aden

* Trans. Ent. Soc. Lond., 1902, pp. 354, 371.

(miles). It is found in Abyssinia, Somâliland (the commonest butterfly at Zaila), the Victorian Nyanza district, British East Africa, German East Africa and in Senegal.

In two males I detected a slight scent, in one described as "sweet," in the other as "stuffy."

55. *Teracolus achine*, Cramer.

This fine species is variable and accordingly has received several names. *T. simplex*, Sharpe, was described from a dry-season male from Durban; *antevippe*, Boisduval, and *helle*, Butler, are names given by the latter author to Petherick's specimens (both sexes) from the White Nile. Selous, in 1911, took two males of the extreme dry-season form at Tawfikîyâ [Lat. 9° 25' N.].

In 1912 I secured four males and two females on the White Nile, viz. single specimens at Dûlêb (not far from Tawfikîyâ), Hillet al-Nuwêr, Kanîsa and Kirô, and a pair at Rejâf. From these occurrences it may be gathered that on the White Nile *T. achine* is confined to localities south of Lat. 9° 30' N., and that it is not very common anywhere.

Cholmley took a dry-season male (*simplex*, Sharpe) north of Suâkin. Peel took a wet-season female in Somâliland. I took six males and four females at Port Sûdân.

It occurs in Rhodesia, Natal, and Cape Colony, and indeed probably over the whole of Africa south of the Sahara, if with Dr. Dixey we reckon the West African *T. carteri*, Butler, as a sub-species.

56. *Teracolus evippe*, Linné.

The form of this variable species usually met with on the White Nile is *epigone*, Felder, which is the same as *microcale*, Butler.

Petherick took a male somewhere on the White Nile. Loat took a male and six females at Mongalla.

I did not meet with this species in 1909, but in 1912 took twelve males and two females in localities ranging from Abba Island [Lat. 13° 22' N.] to Gondokoro. It was not common anywhere, but three out of my fourteen specimens were captured on the small patch of firm ground in the Sadd known as Hillet al-Nuwêr [Lat. 8° 13' N.].

Col. Yerbury met with it at Aden [*epigone*], but so far as I know it does not occur at Port Sûdân.

It occurs in the Victoria Nyanza district, Natal, Cape Colony, Sierra Leone, Lagos, South Nigeria, the Gambia district, the Cameroons and Angola.

The White Nile specimens are very small and many of them have the orange-tip paler than in specimens taken further south.

A male yielded a scent like *Freesia*.

[*Teracolus omphale*, Godart.

The Swedish expedition sent home two *Teracoli*, a male and a female, one taken at Renk, the other at Kâkâ, in February. Aurivillius calls them *T. theogone*, Boisduval, the winter form of *omphale*. He adds that both the specimens are small, the male measuring 33 mm. in expanse, the female only 28 mm.

I have not come across any other record of this species being taken on the White Nile, and did not myself meet with it anywhere in the Sûdân.

Odd specimens of the genus *Teracolus* are difficult to determine, and it seems reasonable to conjecture that the butterflies taken by the Swedes were not *omphale*, but perhaps the *epigone* form of *evippe*, or some other admittedly White Nile species, such as *achine*, or *evagore*.

Omphale occurs in Somâliland, though Peel did not come across it there; the two butterflies which Dr. Dixey (11. p. 15) so named, turn out, as he informs me, to be respectively an "intermediate" male of *T. evagore*, Klug, and a wet-season female of *T. achine*, Cramer.

It has also been taken in Abyssinia and almost all over Africa south of the Equator. The Hope collection contains two specimens from the Gambia.

In the absence of confirmatory evidence I exclude *T. omphale* from the White Nile list.]

57. *Teracolus दौरα*, Klug.

The synonymy of this species also is puzzling. Not only is it sexually dimorphic, but the ground-colour of the female may be either white or ochreous. Klug stated that the types came "ex Arabia felici."

Dr. Dixey has carefully studied long series of this butterfly and a closely allied form from Aden, which he is convinced is quite distinct. While admitting that Klug's male insect might well have come from Arabia, he asserts that no such

(ochreous) female as that figured in the *Symbolae Physicae* has been received from Arabia since Klug's time. Shortly, he thinks that Klug had before him two nearly allied species, an Arabian male and an African female.

Meanwhile Swinhoe described the Aden species as *yerburii*, and Dixey is strongly of opinion that it would be convenient for that name to stand, and the name *daira* to be confined to the African species. Probably Klug's type (female) of *daira* came from Ambukôl.

Petherick took this species on the White Nile. Dunn found it on the Bahr al-Zarâfa. Loat took it near Kâkâ and at Mongalla. Selous took two males at Tawîla and other two near Tawfikîyâ. The Swedish expedition sent home four males and four females, from Abba Island, Renk and Kâkâ.

In 1909 I took a male at Khartûm, six males and four females at Ad-Duwêm, a female at Hillet Abbâs, and three males and two females at Tawîla.

In 1912 I captured a male between Sôba and Khartûm, and met with it more or less commonly all the way up the White Nile to Rejâf. My specimens vary in colour and even more in size, but the dwarfs were not localised, *e. g.* at Malêk two males were taken, one of them described as "a dwarf with very little black," the other as "a fine large specimen with much black." One male was yellowish in ground-colour; in some females there is an orange-red flush before the tip, but in a large specimen this is quite absent, the tip being broadly black.

Mrs. Waterfield took a number at Port Sûdân, where I found one of each sex. Rothschild took it on the Atbara, also at Shendî. Cholmley took a female "below Shelal mountain."

It occurs in Abyssinia, Somâliland and British East Africa.

58. *Teracolus evagore*, Klug.

The type is said to have come "ex Arabia deserta." Dr. Dixey considers *T. nouna*, Lucas, *T. saxeus*, Swinhoe, *T. glycera*, Butler, *T. demagore*, Felder, and *T. heuglini*, Felder, to be all synonyms of this variable species, which has a wide distribution almost throughout Africa, and extending to S. Arabia.

Petherick took a male on the White Nile, also a female which Butler referred to *demagore*, Feld. Dunn took it on

the Bahr al-Zarâfa (*glycera*). Loat met with it (*glycera*) commonly near Kâkâ and at Mongalla, also four males at Gondokoro. The Swedes seem to have found it pretty common at Renk and Kâkâ (*heuglini*). Selous took both sexes at Tawfikîyâ (f. *heuglini*).

I did not come across it in 1909, but in 1912 found it from Gebel Ahmad Agha (a degree and a half south of the furthest point reached by me in 1909), at most of the places visited right up to Rejâf. It was distinctly commoner south of Shambî [Lat. 7° 0' N.], being especially abundant at Mongalla [Lat. 5° 12' N.]. It varied in size, and the female varied in the proportion of black and orange in the tip of the fore-wing.

Col. Yerbury took it at Aden (*nouna* and *saxeus*), also on the Somali coast. Under the name *nouna* it is well known as the Algerian *Teracolus*. Its larva feeds on a species of *Capparis*.

59. *Teracolus ephyia*, Klug.

[Plate II, fig. 4 ♂, fig. 5 ♀, fig. 6 ♂ u. s.]

The type (male) of this little-known butterfly came from Ambukôl. Aurivillius (l. p. 439) gives as other localities “? Angola, ? Damaraland : Rehabeth (Coll. Staud.),” but the same author writing later (3. p. 59) says : “Mit sicherheit nur aus Nubien bekannt.”

The Swedish expedition took two males at Khartûm.

In 1909 I took four males and a female at Khartûm, and also four males at Sôba.

In 1912 I took three males near Sôba station, on the opposite side of the Blue Nile to the ruins of the city. I also took three males and a female at Kaderû, opposite to the battlefield of Kerreri (Omdurman).

The Hon. N. C. Rothschild took a *Teracolus* near Shendî, where it was abundant, and believes that he saw the same species on the battlefield of Kerreri in March 1900.* This he named *T. liagore*, Klug (18. p. 21), but Dr. Jordan, who kindly re-examined the specimens at my suggestion, agrees that they should be referred to *ephyia*.

The British Museum has two specimens, males, labelled “Upper Egypt.”

* In my two flying visits to the battlefield, in 1909 and 1912, I did not take any *Teracoli*, though I have a recollection of having seen one.

This *Teracolus* has a more restricted distribution than any that I have met with; my specimens were all taken within a dozen miles of Khartûm—the most southerly at Sôba [Lat. $15^{\circ} 32' N.$]. Shendî is in Lat. $16^{\circ} 42' N.$, and Ambukôl in Lat. $18^{\circ} 4' N.$, so that the total range in latitude is but $2\frac{1}{2}^{\circ}$.

There is a specimen in the Hope collection taken by E. N. Bennett on the Upper Nile near the Pyramids of Meroë [Lat. $16^{\circ} 55' N.$], which are not many miles north of Shendî. There is, however, another specimen, which seems to be referable to the same species, that was taken by "S. L. and H. Hinde" in the Kenya district of British East Africa—about on the Equator.

Very closely allied to *ephyia*, but separable from it, is *T. lais*, Butl., of which Aurivillius (3. p. 5) gives the distribution as from Damaraland to Natal. Prof. E. B. Poulton, in 1905, took a specimen at Artesia station, British Bechuanaland [Lat. $24^{\circ} S.$]. *T. lais* might be termed the representative species of *T. ephyia* in South Africa.*

Mr. Hinde's specimen was taken $15\frac{1}{2}^{\circ}$ south of my specimens of *ephyia*, and the extreme north of Damaraland is yet another 17° further south, so that whether it be referred to *ephyia* or to *lais*, it was found in an (at least apparently) extremely isolated position.

60. *Teracolus liagore*, Klug.

[Plate II, fig. 7 ♂, 8 ♀, 9 ♂ u. s.]

The type came from Ambukôl, though Kirby's Catalogue gives Arabia.

This is another little-known butterfly. Miss Sharpe [A Monograph of *Teracolus*, 1901, p. 128] considers *liagore* to be the dry-season form of *daira*, but on what grounds I know not. Dr. Dixey says it is impossible.

In 1909 I took a male at Ad-Duwêm [Lat. $14^{\circ} 0' N.$], the only White Nile record that I know of. In 1912 I took a female near Sôba station.

[For the Hon. N. C. Rothschild's captures see the preceding species.]

Mr. Cholmley took four males in the district to the north of Suâkin. Mrs. Waterfield takes it at Port Sûdân, where I myself took seven males and five females.

* Compare Dr. Dixey's remarks, Proc. Ent. Soc. London (1912), p. cxli.

Aurivillius (3. p. 59) confines this species to Nubia, but the British Museum has two males and a female from Muscat, South-east Arabia.

The range of this species, though decidedly restricted, is wider than that of the last, reaching the Red Sea Littoral on the north-east, and going $1\frac{1}{2}^{\circ}$ above Khartûm on the White Nile towards the south.

I have a fine large female which differs from the example figured in that the transverse dark bar on the fore-wing is reduced to two spots, whereas the marginal black spots on the hind-wing are much more pronounced.

61. *Teracolus evarne*, Klug.

The type came from Ambukôl.

Butler calls the dry-season form *citreus*, and the geographical race occurring in Upper Egypt, the White Nile and Abyssinia, *xanthevarne*.

This butterfly was taken by Petherick on the White Nile (*citreus* and *xanthevarne*). Dunn took it on the Bahr al-Zarâfa. It was found in some numbers by Loat at Mongalla and Gondokoro. Selous took two females, one opposite Renk, the other at Tawfikiyâ. Two males and six females brought home by the Swedish expedition from Renk, Gebel Ahmad Agha and Kâkâ were referred by Aurivillius to "var. hib. *citreus*, Butl."

A solitary male was taken by myself in 1909 at Gebel Ên [Lat. $12^{\circ} 37' N.$], but in 1912 I brought back twenty-eight specimens from various places on the White Nile, extending from Gebel Ahmad Agha in Lat. $11^{\circ} 0' N.$ right up to Gondokoro. It was by far the commonest at Shambî [Lat. $7^{\circ} 0' N.$]. As it is not a very attractive insect on the wing the number of specimens brought home is not an exact measure of its abundance, for one's attention is apt to be diverted by more conspicuous things.

Rothschild found it common on the Atbara, but it was not reported by either Cholmley or Yerbury. At Port Sûdân Mrs. Waterfield looks upon it as the commonest butterfly.

It occurs in Abyssinia, Somâliland (*philippsi*, Butler), the Victoria Nyanza district, British East Africa, German East Africa and Senegal.

I detected a scent in five males; it was distinct and sweet in character, in one case compared to Freesia, but in another described as "somewhat medicinal."

62. *Eronia cleodora*, Hübner.

The Sûdân form is var. *erxia*, Hewitson, which is more similar to the Natal form than to the race with very wide black borders which is found in the Mombâsa district.

Loat took a wet-season male at Mongalla [Lat. 5° 12' N.]. Selous took a small wet-season male near Tawfikîyâ [Lat. 9° 25' N.]. The Swedes took a small (51 mm.) male as far north as Gebel Ên [Lat. 12° 37' N.].

In 1912 I took two males at Renk [Lat. 11° 45' N.], and saw another specimen at Kîrô [Lat. 5° 22' N.].

This handsome insect ranges over the whole of the Eastern side of Central and Southern Africa, and it also occurs in Angola.

63. *Eronia leda*, Boisduval.

In 1912 I secured a specimen of this very swift butterfly on the tiny island in the Sadd known as Hillet al-Nuwêr [Lat. 8° 13' N.], and saw others at Bôr [Lat. 6° 13' N.] and at Kîrô [Lat. 5° 22' N.].

It would appear that this conspicuous South African insect does not get further down the White Nile than the Sadd.

This species has almost the same but not quite as wide a range over the continent as the preceding.

64. *Leuceronia buquetii*, Boisduval.

Loat took a female at Gondokoro. Selous took a male at Tawîla.

In 1909 I took a female at Tawîla, and in 1912 took six specimens in all, viz. two males at Tawîla, two males at Masran Island, a female at Kâkâ wooding station, and a female at Malêk [Lat. 6° 7' N.].

Its northern limit, according to these records, is Tawîla [Lat. 13° 16' N.], whence came four out of the total of nine specimens.

Col. Yerbury took it at Aden [form *arabica*, Hopff.]; Thrupp took the same form in Somâliland.

It is found over nearly all Central and South Africa; it also occurs in Sierra Leone and Madagascar.

I suspected a faint sweet scent in a male specimen, and noted a slight "scarcely agreeable" scent in another.

65. *Catopsilia florella*, Fabricius.

Dunn took this on the Bahr al-Zarâfa. The Swedes took a solitary male to the south of Kâkâ.

It was common during my stay at Khartûm in 1909, less so in 1912. Though I did not myself take this butterfly on the White Nile above Khartûm, it is very possible that I may have seen it.

Rothschild mentions it as common round Khartûm, and also as seen at Shendî. Cholmley took several north of Suâkin. Mrs. Waterfield found it common enough at Port Sûdân, though I did not myself see it there. Col. Yerbury took it freely at Aden. Peel found it abundant in Somâliland, and it extends even to Sokotra, where Bennett noted of it: "Flight strong," a fact that no one acquainted with the insect will dispute.

It ranges over Arabia, the whole of Africa south of the Sahara, and occurs in Madagascar and the Mascarenes.

At Khartûm I repeatedly saw this butterfly settle upon *Cassia obovata*, Callad., a dwarf shrub with yellow flowers that grows commonly on the sand in the outskirts of the city. Col. Nurse says that its larva feeds upon species of *Cassia*.

The strong luscious sweet scent of the males, noticed by me in South Africa, was confirmed.

66. *Terias senegalensis*, Boisduval.

Butler considered his *chalconiaeta* to be an insular race of this species.*

Found by Dunn on the Bahr al-Zarâfa. Loat took three males and a female at Gondokoro; the males were "dry," the female "intermediate."

In 1912 I took a single female, of the dry-season form, and saw another specimen, at Masran Island [Lat. 12° 45' N.]. Perhaps that may be taken as about the extreme northern limit of this butterfly, which is found throughout Africa south of the Sahâra, in Madagascar, and in Southern Arabia.

Yerbury took the form *chalconiaeta* at Aden.

67. *Terias brigitta*, Cramer.

Taken by Dunn on the Bahr al-Zarâfa. Loat took one of each sex at Gondokoro in January 1902; the male was

* Ann. Mag. Nat. Hist., Ser. 7, vol. i (1898), p. 67.

distinctly of the wet-season form, the female "wet" or "intermediate."

In 1912 I took a male at Kîrô, another at Lâdô, also a male and two females at Gondokoro.

As butterflies of the genus *Terias* are quite easily seen when on the wing, it might appear allowable to conjecture that *brigitta* does not extend far north of Lake Nô [Lat. 9° 30' N.], but the fact that specimens of the preceding species turned up no less than three degrees north of that place makes one cautious.

T. brigitta is found in Abyssinia, Somâliland and throughout tropical and South Africa.

68. *Colias hyale*, auctorum, f. *marnoana*, Rogenh.

In 1909 I found this butterfly almost abundant in the beanfields at the junction of the Blue and White Nile, just below Khartûm, near a village called Mogran.

During my visit in 1912 I did not work that exact locality, but I netted two males at the edge of a large cottonfield at Kadarû, opposite to Kerreri, and a few miles to the north of Khartûm.

Peel took a female in Somâliland in 1897. It is fairly common at Port Sûdân, and it occurs in Abyssinia, but Col. Yerbury tells me that the genus has no representative at Aden.

C. hyale is very widely distributed over the Palaearctic region.

Sub-family *PAPILIONINAE*.

69. *Papilio demodocus*, Esp.

Taken by Dunn on the Bahr al-Zarâfa; by the Swedes at Khartûm, where the Rothschild party found it abundant among lemon trees.

I saw but few at Khartûm in 1909; at the time of my second visit, however, it was quite common among limes (*Citrus limetta*).

Mr. H. H. King assured me that *demodocus* is found up the White Nile, but could give no particulars.

Selous took two at Ardeiba in the Southern Bahr al-Ghazâl. It occurs at Aden, also in Somâliland, and is found throughout tropical and South Africa.

70. *Papilio pylades*, Cramer.

Loat took a female at Gondokoro, noting it as "rare."

Selous took it commonly at Ardeiba in the Southern Bahr al-Ghazâl; Trimen (24.) notes that all Selous' specimens, though some of them are rather small, are of the typical West Coast form.

For the typical *pylades* Aurivillius (3. p. 21) gives Senegal to the White Nile, Northern Congo.

Family HESPERIIDAE

71. *Sarangesa eliminata*, Holland.

The Swedish expedition took two specimens, both males, on the White Nile, but the locality is not specified; Aurivillius suggests that perhaps *Cyclopides phidyle*, Walker [Entomologist, v, p. 56, 1870], may be this species.

Peel took it in Somâliland. It occurs also in British East Africa, Rhodesia and in Cape Colony.

Possibly this is identical with *S. tsava*, B.-Baker, a common insect at Port Sûdân.

72. *Gegenes nostradamus*, Fabricius.

Loat took three males and a female near Kâkâ [Lat. 10° 40' N.].

In 1912 I took one near Sôba station and two at Khartûm.

In 1909 I took one (a male) at Aswân; I had previously taken it in Northern India. Bennett took a female in Sokotra, and Yerbury met with it at Aden [form *karsana*, Moore]. It occurs in British East Africa; northwards it extends to Cyprus; westwards to Gibraltar; and eastwards to Afghânistân and the Panjâb. It is a dingy insect, and very inconspicuous, so that it might easily be overlooked.

73. *Parnara mathias*, Fabricius.

Loat took a male near Kâkâ.

In 1912 I took one at Tombê [Lat. 5° 43' N.] and another at Rejâf wooding station [Lat. 4° 50' N.].

Rothschild found it commonly at Cairo, and Yerbury took it freely at Aden.

This is a very common and widely-distributed species, but like the preceding it is inconspicuous and easily overlooked. It occurs in British East Africa, on the Zambesi and in Natal; it is found also in Cyprus and extends to India, Ceylon and the Philippines.

74. *Parnara fatuellus*, Hopffer.

This species was taken by Capt. Dunn on the Bahr al-Zarâfa, but I have no other records of it in that part of the world; it occurs in the Victoria Nyanza district, Portuguese East Africa, Rhodesia and Natal.

75. *Rhopalocampta forestan*, Cramer.

This fine Skipper was also taken by Capt. Dunn, but I have no other record.

Like the preceding this insect has a wide range, including Uganda, the Congo, British East Africa, Rhodesia, Natal, the Gambia and Sierra Leone.

A perusal of the above list leads to certain conclusions, which are made even more obvious by grouping the species in families and sub-families.

	Total Species found on White Nile.	Total Species found in S. Arabia.	Species common to both.
<i>Danainae</i> . . .	2	1	1
<i>Satyrinae</i> . . .	1	2	1
<i>Nymphalinae</i> . . .	10	8	7
<i>Acraeinae</i> . . .	5	0	0
<i>Lycaenidae</i> . . .	17	13	10
<i>Pierinae</i> . . .	33	19	16
<i>Papilioninae</i> . . .	2	1	1
<i>Hesperiidae</i> . . .	5	6	2
Total . . .	75	50	38

The Butterfly Fauna of the White Nile is a very poor one, comparable indeed, as far as numbers go, with that of the British Isles.

Several groups are very poorly represented, both as regards species and individuals, notably the *Satyrinae*, of which but a single specimen was found among several hundreds of butterflies sent home.

That typically African group, the *Acraeinae*, was represented by very few individuals; the same is true of the *Papilioninae* and the *Danainae*, while the *Nymphalinae* are not much more numerous.

The *Lycaenidae* contribute more species, but they are for the most part inconspicuous, and none of them strikingly common.

There are many species of *Pierinae*, and several of these are abundant, or at least common, so that when individuals are taken into consideration this group by far outnumbers all the others put together.

In the S. Sûdân, as everywhere, there are some favoured spots where butterflies are found in unusual numbers. One may spend an hour in such a spot among clouds of "Whites" and "Yellows" without catching sight of a Swallow-tail, a Nymphalid or a Skipper.

The impression left on the mind is that throughout the Anglo-Egyptian Sûdân, alike on the Red Sea coast and on the White Nile, from Khartûm right up to Rejâf, the beautiful, but puzzling genus *Teracolus* is dominant.

The most abundant and generally distributed species are *T. evarne* and *T. eupompe*, but several others—*T. दौरا*, *T. evagore*, *T. phisadia*, *T. halimede* and *T. protomedia*, are common enough where they occur, and it is indeed a beautiful and a bewildering sight to see these "orange-tips" and "crimson-tips," with here and there a "purple-tip" flying over the dead grass or the flowering shrubs.

That the Butterfly Fauna of the White Nile has a decidedly desert character was noticed long ago by Butler (9. p. 25) and by Dixey (12. p. 142). This is made very clear by a comparison with the fauna of S. Arabia, brought to our knowledge mainly by the labours of Col. Yerbury in Aden and its neighbourhood.

A glance at the preceding table shows that, as might have been expected, the South Arabian Fauna is even poorer than that of the White Nile, but—with the notable exception of the total absence of the great genus *Acraea*—the distribution between the families is very similar. It is very remarkable that out of the Arabian total of fifty species, no less than thirty-eight are found on the White Nile.*

Although Yerbury's operations were confined to a comparatively small area it may be assumed that his list is nearly complete, whereas mine is very far from such perfection. Collectors with more time at their disposal

* It is not possible when comparing lists to be certain that different authors mean the same things by the same names. But this difficulty has been minimised by the fact that neither Dr. Dixey nor Col. Yerbury are "splitters." My conclusions are mainly, though not entirely, founded upon the great Hope Collection, in which the *Pierinae* have been so admirably arranged by Dr. Dixey.

will without doubt add many species to my list, more especially among the less conspicuous *Lycaenidae* and *Hesperiidae*, and will give new localities to many species already recorded.

The following lists illustrate the relationship between the two faunas, and may, I hope, be instructive in other ways. The first (and longer) list gives all the butterflies for which I have records from Khartûm up to Ad-Duwêm; the four shorter lists give the *additional* species met with for each 2° of latitude as one ascends the river.

SPECIES RECORDED IN LATITUDES 16° N.—14° N.

(Khartûm to Ad-Duwêm inclusive.)

1. <i>D. chrysippus</i>	A	45. <i>T. chrysonome</i>	A
4. <i>P. cardui</i>	A	48. <i>T. protomedia</i>	A
5. <i>P. cebrene</i>	A	49. <i>T. halimede</i>	A
8. <i>H. misippus</i>	A	54. <i>T. eupompe</i>	A
19. <i>P. baeticus</i>	A	57. <i>T. daira</i>	
21. <i>T. theophrastus</i>	A	59. <i>T. ephyia</i>	
25. <i>C. eleusis</i>		60. <i>T. liagore</i>	A
27. <i>Z. lysimon</i>	A	65. <i>C. florella</i>	A
28. <i>C. trochilus</i>	A	68. <i>C. marnoana</i>	
30. <i>L. otacilia</i>		69. <i>P. demodocus</i>	
32. <i>A. ubaldus</i>	A	71. <i>S. eliminata</i> ? *	
39. <i>B. mesentina</i>	A	72. <i>P. nostradamus</i>	
41. <i>C. eulimene</i>			

ADDITIONAL SPECIES RECORDED IN LATITUDES
14° N.—12° N.

(S. of Ad-Duwêm to Gebel Ên.)

14. <i>A. acerata</i>		43. <i>T. phisadia</i>	N A
20. <i>L. bibulus</i>		51. <i>T. eris</i>	N
33. <i>D. livia</i>	N A	53. <i>T. phleggyas</i>	P
34. <i>V. antalus</i>	N	56. <i>T. evippe</i>	P A
35. <i>H. philippus</i>		61. <i>T. evarne</i>	P
36. <i>H. eriphia</i>	N A	62. <i>E. cleodora</i>	
37. <i>B. gidica</i>		64. <i>L. buquetii</i>	A
42. <i>T. calais</i>	N A	66. <i>T. senegalensis</i>	A

* It is not stated where the Swedish expedition came across this butterfly.

ADDITIONAL SPECIES RECORDED IN LATITUDES
12° N.—10° N.

(Renk to Melût inclusive.)

11. <i>B. ilithyia</i>	A	47. <i>T. amelia</i>	
17. <i>A. encedon</i>		50. <i>T. pleione</i>	N A
22. <i>T. telicanus</i>	N A	52. <i>T. hetaera</i>	
24. <i>C. cretosus</i>		58. <i>T. evagore</i>	P A
26. <i>C. malathana</i>	A	73. <i>P. mathias</i>	N A
38. <i>B. severina</i>	A		

ADDITIONAL SPECIES RECORDED IN LATITUDES
10° N.—8° N.

(Kôdôk to Hillet al-Nuwêr inclusive: mostly Sadd.)

2. <i>T. petiverana</i>		29. <i>L. amarah</i>	A
6. <i>P. clelia</i>	A	40. <i>P. venata</i>	
7. <i>P. boopis</i>		55. <i>T. achine</i>	P
12. <i>B. goetzius</i>	A	63. <i>E. leda</i>	
13. <i>A. phalantha</i>		67. <i>T. brigitta</i>	
16. <i>A. natalica</i>		74. <i>B. fatuellus</i>	
18. <i>A. abdera</i>		75. <i>R. forestan</i>	

ADDITIONAL SPECIES RECORDED SOUTH OF LAT. 8° N.

(Shambî to Rejâf: mostly above the Sadd.)

3. <i>Y. asterope</i>	N A	31. <i>A. jésous</i>	N A
9. <i>H. daedalus</i>	A	44. <i>T. castalis</i>	
10. <i>N. agatha</i>		46. <i>T. vesta</i>	
15. <i>A. terpsichore</i>		70. <i>P. pylades</i>	
23. <i>C. usemia</i>			

The letter A indicates that the species is recorded also for S. Arabia.

The letter N signifies that the species is known to occur north of Khartûm, and that therefore it may well be expected to occur further north than yet recorded.

The letter P signifies that the species was found by Petherick, and as the precise localities in which his captures were made are unknown, it is quite possible that he may have found the species further north.

As might have been expected it is seen that north of Kôdôk—roughly speaking north of the Sadd—the fauna

is decidedly more Arabian, or Desert, in character than it is to the south.

Again as might have been expected the great majority of the species are Ethiopian, that is to say peculiar to the Province made up of Africa, with the adjacent islands, and Southern Arabia. The species that extend beyond that Province are eighteen in number, viz. :—

2. *Ypthima asterope*. Syria.
4. *Pyrameis cardui*. Cosmopolitan.
8. *Hypolimnas misippus*. India, Ceylon, Malaya, etc.
11. *Byblia ilithyia*. India, Ceylon.
13. *Atella phalantha*. India, Ceylon, Malaya, China, Japan.
19. *Polyommatus baeticus*. Cosmopolitan.
21. *Tarucus theophrastus*. Persia, Balûchistân, India, Ceylon, Burma, S. Europe.
22. *Tarucus telicanus*. India, Ceylon, Burma, Java, China, Europe.
27. *Zizera lysimon*. S. Europe, W. Asia, India, Ceylon, Malaya, Australia.
30. *Chilades trochilus*. S.E. Europe, Central Asia, India, Malaya.
31. *Azanus jesusus*. }
32. *Azanus ubaldus*. } Balûchistân, India, Ceylon, Burma.
39. *Belenois mesentina*. Persia, Afghanistân, India, Ceylon.
42. *Teracolus calais*. Persia, Sind, N.W. India.
43. *Teracolus phisadia*. Syria (Lebanon).
68. *Colias hyale*. Palaearectic Province.
72. *Gegenes nostradamus*. Gibraltar, Cyprus, Afghanistân, Panjâb.
73. *Parnara mathias*. Cyprus, India, Ceylon, Philippines.

There are a few species which may be said just to touch the northern fringe of our district in the neighbourhood of Khartûm.

Such are :—

25. *Catochrysops eleusis*.
30. *Lycænesthes otacilia*.
41. *Calopieris eulimene*.
45. *Teracolus chrysonome*.
59. *Teracolus ephyia*.
68. *Colias marnoana*.

Of these *L. otacilia* is an East African and South

African species, and probably has a wider range up the river than has been yet recorded.

The other five are more Palaearctic in character, or are borderland species. *C. eulimene*, so far as is known, is confined to the Anglo-Egyptian Sūdân, and I know of only one example of *T. ephyia* taken outside that country. *Synchloë glauconome* has a wider range to the north, at Shendî it gets within sixty-five miles of Khartûm, but does not actually enter our district.

In like manner there are three butterflies which just attain the southern end of our district, viz. :—

23. *Castalius usemia*.

46. *Teracolus vesta*.

70. *Papilio pylades*.

These are all Central or South African forms.

Though well known to have a wider range outside our limits there are three species which, so far as actually recorded have a very restricted range on the White Nile :—

Tercolus halimede, 13° 22'—10° 40'.

Tercolus pleione, confined to Kâkâ, Lat. 10° 40', excepting so far as the locality of Petherick's specimens is unknown.

Tercolus phisadia, 13° 22'—10° 50', but presumably Capt. Dunn's specimens came from something like 2° further south.

The most northerly limit of the great genus *Acraea* would seem to be attained by *A. acerata* (f. *viridia*) in Lat. 12° 37' N.

The sole species peculiar to the White Nile district would appear to be the little-known, and hitherto rare, *Pinacopteryx venata*.*

Any one dealing with the Butterflies of N.E. Africa must depend greatly on the magnificent work of Klug. The writer has had the good fortune to take all his *Pierinae*.

* While this paper was going through the press my attention was called by Commander J. J. Walker to the description by A. G. Butler [Ent. Mo. Mag., vol. ii, p. 169, 1866] and a good wood-cut of *Aphnaeus* (?) *marmoreus*, n. sp. The type, a female, was taken by Petherick on the White Nile, and would appear to be unique; it now stands in the National Collection next to the S. African *Stugeta bowkeri*, Trimen.

The Hon. N. C. Rothschild's captures on the R. Atbara derive especial interest from the fact that, since Klug's time, no collector has worked so near to Klug's locality—Ambukôl.

I have to thank alike draughtsman and printer for the admirable plate.

Col. J. W. Yerbury, R.A., and Mr. Roland Trimen, F.R.S., have kindly assisted me with valuable information, the latter having placed his MS. notes on Mr. F. C. Selous' captures in the spring of 1911 at my disposal.

Prof. E. B. Poulton, F.R.S., and his able assistants have, as always, been most kind and helpful.

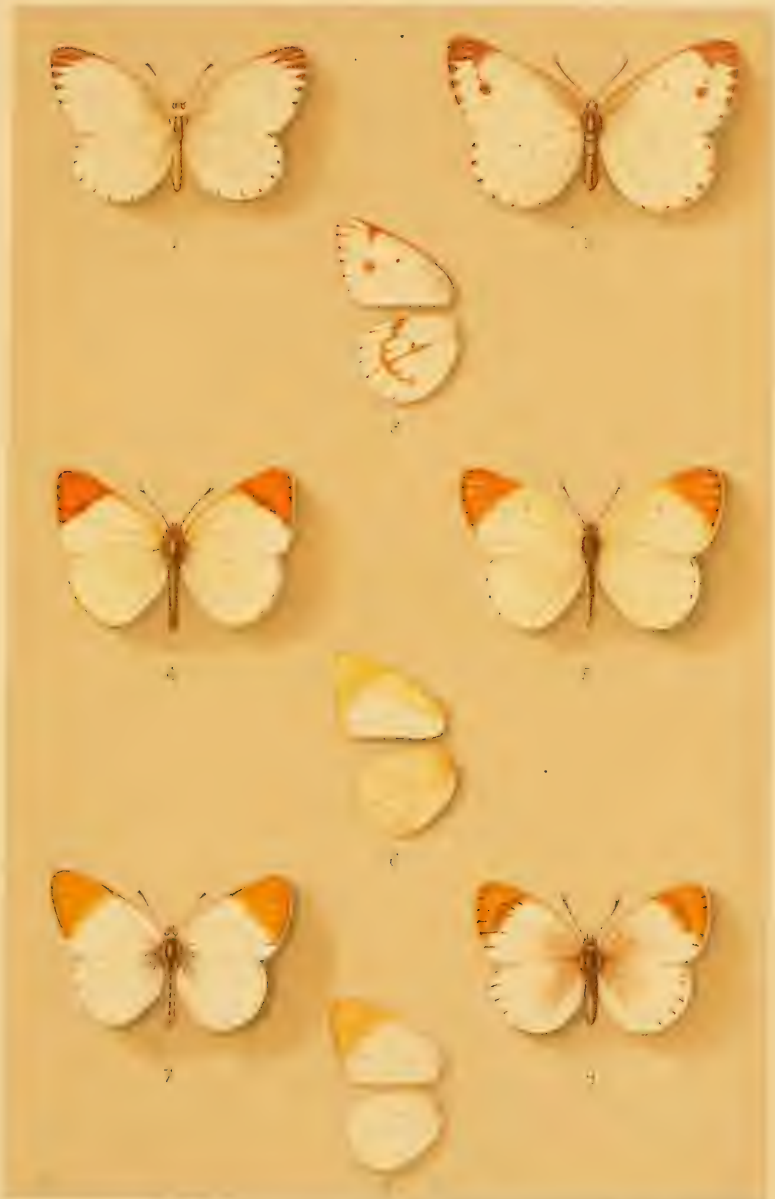
Dr. F. A. Dixey, F.R.S., has allowed me to draw upon his unique knowledge of the *Pierinae* and helped to guide me through the mazes of the genus *Teracolus* and steered me clear of many pitfalls.

LOCALITIES MENTIONED.

	Lat. N.		Lat. N.
[Port Sûdân	19° 35']	Melût	10° 27'
[Suâkin	19° 8']	[Berbera(Somâliland)	10° 25']
Ambukôl	18° 4'	Kôdôk (Fâshôda)	9° 54'
El-Nakhîla	17° 25'	Lûl	9° 47'
Shendî	16° 42'	Wâw	9° 40'
Kerreri	15° 47'	Malakal	9° 35'
Kadarû	15° 46'	Tawfikîyâ	9° 25'
Khartûm	15° 37'	Dûlêb (R. Sobat)	9° 22'
Sôba	15° 32'	Khor Atâr	9° 20'
Ad-Duwêm	14° 0'	Lake Nô	9° 30'
Kawwah	13° 45'	Bahr al-Zarâfa	9° 25'—7° 0'
Abba Island, " Mahdi's place "	13° 22'	Hillet al-Nuwêr	8° 13'
Tawîla	13° 16'	Shâmîbî	7° 0'
Kosti	13° 10'	Kamîsa	6° 50'
Kôz Abû Gûma	13° 8'	Bôr	6° 13'
Hillet Abbâs	13° 7'	Malêk	6° 7'
Masran Island	12° 45'	Tombê	5° 43'
[Aden	12° 45']	Kîrô	5° 22'
Gebel Ên	12° 37'	Mongalla	5° 12'
[Sokotra	12° 30']	Lâdô Wooding Stn.	5° 8'
Renk	11° 45'	Lâdô	5° 2'
Gebel Ahmad Aghâ	11° 0'	Gondokoro	4° 54'
Mashra Zarâfa	10° 50'	Rejâf Wooding Stn.	4° 50'
Kâkâ	10° 40'	Rejâf	4° 45'

EXPLANATION OF PLATE II.

- FIG. 1. *Pinacopteryx venata*, ♂.
2. " " ♀.
3. " " ♂, underside.
4. *Teracolus ephyia*, ♂.
5. " " ♀.
6. " " ♂, underside.
7. *Teracolus liagore*, ♂.
8. " " ♀.
9. " " ♂, underside



Horace Knight del. et lith.

West, Newman chr.

1. PINACOPTERYX VENATA ♂. 2 do ♀. 3. do ♂, underside.
4. TERACOLUS EPHYIA ♂. 5 do ♀. 6. do ♂, do.
7. do. LIAGORE ♂. 8 do ♀. 9. do ♂, do.

[The spelling of place-names is based on that of Dr. E. A. Wallis Budge in "Cook's Handbook for Egypt and the Sûdân," 2nd edition, 1906; "â" pronounced as "a" in "father"; "a" pronounced as "u" in "mud"; "ê" pronounced as "a" in "mane"; "î" pronounced as "e" in "meet"; "û" pronounced as "oo" in "boot."]

III. *Notes on various Central American Coleoptera, with descriptions of new genera and species.* By GEORGE CHARLES CHAMPION, F.Z.S.

[Read November 20th, 1912.]

PLATES III, IV.

THIS paper is mainly devoted to the enumeration and description of the Coleoptera rejected by the various contributors to the "Biologia Centrali-Americana" as not belonging to the particular groups studied by them,¹ or which have been overlooked in the sorting of the large collections that have passed through the hands of the Editors of that work during the past thirty-five years. The material has been supplemented by a number of interesting Mexican, Guatemalan, and Antillean forms recently sent for determination by the authorities of the U.S. National Museum, who have kindly allowed me to retain co-types of the new species for the British Museum. To determine these insects a few closely allied Antillean and South American forms have also had to be studied, and these, too, are dealt with in the following pages. The Coleoptera examined belong to the Clavicorn or Serricorn series, with the exception of the Psephenidae, Tenebrionidae, and Othniidae. The described Central American *Lytopeplus* (= *Brachylon*, Gorb.), *Hapalips*, *Trichodesma*, *Petalium* (= *Micranobium*, Gorb.), *Eupactus* (= *Lioolius*, Gorb.), *Priotoma* (= *Eutylistus*, Fall), etc., have all had to be re-examined, and a revised table of the species of each of these genera (*Petalium* excepted) is appended. The section Coleoptera of the "Biologia" was completed in Dec. 1911, eighteen volumes in all having been required for the enumeration of 18,039 species. This article, therefore, is practically a supplement to one of the divisions of the "Insecta" of that work, and the names of the species not occurring in Central America are, for convenience of reference, placed within square brackets. The additions to the fauna, 106, are marked (except in the preliminary list) with an asterisk, 89 of them being described as new.

¹ The Tenebrionid *Rhipidandri* were dealt with by Dr. Sharp in "B. C.-Am.," Coleoptera, II, 1, pp. 690-692 (March, 1905),

LIST OF SPECIES DESCRIBED OR RENAMED.

PSEPHENIDAE.

- | | |
|----------------------------------|------------|
| † <i>Psephenus palpalis</i> . | Mexico. |
| † <i>Psephenops grouvellei</i> . | Guatemala. |

SILPHIDAE.

- | | |
|---|--------------|
| <i>Liodes mexicanus</i> . | Mexico. |
| <i>Aglyptonotus</i> (n. n.) <i>majusculus</i> . | Mexico. |
| " <i>melas</i> . | Mexico, etc. |
| " <i>matthewsi</i> (n. n.) | Panama. |
| <i>Colenis phalacroides</i> . | Guatemala. |

SCAPHIDIIDAE.

- | | |
|------------------------------------|---------|
| <i>Scaphidium flavofasciatum</i> . | Mexico. |
| <i>Scaphisoma occidentale</i> . | Mexico. |
| <i>Baeocera irregularis</i> . | Mexico. |

NITIDULIDAE.

- | | |
|------------------------------------|--------------|
| † <i>Cybocephalus aciculatus</i> . | Mexico. |
| " <i>flavicornis</i> . | Guatemala. |
| " <i>schwarzi</i> . | Mexico, etc. |

COLYDIIDAE.

- | | |
|--|--------------|
| † <i>Pseudaulonium discolor</i> . | Panama, etc. |
| " <i>nitidum</i> . | Guatemala. |
| <i>Pycnomerus stenosoma</i> . | Guatemala. |
| † <i>Tyrtaeus</i> (n. g.) <i>rufus</i> . | Guatemala. |
| " <i>cribripennis</i> . | Panama. |
| <i>Lapethus sharpi</i> (n. n.) | Mexico, etc. |
| [" <i>brasilianus</i> . | Brazil.] |
| <i>Lytopeplus substriatus</i> . | Mexico. |
| " <i>curtulus</i> . | Mexico, etc. |
| " <i>laevipennis</i> . | Mexico, etc. |
| " <i>tibialis</i> . | Nicaragua. |
| " <i>sulcimargo</i> . | Nicaragua. |
| <i>Murmidius estriatus</i> . | Mexico. |

CUCUJIDAE.

- | | |
|--|------------|
| <i>Laemophloeus quadridentatus</i> . | Guatemala. |
| <i>Lathropus minimus</i> . | Guatemala. |
| † <i>Salpingomimus</i> (n. g.) <i>deceptor</i> . | Panama. |

CRYPTOPHAGIDAE.

† <i>Truquiella</i> (n. g.) <i>gibbifera</i> .	Mexico.
<i>Platoberus nigrolimbatus</i> .	Mexico.
<i>Tomarus gibbipennis</i> .	Mexico.
„ <i>fuscicornis</i> .	Panama.
<i>Trogocryptus longiusculus</i> .	Mexico, etc.
„ <i>senecionis</i> .	Mexico.
† <i>Cleridopsis</i> (n. g.) <i>latimanus</i> .	Guatemala, etc.
[<i>Hapalips crenatus</i> .	Brazil.]
„ <i>dimidiatus</i> .	Mexico.
[„ <i>parvicollis</i> .	Brazil.]
„ <i>sulcicollis</i> .	Nicaragua, etc.
„ <i>perlongus</i> .	Guatemala.
„ <i>lucidus</i> .	British Honduras, etc.
[„ <i>batesi</i> .	Amazons.]
[„ <i>brevipes</i> .	Brazil.]
„ <i>nitidulus</i> .	Mexico, etc.
„ <i>suturalis</i> .	Guatemala.
„ <i>obliteratus</i> .	Guatemala.
„ <i>lanuginosus</i> .	Mexico.
[„ <i>sculpticollis</i> .	Jamaica.]
[<i>Pseudhapalips</i> (n. g.) <i>lamellifer</i> .	Amazons.]

LATHRIDIIDAE.

† <i>Pseudevolocera</i> (n. g.) <i>atomarioides</i> .	Guatemala.
† <i>Lycoperdinella</i> (n. g.) <i>subcaeca</i> .	Guatemala.

MYCETOPHAGIDAE.

† <i>Pseudesarcus</i> (n. g.) <i>villosus</i> .	Panama.
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LYCTIDAE.

† <i>Berginus nigricolor</i> .	Guatemala, etc.
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ENDOMYCHIDAE.

<i>Micropsephus hemisphaericus</i> .	Mexico, etc.
† <i>Micropsephodes</i> (n. g.) <i>serraticornis</i> .	Guatemala.

COCCINELLIDAE.

<i>Cryptognatha rufoterminata.</i>	Panama.
„ <i>violacea.</i>	Mexico.
„ <i>fenestrata.</i>	Panama.
„ <i>circumducta.</i>	Panama.
„ <i>tumidiventris.</i>	Panama.
„ <i>subaequalis.</i>	Guatemala.
<i>Scymnus cribripennis.</i>	Mexico.
„ <i>caeruleicollis.</i>	Panama.
„ <i>quercicola.</i>	Mexico, etc.
„ <i>nigroaeneus.</i>	Guatemala.
† <i>Lioscymnus</i> (n. g.) <i>diversipes.</i>	Mexico, etc.
† <i>Microscymnus</i> (n. g.) <i>calvus.</i>	Mexico, etc.

MELYRIDAE.

<i>Cymbolus elongatus.</i>	Mexico.
[„ <i>quadrituberculatus.</i>	Brazil.]
† <i>Eucymbolus</i> (n. g.) <i>cyaneus.</i>	Guatemala.

PTINIDAE.

<i>Trichodesma tricristata.</i>	Mexico.
„ <i>pictipennis.</i>	Guatemala.
„ <i>scripta.</i>	Mexico.
„ <i>truncata.</i>	Guatemala.
„ <i>armata.</i>	Guatemala.
<i>Eupactus subvestitus.</i>	Mexico.
„ <i>erythrocephalus.</i>	Guatemala.
„ <i>nitescens.</i>	Panama.
„ <i>semirufus.</i>	Mexico.
„ <i>caeruleus.</i>	Panama.
„ <i>comatus.</i>	Nicaragua.
<i>Caenocara quercus.</i>	Mexico.
„ <i>flohri.</i>	Mexico.
<i>Priotoma nigriventris.</i>	Panama.
„ <i>brevilinea.</i>	Panama.
[„ <i>insularis.</i>	Antilles.]
<i>Ptilinus sericeus.</i>	Guatemala.
„ <i>maculicollis.</i>	Guatemala.

CIOIDAE.

<i>Cis M-nigrum.</i>	Mexico.
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TENEBRIONIDAE.

<i>Corticeus sordidus.</i>	Guatemala.
† <i>Lorelus curvipes.</i>	Guatemala.
,, <i>curticollis.</i>	Mexico, etc.
,, <i>breviusculus.</i>	Panama.
,, <i>angustulus.</i>	Guatemala.
,, <i>exilis.</i>	Guatemala.
[,, <i>rugifrons.</i>	Brazil.]
,, <i>trapeziderus.</i>	Guatemala.

OTHNIIDAE.

<i>Othnius immaculatus.</i>	Mexico.
,, <i>planatus.</i>	Mexico.

The genera marked thus (†) are additions to the Central American fauna.

PSEPHENIDAE.

PSEPHENUS.

Psephenus, Haldeman, Melsh. Cat. Coleopt. U.S. p. 34 (1853); Horn, Trans. Am. Ent. Soc. iii, p. 30 (1870), and x, p. 117, pl. 6, figs. 14, 15 (♂ ♀) (1882); Leconte, Class. Coleopt. N. Am. 1st edit. p. 115 (1861), and 2nd edit. p. 163 (1883); Casey, Ann. N. York Acad. Sci. vii, p. 578 (1893).

Eurypalpus, Leconte, Proc. Acad. Phil. 1852, p. 41.

Fluvicola, De Kay, Zool. N. York, vi, p. 53 (1844) (larva).

The four known members of this extraordinary genus, the larva of one of which was described as a Crustacean, are from the Atlantic and Pacific regions of the United States and Lower California. The species now added from Mexico is evidently a near ally of the southern *P. haldemani*, Horn, the types of which are females.

**Psephenus palpalis*, n. sp. (Plate III, figs. 1, 1a, ♂.)

♂. Oblong-ovate, rather broad, very depressed, shining above, closely pubescent; nigro-piceous, a large indeterminate patch on the disc of each elytron at the base, the sides of the front, the first two joints of the antennae, the under surface in part, the femora, and coxae testaceous, the tibiae and tarsi slightly infusate. Head densely, rugulose punctate, foveate on the vertex, the sides of the front raised; maxillary palpi (fig. 1a) about three-fourths the length of the antennae, the fourth joint cultriform; antennae moderately

long, rather slender, subserrate, 11-jointed, 3-5 elongate, 6-11 gradually becoming shorter. Thorax short, rapidly and obliquely narrowing from the outwardly directed prominent hind angles, deeply bisinuate at the base and also sinuate at the sides before the middle, densely, minutely punctate. Elytra oblong, a little wider than the thorax, rounded at the sides posteriorly; densely, rugulose punctate, and with several longitudinal ridges on the disc and also one near the outer margin. Beneath very densely punctate; fifth ventral segment broadly emarginate, leaving the sixth in part visible, the latter triangularly excised at the apex, the seventh narrow, subcylindrical, rounded at the tip. Legs long; tibiae slender; tarsi with joints 1-4 short, somewhat thickened, 4 small, 5 very slender, longer than the others united, the claws very long.

Length 4, breadth $2\frac{1}{2}$ mm.

Hab. MEXICO (*Truqui*, in *Mus. Brit. ex. coll. Fry*).

One specimen, injured by pinning. The thorax has a very deep transverse sulcus at the base, but this is clearly accidental. It is just possible that *P. palpalis* is the male of *P. haldemani*, but this is hardly likely to be the case.

PSEPHENOPS.

Psephenops, Grouvelle, Notes Leyden Mus. xx, p. 44, (1898).

This genus is based upon a single species, *P. smithi*, Grouv., from the Antillean islands of Grenada and St. Vincent, of which the male only is known, this having a very large, elongate, acuminate-ovate fourth joint to the maxillary palpus. The Guatemalan species now added, the female only of which is known, has the second tarsal joint more strongly and abruptly lobate, with a long slender basal portion, the antennae much longer, etc. The genus *Psephenops* affords a connecting link between the Parnidae and Dascillidae.

**Psephenops grouvellei*, n. sp. (Plate III, figs. 2, 2a, ♀.)

♀. Oblong, widened posteriorly, depressed, moderately shining, densely pubescent; dark brown, the front of the head, the antennae and femora at the base, the scutellum, the margins and base of the elytra, and the under surface, testaceous; the entire surface densely, minutely punctate. Head concave and bifoveate between the eyes, the latter large; antennae moderately long, 11-jointed, 1 and 2 stout, 1 elongate, curved, 2 short, subglobose, 3-11 feebly

serrate, 4-11 very little longer than broad, gradually decreasing in size, 11 acuminate at tip; maxillary palpi comparatively short, about reaching the tip of the second antennal joint, joints 2 and 3 obconic, 4 oblong-ovate, not wider than 3. Thorax short, rapidly and obliquely narrowing from the outwardly-directed, prominent, subacute hind angles; with three small tuberculiform prominences at the base—one opposite the scutellum, and one on either side of it, the latter transverse; the base deeply bisinuate. Elytra with several longitudinal ridges on the disc, the base depressed on each side within the humeri. Abdomen with six visible segments. Legs long; tarsi (fig. 2a) with joints 1 and 2 elongate, dilated, densely spongy-pubescent beneath, 2 excavate at the apex above for the reception of the small third and fourth joints, 1 also excavate for the reception of the slender basal portion of 2, the terminal joint very slender, about half the length of 2, the claws long and slender.

Length $3\frac{2}{3}$, breadth $1\frac{1}{8}$ mm.

Hab. GUATEMALA, Lanquin in Alta Vera Paz (*Champion*).

One example only of this insect was obtained. It was captured in February, 1880, on the banks of the Rio Cahabon, probably about the entrance of the Lanquin Cave. *P. grouvellei* greatly resembles *Psephenus darwini*, C. O. Waterh., from Rio de Janeiro, figured in "Aid ident. Ins.," i, pl. 26; the latter has simple slender tarsi.

SILPHIDAE.

LIODES.

Liodes, Erichson, Nat. Ins. Deutschl. iii, p. 87 (1845); Horn, Trans. Am. Ent. Soc. viii, pp. 277, 296 (1880).

This Holarctic genus, with nine species in North America, has not hitherto been recorded from so far south as Mexico. Mr. H. H. Smith has, however, sent us a single example of a species from the mountains of Guerrero, allied to the European *L. castaneus* and *L. orbicularis*, i. e. with all the tarsi 4-jointed in the female. The only N. American form with confused elytral punctuation, *L. confusus*, has, like the other species enumerated by Dr. Horn, the ♀-tarsi 5-, 4-, 4-jointed. Some authors use the generic name *Anisotoma* for this genus.

**Liodes mexicanus*, n. sp.

Subhemispherical, very convex, shining, nigro-piceous, the labrum, the two basal joints of the antennae and the tip of the

eleventh, the margins of the thorax, and the tarsi more or less ferruginous. Head and thorax with a few widely scattered excessively minute punctures (only visible under the microscope); antennae with joint 3 elongate, 4-6 gradually decreasing in length and increasing in width, 4 and 5 obconic, 6 angular within, the 5-jointed club larger (the small strongly transverse eighth joint excepted); thorax strongly sinuate at the apex; elytra closely, finely, confusedly punctate, without trace of striae on the disc, the sutural stria shallow and running from about the middle to the apex. Beneath with excessively small and widely scattered punctures, each bearing a minute hair; prosternum deeply excavate laterally; posterior coxae deeply grooved for the reception of the femora, the coxae raised greatly above the level of the first ventral segment; fifth ventral segment unimpressed; legs long, tibiae narrow, tarsi slender, 4-jointed.

Length (excl. head) 3, breadth $2\frac{1}{10}$ mm. (♀.)

Hab. MEXICO, Omilteme in Guerrero, 8,000 feet (*H. H. Smith*).

One specimen. Larger than the European *L. orbicularis*, the antennae more elongate, the legs longer and more slender, the elytra without trace of dorsal striae, and with a shallower sutural stria, the under surface almost smooth. *L. confusus*, Horn, is said to have rather coarsely punctate elytra.

AGLYPTONOTUS, n. n.

Aglyptus, Leconte, Proc. Acad. Phil. 1866, p. 369; Horn, Trans. Am. Ent. Soc. viii, pp. 277, 307 (1880); Matthews, Biol. Centr.-Am., Coleopt. ii, 1, p. 77 (1887) [*nec* Förster].

Matthews enumerated three species of this American genus, including *A. laevis*, Lec., the type, from Central America. Two others are contained in our collection. The characters of *Aglyptus* have been given at great length by both Horn and Matthews, but I can find no mention of the very conspicuous curved impressed line (resembling one of the ventral sutures) which extends outward across the first ventral segment to a little behind the middle of the outer margin. Matthews, it is true, describes "the basal segment as slightly but broadly elevated in a curved line at its base, enclosing the whole length of the coxa," but as the line is distinct from the coxa this definition is scarcely accurate. The anterior tarsi are said by Horn

to be 4-jointed in the male, but I am unable to make out the additional joint in any of the species before me.

The generic name *Aglyptus* is preoccupied in *Hymenoptera* (Förster, 1856) and a new one is therefore required.

**Aglyptonotus majusculus*, n. sp.

Broad ovate, convex, shining, piceous or castaneous, the antennae infusate, the two basal joints and the tip of the apical one, and the front of the head, mouth-parts, and legs, rufotestaceous, the under surface ferruginous, with the metasternum more or less infusate. Head, thorax, and elytra (when viewed under the microscope) with excessively minute, widely scattered, punctures; antennae long and slender, with joints 7 and 9-11 thickened, 8 much smaller, about as broad as long, a little shorter than 6, 10 subquadrate, 11 acuminate-ovate. Beneath faintly alutaceous, the ventral segments 2-5 distinctly punctured and pubescent across the middle, the long curved line on the first segment very conspicuous and reaching the outer margin at about one-third from the apex, the metasternum obliquely hollowed on each side to receive the posterior femora when drawn forwards. Tarsi 3-, 3-, 3-jointed in both sexes, the basal joint of the anterior and intermediate pairs distinctly thickened in ♂.

Length (excl. head) 2, breadth $1\frac{1}{2}$ - $1\frac{2}{3}$ mm. (♂ ♀.)

Hab. MEXICO, Omilteme, 8,000 feet, and Chilpancingo, 4,600 feet, both in Guerrero (*H. H. Smith*).

Numerous examples, mostly in imperfect condition. Larger broader than *A. horni*, Matth., the antennae more elongate and with a longer and more acuminate apical joint; the basal joint of the anterior and intermediate tarsi distinctly thickened in male. The elytra are without a sutural stria.

**Aglyptonotus melas*, n. sp.

Short ovate, convex, shining, black, the margins of the thorax, the basal half of the antennae, and the legs testaceous, the under surface piceous. Head, thorax, and elytra with excessively minute, widely scattered punctures; antennae with joints 7 and 9-11 thickened, 8 small, 9 and 10 transversely subquadrate, 11 ovate. Beneath faintly alutaceous. Tarsi 3-, 3-, 3-jointed.

Length (excl. head) $1\frac{1}{2}$, breadth 1 mm.

Hab. MEXICO, Jalapa (*Höge*); GUATEMALA, Cerro Zunil (*Champion*).

Three specimens, probably including both sexes. Narrower and blacker than *A. horni* and *A. laevis*, Matth., and very like a small *Agathidium*. From the much smaller *A. minor*, the relatively broader thorax will sufficiently distinguish *A. melas*. One of the Jalapa examples was labelled *Agathidium estriatum* by Matthews, but it does not agree with Horn's description of that N. American species.

Aglyptonotus matthewsi, n. sp.

Aglyptus laevis, Matth., Biol. Centr.-Am., Coleopt. ii, 1, p. 79 (1887) [*nec* Leconte].

The Chiriqui insect identified and described by Matthews as *A. laevis*, Lec., has obviously nothing to do with the N. American species, as a glance at Horn's figures (Trans. Am. Ent. Soc. viii, pl. 7, figs. 15, 15a) will show, and a new name is therefore required for it. *A. laevis* has much shorter antennae. There are one or two forms in the lesser Antilles very closely allied to, if not actually conspecific with, *A. matthewsi*.

COLENIS.

Colenis, Erichson, Nat. Ins. Deutschl. iii, p. 82 (1845);
Matthews, Biol. Centr.-Am., Coleopt. ii, 1, p. 86.

Matthews enumerated two species of this genus from Central America, both minute forms; a third has since been detected in our collection.

**Colenis phalacroides*, n. sp.

Short ovate, convex, shining, obscure ferruginous, the antennae and tarsi testaceous, the antennal joints 7-10 sometimes slightly infusate. Head faintly alutaceous; antennae with joints 3-6 slender, 3 elongate, obconic, as long as 2, 4-6 small, subequal, 7-11 widened into a loose 5-jointed club, 7 trapezoidal, nearly as wide as 9, 8-10 strongly transverse, 8 small, 11 acuminate-ovate; thorax almost smooth; elytra with somewhat sinuous rows of minute punctures, the interstices sparsely, transversely strigose, and with a short sutural stria on the apical declivity.

Length (excl. head) $1-1\frac{1}{10}$ mm.

Hab. GUATEMALA, Zapote, Pacific slope (*Champion*).

Three specimens. Smaller than *C. punctulata*, Matth., from Panama, ferruginous in colour, the antennae shorter, the proportions of the joints somewhat different, the ninth

and tenth strongly transverse. Very like *C. crassicornis*, Matth., from the same neighbourhood in Guatemala, but with much more slender antennae. This insect is so like a minute *Olibrus* that it was placed amongst the Phalacridae when our collections were sorted.

SCAPHIDIIDAE.

SCAPHIDIUM.

Scaphidium, Olivier, Ent. ii, 20, p. 1 (1791); Matthews, Biol. Centr.-Am., Coleopt. ii, 1, p. 159 (1888).

Matthews enumerated eight species of this genus from Central America. The very distinct new form described below was subsequently received from the mountains of Guerrero, Mexico.

**Scaphidium flavofasciatum*, n. sp.

Broad, subelliptic, robust, shining, black; the thorax (the upper half of the flanks included) testaceous or rufo-testaceous, with a narrow sinuous fascia at the base, a triangular patch or fascia at the apex, and two spots or streaks on the disc, these markings connected in one specimen, black; the elytra with two broad sinuous fasciae, not reaching the suture, testaceous or rufo-testaceous; the antennae with the basal joints obscurely rufescent and the apical joint wholly or in part yellow; the tarsi rufo-testaceous. Head finely punctate; antennae slender, joints 7-11 broadly widened. Thorax closely, finely punctate, the sinuous transverse basal sulcus foveato-punctate. Elytra more sparsely punctured than the thorax, the deep transverse basal groove foveato-punctate, the sutural stria deeply impressed and shallowly punctate.

Var. Rufo-testaceous, the thorax with the basal margin and two oblong streaks on the disc, the suture of the elytra, and the femora and tibiae, piceous, the antennae with joints 7-10 black.

Length $5\frac{1}{2}$ - $5\frac{3}{4}$, breadth 3 - $3\frac{1}{2}$ mm.

Hab. MEXICO, Omilteme, Xucumanatlan and Chilpancingo, 4,600-8,000 feet (*H. H. Smith*).

Four specimens; the pallid varietal form is from Xucumanatlan. Near *S. variabile*, Matth., but larger and more elongate, the thorax and elytra somewhat closely punctate, the black elytral markings showing no tendency to break up into spots, the suture infuscate or black.

SCAPHISOMA.

Scaphisoma, Leach, Edinb. Encycl. ix, p. 89 (1812);
Matthews, Biol. Centr.-Am., Coleopt. ii, 1, p. 170
(1888).

Matthews enumerated thirteen species of this well-known genus from Central America. The following new form was subsequently received from the Guerrero mountains.

**Scaphisoma occidentale*, n. sp.

Oblong-elliptic, very shining, pitchy-black, the labrum, palpi, and antennae, the tip of the pygidium, the ventral segments in part, and the tarsi testaceous or rufo-testaceous, the outer five joints of the antennae slightly infuscate, the femora and tibiae rufopiceous; the punctures of the upper surface each bearing a rather long, fine, adpressed, blackish hair. Head and thorax very sparsely, minutely punctulate, the elytra with a much more distinct scattered punctuation; antennae sparsely setose, joints 3-6 very slender, 3 and 4 short, 4 longer than 3, 5 as long as 3 and 4 united, 6 elongate, equalling 3-5 united, 7-11 long, subequal, arcuately widened within; thorax (as seen from above) arcuately narrowed from the base; elytra rounded at the sides anteriorly, abruptly truncate at the apex, obliquely depressed just before the tip, the sutural stria deep; legs very elongate.

Length 3, breadth $1\frac{1}{2}$ mm.

Hab. MEXICO, Omilteme in Guerrero, 8,000 feet (*H. H. Smith*).

One specimen. Narrower and smoother than *S. thoracicum*, Matth., the elytra more distinctly punctate, the femora and tibiae rufescent. The minute black, adpressed hairs, which are only visible under the microscope, and soon abraded, make the elytral interstices appear obliquely or longitudinally strigose. They are probably also present in *S. thoracicum*. The N. American *S. castaneum*, Motsch., seems to be another allied less elongate form, with more closely punctured upper surface.

BAEOCERA.

Baeocera, Erichson, Naturg. Ins. Deutschl. iii, p. 4, nota (1848); Matthews, Biol. Centr.-Am. Coleopt. ii, 1, p. 168 (1888).

Five species of this genus¹ are mentioned by Matthews as from Central America, two of which he had not seen. A sixth is now added from the mountains of Guerrero.

**Baeocera irregularis*, n. sp.

Oblong, elliptic, very convex, shining, black, the apex of the elytra indeterminately, and the tip of the abdomen, rufo-piceous. The palpi, antennae, tibiae, and tarsi testaceous or rufo-testaceous, the femora piceous. Head and thorax almost smooth; head small; antennae long, joints 3-11 elongate, subequal in length, 3-8 extremely slender, 9-11 arcuately widened within; elytra with numerous coarse deep punctures, which become obsolete towards the apex, the punctures arranged in irregular scattered sinuous lines on the disc and becoming more crowded towards the sides, the sutural stria deep and conspicuously punctate.

Length 2, breadth 1½ mm.

Hab. MEXICO, Omilteme in Guerrero, 8,000 feet (*H. H. Smith*).

One specimen. Differs from all the described species of the genus in having the elytra impressed with extremely coarse subseriately arranged punctures; the antennae are long and very slender, and have the last three joints widened. Viewed laterally, the insect is convex above and beneath.

NITIDULIDAE.

CYBOCEPHALUS.

Cybocephalus, Erichson, in *Germ. Zeitschr.* v, p. 441 (1844); Jacquelin Duval, *Gen. Col. Europ.* ii, p. 151, pl. 40, fig. 200.

Phantazomerus, Jacquelin Duval, *Bull. Soc. Ent. Fr.* 1854, p. xxxvii.

Stagonomorpha, Wollaston, *Ins. Mader.* p. 484, pl. 10, fig. 8 (1854).

Acribis, C. O. Waterhouse, *Proc. Zool. Soc. Lond.* 1877, p. 78.

Dr. Sharp in his enumeration of the Central-American Cybocephalinae (*Biol. Centr.-Am.*, *Coleopt.* ii, 1, pp. 372, 373) does not mention any species of the typical genus

¹ *B. punctipennis*, Matth., has the five apical joints of the antennae widened, and it should be placed under *Scaphisoma*.

Cybocephalus from that region, whence three are now described. Jacquelin Duval, it may be noted, correctly described the antennal club as 3-, and the tarsi as 4-jointed; but in his figure the club is given 4, and the tarsi 5 joints. *Acribis*, Waterh., type *A. serrativentris*, from the Galapagos Is., is not separable from *Cybocephalus*.

**Cybocephalus aciculatus*, n. sp. (Plate III, figs. 3, portion of antenna; 3a, anterior tibia and tarsus.)

Oblong-ovate, transversely convex, black, the margins of the thorax testaceous in one example, the antennae and legs piceous; glabrous above, the pygidium and under surface clothed with long cinereous hairs, the legs setulose. Head and thorax shining, almost smooth; antennae with the 3-jointed club (fig. 3) very stout, oval, about as long as the preceding five joints united. Elytra alutaceous and somewhat closely aciculate (the minute punctures, when viewed under the microscope, in the form of short needle-scratches); the apices broadly subtruncate, leaving the pygidium exposed. Under surface alutaceous and closely, minutely punctate, the hairs long and adpressed; metasternal process very broad, arcuate, margined in front. Tibiae moderately broad, the anterior pair (fig. 3a) hollowed externally at the apex, and with the outer apical angle sharp. Tarsi slender, the third joint narrow, excavate above for the reception of the fourth.

Length about 1 mm.

Hab. MEXICO, near the city (*Flohr*).

Two specimens. The chief characters of this insect are—the alutaceous, aciculate elytra, the excavate apex of the anterior tibiae, the slender tarsi, and the broadly rounded, margined metasternal process. The row of closely placed punctures along the apical margin of each of the ventral segments 2-4 gives an appearance of serrulation, hence the name *serrativentris* for one of the species of this genus.

**Cybocephalus flavicornis*, n. sp. (Plate III, figs. 4, portion of antenna; 4a, anterior tibia and tarsus.)

Subrotundate, very convex, shining, glabrous above, black, the antennae and the margins of the thorax testaceous, the legs fuscotestaceous; the thorax and elytra with widely scattered excessively minute punctures, which become more distinct on the apical declivity, the interspaces polished. Antennae (fig. 4) with the oval 3-jointed club

moderately large, nearly as long as the preceding four joints united, 11 abruptly truncate at the tip. Anterior tibiae (fig. 4a) rounded at the apex externally. Tarsi moderately slender, joint 3 deeply excavate above.

Length about 1 mm.

Hab. GUATEMALA, Zapote, Pacific slope (*Champion*).

Two examples. Easily separable from *C. aciculatus* by the polished upper surface, the widely scattered excessively minute punctuation of the elytra, the pale testaceous antennae, with abruptly truncate club, the rounded outer apical angle of the anterior tibiae, and the stouter tarsi. This insect has exactly the facies of a minute *Agathidium*, and it was placed among the Silphidae when our collections were sorted.

**Cybocephalus schwarzi*, n. sp.

Subrotundate, very convex, shining, glabrous above, black or bronze-black, the antennae testaceous, the club and basal joint sometimes infuscate, the legs fusco-testaceous; the thorax and elytra with widely scattered excessively minute punctures, which become more distinct and more closely placed on the apical declivity. Antennal club abruptly truncate at the tip. Under surface alutaceous, closely, minutely punctate, pubescent. Anterior tibiae rounded at the outer apical angle. Tarsi moderately slender, joint 3 deeply excavate above.

Length $\frac{3}{4}$ -1 mm.

Hab. MEXICO, Tampico in Tamaulipas (*Schwarz*, in *U.S. Nat. Mus.*).

Described from three examples. Two others from the same locality are larger and broader, and have the interspaces of the elytra distinctly alutaceous on the apical declivity; they are probably males of the same species. Another large example from Livingston, Guatemala, doubtless belongs to *C. schwarzi*. Extremely like *C. flavicornis*, but with the minute punctures on the elytra much more closely placed on the apical declivity. *C. nigrutilus*, Lec., is unknown to me, but as the surface is described as "laevis" the present insect can hardly be conspecific with it. Some of the S. European forms, too, are also very similar to the present species.

PYCNOCEPHALUS.

Pycnocephalus, Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 373 (1891) [*nec* Kraatz, 1895¹].

Pycnocephalus metallicus.

Pycnocephalus metallicus, Sharp, loc. cit. pl. 12, figs. 6, 6a.

This species was described from four examples, from as many different localities in Guatemala and Panama. Three have the head or the entire upper surface metallic green, and one is of a uniform dark bronze colour. A short series from Tampico, N.E. Mexico, sent me for determination by the U.S. National Museum, showing similar variation, seem to belong to *P. metallicus*; but they are smaller and have the elytra more distinctly punctured on the posterior half. It is probable that the green coloration is confined to the male sex, as one of the dark examples from Tampico is certainly a female. The legs, too, in the types vary in colour from nigro-piceous to testaceous.

ADIMERIDAE.

MONOEDUS.

Monoedus, Horn, Trans. Am. Ent. Soc. x, p. 116 (1882).

Adimerus, Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 441 (1894).

The above synonymy has already been noted by Arrow [Ann. and Mag. Nat. Hist. (8) iv, p. 195 (1909)].

Monoedus guttatus.

Monoedus guttatus, Horn, loc. cit. p. 116, pl. 4, fig. 10.

Adimerus dubius, Sharp, loc. cit. p. 443.

Additional localities for this species, which was first described from a single example from Cedar Keys, Florida, are:—

MEXICO, Tampico in Tamaulipas (*Schwarz*), Teapa (*H. H. Smith*); CUBA, Cayamas.

We have recently received from the U.S. National Museum specimens of *M. guttatus* (det. *Schwarz*) from N.E. Mexico and Cuba, and I am unable to separate them from *A. dubius*, Sharp. The elytral markings of *M. guttatus*,

¹ This genus of Colydiidae has been re-named *Cephalopycnus* by Arrow [Ann. and Mag. Nat. Hist. (8) iv, p. 193 (1909)].

as shown in Dr. Horn's figure, are, it is true, slightly different from those of *A. dubius*, but no reliance can be placed on this character.

COLYDIIDAE.

PSEUDAULONIUM.

Pseudaulonium, Reitter, Stett. ent. Zeit. 1877, p. 334.

This genus was based upon two species, *P. regale*, from Colombia, and *P. ferrugineum*, from Brazil. There are numerous specimens of the latter, from Rio Janeiro and Parana, in the Fry collection at the British Museum. Two others are now added. These were placed amongst the "genera incertae sedis" when our collections were sorted, and were thus not seen by Dr. Sharp when he enumerated the Central American Colydiidae. The tarsi are 4-, and the antennae 11-jointed, the terminal three joints of the latter being dilated into a large club.

**Pseudaulonium discolor*, n. sp. (Plate III, figs. 5, 5a, ♂.)

Elongate-oval, rather convex, densely alutaceous, dull; ferruginous, with the disc of the thorax and a large, common, elongate or oblong patch on the elytra fuscous or black, the dark markings sometimes obliterated and sometimes black and sharply defined, the head (except in front) and the two basal joints of the antennal club infusate in one example. Head minutely punctate, bifoveate, the eyes large; antennae with the joints preceding the club about as broad as long. Thorax convex, slightly broader than long, the explanate margins somewhat rounded and crenulate, the base distinctly margined, the anterior angles not prominent, the hind angles acute; densely, minutely punctate, the raised submarginal line on each side rather prominent. Elytra a little wider than the thorax, the humeri angular; minutely seriato-punctulate, the interstices flat and densely alutaceous. Beneath alutaceous, dull, sparsely, minutely, the thorax more coarsely, punctate. Prosternal process rather broad, abruptly declivous behind.

Length 2½-3¼ mm. (♂ ♀.)

Hab. PANAMA, Volcan de Chiriqui, Bugaba (*Champion*); BRAZIL, Rio Janeiro, Bahia, Parana (*coll. Fry*).

Nine specimens, all but two from Brazil, varying greatly in the development of the dark markings on the upper surface. Smaller than, and perhaps an extreme form of,

P. ferrugineum, with the thorax shorter and less quadrate, and the dorsal surface of the body usually fusco- or nigro-maculate. *P. regale*, Reitt., from Colombia, is apparently a larger, differently-coloured insect, with the surface of the body shining and the anterior angles of the thorax produced forwards.

**Pseudaulonium nitidum*, n. sp.

Elongate-oval, narrow, convex, shining, very finely alutaceous; nigro-piceous or black, the antennae, palpi, front of the head, legs, humeri, and sometimes the margins of the thorax also, ferruginous. Head closely, finely punctate, bifoveate, the eyes large; antennae with the joints preceding the club subtransverse in ♂, transverse in ♀. Thorax convex, subquadrate, broader than long, somewhat rounded and sharply margined at the sides, and also conspicuously margined at the base, the anterior angles projecting forwards, the hind angles acute; closely, very finely punctate, the submarginal line on each side cariniform. Elytra oblong-oval, a little wider than the thorax, the humeri not very prominent; minutely seriato-punctulate, the interstices flat, alutaceous. Beneath shining, sparsely, minutely, the thorax more coarsely, punctate. Prosternal process narrow. Legs very slender.

Length $2\frac{1}{2}$ - $3\frac{1}{2}$ mm. (♂ ♀.)

Hab. GUATEMALA, Cerro Zunil, Calderas, San Gerónimo, Balheu (*Champion*).

Ten examples. Found on both the Atlantic and Pacific slopes, at elevations between 3,000 and 7,000 feet. Separable at once from *P. ferrugineum* and *P. discolor* by the more shining surface, the prominent anterior angles of the thorax, and the narrower, less convex prosternal process. It cannot be identified with *P. regale*, which has the elytra nigro-piceous, with suture, base, and apex, and also a spot before and beyond the middle, rufo-ferruginous.

PYCNOMERUS.

Pycnomerus, Erichson, in Wieg. Archiv, 1842, 1, p. 214;

Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 474 (1894).

Penthelispa, Pascoe, Journ. Ent. i, p. 111 (1860).

Endectus, Leconte, Class. Coleopt. N. Am. p. 91 (1861).

Three species of this cosmopolitan genus have been described from Central America. The very small form now added is much more finely sculptured than any of them. It has an abrupt freely 2-jointed antennal club,

much as in *Penthelispa truquii* and the N. American *Endectus*.

Pycnomerus stenosoma, n. sp.

Elongate, narrow, cylindrical, flattened above, shining, ferruginous, glabrous. Head large, as wide as the thorax, finely punctate, deeply bifoveate in front, the eyes small; antennae short, with an abrupt, freely 2-jointed club, joint 10 strongly transverse, 11 ovate, nearly as wide as 10. Thorax longer than broad, narrowed posteriorly, compressed at the sides at about the middle, finely margined, the angles obtuse; the surface somewhat closely impressed with oblong moderately coarse punctures, the interspaces alutaceous. Elytra elongate, subparallel, scarcely wider than the thorax, finely punctate-striate, the interstices narrow and alutaceous. Beneath finely punctate; fourth ventral segment in ♂ with a small tubercle in the middle behind, its apical margin slightly sinuate. Legs short.

Length 2 mm.

Hab. GUATEMALA, Livingston, Atlantic coast (*Barber and Schwarz, in U.S. Nat. Mus.*).

Two specimens, one of which has been presented to the British Museum. Smaller and narrower than the Antillean *P. aequicollis*, Grouv., the thorax and elytra more finely punctured, the terminal joint of the antennal club relatively larger.

TYRTAEUS, n. gen.

Antennae (fig. 6a) short, 9-jointed, the joints very closely articulated, completely exposed from above, 7-9 dilated into a very large, compact oval club; head broad, the epistoma large, clearly defined; labrum transverse, exposed; eyes rounded; mandibles feebly emarginate at tip; mentum small, leaving the maxillae exposed; last joint of the maxillary palpi long, stout, cultriform; anterior coxae narrowly separated, the cavities closed; prosterum transversely excavate in front of the anterior coxae, the sutures indistinct, the intercoxal process slightly widened behind; intermediate coxae narrowly, the posterior coxae rather widely, separated; metasternum long; elytra oblong, the epipleura reaching the last ventral suture and widened forwards; prothorax short, margined at sides and base, without trace of basal foveae; legs short, slender; tarsi simple, 4-jointed, sparsely pilose beneath; body oblong, glabrous.

Type, *T. rufus*.

The two species belonging to this genus have somewhat the facies of an *Anommatus*. The principal characters of *Tyrtaeus* are—the 9-jointed antennae, with a very large,

compact 3-jointed club, and the 4-jointed, simple tarsi. The genus can be placed for the present in Colydiidae, near the Cerylinae. *T. rufus* has been found in Ceiba (*Bombax*) bark in Cuba.

**Tyrtaeus rufus*, n. sp. (Plate III, figs. 6, 6a.)

Oblong, somewhat convex, very shining, rufous or rufo-testaceous, the legs and palpi testaceous. Head sparsely, finely punctate; antennae not reaching the middle of the thorax, joints 1 and 2 stout, 2 transverse, 3-6 gradually widening outwards, 3 about as long as broad, 4-6 transverse, the club as long as 3-6 united, 8 strongly transverse, 9 blunt at the tip. Thorax short, transversely convex, rounded at the sides, the latter sinuate before the base, the hind angles acute; the surface sparsely, finely punctured, and with several coarser impressions on each side near the base. Scutellum transverse, flat. Elytra moderately long, somewhat flattened on the disc, of the same width as the thorax, parallel in their basal half, the humeri angular; with rows of scattered punctures, which become almost obsolete towards the apex, the interstices broad, flat, smooth. Beneath very sparsely, finely punctate; fifth ventral segment transversely depressed at the apex in ♂.

Length 2-2½ mm.

Hab. GUATEMALA, San Gerónimo, El Jicaro, Tamahu (*Champion*); CUBA, Cayamas (*Schwarz, in U.S. Nat. Mus.*).

Described from seven specimens from Guatemala. Three others were found by Mr. Schwarz in Cuba.

**Tyrtaeus cribripennis*, n. sp.

Smaller and less elongate than *T. rufus*, obscure ferruginous, the antennal club infusate. Antennae with the intermediate joints a little shorter, the club nearly as long as the rest of the joints united. Thorax very sparsely, finely punctate, with some coarse punctures along the basal margin. Scutellum triangular. Elytra shorter than in *T. rufus*, with irregular rows of closely placed coarse punctures, the interstices narrow and somewhat uneven.

Length 1½ mm.

Hab. PANAMA, Volcan de Chiriqui, between 2,500 and 4,000 feet (*Champion*).

One specimen. In this insect the seventh joint of the antennae is so closely articulated to the club that it is not easily seen.

LAPETHUS.

Lapethus, Casey, Ann. N. York Acad. Sci. v, p. 317 (1890); Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 494 (1895).

In this genus the metasternal and abdominal lines are sharply defined, as in *Lytopeplus*.

Lapethus sharpi, n. n.

Lapethus discretus, Sharp, loc. cit. pl. 15, fig. 22 [*nec* Casey].

Additional localities for this species are:—

MEXICO, Jalapa (*Höge*); GUATEMALA, Coatepeque, Zapote, Capetillo (*Champion*), Jocalo, Lake Yzabal (*Barber and Schwarz, in U.S. Nat. Mus.*).

Apparently a common insect in Central America. The discovery of various allied forms with the lateral margins of the thorax deeply sulcate, so as to have a thick acute marginal bead, as described by Casey for *L. discretus*, shows that the Californian and Oregon insect cannot be conspecific with the Central American form figured under that name by Dr. Sharp, and a new name is therefore required for the latter.¹ The following species from Brazil is nearly related to *L. sharpi*.

[*Lapethus brasilianus*, n. sp.

Short, convex, oblong-elliptic, convex, shining, piceous, the antennae, mouth-parts, and legs rufo-testaceous. Head and thorax densely, finely punctate, the latter finely margined along the sides and feebly bisinuate at the base; elytra coarsely punctate-striate to the apex, the interstices rather convex and closely, minutely punctulate. Beneath smooth down the middle, conspicuously punctured in the femoral depressions, the metasternal and abdominal lines sharply defined; prosternal process shallowly sulcate, extending beyond the anterior coxae and received in a cavity of the mesosternum.

Length $1\frac{2}{3}$ –2 mm.

Hab. BRAZIL, Blumenau (*ex coll. Sharp, in Mus. Brit.*).

Two specimens, one much larger and broader than the other.]

¹ We have now received from the U. S. Nat. Museum an example of *L. discretus*, Casey, which is a very different insect.

LYTOPEPLUS.

Lytopeplus, Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 494 (1895) [sub Colydiidae].

Brachylon, Gorham, op. cit. vii, p. 256 (1898) [sub Erotylidae].

These genera were each based upon a single species from Central America. Various others are now known from the same region, and from the Antilles and South America. They have the antennae apparently 8-jointed, the solid ovate club being formed of three fused joints, making eleven in all; the club itself is received in repose in a deep pit in the prosternum. The tarsi are 4-jointed. The long, curved metasternal and abdominal lines (forming the inner limit of the femoral depressions) are very conspicuous in both *Lytopeplus compactus* and *Brachylon breve*, but they are not mentioned in either author's description. The broader prosternal process separates the genus from *Lapethus*. *Euxestus*, Wollaston, type *E. parkii*, Woll., from Madeira, is deceptively like *Lytopeplus*; but it wants the prosternal fossae and the metasternal and abdominal lines, and the antennae are differently formed: these organs in *Euxestus* appear to me to be 11-jointed, there being six short closely articulated joints between the elongate third (with which the extremely short fourth and fifth are obliquely fused) and the short broad blunt club, which itself is formed of two connate joints. *Eidoreus*, Sharp, type *E. minutus*, Sharp, from the Hawaiian Is., also wants the metasternal and abdominal lines. *Euxestus* appears to be cosmopolitan.¹ The eight species of *Lytopeplus* now known may be tabulated thus:—

a. Thorax without marginal sulcus.

a¹. Elytra with abbreviated series of punctures.

a². Body moderately convex or subdepressed.

a³. Thorax very sparsely punctulate, feebly sinuate at base . . . *compactus*, Sharp.

b³. Thorax closely punctulate, more strongly sinuate at base . . . *substriatus*, n. sp.

¹ *E. piciceps*, Gorh. (1898), from the Antilles and Central America = *E. minor*, Sharp (1885), from the Hawaiian Is. This insect also occurs in Christmas I., Damma I., Java, etc.; it is narrower than the myrmecophilous *E. parkii* (? = *Neoptotera peregrina*, Belon).

- b*². Body more convex.
- c*³. Seriate elytral punctures few in number and present on anterior half of disc only: species very convex, larger, thorax and elytra more rounded at sides *brevis*, Gorch.
- d*³. Seriate punctures more numerous and extending outwards: species very small, thorax and elytra less rounded at sides. *curtulus*, n. sp.
- b*¹. Elytra impunctate, very convex *laevipennis*, n. sp.
- b*. Thorax with a deep marginal sulcus; elytra with abbreviated series of punctures.
- c*¹. Body ovate; tibiae broadly dilated outwards *tibialis*, n. sp.
- d*¹. Body more oblong; tibiae more gradually widened outwards.
- c*². Seriate elytral punctures inconspicuous *sulcimargo*, n. sp.
- d*². Seriate elytral punctures coarse . . . [*insularis*, Grouv.]

**Lytopeplus substriatus*, n. sp.

Oblong-elliptic, somewhat depressed, shining, nigro-piceous, the antennae, the front of the head, and legs testaceous. Head almost smooth; thorax strongly transverse, finely margined laterally, bisinuate at the base, closely, minutely punctulate; elytra with rows of fine, closely placed punctures extending to near the apex, the punctures placed in almost obsolete striae and becoming evanescent towards the suture. Beneath almost smooth; metasternal and abdominal lines well defined, the former reaching the episterna and the latter extending to near the hind angles of the first segment.

Length 1½ mm.

Hab. MEXICO, Cordova (*Sallé*).

One specimen. Smaller and more depressed than *L. compactus*; the prothorax shorter, more closely punctulate, and with the base distinctly lobed in the middle behind.

Lytopeplus brevis.

Brachylon breve, Gorch., Biol. Centr.-Am., Coleopt. vii, p. 257 (1898).

This species has been found in Mexico (Omiteme and Jalapa) and Nicaragua. There is a single example of an allied undescribed form from Trece Aguas, Guatemala, in the U.S. National Museum, with the abbreviated rows of

scattered punctures present at the sides of the elytra only, and the femoral excavations in the first ventral segment very deep. It must be left to the American entomologists to describe.

**Lytopeplus curtulus*, n. sp.

Ovate, convex, shining, fusco-ferruginous, the antennae, mouth-parts, and legs testaceous. Head and thorax with a few widely scattered excessively minute punctures; thorax narrowing from the base, finely margined, distinctly bisinuate at the base; elytra with abbreviated series of fine scattered punctures, the interstices almost smooth, the inferior marginal carina not very prominent. Prosternal pits deep. Metasternum hollowed behind for the reception of the posterior femora. Metasternal and abdominal lines conspicuous, the former extending outwards to the episterna.

Length $1\frac{2}{3}$ – $1\frac{1}{2}$ mm.

Hab. MEXICO, Omilteme in Guerrero (*H. H. Smith*); GUATEMALA, Capetillo, Zapote (*Champion*).

Ten examples, one only of which is from Mexico. Smaller, more convex, and less elongate than *L. compactus*, Sharp. The prothorax and elytra with less prominent marginal carina, the prothorax rather strongly sinuate at the base, the prosternal fossae deeper. The seriate punctures on the elytra are coarse in the Mexican specimen.

**Lytopeplus laevipennis*, sp. n.

Short ovate, very convex, shining, black, the front of the head, the margins of the prothorax, and the prosternum sometimes rufescent, the antennae, mouth-parts, and legs testaceous. Head, thorax, and elytra smooth (the elytra without trace of the usual dorsal series of punctures, when viewed under the microscope), the thorax finely margined at the sides and rather strongly bisinuate at the base. Beneath smooth; metasternal and abdominal lines sharply defined; prosternal process very broad.

Length $1\frac{1}{2}$ –2 mm.

Hab. MEXICO, Cordova (*Sallé*); GUATEMALA, San Gerónimo (*Champion*); PANAMA, Volcan de Chiriqui (*Champion*).

Four specimens, the two from Guatemala, taken as the types, larger than the others. The very convex body and entirely impunctate upper surface readily distinguish *L. laevipennis*. The thorax is much more strongly sinuate at the base than in *L. compactus*, the type of the genus.

**Lytopeplus tibialis*, n. sp.

Ovate, convex, shining, ferruginous, the legs and antennae testaceous. Head and thorax smooth, the latter deeply sulcate along the lateral margins and bisinuate at the base; elytra with rows of scattered fine, conspicuous punctures which become obsolete beyond the middle. Beneath smooth; metasternal and abdominal lines conspicuous; prosternal process moderately broad. Tibiae short, broadly dilated.

Length 2 mm.

Hab. NICARAGUA, Chontales (*Janson*).

One specimen, in perfect condition, but somewhat immature, labelled by Dr. Sharp long ago as belonging to his genus *Lytopeplus*. The regularly ovate shape and the short, broadly dilated tibiae distinguish this species from *L. sulcimargo* and *L. insularis*. The thorax is rapidly arcuately narrowed from the base and the deep lateral sulcus extends forwards to near the apex.

**Lytopeplus sulcimargo*, n. sp.

Brachylon breve, Gorh., Biol. Centr.-Am., Coleopt. vii, p. 257 (part.).

Short, oblong-elliptic, convex, shining, piceous, the antennae, mouth-parts, and legs testaceous. Head and thorax almost smooth, the latter with a deep sulcus along the lateral margins and the base feebly bisinuate; elytra with rows of very fine, shallow, scattered punctures, which become coarser towards the sides and almost obsolete towards the suture. Beneath almost smooth; metasternal and abdominal lines fine, but conspicuous; prosternal process very broad.

Length $1\frac{1}{2}$ –2 mm.

Hab. NICARAGUA, Chontales (*Janson*).

Two specimens, one much larger than the other. The larger one was included by Gorham under his *Brachylon breve*, from which it differs in having the margins of the thorax deeply sulcate. *L. sulcimargo* is very like the Antillean *L. insularis*, Grouv. (Notes Leyden Mus. xx, p. 40, 1898), but it is less elongate and has smoother elytra.

MURMIDIUS.

Murmidius, Leach, Trans. Linn. Soc. xiii, p. 41 (1822);
Lewis, Biol. Centr.-Am., Coleopt. ii, 1, p. 243 (1888).

Two Central American species were referred to this genus by Lewis, who placed it in the Histeridae. Casey [Ann. N. York Acad. Sci. v, p. 318 (1890)] associates *Murmidius* with *Lapethus*, in his section "Murmidini" of the Colydiidae, and this seems to me to be its proper position. The new form now added from N. E. Mexico is more elongate than the cosmopolitan *M. ovalis*, and entirely glabrous. The non-striate prosternal process, etc., distinguish it from *M. irregularis* and *M. rectistriatus*.

**Murmidius estriatus*, n. sp.

Oblong, shining, castaneous, the legs and antennae testaceous, glabrous; the upper surface somewhat closely, minutely, confusedly punctate, the punctures on the under surface widely scattered and excessively minute. Head rather small; thorax short, very gradually narrowed to the rounded anterior angles; elytra oblong, subparallel for some distance below the base, finely margined; prosternal process very broad, arcuate-emarginate at the apex, sharply separated from the flanks, but without submarginal stria; mesosternal process very broad, rounded in front, the marginal stria complete.

Length $1\frac{1}{4}$ mm.

Hab. MEXICO, Tampico in Tamaulipas (*Schwarz, in U.S. Nat. Mus.*).

Four specimens.

CUCUJIDAE.

LAEMOPHLOEUS.

Laemophloeus, Castelnau, Hist. Nat. Ins. Coleopt. ii, p. 385 (1840); Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 513 (1899).

Dr. Sharp enumerated forty species of *Laemophloeus* from Central America, some of which have a very different facies from the type, *L. monilis*. The Guatemalan form now added should perhaps form the type of a new genus. It approaches *Rhabdophloeus*, but differs from it in having a broadly truncate intercoxal abdominal process. The last three joints of the antennae are much larger than the preceding joints, the elytra are tricostrate, the anterior acetabula are open, and the upper surface of the body is densely punctulate and pubescent.

**Laemophloeus quadridentatus*, n. sp. (Plate III, fig. 7, ♂.)

Oblong-ovate, rather broad, flattened, feebly shining, closely, finely pubescent; testaceous, the head and the disc of the thorax, and the last three joints of the antennae (the eleventh pale in one specimen), more or less infuscate, the elytra with a common, large, subtriangular patch, a broad angulate median fascia, and the apex fuscous, the legs testaceous; the entire upper surface densely, minutely punctate. Head broad, short, obliquely depressed on each side anteriorly, the labrum transverse; eyes very large, coarsely faceted; antennae about half the length of the body, joints 3-8 slender, gradually becoming shorter and stouter outwards, 9-11 abruptly widened, 9 and 10 transverse, 11 ovate, as long as 9 and 10 united, and constricted at the middle. Thorax broad, strongly transverse, somewhat rounded at the sides, the latter explanate, undulate, and strongly, equally crenate, the disc with a very prominent oblique ridge on each side, limited inwards by a shallow groove, the hind angles sharply rectangular. Elytra broader than the thorax, arcuato-explanate at the sides, and (viewed laterally) distinctly tricostate, the suture also a little raised posteriorly. Femora clavate, tibiae and tarsi slender.

Var. Antennae entirely rufo-testaceous, the testaceous markings of the elytra more extended, and not interrupted by the costae, which are less prominent.

Length $1\frac{2}{3}$ - $1\frac{3}{4}$ mm.

Hab. GUATEMALA, Livingston and Trece Aguas (*Barber and Schwarz, in U.S. Nat. Mus.*).

Five specimens, three paler than the others and with the elytra somewhat differently marked. In the dark form the testaceous portions of the elytral surface are clothed with cinereous pubescence, which accentuates the light markings, these being interrupted by the costae and appearing as oblong streaks. The undulation of the thoracic margin forms four equidistant teeth, one of which represents the anterior angle. In the paler form the oblique testaceous elytral fascia is broader and almost uninterrupted. The hind tarsi appear to be 4-jointed in the male.

LATHROPUS.

Lathropus, Erichson, *Naturg. Ins. Deutschl.* iii, p. 327 (1848); Sharp, *Biol. Centr.-Am.*, *Coleopt.* ii, 1, p. 531 (1899).

Dr. Sharp enumerated two species only under this genus,

L. pictus, Schwarz, and *L. parvulus*, Grouv., which may prove to be synonymous: both were described in 1878. The N.-American *L. vernalis*, Lec., and *L. pubescens*, Casey, are unknown to me. The minute form now added is closely related to the Palaearctic *L. sepicola*, Müll.

**Lathropus minimus*, n. sp.

Oblong-oval, depressed, opaque, piceous, the front of the head, the antennae (the club excepted), and legs ferruginous, almost glabrous. Head and thorax very densely, minutely, rugulose punctate; antennae short, joints 1 and 2 stout, 3-8 slender, 3 as long as broad, 4-8 transverse, 9-11 stout, about as long as 3-8 united, and forming a long, loosely-articulated club; thorax transverse, the lateral margins crenulate and moderately rounded, the hind angles acutely rectangular, the submarginal carina inconspicuous, the disc transversely impressed or obsoletely bifoveate towards the base and apex. Elytra oblong, a little wider than the thorax, finely punctate-striate, the interstices rugulose, the disc shallowly depressed below the base. Beneath alutaceous, densely, minutely punctate. Legs very short.

Length $1\frac{1}{10}$ - $1\frac{1}{4}$ mm.

Hab. GUATEMALA, Zapote, Las Mercedes, Senahu (*Champion*).

A long series, all but two from Zapote. Very like *L. sepicola*, but much smaller, the elytra relatively narrower, the two shallow foveae on the disc of the thorax towards the apex indistinct. In *L. minimus* all the coxae are widely separated and the elytral epipleura extend rather broadly to the apex. Viewed laterally, the alternate elytral interstices appear to be slightly raised. *L. parvulus*, Grouv., is described as ovate and rather convex, with an oblique luteous mark on the anterior portion of the elytra.

SALPINGOMIMUS, n. gen.

Head short, broad, constricted behind, obliquely narrowed anteriorly, the small transverse epistoma limited posteriorly by a deep groove; eyes convex, very prominent; labrum transverse, exposed; mentum transverse; maxillae (fig. 8a) with two ciliated lobes; maxillary palpi (fig. 8a) stout, joint 4 broadly oval, obliquely truncate at tip; last joint of labial palpi narrow, conical; mandibles short, bifid at tip; antennae free, stout, the last three joints widened and forming a distinct club, the preceding joints more or less moniliform; thorax constricted behind, immarginate laterally; scutellum

transverse; elytra oblong, parallel, the epipleura extremely narrow; anterior coxae small, placed near the base of the prosternum, separated by a thin lamella, the acetabula open; middle coxae somewhat widely separated; tibiae obliquely truncated at tip; tarsi 4-jointed in both sexes, 1-3 clothed with a few long hairs beneath, 1 as long as 2 and 3 united, 3 small, free, 4 elongate; body elongate, glabrous, metallic.

Type, *S. deceptor*.

The insect forming the type of this genus was rejected by myself from the Pythidae in 1889, when dealing with the Central American representatives of that family of the Heteromerous Coleoptera. It has exactly the facies of a Salpingid (such as *Sosthenes*), and if excluded from the Pythidae, on account of its tarsal structure, the genus must be placed in Cucujidae, near *Phlocostichus* and *Hymaea*, which have the tarsi 5-, 5-, 4-jointed in the male. It is probable, however, that the Pythidae will have to be placed, sooner or later, in the Clavicorn series, near Cucujidae, *Salpingomimus* clearly showing that the tarsal formula alone is a character upon which too much dependence has been placed by systematists.

**Salpingomimus deceptor*, n. sp. (Plate III, figs. 8, ♂; 8a, maxilla and maxillary palpus.)

Moderately elongate, shining, glabrous, aeneous or greenish-aeneous, the mouth-parts, base of antennae, and tarsi ferruginous. Head closely punctate, the transverse groove behind the epistoma very deep; antennae moderately long, a little shorter in ♀, joint 1 very stout, 7 and 8 transverse, 9-11 much wider and stouter, 9 and 10 strongly transverse, 11 acuminate-ovate. Thorax convex, oval, as long as broad, narrower than the head with the eyes, feebly margined at the base only, closely punctate. Elytra oblong, as wide as the thorax, depressed on the disc below the base; seriato-punctate, the seriate punctures becoming almost obsolete towards the apex and more confusedly arranged at the base, the interstices usually with a few scattered punctures. Beneath densely, the metasternum more sparsely, punctate, the abdomen almost smooth. Tibiae widened on the inner side from about the middle to the apex in ♂, more feebly so in ♀. Tarsi slender, joints 1 and 2 slightly thickened.

Length $2\frac{9}{16}$ -3 mm. (♂ ♀.)

Hab. PANAMA, Volcan de Chiriqui, 8,000 feet (*Champion*).
Twelve specimens, found in June 1882, varying in the

arrangement of the punctures on the basal portion of the elytra, as is often the case in *Salpingus* and its allies.

CRYPTOPHAGIDAE.

TRUQUIELLA, n. gen.

Body elongate, pilose throughout; last joint of the maxillary palpi narrow, ovate; antennae with joints 9-11 widened and forming an abrupt club; head short, broad, subtriangular in ♀, the sides of the front subangularly raised in ♂; thorax gibbous in front in ♂; anterior coxal cavities open behind, the prosternal side-pieces not reaching the rather broad bisulcate process; prosternal sutures obliterated; intermediate and posterior coxae about equally separated; tarsi pilose to the tip, 4-jointed, 1-3 widened, short, 3 sublobate, excavate above for the reception of the long claw-joint; tibiae very obliquely truncated at the apex.

Type, *T. gibbifera*.

This genus must for the present be placed in the subfamily Telmatophilinae of the Cryptophagidae, its 4-jointed tarsi notwithstanding.¹ The structure of the head in the male is suggestive of Tenebrionidae, and a similar dorsal hump on the thorax in the same sex is to be found in certain species of *Hapalips*. There is no trace of a node or minute additional tarsal joint at the base of the terminal one when the claw-joint is broken off for examination. The entire body is densely punctate and hairy, and the hairs even extend to the fourth tarsal joint. *T. gibbifera* has the general facies of a large *Telmatophilus*.

**Truquiella gibbifera*, n. sp. (Plate III, figs. 9, 9a, ♂.)

Elongate, moderately convex, closely pilose, feebly shining, piceous, the front of the head, the base of the antennae, and the legs in part, ferruginous. Head densely, finely punctate, without definite line behind the epistoma, the sides of the front in ♂ raised into a stout subangular ridge; eyes rounded, prominent, coarsely granulated; antennae moderately long, joint 3 longer than 2, 4-8 shorter and submoniliform, 9-11 much widened, about equal in width, 9 and 10 transverse. Thorax transversely convex, much broader than long, a little wider at the apex than at the base, slightly rounded and narrowly margined at the sides, the base also feebly margined, the hind angles not very prominent; the entire

¹ *Platoberus*, Sharp, apparently has tetramerous tarsi.

surface densely, minutely, confluent punctate, the disc with a compressed, cariniform hump in the middle in front in ♂. Scutellum small. Elytra subparallel, about as wide as the thorax, finely punctate-striate, the interstices rugulose punctured. Beneath densely, finely punctate.

Length $3\frac{3}{4}$ -4 mm. (♂ ♀.)

Hab. MEXICO (*Truqui*, in *Mus. Brit.*, ex coll. *Fry*).

One pair.

PLATOBERUS.

Platoberus, Sharp, *Biol. Centr.-Am.*, *Coleopt.* ii, 1, p. 586 (1900).

Four species from Panama were referred to this genus by Dr. Sharp. A fifth, from Mexico, has since been detected in our collection. The tarsi appear to have the usual minute penultimate joint fused with the apical one, so that they are really 4-jointed.

**Platoberus nigrolimbatus*, n. sp.

Ovate, rather broad, shining, ferruginous, the elytra with more than the outer half black, the two basal joints of the antennal club infuscate; clothed with long, fine, curled, decumbent, yellowish hairs. Head finely punctate, the eyes convex, very large and prominent; antennae long, the club large, joints 9 and 10 subquadrate. Thorax strongly transverse, subquadrate, sharply margined, the sides straight, the anterior angles tumid and very prominent, the basal foveae connected by a deep transverse sulcus; finely punctate. Elytra convex, oval, much wider than the thorax, the lateral excavation moderately large; finely seriato-punctate, the interstices with a few widely scattered smaller punctures, each puncture bearing a long curled hair. Legs short, stout. Beneath finely punctate, the metasternum smoother down the broad median space and hollowed in front of the posterior coxae.

Length $2\frac{3}{8}$, breadth $1\frac{1}{2}$ mm.

Hab. MEXICO, Motzorongo in Vera Cruz (*Flohr*).

One specimen. Near *P. divisus*, Sharp.

TOMARUS.

Tomarus, Leconte, *Class. Coleopt. N. Am.* ed. 1, p. 99 (1861); Sharp, *Biol. Centr.-Am.*, *Coleopt.* ii, 1, p. 587 (1900).

Dr. Sharp (loc. cit.) enumerated fifteen species of this genus from Central America. The two others unnamed in our collection may be described thus:—

**Tomarus gibbipennis*, n. sp.

Short, broad, convex, moderately shining, brown, the legs and antennae paler, the latter with joints 9 and 10 nigro-piceous, the tibiae also infusate at the middle, the tarsi testaceous; sparsely, very finely pubescent. Head finely punctate, the eyes small; antennae very slender, elongate, joints 5 and 7 much longer than 4, 6, and 8, 8 a little shorter than 6, 9–11 dilated into a rather long, abrupt club, 9 as long as broad, 10 transverse. Thorax short, transversely convex, rounded at the sides, slightly narrowed behind, faintly transversely grooved at the base, the base itself very feebly sinuate, the hind angles rectangular, the anterior angles prominent; densely finely punctate, without basal foveae. Elytra broad, gibbous, subcordate, a little more sparsely punctured than the thorax, the humeri obtuse. Beneath densely punctate; mesosternum feebly margined on each side between the coxae; metasternum unimpressed. Legs long and slender.

Length $1\frac{1}{2}$ mm.

Hab. MEXICO, Omilteme in Guerrero, 8,000 feet (*H. H. Smith*).

One specimen. The uniformly brown body, the alternately longer and shorter intermediate joints of the antennae, the short, transversely convex thorax, with the base subtruncate, and the broad, gibbous elytra, readily distinguish *T. gibbipennis*. The apical joint of the antennae is abruptly paler, as in the allied *T. picticornis*, Sharp, and other species of the genus.

**Tomarus fuscicornis*, n. sp.

Convex, shining, rufo-testaceous, the thorax in great part, the elytra with a very large subquadrate patch below the base (not reaching the suture) and the apex, the antennae (the two basal joints excepted), and the base of the tibiae, piceous; finely pubescent. Head broad, closely, very finely punctate, the eyes small; antennae moderately elongate, slender, joint 5 longer than 4 and 6, 8 small, transverse, 9–11 rather large and transverse. Thorax convex, transverse, rounded at the sides anteriorly, sinuously narrowed behind, subtruncate and feebly transversely grooved at the base; closely, very finely punctate. Elytra convex, ovate, wider and a

little more sparsely punctate than the thorax, the humeri prominent. Mesosternum sharply margined on each side between the coxae.

Length $1\frac{3}{4}$ mm.

Hab. PANAMA, Volcan de Chiriqui, 8,000 feet (*Champion*).

One specimen. More elongate than *T. gibbipennis*, the elytra less inflated, the antennae infuscate to the tip (the two basal joints excepted), the thorax less transverse, the humeri prominent, etc. The elytra have an ill-defined basal and sub-apical fascia, connected along the suture, rufo-testaceous. *T. fuscicornis* is not very closely related to any of the species described by Dr. Sharp. The Mexican *T. cruciatus*, Reitt., was unknown to him, but it is evidently different from the Panama insect.

OCHOLISSA.

Ocholissa, Pascoe, Journ. Ent. ii, p. 85 (1863).

Two species were referred to this genus by Pascoe—*O. laeta*, from Ega, and *O. humeralis*, from Saylee, Mysol, and other eastern islands. It may be stated that in the type of *Ocholissa*, *O. laeta*, the anterior acetabula are incompletely closed behind, the prosternal sutures are almost obsolete, and the tarsi are 4-jointed. *Ocholissa* was referred by Pascoe to the Colydiidae, but it seems to me to be better placed in Cryptophagidae, near *Holosternus* and *Anepsicus*, Sharp.

**Ocholissa laeta*.

Ocholissa laeta, Pasc. loc. cit. pl. 5, fig. 1.

The following description was made from Guatemalan specimens before the identity of the species was suspected, and as the insect is somewhat variable in colour, the particulars given will supplement Pascoe's diagnosis. The measurements include a very small Amazonian example found by Bates.

Moderately elongate, parallel, depressed, shining; piceous, the elytra testaceous, with a common transverse black median fascia, which extends indeterminately up and down the suture, the antennae partly or entirely ferruginous, the legs testaceous. Head very finely punctate, shallowly transversely grooved behind the epistoma, greatly developed and as broad as the thorax in ♂, smaller in ♀; eyes moderately large, rather prominent; antennae with joints 4-8

small and transverse, the club rather large, joints 9 and 10 strongly transverse. Thorax about as long as broad, regularly quadrate, the hind angles rectangular, the narrow lateral margins not visible from above; closely minutely punctate. Elytra rather more than twice the length of the thorax, parallel, the humeri angular; finely punctate-striate, the interstices almost smooth.

Length $1\frac{3}{4}$ – $2\frac{1}{2}$ mm. (♂ ♀.)

Hab. GUATEMALA, Panzos and Teleman in the Polochic valley (*Champion*); AMAZONS, Ega.

This genus is an addition to the Central American fauna.

HOLOSTERNUS.

Holosternus, Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 599 (1900).

This is one of four Central American genera—the others being *Anepsicus*, *Cissocryptus*, and *Trogocryptus*—referred somewhat doubtfully by Dr. Sharp to the Cryptophagidae. He described the tarsi in all of them as 5-jointed; but this is a mistake, as the types have in each case the tarsi clearly 5-, 5-, 4-jointed.¹ Additional specimens of all these insects, moreover, are now available for examination, and the tarsi prove to be heteromerous in both sexes in each of the genera mentioned. The imperfectly closed anterior coxal cavities, combined with the tarsal formula, is suggestive of Pythidae; but in this last-mentioned family the thorax is not margined laterally, etc. The four genera, therefore, must remain for the present where Dr. Sharp placed them, the heteromerous tarsi notwithstanding. Various Cucujidae are known to have this form of tarsus in the male, so that it is not surprising to find a similar structure in both sexes amongst some of the Clavicornia.

Holosternus distans.

Holosternus distans, Sharp, loc. cit. p. 600, pl. 18, fig. 18.

Described from two specimens from Capetillo, Guatemala. The following are additional localities:—

GUATEMALA, El Tumbador, Las Mercedes, Zapote, Guatemala city (*Champion*).

¹ The tarsi of *Holosternus* are correctly, and those of the other genera incorrectly, shown in the published figures of these genera.

ANEPSICUS.

Anepsicus, Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 600 (1900).

This genus seems to me to be nearly related to *Ocholissa*, Pasc., referred by its describer to Colydiidae.

Anepsicus brunneus.

Anepsicus brunneus, Sharp, loc. cit. p. 600, pl. 18, fig. 19.

Described from three specimens only. Additional localities are:—

MEXICO, Jalapa (*Höge*); GUATEMALA, El Tumbador, Las Mercedes, Cerro Zunil, Zapote, Capetillo, San Gerónimo (*Champion*).

Numerous examples, varying from 2–3 mm. in length.

CISSOCRYPTUS.

Cissocryptus, Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 601 (1900).

This genus would perhaps be better placed in Pythidae, near *Lissodema*, the tarsi being heteromorous.

Cissocryptus insolitus.

Cissocryptus insolitus, Sharp, loc. cit. p. 601, pl. 18, fig. 20.

Described from a single example from Guanajuato, Mexico. Three others, found by Truqui in Mexico, are contained in the Fry collection—one, a male, with the body almost black, the others, females, paler in colour.

TROGOCRYPTUS.

Trogocryptus, Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 602 (1900).

The members of this genus are separable from the allied forms by the acutely dilated, spinulose apices of the tibiae, and the strongly marked prosternal sutures. *T. nigripectus*, was described from a single (? ♀) example found by myself at Cahabon, Alta Vera Paz; two others, from Sinanja, Alta Vera Paz, have since been detected in our collection, one with the head greatly developed, and presumably a male. The tarsi are really heteromorous, as stated above under *Holosternus*. Two additional species are now known.

**Trogocryptus longiusculus*, n. sp.

Moderately elongate, rather broad, subparallel, very shining, glabrous; ferruginous, the apical half of the elytra, the disc of the thorax, and part of the under surface sometimes piceous or black. Head very broad in fully-developed ♂, narrower in ♀, finely and somewhat thickly punctate, transversely grooved or bifoveate behind the epistoma; antennae short, joints 4-8 strongly transverse, the club very abrupt, joint 10 wider than 9. Thorax transverse, moderately convex, rounded at the sides, and a little narrowed towards the apex in ♀, broader anteriorly in ♂, finely margined, the angles obtuse; finely, somewhat closely punctate. Elytra comparatively short, finely punctate-striate, the interstices minutely uniseriate-punctate. Beneath with a few scattered fine punctures along the sides, for the rest almost smooth. Legs short; tibiae rapidly widened outwards, acutely dilated at the outer apical angle, and spinulose along their apical margin.

Length $3\frac{1}{2}$ - $3\frac{3}{4}$ mm. (♂ ♀.)

Hab. MEXICO, Jalapa (*Höge*), Teapa (*H. H. Smith*); GUATEMALA, Purula and Sinanja in Alta Vera Paz, Las Mercedes, Pantaleon (*Champion*); PANAMA, Volcan de Chiriqui (*Champion*).

Eleven specimens, some of them uniformly ferruginous, others with the disc of the thorax and the apical half of the elytra infuscate, those with broader head and thorax assumed to be males. This species is considerably less elongate than *T. nigripectus*, Sharp, and also differs from it in the transverse thorax and the finely punctate-striate elytra.

**Trogocryptus senecionis*, n. sp.

Elongate, subcylindrical, moderately convex, shining, glabrous; black, the head, antennae, and legs, and in one specimen the sides of the thorax, the humeri, and the under surface also in great part, ferruginous. Head alutaceous and finely punctate, transversely grooved behind the epistoma, the eyes not prominent; antennae reaching very little beyond the middle of the thorax, joints 4-8 transverse, the club abrupt, rather large, joints 9 and 10 equal in width. Thorax convex, transverse, rounded at the sides, about equal in width at the base and apex, the sides sinuate before the rectangular hind angles, the base distinctly margined; thickly punctate, the punctures oblong in shape, the interspaces finely alutaceous. Elytra elongate, scarcely wider than the thorax, parallel to beyond the middle; punctate-striate, the interstices

sparsely, very finely, uniseriate-punctate. Beneath sparsely, finely punctate. Tibiae much widened outwards, strongly spinose along their apical margin, the anterior pair acutely produced at the outer apical angle.

Length $4\frac{1}{2}$ – $5\frac{1}{4}$ mm. (♀.)

Hab. MEXICO, near the city (*Flohr*).

Two specimens, labelled as having been found in the stems of *Senecio* by the late Julius Flohr. Larger and broader than *T. nigripectus*, the thorax (except at the sides in one example) and elytra black, the legs and antennae longer, the tibiae more strongly spinose at the apex. *T. senecionis* has quite the facies of a Tenebrionid, and this is accentuated by its heteromerous tarsi, but the insect is certainly congeneric with *Trogoeryptus nigripectus*, Sharp.

CLERIDOPSIS, n. gen.

Head oblong, convex, exserted, shallowly arcuate-emarginate at the apex, leaving the small labrum exposed, the epistoma confused with the front, the eyes transverse, distant from the anterior margin of the prothorax; antennae inserted under the sides of the front, 11-jointed, 9–11 widened into an abrupt club; mentum small, triangular, leaving the maxillae exposed; last joint of the maxillary palpi long, conical, that of the labial palpi stout, ovate, truncate at the tip; anterior coxae globose, separated by a thin lamina, the cavities narrowly closed behind; intermediate and posterior coxae narrowly separated; prosternum truncate in front, the sutures obliterated; metasternum long, the episterna very narrow, cuneiform; ventral segment 1 long, the intercoxal process cariniform, the segments 2–4 much shorter, equal in length; prothorax elongate, constricted at the base, without marginal carina; scutellum small; elytra parallel, confusedly punctate; femora strongly clavate; tibiae obliquely truncate at the tip, unarmed; tarsi 4-jointed, joints 1–3 of anterior pair (♂) (fig. 10a) broadly lobate, spongy-pubescent beneath, each deeply excavate above for the reception of the succeeding joint, the corresponding joints of the intermediate and posterior pairs simple, pilose beneath, the claw-joint of all of them as long as 1–3 united, the claws simple; body subcylindrical, hairy.

Type, *C. latimanus*.

The small, subcylindrical, hairy insect forming the type of this genus has quite the facies of a Clerid, but the tarsal structure is foreign to the species of that family. For the present *Cleridopsis* would perhaps be best placed in Crypto-

phagidae or Cucujidae. The extraordinary dilatation of the anterior tarsi may prove to be peculiar to the male sex. The exerted head; the 3-jointed, abrupt antennal club; the basally constricted, long thorax; the greatly thickened anterior femora; the closed anterior acetabula, etc., are also characteristic. The two basal joints of the intermediate and posterior tarsi are so closely articulated that the separation between them is not easily seen.

**Cleridopsis latimanus*, n. sp. (Plate III, figs. 10, ♂; 10a, anterior tarsus.)

Elongate, subcylindrical, shining, ferruginous or obscure ferruginous, the elytra with a faint oblong darker patch on the outer part of the disc; clothed with long, fine, erect hairs. Head, as seen from above, nearly as long as broad, closely punctate, the eyes not prominent; antennae moderately long, joint 1 stout, 2 about as long as broad, 3 obconic, 4-8 shorter, submoniliform, 9-10 very broad, transverse, 11, stout, oval. Thorax as long as broad, convex, cylindrical, abruptly constricted into a short neck behind the inconspicuous rectangular hind angles, margined at the base only; punctured like the head. Elytra parallel, about twice the length of the thorax, strongly, transversely depressed before the middle; rather coarsely, closely, confusedly punctate, the punctures becoming very fine towards the apex. Beneath coarsely, closely, the ventral segments sparsely and finely, punctate. Anterior femora broadly, the other femora less strongly, clavate.

Length $2\frac{1}{10}$ - $2\frac{1}{2}$ mm. (♂.)

Hab. GUATEMALA, Rio Maria Linda, Pacific slope (*Champion*); PANAMA, Volcan de Chiriqui (*Champion*).

One specimen from each locality, the first taken in Guatemala on March 4th, 1881.

PHARAXONOTHA.

Pharaxonotha, Reitter, Deutsche ent. Zeitschr. 1875, Heft. iii, p. 44; Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 598 (1900).

This genus was referred to the Cryptophagidae by both Reitter and Sharp.

Pharaxonotha kirschi.

Pharaxonotha kirschi, Reitt., loc. cit.; Sharp, Biol. Centr.-Am., Coleopt. ii, 1, p. 598 (1900).

Thallisella conradti, Gorh., Biol. Centr.-Am., Coleopt. vii, p. 249 (1898) [sub Erotylidae].

Additional localities for *P. kirschi* are :—

MEXICO, Tupataro (*Höge*), Guanajuato (*Sallé*), Cordova (*Sallé, Höge*), Mitla (*Deam, in U.S. Nat. Mus.*); GUATEMALA, (*Sallé*) Senahu, Cahabon, San Juan, Panima, San Gerónimo, and Balheu in Vera Paz, Capetillo (*Champion*), Trece Aguas, Santa Lucrecia (*Barber and Schwarz, in U.S. Nat. Mus.*). The above synonymy has already been noted by me (*Ent. Monthly Mag.* xl, p. 36). The insect has been found in corn (maize) in Guatemala.

HAPALIPS.

Hapalips, Reitter, Verh. Ver. Brünn, Abhandl. xv, p. 122 (1877) [sub Rhizophagidae]; Gorham, Biol. Centr.-Am., Coleopt. vii, p. 250 (1898) [sub Erotylidae, Languriides]; Grouvelle, Ann. Soc. Ent. Fr. 1908, p. 58 [sub Cryptophagidae].

Gorham's enumeration of the Central American species of this genus was based upon insufficient material, nearly all the examples obtained by myself having been mislaid when our collections were sorted, and were therefore not seen by him. These insects have since been found, and a complete revision of the various forms has become necessary. The unnamed American specimens in the collections of Fry and Pascoe at the British Museum have also been studied. Upwards of 20 species of *Hapalips* have been described altogether, by Reitter, Gorham, Grouvelle, and Schaeffer, one of which is African (*H. eichelbaumi*, Grouv.), and *Xenoscelis prolixus*, Sharp, an insect found in tree-ferns, must be included in it as here understood. The tarsi are described by both Reitter and Gorham as 4-jointed, whereas they are really pentamerous (as in the Cucujid genus *Xenoscelis*, Woll.), the minute penultimate joint being hidden in the lobe of the third joint; the three basal joints are short, more or less widened, and spongy-pubescent and pilose beneath. The tibiae are very obliquely truncated at the apex, much widened and angularly dilated at the outer apical angle in some of the larger species, narrow in the small forms. The first ventral segment is sometimes hollowed on each side for the reception of the hind femora, but I am unable to detect the raised cariniform lines mentioned by Gorham and Grouvelle. The resemblance to

the Languriides is purely superficial,¹ and the genus seems best placed amongst the Cryptophagidae for the present, not far from *Haplolophus* and *Leucohimatium*. The sub-joined table, based upon the species represented in the British Museum, or in the U.S. National Museum at Washington, will assist in the identification of many of the American forms.

- A. Thorax without impressed lines on the disc.
- a. Thorax more or less truncate in front in both sexes.
- a¹. Body glabrous above, shining; elytra punctate-striate.²
- a². Tibiae much widened outwards; elytra about as wide as thorax.
- a³. Head short; eyes large and prominent; thorax strongly crenate at sides: body moderately elongate, black or piceous [*crenatus*, n. sp.]
- b³. Head longer; eyes small and depressed; thorax oblong-quadrate: body very elongate, anterior half testaceous, rest piceous. *dimidiatus*, n. sp.
- b². Tibiae slender; eyes large: body rather convex: species very small.
- c³. Thorax narrow, subquadrate [*parvicollis*, n. sp.]
- d³. Thorax transverse, narrowed and transversely excavate towards base *sulcicollis*, n. sp.
- b¹. Body pubescent (in *H. batesi* only a few hairs visible).
- c². Eyes large.
- e³. Thorax distinctly angulate at sides anteriorly; elytra punctate-striate, broader than thorax, usually fasciate: body very shining *cribricollis*, Gorb.
(?= *gracilicornis*, Reitt.)

¹ *Crotchia* has a stridulating file on the head, a series of setigerous pores on each side of the abdomen, etc.

² *H. dufauri* and *H. guadalupensis*, Grouv., belong to this section.

- f*³. Thorax not or feebly crenulate at sides; elytra punctate-striate.
- a*⁴. Thorax longer than broad, as wide as elytra; elytra very elongate, attenuate: body and legs black, elytra with rufous humeral patch: species large *perlongus*, n. sp.
- b*⁴. Thorax subquadrate or transverse, about as wide as elytra.
- a*⁵. Sides of thorax almost straight or feebly rounded, sometimes crenulate.
- a*⁶. Elytra long and subparallel, interstices usually conspicuously punctate; eyes very large; thorax strongly transverse, anterior angles not in line with apical margin.
- a*⁷. Eighth antennal joint moniliform *reitteri*, Gorch.
- b*⁷. Eighth antennal joint transverse, often angulate within *fuscus*, Reitt.
(= *parallelus*, Gorch.)
- b*⁶. Elytra narrowed posteriorly; thorax quadrate or subquadrate, anterior angles nearly or quite in line with apical margin.
- c*⁷. Elytral interstices with punctures similar to those of the striae: body rather convex.
- a*⁸. Thorax as long as broad in ♂, shorter in ♀ *flohri*, Gorch.
- b*⁸. Thorax transverse in both sexes *lucidus*, n. sp.
- d*⁷. Elytral interstices almost smooth, the striae regularly punctate: body more depressed.

- c*⁸. Thorax quadrate, sparsely, finely punctate; elytra more finely punctate-striate; antennae stout; tibiae triangular [*batesi*, n. sp.]
- d*⁸. Thorax transversely quadrate, more coarsely punctate; elytra strongly punctate-striate; antennae and legs more slender. [*brevipes*, n. sp.]
- b*⁵. Sides of thorax rounded, sharply margined: surface shining *nitidulus*, n. sp.
- c*⁴. Thorax strongly transverse, narrower than elytra; tibiae narrow: species small . . . [*nigriceps*, Reitt.]
- d*². Eyes small.
- g*³. Joints 7 and 8 of antennae about as wide as those preceding; elytra regularly punctate-striate: body narrow, elongate.
- d*⁴. Eyes more depressed; elytral suture usually infusate . . . *suturalis*, n. sp.
- e*⁴. Eyes smaller, convex; elytral suture not infusate . . . *filum*, Reitt.
- h*³. Joints 7 and 8 of antennae wider than those preceding; elytra densely, confusedly punctate, the striae not traceable: body broader and more attenuate posteriorly *obliteratus*, n. sp.
- c*¹. Body lanuginose; thorax transverse; elytra broad, subparallel, striae almost obsolete *lanuginosus*, n. sp.
- b*. Thorax angularly produced in front in ♂, apical margin subtruncate in ♀; eyes large; elytra punctate-striate, interstices punctured: body pubescent.¹

¹ *H. angulosus*, Grouv., and *H. texanus*. Schaeff., belong to this section.

- d*¹. Upper surface rather dull; thorax densely punctate, the prominence in ♂ compressed at apex *mexicanus*, Reitt.
- e*¹. Upper surface shining; thorax more sparsely punctate, the prominence in ♂ not compressed [*grouwellei*, Gorh.]
- B. Thorax with two deeply impressed lines on disc [*sculpticollis*, n. sp.]

[*Hapalips crenatus*, n. sp.]

Elongate, somewhat depressed, narrowing posteriorly, nigropiceous or black, the antennae, legs, and mouth-parts ferruginous, glabrous above and very finely pubescent beneath, moderately shining, the head and thorax distinctly alutaceous. Head short, finely punctate, the oblique impressed line on each side of the epistoma just traceable, the eyes moderately large, prominent; antennae with joints 4-8 moniliform, the club broad and abrupt. Thorax transversely subquadrate, sharply margined and crenate at the sides, the base bisinuate and feebly margined, the apex subtruncate, the anterior angles obtuse, the hind angles acute; sparsely, finely punctate, obsolete foveate in the middle before the base, the basal foveae distinct. Elytra about as wide as the thorax, moderately long, narrowing from the middle; regularly punctate-striate, the interstices faintly punctulate. Beneath alutaceous, finely punctate. Prosternal process rather broad. Tibiae gradually widened outwards. Tarsal joints 1-3 broad.

Length $4\frac{1}{2}$ - $4\frac{3}{4}$ mm.

Hab. BRAZIL, Parana (*coll. Fry, in Mus. Brit.*).

Two specimens, one with the lateral margins of the thorax strongly, the other with the margins more feebly, crenate. A moderately elongate, rather broad form, glabrous above, with two or three short teeth at the sides of the thorax. *H. crenatus* bears a certain resemblance to the cosmopolitan *Nausibius dentatus*, Marsh.]

**Hapalips dimidiatus*, n. sp.]

Very elongate, depressed, gradually narrowing posteriorly, shining, testaceous, the head ferruginous, the eyes black, the antennae with joints 1, 2 and the club ferruginous and the intermediate joints black, the elytra piceous from about the basal fourth, the dark colour extending forwards along the suture to near the base; glabrous above and very sparsely pubescent beneath. Head rather long, moderately convex, finely punctate, the oblique

impressed lines conspicuous, the eyes not prominent and comparatively small; antennae about as long as the prothorax, joints 3-8 moniliform, 6-8 transverse. Prothorax about as long as broad, subquadrate, slightly widened anteriorly, truncate at the apex, the anterior angles obtuse and deflexed, the hind angles rectangular, the base finely margined, the foveae almost obsolete; sparsely, finely punctate, except along a narrow space down the middle. Elytra very elongate, gradually narrowed towards the apex; regularly punctate-striate, the interstices flat, the alternate ones with a few very widely scattered fine punctures. Tibiae much widened outwards, the joints 1-3 of the tarsi broad.

Length $5\frac{1}{2}$ mm. (? ♂.)

Hab. MEXICO, Oaxaca (*Höge*).

One specimen. Smaller and more shining than *H. perlongus*, and differently coloured, the upper surface glabrous, the eyes depressed, much smaller, the thorax not longer than broad and sparsely punctate, the elytral interstices much smoother.

[*Hapalips parvicollis*, n. sp.]

Moderately elongate, rather convex, fusco-ferruginous, the elytra, legs, and antennae testaceous, the eyes black; shining, glabrous above, very finely pubescent beneath. Head triangular, finely punctate, the oblique line on each side of the epistoma distinct, the eyes moderately large and prominent; antennae reaching to a little beyond the base of the thorax, joints 3-8 comparatively slender, 8 transverse, the club moderately large. Thorax small, transversely subquadrate, the anterior angles obtuse, the hind angles acute; thickly, finely punctate. Elytra moderately long, somewhat convex, considerably wider than the thorax, slightly rounded at the sides, narrowing from about the middle; finely punctate-striate, the interstices faintly punctulate. Leg slender; tibiae but little widened outwards.

Length $3\frac{1}{5}$ mm. (♀.)

Hab. BRAZIL, Rio de Janeiro (*coll. Fry, in Mus. Brit.*).

One specimen. This small form is not unlike the insect here identified as *H. nigriceps*, Reitt., but differs from it in having the upper surface glabrous and more shining; the intermediate joints of the antennae longer and more slender; the thorax relatively narrower (and therefore less transverse); the elytra more convex; and the legs more slender. In its general shape *H. parvicollis* approaches *H. cribricollis*, Gorbh.]

**Hapalips sulcicollis*, n. sp.

Moderately elongate, narrow, convex, shining, ferruginous, the eyes black; glabrous above, the under surface with a few minute scattered hairs. Head short, thickly punctate, the line behind the epistoma almost obsolete, the eyes large and prominent; antennae comparatively slender, joints 4-8 short, subquadrate, the club abrupt. Thorax transverse, convex, somewhat rounded at the sides, and distinctly narrowed behind, the lateral margins feebly crenulate posteriorly, the hind angles acute, the disc deeply transversely grooved before the base; the surface somewhat thickly punctate. Elytra about as wide as the thorax, moderately long, gradually narrowed posteriorly; punctate-striate to near the apex, the striae faintly impressed, the interstices almost smooth. Beneath very sparsely punctate, the ventral segments almost smooth down the middle. Tibiae narrow.

Length $2\frac{1}{2}$ mm.

Hab. NICARAGUA, Chontales (*Janson*); PANAMA, Tolé (*Champion*).

Three specimens. Smaller and more convex than any of the other species of the genus known to me; the thorax narrowed posteriorly and also deeply transversely grooved on the disc before the base. *H. sulcicollis* was placed under the Languriid-genus *Crotchida* when our collections were sorted, and, indeed, is not unlike *C. parvula*, Gorb., from which it differs in having a smaller antennal club, a less constricted thorax, etc. The species agrees sufficiently well with *H. cribricollis* to be included in the same genus.

Hapalips cribricollis.

Hapalips cribricollis, Gorb., Biol. Centr.-Am., Coleopt. vii, p. 250.

Described from Mexican specimens. The following are additional localities for it:—

BRITISH HONDURAS, Belize (*Blancaneaux*); GUATEMALA, Trece Aguas (*Barber and Schwarz, in U.S. Nat. Mus.*); PANAMA, David (*Champion*), Tabernilla, Canal Zone (*Busck, in U.S. Nat. Mus.*); BRAZIL, Pernambuco (*coll. Fry*).

Amongst the long series received from Teapa there are some specimens with the post-median fascia of the elytra almost or quite obsolete. They have the thorax shaped exactly as shown in Reitter's figure of the Colombian

H. gracilicornis, but the intermediate joints of the antennae in *H. cribricollis* are apparently more transverse than in that insect. The prothorax often has a longitudinal vitta on each side of the disc, and the elytra a more or less distinct, common, oblique post-median fascia, infuscate or black.

**Hapalips perlongus*, n. sp. (Plate III, fig. 11, ♂.)

Very elongate, depressed, gradually narrowing posteriorly, shining, very finely alutaceous, black, the head, thorax, and base of the antennae nigro-piceous, the tips of the tarsi and a large elongate humeral patch on each elytron ferruginous; somewhat thickly clothed with rather long, fine, yellowish hairs. Head triangular, feebly convex, thickly, finely punctate, bifoveate between the points of insertion of the antennae, the impressed oblique lines short, the eyes moderately large and prominent; antennae rather stout, barely as long as the prothorax, joints 4-8 transverse and moniliform. Thorax oblong-subquadrate, longer than broad, sharply margined at the sides and base, truncate at the apex, the sides faintly emarginate before the acute hind angles, the anterior angles rounded and not prominent, the basal foveae very shallow; closely, finely punctate, except along a narrow space down the middle. Elytra very elongate, gradually narrowed towards the apex; regularly punctate-striate, the dorsal interstices with a few scattered punctures, the sides, apex, and suture closely punctate. Tibiae much widened outwards, the joints 1-3 of the tarsi broad.

Length $7\frac{1}{2}$ mm. (♂.)

Hab. GUATEMALA, Senahu in Alta Vera Paz (*Champion*).

One specimen, somewhat abraded above. A very elongate, black form, with a large oblong rufous humeral patch on each elytron; the thorax longer than broad, and closely punctate, except along the median line; the tibiae much widened outwards. The latero-basal emargination of the thorax is preceded by a minute tooth.

Hapalips reitteri.

Hapalips reitteri, Gorb., Biol. Centr.-Am., Coleopt. vii, p. 251.

This insect is very like the ferruginous form of *H. fuscus*, Reitt. (*parallelus*, Gorb.), but it is more elongate and much larger, and the joints of the antennae preceding the club are moniliform. The head is short, and the eyes

very large and prominent. The thorax is strongly transverse in the female, and a little longer and with the anterior angles placed further backward in the male [described as nearly square, not wider than long]. I cannot detect the very short raised carinae on the abdomen mentioned by Gorham.

Hapalips fuscus.

Hapalips fuscus, Reitt., Verh. Ver. Brünn, Abhandl. xv, p. 127.

Hapalips brevicornis, Reitt., loc. cit.

Hapalips parallelus, Gorh., Biol. Centr.-Am., Coleopt. vii, p. 252.

Additional localities for this species are :—

MEXICO, Tampico (*Schwarz, in U.S. Nat. Mus.*), Acapulco (*Baker, in U.S. Nat. Mus.*); BRITISH HONDURAS (*Blancaneaux*); GUATEMALA, Champerico (*Baker, in U.S. Nat. Mus.*); PANAMA, Volcan de Chiriqui (*Champion*); BRAZIL, Rio Janeiro, Santa Catharina (*Fry*).

After examining a long series of specimens from Brazil and Panama I am unable to separate the Mexican *H. parallelus* from the Brazilian *H. fuscus*, the punctuation of the elytral interstices being somewhat variable. *H. brevicornis*, from Parahyba, is doubtless a ferruginous form of the same species, of which there are several in the Fry collection. The similarly-coloured variety mentioned by Gorham, from Mexico and British Honduras, has the elytral interstices much smoother than usual. Dark examples usually have the humeri rufescent. The eyes are coarsely faceted, very large, and prominent. The antennae are rather short, and the joints preceding the club are transverse, the eighth often subangulate within. The thorax is strongly transverse in both sexes, a little shorter in the female than in the male. The elytra are long and subparallel, and usually have the interstices conspicuously seriate-punctate. Two of the Brazilian examples are smoother and more shining, as well as being larger and more elongate, than the rest, but they seem to belong to the same species; these specimens come near *H. grandis*, Reitt.

Hapalips flohri.

Hapalips flohri, Gorh., Biol. Centr.-Am., Coleopt. vii, p. 251.

Described from a single specimen (δ) from Motzorongo, Mexico. The following localities may be added:—

GUATEMALA, Telemán and Chacoj in the Polochic valley (*Champion*: δ ♀).

Compared with *H. reitteri*, the present species has the eyes smaller and less prominent; the thorax more coarsely punctate, and with the anterior angles in a line with the front margin; the elytra more narrowed posteriorly, regularly punctate-striate, and with the interstices much more distinctly punctured; the anterior tibiae more acutely dentate at the outer apical angle; and the surface of the body more shining and clothed with longer hairs. The thorax is nearly square in the male, and transverse in the female.

**Hapalips lucidus*, n. sp.

Moderately elongate, narrowing posteriorly, shining, ferruginous, the eyes black, strongly pilose. Head short, closely punctate, shallowly bifoveate, the oblique impressed line on each side of the epistoma distinct, the eyes moderately large; antennae barely reaching the base of the thorax, joints 4–8 short, the club abrupt. Thorax transversely subquadrate, margined at the sides and base, obliquely narrowed immediately before the acute hind angles, the anterior angles almost in line with the apical margin, the basal foveae distinct; closely punctate. Elytra moderately long, about as wide as the thorax, narrowing posteriorly; finely punctate-striate, the interstices irregularly seriate-punctate. Legs short; tibiae rapidly widened outwards, the anterior pair more or less toothed at the outer apical angle.

Length 4–4½ mm.

Hab. MEXICO, Tampico (*Schwarz*, in *U.S. Nat. Mus.*), Vera Cruz (*Höge*; *U.S. Nat. Mus.*); BRITISH HONDURAS, Belize (*Blancaneaux*).

Very near the Mexican *H. flohri*, Gorb., but less robust, smaller, and not so elongate, the thorax strongly transverse. The more dilated tibiae and the less distinctly punctate-striate elytra separate *H. lucidus* from the females of *H. grouvellei*, Gorb., and *H. mexicanus*, Reitt. The description is taken from the three specimens from Belize, these even varying in the intensity of the punctuation of the upper surface. Five others have been seen from Mexico.

[*Hapalips batesi*, n. sp.]

Elongate, depressed, narrowing posteriorly, shining, ferruginous, the eyes black; almost glabrous above, the margins of the thorax and elytra only with a few fine hairs. Head broad, subtriangular, finely punctate, the oblique impressed line on each side of the epistoma conspicuous, the eyes large; antennae short, stout, joints 4-8 transverse, the club large. Thorax subquadrate, nearly as long as broad, the hind angles somewhat acute, the base feebly, the sides more sharply margined, the basal foveae distinct; sparsely, finely punctate, except along a narrow smooth space down the middle. Elytra elongate, narrowing towards the apex; punctate-striate, the interstices almost smooth. Beneath very sparsely, finely punctate; fifth ventral segment shallowly foveate in the middle before the apex. Legs short, stout, the tibiae triangular, the anterior pair acutely produced at the outer apical angle; joints 1-3 of the tarsi broad.

Length $4\frac{1}{2}$ mm. (♂.)

Hab. AMAZONS, Ega (*Bates, in Mus. Brit.*).

One specimen, labelled "*Temesia batesii*, Pasc., type," in the Pascoe collection, but I cannot find a published description of the insect. It is very like a *Rhizophagus*. The broad head; the stout antennae; the finely punctate, subquadrate thorax; the punctate-striate, attenuate elytra; the triangular tibiae; the clear ferruginous colour; and the almost glabrous upper surface readily distinguish *H. batesi*. The type is perhaps somewhat rubbed on the dorsal surface, as some fine hairs are still present along the margins.]

[*Hapalips brevipes*, n. sp.]

Elongate, depressed, narrowing posteriorly, testaceous, the eyes black; shining, finely pubescent. Head triangular, short, closely, rather coarsely punctate, the oblique groove on each side of the epistoma conspicuous, the eyes moderately large and prominent; antennae with joints 4-8 short, 7 and 8 transverse, the club abrupt. Thorax subquadrate, slightly broader than long, the sides sharply, and the base obsoletely, margined, the anterior angles obtuse and in line with the apical margin; rather coarsely, closely, uniformly, punctate, the basal foveae barely traceable. Elytra moderately long, about as wide as the thorax, gradually narrowing from a little below the base; regularly punctate-striate, the interstices impunctate. Legs short, the tibiae gradually widening outwards.

Length $4\frac{1}{2}$ mm.

Hab. BRAZIL, Rio de Janeiro (*coll. Fry, in Mus. Brit.*).

One specimen, probably somewhat immature, the head and antennae being of a darker and more ferruginous colour than the rest of the body. Recognisable by its depressed form and shining, pubescent surface; the attenuate, regularly punctate-striate elytra; the transversely subquadrate, evenly punctured thorax; the moderately large eyes; and the comparatively short legs. The smoother head and thorax, the less thickened antennae and legs, and the pubescent surface distinguish *H. brevipes* from *H. batesi*.]

[*Hapalips nigriceps*.

Hapalips nigriceps, Reitt., Verh. Ver. Brünn, Abhandl. xv, p. 126.

The only locality given for this insect is "Brazil." In Fry's collection there are three specimens apparently belonging to it, from S. Paulo (Campinas) and Rio de Janeiro.]

**Hapalips nitidulus*, n. sp.

Elongate, rather convex, narrowing posteriorly, shining, varying in colour from piceous with the margins of the prothorax and the elytral humeri rufescent to entirely ferruginous or testaceous, the eyes black; finely pubescent. Head short, triangular, much narrower than the thorax, closely punctate, obsoletely bifoveate, the oblique line on each side of the epistoma distinct, the eyes moderately large; antennae extending to a little beyond the base of the thorax, joints 3-8 rather slender, gradually decreasing in length, the club abrupt. Thorax transverse, still shorter in the ♀, the sides rounded, sharply margined, and obsoletely crenulate, the base bisinuate and obsoletely margined, the anterior angles obtuse and not in line with the apical margin; closely, finely punctate, except along a narrow median space, shallowly bifoveate at the base. Elytra about as wide as the thorax narrowing from about the middle; finely punctate-striate, the interstices flat, finely seriate-punctate. Beneath sparsely, very finely punctate. Tibiae rather narrow, gradually widened outwards.

Length $3\frac{2}{3}$ - $4\frac{2}{3}$ mm.

Hab. MEXICO, Cerro de Palmas (*Höge*); GUATEMALA, near the city (*Salvin, Champion*), Capetillo, Dueñas, Zapote (*Champion*).

Found in abundance in Guatemala; a single immature example only from Mexico. This species may be known

by the rounded, sharply margined sides of the thorax, the comparatively long antennae, the moderately large eyes, the posteriorly narrowed elytra, and the rather narrow tibiae. Amongst the forms described by Reitter, it can only be compared with *H. semifuscus*, from Brazil, which is said to have rather short, stout antennae. *H. nitidulus* is broader and less elongate than *H. suturalis*, and it has the intermediate joints of the antennae more slender, much as in *H. cribricollis*, Gorh. (? = *gracilicornis*, Reitt.).

**Hapalips suturalis*, n. sp. (Plate III, fig. 12, ♀.)

Very elongate, narrow, narrowing posteriorly, depressed, shining, finely alutaceous, the body varying in colour from black, with the front of the head, the basal joint of the antennae, and a broad stripe down the disc of each elytron ferruginous, to entirely testaceous, the head, thorax, and scutellum usually fusco-ferruginous and the elytra testaceous with the suture piceous, the legs always testaceous; clothed with rather long, fine, adpressed hairs. Head triangular, closely punctate, obsoletely bifoveate, the oblique impressed line on each side of the epistoma just traceable, the eyes moderately large, somewhat depressed; antennae not reaching the base of the thorax, joints 5-8 transverse. Prothorax subquadrate, as long as or longer than broad in ♂, shorter in ♀, obsoletely margined at the base, truncate in front, the anterior angles obtuse and not in a line with the apical margin; closely punctate, except along a narrow median space. Scutellum almost smooth. Elytra elongate, narrowing towards the apex; regularly punctate-striate, the interstices almost impunctate. Legs short.

Length $4\frac{1}{4}$ - $5\frac{1}{2}$ mm. (♂ ♀.)

Hab. GUATEMALA, Dueñas and Capetillo (*Champion*).

A long series. A narrow, elongate, posteriorly attenuate form, with the suture of the elytra usually infusate (as in many small Elaterids), the thorax subquadrate, longer in the male than in the female. Much smaller than *H. dimidiatus*, pubescent above, the head shorter, the thorax more closely punctured, the eyes more prominent. Compared with *H. perlongus*, the eyes are more depressed; the antennae are not so stout; the thorax is more coarsely punctate, and less distinctly margined at the base; and the sutural interstice and apex of the elytra are smoother. The eyes are larger and more depressed than in *H. filum*.

Hapalips filum.

Hapalips filum, Reitt., Verh. Ver. Brünn, Abhandl. xv, p. 125 (1877); Gorh., Proc. Zool. Soc. Lond. 1898, p. 335; Biol. Centr.-Am., Coleopt. vii, p. 251.

? *Hapalips tenuis*, Reitt., loc. cit.

Recorded by Gorham from Mexico on the authority of a single specimen from Frontera in Tabasco. Additional localities for it are:—

MEXICO, Teapa (*H. H. Smith*); GUATEMALA, Purula, Tamahu, Chacoj, and Senahu in Vera Paz, Paraiso, Las Mercedes (*Champion*), Trece Aguas (*Barber and Schwarz*, in *U.S. Nat. Mus.*); PANAMA, Volcan de Chiriqui (*Champion*); BRAZIL, Parana (*coll. Fry*, in *Mus. Brit.*); CUBA, Cayamas (*Schwarz*, in *U.S. Nat. Mus.*).

Also found in the Antillean island of Grenada. *H. tenuis*, Reitt., to judge from the description, and from the long series of specimens before me, is no doubt the female of *H. filum*, the sexes of some of the allied species also having the thorax shorter in the female than in the male. The types of both came from Colombia, and were contained in the Schaum collection. The eyes in this insect are small and prominent; the thorax is subquadrate, longer than broad in the male (*H. filum*), much shorter in the female (*H. tenuis*), and always has a narrow smooth space down the middle; the elytra are very long, strongly punctate-striate, subparallel in some examples, and narrowed posteriorly in others, even amongst a series from the same locality. The length varies from $3\frac{1}{10}$ –5 millim. The specimens from Cuba are labelled as having been found in corn (maize) stalks.

**Hapalips obliteratus*, n. sp. (Plate III, fig. 13.)

Elongate, depressed, narrowing posteriorly, moderately shining, obscure ferruginous, the eyes black; closely, finely pilose; the entire upper surface, a narrow line along the disc of the thorax excepted, densely, finely, confusedly punctate, the under surface more sparsely, minutely punctate. Head short, triangular, much narrower than the thorax, obsoletely bifoveate, the usual oblique line on each side of the epistoma wanting, the eyes small, but prominent; antennae stout, reaching the base of the thorax, joints 4–6 moniliform, 7 and 8 strongly transverse, wider than 6, 9–11 much wider than 8. Thorax transversely subquadrate, truncate at the base and apex, finely margined at the sides and base, the

anterior angles rounded, the hind angles subacute, the basal foveae small, but distinct. Scutellum strongly transverse, somewhat tumid on each side. Elytra moderately long, narrowed towards the apex, without trace of striae. Tibiae gradually widened outwards, the anterior pair bowed at the apex. Tarsi with joints 1-3 moderately stout.

Length $4-4\frac{1}{2}$ mm.

Hab. GUATEMALA, El Tumbador, Pacific slope (*Champion*).

Four examples, found in Nov. 1880. This insect differs from all its allies in having joints 7 and 8 of the antennae intermediate in width between those preceding and the club, and in the complete obliteration of the elytral striae, the entire upper surface being densely, finely, confusedly punctate.

**Hapalips lanuginosus*, n. sp.

Moderately elongate, rather broad, obscure ferruginous, the eyes black; alutaceous, feebly shining, thickly clothed with long decumbent hairs, the entire surface closely, finely punctate, the elytra with indications of faint striae. Head short, the oblique line on each side of the epistoma just traceable, the eyes moderately large; antennae with joints 4-8 subequal in length, the club abrupt. Thorax feebly margined at the sides, transversely subquadrate, the angles somewhat obtuse, the anterior ones almost in line with the apical margin. Elytra much wider than the thorax, moderately long, subparallel in their basal half. Tibiae gradually widened outwards.

Length $4\frac{1}{3}-4\frac{1}{2}$ mm.

Hab. MEXICO, Guajuco in Nuevo Leon (*Dr. Palmer*).

Six specimens, mostly in very dirty condition. A comparatively broad, moderately elongate form, thickly clothed with long hairs; the thorax strongly transverse; the elytra much wider than the thorax, confusedly punctured, the striae so faint as to be scarcely visible till the insect is viewed from the side. *H. lanuginosus* has the general facies of a very large elongate *Cryptophagus*. *H. delauneyi*, Grouv., from the island of Guadeloupe, is described as having similarly long hairs.

**Hapalips mexicanus*.

Hapalips mexicanus, Reitt., Verh. Ver. Brünn, Abhandl. xv, p. 128, pl. 2, figs. 4a (♀), 4b (♂) (1877).

This species was omitted from Mr. Gorham's enumeration

of the Mexican species in the "Biol. Centr.-Americana." The locality given by Reitter was simply "Mexico." We have received examples of both sexes from Tehuacan, Puebla. The male has a compressed, oblong, cariniform prominence at the middle of the angularly produced anterior margin of the thorax (as in the Texan *H. texanus*, Schaeffer), and a tubercle on each side of the disc towards the apex; and the epistoma of the head tumid between the oblique impressed lines. *H. growellei*, Gorh., from St. Vincent and Grenada, and *H. angulosus*, Grouv., from Guadeloupe, have a somewhat similarly shaped thorax in the male. *H. angulosus* is recorded as having been found in the flowers of a cactus, *Cereus triangularis*.

[*Hapalips growellei*.

Hapalips growellei, Gorh., Proc. Zool. Soc. Lond. 1898, p. 334, pl. 27, figs. 11, 11a (♂), 12 (♀).

Described from a long series from the Antillean islands of Grenada and St. Vincent. There is a male of it from Trinidad in the Fry collection.]

[*Hapalips sculpticollis*, n. sp. (Plate III, fig. 14, thorax.)

Elongate, rather broad, feebly shining; rufo-piceous above, ferruginous beneath, the antennae and legs testaceous; the smaller punctures each bearing an excessively minute squamiform hair, these soon becoming abraded on the upper surface. Head subtriangular, rather small, finely punctured, the eyes coarsely faceted, moderately large; antennal club large, abrupt. Thorax transverse, somewhat rounded at the sides, a little narrowed anteriorly, the angles obtuse; closely punctate, and with a deep, longitudinal, crescentiform sulcus on each side of the disc behind, extending forwards from the transverse basal groove to about the middle and there becoming slightly sinuous, the intervening space smoother than the rest of the surface. Elytra moderately long, subparallel in their basal half; coarsely punctate-striate, the interstices convex and closely punctulate. Beneath finely, the metasternum and first ventral segment more coarsely, punctate. Tibiae moderately widened outwards.

Length 4 mm. (? ♂.)

Hab. JAMAICA (Hubbard, in *U.S. Nat. Mus.*).

One specimen. Differs from all the other forms known to me in having two deep longitudinal arcuate sulci on the

disc of the thorax behind. This insect has the general facies of a *Tribolium*.]

[PSEUDHAPALIPS, n. gen.

Head short and broad, the epistoma confused with the front, differently shaped in the two sexes; eyes convex, coarsely granulated; terminal joint of the maxillary palpi narrow, cultriform, that of the labial palpi stout and subsecuriform; mandibles acute, with a small tooth towards the tip; antennae with an abrupt 3-jointed club; thorax transversely quadrate, sharply margined, with two basal foveae connected by a deep transverse sulcus; scutellum strongly transverse; elytra elongate, sharply margined laterally; prosternum with deep sutures, the intercoxal process horizontal; anterior coxal cavities closed behind; tarsi 5-jointed, 1-3 short and broad, spongy-pubescent beneath, 2 and 3 lobate, 4 minute, hidden in the excavate lobe of 3; tibiae very obliquely truncate at apex; body elongate, subglabrous.

Type, *P. lamellifer*.

The single species referred to this genus is closely related to *Hapalips*, from which it differs in having deep basal foveae on the thorax connected by an equally deep transverse sulcus, in the extraordinary form of the head in the two sexes (suggestive of certain Tenebrionids), and in the very prominent convex eyes. The penultimate tarsal joint is so small that it can scarcely be seen unless the tarsus is viewed laterally. The thorax is shaped as in *Platoberus*. The head is considerably broader in the female than in the male.

Pseudhapalips lamellifer, n. sp. (Plate III, figs. 15, ♂; 15a, head from in front, ♂.)

Elongate, somewhat depressed, ferruginous, shining, the eyes black; almost glabrous above (the minute hairs arising from the punctures soon abraded). Head (♀) uneven, bifoveate, very sparsely punctate, with a broad, arcuate, tumid margin in front which extends round to the greatly swollen antennary orbits, (♂) with a prominent, mesially depressed, vertical ridge between the points of insertion of the antennae (the ridge concave behind and somewhat convex in front), and the transversely depressed inter-ocular space smooth; antennae moderately long, joints 3-8 moniliform, the two basal joints of the club (9 and 10) strongly transverse. Thorax about one-half broader than long, the disc transversely convex, the lateral margins explanate, crenulate, slightly sinuate towards the base,

the anterior angles projecting a little forwards, obtuse, the hind angles acute, the base slightly sinuate; the surface sparsely, irregularly punctate, the convex portion of the disc limited outwards by a stout longitudinal callosity, the basal sulcus and foveae very deep. Elytra moderately long, a little wider than the thorax, narrowing from about the middle; regularly punctate-striate, the interstices almost smooth. Beneath very finely punctate.

Length 4-5 mm. (♂ ♀.)

Hab. AMAZONS, Santarem (*Bates*), Ananá, R. Solimoes (*Trail*).

Three specimens.]

LATHRIDIIDAE.

PSEUDEVOLOCERA, n. gen.

Head retractile, small; antennae (fig. 16*a*) apparently 10-jointed, the basal joint very stout, the last three connate and forming a very large oval club; palpi stout; eyes small; prothorax with a deep basal groove; scutellum transverse; prosternum with large fossae for the reception of the antennal club, the sutures deep, the intercoxal process broad, parallel between the anterior coxae, truncate behind, and extending convexly forward across the long ante-coxal portion to the apical margin; anterior acetabula closed by the short mesosternum; metasternal lines present; first ventral segment about as long as the other four segments united, the intercoxal process very broad, truncate in front; legs very short; femora compressed, clavate, received in depressions of the under surface; tibiae broad; tarsi slender, 3-jointed, joints 1 and 2 very short; body ovate, glabrous.

Type, *P. atomarioides*.

This genus is nearly related to the monotypic *Evolocera*, Sharp, from which it differs in having the head much smaller; the antennal club 3-jointed; the prosternum much more developed before the anterior coxae, and with a large pit on each side for the reception of the antennal club; the coxae more widely separated, the convex intercoxal process of the anterior pair extending forwards to the anterior margin; the coxal lines present on the metasternum, but scarcely traceable on the first ventral segment, the latter about as long as the following four segments united. The slender intermediate joints of the antennae (3-7) are so closely articulated that it is possible another

short joint may be present. The type is a minute insect superficially like an *Atomaria*.

**Pseudevlocera atomarioides*, n. sp. (Plate III, figs. 16, 16a.)

Ovate, convex, shining, obscure ferruginous, the elytra infusate and subalutaceous, the antennae and legs testaceous; the surface above and beneath not visibly punctate. Thorax with an abrupt deep basal groove extending across more than half its width, but without trace of foveae. Antennae with joints 2 and 3 elongate, 3-7 slender, 4 and 5 apparently longer than broad, 6 and 7 transverse, the club (8-10) with the last two joints strongly transverse.

Length $1\frac{1}{2}$ mm.

Hab. GUATEMALA, Cerro Zunil, 4,000 feet, Pacific slope (*Champion*).

Two specimens. The less dilated, non-foveate thorax and the smooth surface separate *P. atomarioides* at once from *Evolocera championi*, Sharp, which also is an inhabitant of Guatemala.

LYCOPERDINELLA, n. gen.

Antennae (fig. 1a) 10-jointed, 1 and 2 stout, subcylindrical, 3-9 obconic, decreasing in length, 10 dilated into a very large triangular club; terminal joint of the maxillary palpi narrow; head subtriangular, deeply sunk into the prothorax, the labrum and epistoma transverse, the antennae inserted immediately before the eyes, which are reduced to four or five facets; prothorax largely developed, sharply margined, strongly plicate on each side behind, and deeply transversely sulcate before the base; scutellum small; elytra acuminate-ovate, with a deep sutural stria and extremely narrow and incomplete epipleura; prosternum well developed in front of the anterior coxae, the sutures sharply defined, the intercoxal process narrow and parallel-sided; metasternum rather long, the episterna moderately broad; ventral segments 2-5 subequal in length, the sutures straight; legs long, the femora clavate, the tibiae narrow, the tarsi slender, 3-jointed, joint 1 longer than 2, 3 elongate; body oblong-ovate, convex, setose.

Type, *L. subcaeca*.

This interesting genus must, I think, be included in the subfamily *Merophysini* of the *Lathridiidae*, near *Holoparamacus*. It has the facies of a miniature *Lycoperdina*.

The metasternum and first ventral segment are without femoral lines, and the posterior coxae are not grooved.

**Lycoperdinella subcaeca*, n. sp. (Plate IV, figs. 1, 1a, 1b.)

Shining, castaneous above, rufo-testaceous beneath, the legs and antennae testaceous; sparsely clothed, the legs and antennae included, with long pallid bristly hairs. Head almost smooth; antennae reaching to a little beyond the base of the thorax. Thorax broader than long, the sides rounded anteriorly and parallel at the base, the margins finely denticulate, the deep transverse basal sulcus extending outwards to the abrupt longitudinal submarginal plica; the surface with very minute scattered punctures and a row of larger impressions along the basal margin. Elytra a little wider than the thorax rounded at the sides below the base and obliquely narrowed thence to the apex, the sutural stria extending to the apex; the scattered piligerous punctures irregularly arranged. Beneath very sparsely, minutely punctate.

Length $1\frac{1}{3}$ mm.

Hab. GUATEMALA, Livingston, Atlantic coast (*Barber and Schwarz, in U.S. Nat. Mus.*).

Two examples, one of which has been presented to the British Museum.

MYCETOPHAGIDAE.

PSEUDESARCUS, n. gen.

Antennae inserted under the obliquely raised sides of the head, long, stout, perfoliate, 11-jointed, widening outwards, 11 abruptly truncate at tip; head deeply inserted, subtriangular, small, the epistoma sharply separated from the front; labrum transverse, exposed; eyes strongly transverse, emarginate; mentum small, longer than broad, leaving the maxillae exposed; last joint of the maxillary palpi cultriform, that of the labial pair oval, truncate at tip; ligula corneous, triangular; coxae rather narrowly, subequally separated; anterior acetabula closed behind; prothorax with broadly expanded margins, emarginate in front; scutellum large; elytra broadly oval, the epipleura wide, reaching to very near the apex; metasternum short, the episterna broad; ventral segments 1 and 2 equal in length, 1 triangularly produced between the hind coxae; tibiae narrow, unarmed at apex; tarsi simple, freely 4-jointed, 1-3 short, 4 as long as the others united, clothed with long hairs beneath, the claws long; body broad ovate, convex, villose, winged.

Type, *P. villosus*.

The Panama insect from which the above characters are taken seems to me to be nearly related to *Esarcus*, Reiche, type *E. leprieurii*, from Algeria, three other species of which occur in the Mediterranean region. The long, stout, perfoliate, loosely-articulated antennae, with abruptly truncated terminal joint, the freely 4-jointed simple tarsi, and somewhat narrowly separated coxae, are its chief characters. The general facies is that of a Coccinellid or Endomychid (*Stenotarsus*, etc.). *Pseud-esarcus* must, for the present, be included in Colydiidae or Mycetophagidae, agreeing perhaps best with the latter. Two specimens only have been found, possibly both females.

**Pseudesarcus villosus*, n. sp. (Plate IV, fig. 2.)

Shining, ferruginous, the elytra and the disc of the thorax with a cupreous or purplish lustre, the under surface darker, the outer seven joints of the antennae black; thickly clothed with long, erect, fulvous hairs, the under surface, legs, and antennae also set with long hairs. Head closely, finely punctate, the eyes rather small; antennae reaching beyond the base of the thorax, stout, joints 1 and 3 obconic, 2 short, 3 about as long as 1 and 2 united, 4-11 broad, subtriangular, 5-11 more or less transverse. Thorax transverse, rounded and sharply margined at the sides, the latter sinuate towards the base, the hind angles sharply rectangular, the anterior angles angularly extending forwards; the convex disc very minutely punctate, the expanded lateral portions granulate. Elytra much wider than the thorax, transversely convex, subparallel at the base; with rows of closely placed, transverse, rather coarse punctures, the interstices broad, convex, minutely punctate. Beneath sparsely punctate.

Length $5\frac{1}{2}$, breadth 3 mm. (? ♀.)

Hab. PANAMA, Volcan de Chiriqui, Bugaba (*Champion*).
One specimen from each locality.

LYCTIDAE.

BERGINUS.

Berginus, Erichson, Naturg. Ins. Deutschl. iii, p. 405 (1848);
Wollaston, Ins. Mad. p. 194 (1854); Leconte, Class.
Coleopt. N. Am. 2nd edit. p. 139 (1883).

Three species have been referred to this genus, one of which, the type, abounds on tamarisks in the Mediterranean region, the others are American. The 2-jointed antennal club, and the 4-jointed tarsi, the anterior pair with three joints only in the male, are its chief characters. Casey is of opinion that *Berginus* should be placed near *Lycetus* [cf. Journ. N. York Ent. Soc. viii, p. 129 (1900)]; the latter was included in the Bostrychidae by Gorham in the "Biologia."

**Berginus nigricolor*, n. sp.

Moderately elongate, opaque, black or piceous, the legs sometimes obscure ferruginous; thickly clothed with short, curled, squamiform, cinereous hairs, which are seriatly arranged on the elytra. Head and thorax very densely, somewhat coarsely punctate; the latter convex, about as long as broad, narrowed anteriorly, the sides rounded and finely serrulate, the hind angles distinct; eyes convex, small, prominent; antennae barely reaching the base of the thorax, joints 1 and 2 stout, 3 narrow, as long as 2, 4-9 short, about as broad as long, the two joints of the club (10 and 11) stout. Elytra moderately long, considerably wider than the thorax, subparallel in their basal half; with rows of closely packed rather coarse punctures, the interstices narrow, transversely rugose. Beneath densely, coarsely, the ventral segments 2-5 more finely, punctate.

Length $1\frac{1}{8}$ - $1\frac{3}{8}$ mm. (♂ ♀.)

Hab. GUATEMALA, San Gerónimo, Mirandilla (*Champion*); NICARAGUA, Chontales (*Janson*); PANAMA, Tolé (*Champion*), Portobello, Paraiso, Panama city (*Schwarz, in U.S. Nat. Mus.*).

Apparently a common insect in Central America. From *B. pumilus*, Lec., it may be known by its smaller size, more slender build, the non-costate, regularly punctate-striate elytra, and the finer vestiture; and from *B. bahamicus*, Casey, by its black antennae. In the U.S. National Museum there is a mutilated example from Brownsville, Texas, labelled as having been found in dead cotton bolls, that may be referable to this species. Specimens of the described American forms have been sent us by the U.S. National Museum.¹ *B. bahamicus* has been found on

¹ In the British Museum there is a single example (♀) of an unnamed species related to *B. nigricolor*, with much larger eyes and stouter tarsi; it is from Grahamstown, S. Africa.

cotton. The genus is an addition to the Central American fauna.

ENDOMYCHIDAE.

MICROPSEPHUS.

Micropsephus, Gorham, Biol. Centr.-Am., Coleopt. vii, p. 149 (1891).

The type of this genus is a minute, globose, shining insect, not unlike an *Aspidophorus*, with 11-jointed antennae (joints 1 and 2 long and stout, 1 curved and longer than 2, 3-8 very slender and closely articulated, 9-11 dilated into a long, loosely-articulated club), stout, compressed femora, slender tibiae, slender, elongate, 4-jointed tarsi, widely separated intermediate and posterior coxae, and an elongate first ventral segment. The additional species now added from Central America has the intermediate antennal joints more slender and reduced in number, but otherwise agrees perfectly with *M. mniophilinus*. The Antillean insect described by Gorham (Proc. Zool. Soc. Lond., 1898, p. 338) under the name *Dialexia punctipennis* is very like *M. hemisphaericus*, and also has 9-jointed antennae, but it differs from the latter in having basal sulci to the thorax, etc.

**Micropsephus hemisphaericus*, n. sp.

Orbicular, convex, shining, nigro-piceous above, piceous beneath, the antennae and legs testaceous. Head, thorax, and elytra impressed with closely placed, small, conspicuous punctures; antennae 9-jointed, 1 and 2 long and stout, 3-6 very slender, 3 elongate, as long as 4-6 united, the latter strongly transverse, 7-9 dilated into a long, stout, loosely-articulated club. Tibiae and tarsi very slender.

Length $1\frac{1}{10}$ - $1\frac{1}{8}$ mm.

Hab. MEXICO, Tampico and Trece Aguas (*Barber and Schwarz, in U.S. Nat. Mus.*), Motzorongo in Vera Cruz (*Flohr*); GUATEMALA, Cerro Zunil (*Champion*); NICARAGUA, Chontales (*Janson*).

Seven specimens, some of which were placed amongst the *Scymni* when our collections were sorted. Smaller than *M. mniophilinus* (from Mexico and Guatemala), the elytra closely, conspicuously punctate, the antennae with

four slender joints only between the two stout basal ones and the club, the tarsi relatively less elongate. The antennae have been examined in three examples and nine joints only can be counted, the two missing joints being doubtless fused into the elongate third.

MICROPSEPHODES, n. gen.

Head retractile, broad, abruptly narrowed before the large, prominent eyes; labrum small, exposed; last joint of the maxillary palpi (fig. 3*b*) oblong-ovate, obliquely truncated at the tip; antennae (fig. 3*a*) moderately long, inserted under the sides of the front, 7-jointed, 1 and 2 stout, 3 and 4 slender, 5-7 widened into a very large, loosely-articulated, serrate club; prothorax finely margined laterally, bisinuate at the base and apex, the median basal lobe almost covering the scutellum; elytra very convex, closely embracing the prothorax; legs moderately elongate; tibiae narrow; tarsi (fig. 3*c*) very slender, long, 3-jointed, the first joint extending beneath the second to near its apex and clothed with some long hairs, 2 short, 3 nearly as long as 1 and 2 united, the claws slender; body globose, glabrous.

Type, *M. serraticornis*.

This minute insect seems to be nearly related to *Micropsephus*, from which it differs in its 3-jointed tarsi, the larger eyes, and the very peculiarly formed antennae, suggestive of that of a *Dorcatoma*. The unique example found is in such fragile condition that it cannot be safely taken off the card again for the examination of the under surface. The intermediate and posterior coxae are doubtless widely separated, as in *Micropsephus*. The very slender antennal joints between the thickened basal ones and the broad loose serrate club are so closely articulated that it is not easy to make out their exact number, and it is possible one more joint may be present.

**Micropsephodes serraticornis*, n. sp. (Plate IV, figs. 3, 3*a-c*.)

Rotundate, very convex, shining; black with an aeneous reflection, the antennae with the club piceous and the other joints flavo-testaceous, the first slightly infusate, the palpi, femora, and tibiae piceous, the tarsi fusco-testaceous; the entire upper surface sparsely, minutely, confusedly punctate. Antennae with joint 1 curved, stout, elongate, clavate, 2 much shorter, obconic, 3 and 4 extremely

slender, 3 elongate, 4 transverse, 5 and 6 greatly enlarged, triangular, hollowed at the apex (so as to appear subcycathiform), 7 broad ovate.

Length $1\frac{1}{4}$ mm.

Hab. GUATEMALA, Purula in Vera Paz (*Champion*).

One specimen. Till the limbs of this species are examined, it might be passed over for a very convex small Phalacrid or Silphid. The tibiae are a little broader than in *Micropsephus*.

COCCINELLIDAE.

Shortly after the conclusion of Gorham's work on the Central American species of this family, in Feb. 1899, Captain Casey's "Revision of the American Coccinellidae" was issued [Journ. N. York Ent. Soc. vii, pp. 71-169 (June 1899)]. He added one new genus (*Nephaspis*) and four new species to the Central American list—**Cycloneda hondurasica*, from Honduras, **Nephaspis gorhami* and **N. brunnea*, and **Zagloba beaumonti*, from Panama. The descriptions of the few species added here were written before I had seen Casey's paper; but it does not appear that any of them were known to him. The true generic position of various Coccinellids described in the "Biologia" could doubtless be ascertained by a study of Casey's work; but this task is beyond the scope of the present "Notes," the material examined consisting mainly of forms left unnamed by Gorham.

CRYPTOGNATHA.

Cryptognatha, Mulsant, Spec. Col. Trim. sécur. p. 497 (1850); Gorham, Biol. Centr.-Am., Coleopt. vii, pp. 181, 258 (1894).

Gorham enumerated eleven species of this genus from Central America. Various others are contained in our collection, some of which are now described.

**Cryptognatha rufoterminata*, n. sp.

Hemispherical, very convex, shining, glabrous; head, thorax, and apex of the elytra rufous, the rest of the elytra cupreo-aeous, the under surface in part and the legs obscure ferruginous, the metasternum rufo-piceous. Head and thorax closely, minutely, the elytra more sparsely and a little more coarsely, punctate; thorax very broad, and with the anterior angles considerably produced,

the broad retractile head invisible from above; elytra finely margined. Coxal lines prominent, that of the metasternum extending round the coxae to the episternal suture, that of the first ventral segment running in front of the apical margin of the latter to its outer limit. Tibiae broad, the anterior pair deeply sulcate for the reception of the tarsus.

Length $2\frac{1}{2}$, breadth $1\frac{9}{10}$ mm.

Hab. PANAMA, Bugaba (*Champion*).

One specimen, found in our collection mixed with *Scymnus panamensis*, to an abraded unset example of which it bears a certain amount of resemblance. The aeneous elytra, with rufous apex, and the rufous head and thorax, are characteristic of the present species.

**Cryptognatha violacea*, n. sp.

Hemispherical, very convex, shining, glabrous; cupreo-violaceous, the head above (in part or entirely) and beneath, the last four ventral segments, and the legs ferruginous, the rest of the under surface black. Head and thorax closely, minutely, the elytra more sparsely and distinctly, punctate, the punctures on the elytra becoming coarser towards the outer margin; thorax very broad; elytra finely margined. Beneath rather closely punctate. Coxal lines prominent, that of the metasternum extending round the coxae, that of the first ventral segment running just in front of the apical margin of the segment to its outer limit. Tibiae broad, the anterior pair deeply sulcate for the reception of the tarsus.

Length $2\frac{1}{10}$ - $2\frac{1}{4}$, breadth 2 mm.

Hab. MEXICO, Atoyac in Vera Cruz (*H. H. Smith*).

Two specimens, found placed in our collection under *C. flaviceps*, Crotch, but not agreeing with the author's description, nor with the other Central American examples identified by Gorham as that species. These latter have more broadly margined elytra, the upper surface black, etc.

**Cryptognatha fenestrata*, n. sp.

Hemispherical, very convex, shining, glabrous; black, the elytra each with a large rufous patch on the middle of the disc, the coxae and legs testaceous. Thorax closely, minutely, the elytra more sparsely and much more distinctly, punctulate. Coxal line of the first ventral segment extending outwards in a feeble curve to within some little distance of the outer margin of the segment. Tibiae broad, the anterior pair deeply sulcate,

Length $1\frac{2}{3}$ mm.

Hab. PANAMA, Bugaba (*Champion*).

One specimen. A small black form, with a rufous patch on the middle of each elytron and pallid legs. The coxal lines are placed as in *C. tumidiventris*.

**Cryptognatha circumducta*, n. sp.

Hemispherical, very convex, moderately shining, glabrous; ferruginous, the elytra with the base, apex, outer margin, and suture broadly piceous, the metasternum also infuscate or piceous. Head, thorax, and elytra somewhat closely punctulate, the interspaces alutaceous. Beneath very finely punctate, the metasternum with a transverse smoother space behind each coxa; coxal line of first ventral segment extending arcuately outwards at some distance behind the coxae to near the outer margin of the segment. Tibiae broad, the anterior pair deeply sulcate.

Length $1\frac{1}{2}$ mm.

Hab. PANAMA, Tolé, Peña Blanca (*Champion*).

Two specimens, left labelled *Cryptognatha* sp. ? by Gorham. The dark margins to the elytra in this insect leave a very large, ill-defined, ferruginous dorsal patch. The elytral surface is alutaceous and distinctly, finely punctate. The coxal line on the first ventral segment is somewhat strongly curved.

**Cryptognatha tumidiventris*, n. sp.

Hemispherical, very convex, shining, glabrous, black, the antennae, coxae, and legs, and in one specimen (σ ?) the head and a patch at the anterior angles of the thorax also, testaceous, the ventral segments rufous. Head and thorax closely, the elytra very sparsely, punctulate; elytra finely margined. Beneath very sparsely, minutely punctate; intercoxal process of the first ventral segment broadly tumid in the middle; coxal lines prominent, that of the metasternum curved round the coxae, that of the first ventral segment extending far outwards in a feeble curve to within a short distance of the outer margin of the segment. Tibiae broad, the anterior pair deeply sulcate for the reception of the tarsus.

Length $1\frac{1}{2}$ – $1\frac{2}{3}$ mm.

Hab. PANAMA, Bugaba, Tolé (*Champion*).

Two specimens, the one with a pallid head (from Tolé) presumably a male. The elytral punctuation is excessively minute and scattered in this insect. The general shape is that of *C. erythrodera*, Gorh.

**Cryptognatha subaequalis*, n. sp.

Hemispherical, very convex, shining, glabrous, black, the legs testaceous. Head, thorax, and elytra closely punctulate, the punctures on the elytra nearly as approximate as those on the thorax. Beneath closely, very finely punctate; intercoxal process of the metasternum hollowed in the middle, that of the first ventral segment flattened; coxal line on latter extending outwards almost parallel with the apical margin to within some little distance of the outer margin. Tibiae moderately widened, the anterior pair shallowly sulcate.

Length $1\frac{1}{2}$ mm.

Hab. GUATEMALA, Cerro Zunil, 4,000 feet (*Champion*).

One specimen. Extremely like *C. tumidiventris*, but with the elytra much more closely punctured, the anterior tibiae narrower and less deeply sulcate, the coxal line of the first ventral segment less curved and a little less extended outwards, etc. The tibiae are broader than in *Scymnus*.

SCYMNUS.

Scymnus, Kugelann, in Schneider's Mag. i, p. 545 (1794);
Gorham, Biol. Centr.-Am., Coleopt. vii, p. 226 (1897).

Gorham (loc. cit.) enumerated 25 species of this genus from Central America, and left many others undetermined. Amongst the latter, four are worth naming. The whole of these Tropical American *Scymni* require further study, the structural characters in the palpi, antennae, under surface, etc., having been to a large extent overlooked.

**Scymnus cribripennis*, n. sp.

Short-ovate, convex, shining, black, the antennae, mouth-parts, tibiae, and tarsi testaceous; clothed with rather long, fine, cinereous pubescence. Head broad, very finely punctulate; last joint of the maxillary palpi acuminate-ovate; thorax and elytra closely punctate, the punctures on the latter coarse and crowded. Beneath closely, rugosely, the ventral segments more finely, punctate; intermediate femora received in a very deep, and the posterior femora in a shallower, depression, the depressions extending on to the elytral epipleura; metasternum without lines; first ventral segment with the coxal lines complete and sharply defined, extending round to

the metathoracic epimera; epipleura slightly depressed for the reception of the tips of the intermediate and posterior femora.

Length $1\frac{1}{8}$ mm.

Hab. MEXICO, Motzorongo (*Flohr*), Cordova (*Höge*).

Three specimens, all from the State of Vera Cruz. A minute convex form, with unusually coarsely punctate elytra, a rugose metasternum, a narrow apical joint to the maxillary palpi, and semicircular coxal fossettes on the first ventral segment. This species belongs to the subgenus *Pullus*, Muls., following the arrangement adopted by Gorham, and it is allied to his *S. granum*, from which it differs in the very coarsely punctate elytra.

**Scymnus caeruleicollis*, n. sp.

Broad ovate, short, convex, glabrous above, shining, the head and thorax blue, the scutellum and elytra cupreo-aeueous, the body beneath black, the labrum, mouth-parts, antennae, under surface of the head, and legs testaceous, the femora slightly infuscate. Head and thorax very closely, the elytra more sparsely, punctulate; maxillary palpi stout, short, the last joint obliquely subsecuriform; eyes depressed, large, vertical as seen from in front. Beneath sparsely, finely punctate; anterior coxae very widely separated; coxal lines sharply-defined, that of the metasternum curving outwards and forwards just behind the coxae to the episternal suture, that of the first ventral segment running obliquely to the outer apical angle; epipleura excavate for the reception of the tips of the intermediate and posterior femora. Legs short, tarsi rather stout.

Length $1\frac{1}{2}$ – $1\frac{3}{10}$ mm.

Hab. PANAMA, Volcan de Chiriqui, Tolé, Peña Blanca (*Champion*).

Four specimens. The metallic, glabrous upper surface and large eyes are characters foreign to *Scymnus*, as generally understood, but the present species can quite well be included in that genus till the allied forms are properly studied. It would be out of place amongst the heterogeneous Coccinellids referred by Gorham to *Neaporis*.

**Scymnus quercicola*, n. sp.

Short ovate, convex, glabrous above, shining, black, the antennae testaceous at the base, the tibiae and tarsi piceous; the entire upper surface rather closely, minutely punctulate. Last joint of the maxillary palpi elongate, narrow, cultriform. Antennal club oblong-

ovate, rather stout, blunt at the tip. Body beneath finely pubescent, sparsely, minutely punctulate, alutaceous, the middle of the metasternum smoother and shining. Coxal lines very fine, oblique, that of the metasternum extending outwards to the middle of the episternal suture, that of the first ventral segment feebly curved and running obliquely to the apical margin of the latter at about one-third from the outer margin. Epipleura excavate for the reception of the tips of the intermediate and posterior femora.

Length $1-1\frac{1}{2}$ mm.

Hab. MEXICO, near the city (*Flohr*); GUATEMALA, San Gerónimo (*Champion*).

Six specimens, the five from Mexico labelled as having been beaten from small oaks. The long narrow apical joint to the maxillary palpi, the position of the coxal lines, the dark legs, and the glabrous upper surface, are the chief characters of this minute insect.

Scymnillus, Horn, appears to include some equally minute glabrous forms, but the legs in this genus, according to Casey, are free.

**Scymnus nigroaeneus*, n. sp.

Short ovate, broad, convex, glabrous above, shining, black with a faint aeneous lustre, the front and under surface of the head and last three ventral segments ferruginous, the legs, antennae, and palpi testaceous. Head and thorax closely, excessively minutely, the elytra much more distinctly, punctate; last joint of the maxillary palpi narrow, subcultriform; eyes rather small. Beneath sparsely, very finely punctate; coxal lines long, fine, that of the metasternum extending round behind the coxæ to very near the episternal suture, that of the first ventral segment running obliquely and arcuately to very near the apical margin of the latter and continued parallel with it to about one-fourth from the outer margin.

Length $1\frac{1}{3}$ mm.

Hab. GUATEMALA, Zapote (*Champion*).

One specimen. Broader than *S. quercicola*, nigroaeneous above, the elytra much more distinctly punctured than the thorax, the legs testaceous, the coxal lines differently placed, that on the first ventral segment extending further outwards, the maxillary palpi stouter.

LIOSCYMNUS, n. gen.

Head strongly retractile, in repose closely applied to the projecting, raised, prosternal chin-piece, the palpi and antennae received in

grooves beneath; last joint of the maxillary palpi (fig. 4b) elongate-ovate, stout, acuminate; antennae (fig. 4a) apparently 11-jointed, 1 very stout, 2 small, obovate, 3-8 very slender, 3 elongate, 4-8 short, 9-11 dilated into an elongate compact club; eyes depressed, moderately large; anterior tibiae long, narrow, almost straight on their outer edge, feebly arcuately dilated towards the base within; intermediate and posterior tibiae moderately long, angularly dilated externally; tarsi 3-jointed, long, slender, 1 and 2 each produced beneath the succeeding joint, 1 elongate, 2 short, excised for the reception of 3, the lobe beneath reaching the middle of the next joint, the latter slender at the base, the claws appendiculate; femora stout, clavate, compressed, grooved, received in deep cavities of the under surface, those for the intermediate and posterior pairs extending outwards across the elytral epipleura and limited behind by the curved, cariniform coxal lines; intermediate and posterior trochanters large, elongate, laminiform; body hemispherical, glabrous above.

Type, *L. diversipes*.

This genus may be known by the strongly retractile limbs; the prominent, raised, prosternal chin-piece; the long, narrow, sinuous, anterior, and the angularly dilated intermediate and posterior, tibiae; the greatly developed intermediate and posterior trochanters; the long, slender tarsi, with elongate basal joint; and the hemispherical almost glabrous body. The head in repose is so closely applied to the prosternum that the mouth-parts and antennae cannot be seen till the head is forcibly raised, the legs also being equally retractile, though the tibial grooves are wanting on the anterior pair. The type is a minute, convex insect superficially resembling the Endomychid genus *Micropsephus*. *Delphastus*, Casey, of the group Oenini, seems to be related to *Lioscymnus*.

**Lioscymnus diversipes*, n. sp. (Plate IV, figs. 4, 4a, b.)

Very convex, shining, black, the antennae, mouth-parts, and legs flavo-testaceous, the under surface of the head, the pro- and mesosternum, and the ventral segments testaceous or rufescent, the head in one specimen testaceous in front. Head and thorax sparsely, very finely punctate, the elytra almost smooth. Beneath minutely punctulate.

Length $1\frac{1}{4}$ - $1\frac{1}{2}$ mm.

Hab. MEXICO, Cuernavaca (*H. H. Smith*), Motzorongo

(*Flohr*); BRITISH HONDURAS, Rio Hondo (*Blancaneaux*); GUATEMALA, Zapote, Aceituno (*Champion*).

Six specimens, sex not ascertained. Apparently a rare but widely distributed insect.

MICROSCYMNUS, n. gen.

Maxillary palpi (fig. 5*b*) very stout, the last joint subconical; antennae (fig. 5*a*) apparently 11-jointed, joints 1 and 2 very stout, 8-11 dilated into an oblong club; eyes very large, depressed; anterior tibiae (fig. 5) broadly widened, sulcate above for the reception of the tarsi, and received in repose in a deep groove in the anterior femora, the other tibiae moderately widened and imperfectly sulcate for the reception of the tarsi; coxae widely separated; intermediate and posterior femora received in deep grooves, which extend outwards across the elytral epipleura and are limited behind by the curved, cariniform coxal lines, the groove for the posterior pair extending forwards into the metasternum; tarsi 3-jointed, short, joints 1 and 2 strongly lobed beneath, the claws appendiculate; ventral segments 2-4 very short, 5 as long as 2-4 united; body spherical, glabrous above.

Type, *M. calvus*.

The minute Scymnid from which the above characters are taken is a fairly common insect in Central America. It was rejected from the Coccinellidae by Gorham, and one of our specimens is marked "? Histeridae," owing to its convex, glabrous, shining body, and the broadly dilated anterior tibiae. These characters are quite sufficient for the recognition of the insect. There is apparently a minute node at the base of the terminal tarsal joint.

**Microscymnus calvus*, n. sp. (Plate IV, figs. 5, 5*a*, *b*.)

Very convex, shining, black, the antennae, mouth-parts, and legs flavo-testaceous, the inter-ocular portion of the head and the sides and under surface of the thorax sometimes similarly coloured. Head and thorax closely, the elytra more sparsely, punctulate. Beneath shining down the middle, the ventral segments 2-5, and the sides of 1, alutaceous and more or less punctulate.

Length 1-1 $\frac{1}{2}$ mm.

Hab. MEXICO, Teapa (*H. H. Smith*); BRITISH HONDURAS, Belize, Rio Hondo (*Blancaneaux*); GUATEMALA, San Juan and Tamahu in Vera Paz (*Champion*).

A long series. This insect might, at first sight, easily be mistaken for a minute convex Histerid, or a *Cercyon* or *Micropsephus*.

MELYRIDAE.

CYMBOLUS.

Cymbolus, Gorham, Biol. Centr.-Am., Coleopt. iii, 2, p. 324 (1886).

Three species were included under this genus by Gorham—two from Guatemala and one from Mexico. A second was subsequently received by us from Mexico, and this is now described, as well as one from Brazil, this latter extending the distribution of *Cymbolus* southward. The genus is related to *Arthrobrachys*, Solier. It belongs to the section Dasytinae.

**Cymbolus elongatus*, n. sp.

Elongate, broad, rather depressed, shining; brown, the eyes and abdomen black, the rest of the under surface, mouth-parts, antennae, and legs ferruginous; thickly clothed above with very long, erect, fine, fulvous hairs, the under surface sparsely pubescent, the legs villose. Head sparsely punctate; eyes large, coarsely faceted; antennae moderately long, joints 4-10 strongly serrate. Thorax short, nearly or quite as wide as the elytra, rounded at the sides, narrowing from a little before the base, the angles obtuse, the lateral margins crenulate; the surface impressed with coalescent umbilicate punctures between the irregular polished raised spaces, which are large and here and there confluent on the disc and small and more scattered towards the sides. Elytra elongate, somewhat depressed on the disc, subparallel in their basal half; closely, coarsely confusedly, punctate, the submarginal ridge narrowly separated from the marginal carina and bordered within by a row of slightly coarser impressions. Beneath finely punctate, the ventral segments much smoother down the middle and subequal in length.

Length 7-7 $\frac{1}{10}$, breadth 3-3 $\frac{1}{4}$ mm.

Hab. MEXICO, Chilpancingo in Guerrero, 4,600 feet, (H. H. Smith).

Two specimens, probably male and female, one of them having the thorax broader than the other. More elongate than *C. castaneus* and *C. rufopiceus*, differing also from the former in its ferruginous antennae and the very irregular

sculpture of the thorax, and from the latter in the much smaller submarginal foveae on the elytra. The polished spaces on the disc of the thorax are large and irregularly shaped, much as in *C. rufopiceus* and *C. punctipennis*, Gorh.

[*Cymbolus quadrituberculatus*, n. sp.

Moderately elongate, depressed, shining; above brown, the thorax piceous on the disc and rufescent in front, beneath obscure ferruginous, the antennae, mouth-parts, and legs testaceous, the eyes black; thickly clothed with very long, erect, pale brownish hairs, the legs also villose, the under surface sparsely pubescent. Head short, irregularly punctate; eyes large, coarsely faceted; antennae serrate from the fourth joint (8-11 are missing). Thorax short, rounded at the sides, slightly narrowed in front, the base sinuate near the obtuse hind angles, the margins crenulate; the surface densely, confluent, umbilicate-punctate, the disc with several small, scattered, polished, tuberculiform callosities, four of which (quadrangularly placed) are more prominent than the rest. Elytra moderately elongate, depressed, very little wider than the thorax, subparallel to beyond the middle; coarsely, closely, confusedly punctate, and with a row of larger foveiform impressions along the submarginal ridge, the latter placed extremely close to the crenulate outer margin. Beneath finely punctate.

Length $4\frac{1}{2}$, breadth 2 mm.

Hab. BRAZIL, Rio de Janeiro (*Fry, in Mus. Brit.*).

One specimen. This insect unquestionably belongs to *Cymbolus*; it differs from the northern forms in having four small polished tuberculiform prominences on the disc of the thorax and the submarginal ridge of the elytra placed extremely close to the marginal carina.]

EUCYMBOLUS, n. gen.

Eyes transverse, sinuato-emarginate in front, finely faceted; elytra with a very sharp submarginal carina, corresponding in length with the deeply excavate epipleuron, the latter becoming very broad anteriorly and narrow behind, and about reaching the second ventral suture; metasternum short; ventral segments 3-5 much shorter than those preceding; body broad-ovate, convex, metallic, strongly villose; the other characters as in *Cymbolus*.

Type, *E. cyaneus*.

The single species referred to this genus has the general structure of *Cymbolus*—serrate antennae, securiform apical

joint to the labial and maxillary palpi, lobed tarsal claws, a coarsely punctured villose surface, etc.; but differs from it in the shape of the body, and in the less coarsely faceted, transverse eyes, and the more sharply carinate sides of the elytra. The type appears to have been placed amongst the Eumolpid Phytophaga when our collections were sorted.

**Eucymbolus cyaneus*, n. sp. (Plate IV, fig. 6.)

Shining, cyaneous above, black beneath, the head rufous, the mouth-parts, antennae, legs, mesosternum, and fifth ventral segment rufo-testaceous; above thickly set with long, erect, cinereous hairs, the under surface sparsely clothed with adpressed pallid pubescence, the legs villose. Head rather sparsely punctate; antennae moderately long, joints 4-10 strongly, and 3 more feebly, serrate. Thorax short, rapidly narrowing forwards, finely margined and bisinuate at the base, the angles rounded, the margins crenulate; sparsely, finely punctate on the disc, the punctures becoming coarser, closer, and umbilicate towards the sides. Elytra coarsely, closely, confusedly punctate, with a row of coarser impressions within the sub-marginal ridge, the latter becoming somewhat widely separated from the marginal carina towards the base; transversely compressed below the humeral callus. Beneath finely punctate.

Length $4\frac{1}{2}$, breadth 3 mm. (♂.)

Hab. GUATEMALA, Sinanja in Alta Vera Paz (*Champion*).

One specimen, found in April 1880. Seen from above the sides of the thorax form an almost continuous outline with those of the elytra, the general shape being broad ovate.

PTINIDAE.

OZOGNATHUS.

Ozognathus, Leconte, *Class. Coleopt. N. Am.* p. 205 (1861), and *Proc. Acad. Phil.* 1865, p. 226; *Fall, Trans. Am. Ent. Soc.* xxxi, pp. 132, 135 (1905); *Pic, Cat. Anobiidae*, p. 16 (1912).

Micranobium, Gorham, *Biol. Centr.-Am., Coleopt.* iii, 2, p. 202 (1883) (part.); *Pic, L'Echange*, xix, p. 171 (1903).

Durangoum, *Pic, L'Echange*, xix, p. 182 (1903).

Mr. Fall (loc. cit. p. 136) correctly states that two very dissimilar insects, belonging to two different groups of the Ptinidae, were placed by Gorham under *Micranobium*: one, *M. exiguum*, appertains to the genus *Ozognathus*, Lec.,

of the Dryophilini; the other, *M. pulicarium* (under which various species, as already pointed out by M. Pic, were confused by the author), to the genus *Petalium*, Lec., of the Dorcatomini. The characters of the genus *Micranobium*, Gorh., were drawn from the two species: those referring to the structure of the antennae, head, and thorax having been taken from the *Ozognathus*, and that of the relative length of the abdominal segments from the *Petalium*. The synonymy of *O. exiguus* is given below. *O. mexicanus*, Pic, is unknown to me.

Ozognathus exiguus.

Micranobium exiguum, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 202 (nec *M. exiguum*, Gorh., Proc. Zool. Soc. Lond., 1898, p. 325).

Ozognathus exiguus, Fall, loc. cit.; Pic, loc. cit.

This insect has only been found at San Gerónimo, Guatemala. It has been examined by Fall, who records three other species of the genus from the Southern United States, one of which has a horn on each mandible in the male. The Antillean specimens subsequently referred by Gorham to *M. exiguum* belong to two genera—*Cryptorama* (?) and *Petalium*, and of course have nothing to do with the Guatemalan *Ozognathus*.

**Ozognathus mexicanus*.

Micranobium (s. g. *Durangoum*) *mexicanum*, Pic, L'Echange, xix, p. 183 (1903).

Ozognathus mexicanus, Pic, Cat. Anobiidae, p. 17 (1912).

“Luteo pubescens, robustus, latus, paululum nitidus, subconvexus, brunneus sed ad suturam et apice rufescens, antennis testaceis; thorace transverso, postice dilatato-subrotundato; elytris satis latis et brevibus, minute et dense punctatis, instriatis; pedibus testaceis; subtus corpore nigro. Long. 2, 6 m.” The subgenus *Durangoum* is characterised thus:—“Prothorace minus late ad basin lateraliter sejuncto, antennarum articulis intermediis satis brevibus, ultimis modice crassis et submodice longioribus, distinctis.”

Hab. MEXICO, “Sierra de Durango.”

TRICHODESMA.

Trichodesma, Leconte, Class. Coleopt. N. Am. p. 204 (1861), and Proc. Acad. Phil. 1865, p. 230; Gorham, Biol.

Centr.-Am., Coleopt. iii, 2, p. 199 (1883); Fall, Trans. Am. Ent. Soc. xxxi, pp. 154, 171 (1905); Pic, Ann. Soc. Ent. Belg. xlvi, p. 408 (1902), and Cat. Anobiidae, p. 30 (1912).

Gorham enumerated four species of this genus from Central America, eight are recorded by Fall from the United States or Lower California, and various others have been described by Pic from Mexico or S. America. *T. imperator*, Cast., from Mexico, was, as stated by Pic, wrongly identified by Gorham, and the examples from the Mexican and Guatemalan localities quoted by him belong to various different species. These are described below, and some notes on the other Mexican forms are also appended. The thirteen species now known from Mexico and Central America may be tabulated thus:—

Thorax without lateral tooth, simply sinuate at the sides behind.

Elytra conjointly rounded at apex.

Elytral vestiture dense, in great part whitish.

Elytra with brown lines on disc and a broad white fascia towards apex . . . *imperator*, Cast.

Elytra with spots on the disc and a broad common saddle-shaped post-median fascia blackish brown, strongly nigro-tricristate on disc . . . *tricristata*, n. sp.

Elytra with apical fourth sparsely set with small tufts of fulvous pubescence, and with an irregular transverse row of small dark tufts at about one-fourth from the tip . . . *texana*, Schaeff.

Elytra with a large black lateral patch . . . *albina*, Gorh.

Elytral vestiture dense, pale brownish, that of the numerous small fascicles whitish: body elongate . . . *gorhami*, Pic.

Elytral vestiture close, mottled, greyish-brown, fulvous, and whitish, the whitish pubescence condensed into transverse lines at tip. . . *pictipennis*, n. sp.

Elytral vestiture dense, brown, spotted with black, and with a sharply-defined common, narrow, W-shaped median fascia and other markings white . . . *w-album*, Gorh.

Elytral vestiture rather sparse, in great part black, the whitish pubescence condensed into sharply-defined markings.

The whitish pubescence condensed into a broad **W**-shaped median fascia and other markings; antennae ferruginous *scripta*, n. sp.

The whitish pubescence condensed into a submarginal line and a common transverse mark on disc; antennae black *albistolata*, Gorb.

Elytral vestiture rather sparse, in great part plumbeous, the black pubescence condensed into two common transverse patches *plumbea*, Gorb.

Elytra truncate at apex, the vestiture mottled.

Elytra with several large tufts of fulvous and black setae on disc: body elongate *mexicana*, Pic.

Elytra with three small oblong tufts of black decumbent setae on third interstice and a common pallid subapical fascia *truncata*, n. sp.

Thorax toothed at the sides; elytra truncate at apex; vestiture mottled *armata*, n. sp.

Trichodesma imperator.

Anobium imperator, Cast., Silb. Rev. iv, p. 58 (1836).

“Granuleux, brun, couvert d’un duvet blanc; corselet avec une strie longitudinale et présentant au milieu une forte élévation de couleur jaune; élytres couverts de gros points enfoncés bruns avec quelques lignes longitudinales; sur la base un trait sinueux au milieu et une large bande transversale en arrière formée d’un duvet blanc; dessous du corps noir et velu, ainsi que les pattes; antennes rougeâtres. Long. 3, larg. 1½ lig.”

Hab. MEXICO.

This species cannot be identified from the Mexican material before me.

**Trichodesma tricristata*, n. sp.

Oblong, broad, black, the antennae and tarsi, and the margins of the dorsal abdominal segments, rufo-ferruginous; variegated with a dense clothing of decumbent pale brown, whitish, and

brownish-black pubescence, the whitish pubescence condensed on the elytra into a narrow, conspicuous, sharply-angulated, common, submedian fascia, which is preceded by two dark spots and followed by a broad, common, transverse, saddle-shaped blackish-brown patch; the surface also set with very long, erect, scattered whitish hairs and black setae, the latter condensed into three large fascicles on the elytra (one at the suture before the middle, and one on the disc of each towards the apex) and two smaller tufts on the dorsal hump of the thorax. Antennae long, rather slender, the three joints of the club elongate, the terminal joint longer than the preceding. Thorax arcuato-explanate anteriorly, sinuate at the sides behind, densely punctate, the dorsal hump abrupt. Elytra much wider than the thorax, moderately long, parallel, conjointly rounded at the apex; with rows of closely placed coarse transverse punctures.

Length $4\frac{1}{2}$, breadth $2\frac{2}{3}$ mm. (? ♂).

Hab. MEXICO, Orizaba (*Sallé*).

One specimen, with the dense whitish woolly vestiture somewhat matted and discoloured, but nevertheless leaving the sharply angulate submedian elytral fascia (which extends some distance down the third interstice, and is followed by one of the tufts of black setae) very conspicuous. Near *T. w-album*, Gorh., but with the tufts of black setae on the disc of the elytra towards the apex much longer, the common W-shaped mark broader, and preceded and followed by sharply-defined dark patches. This is one of the examples quoted by Gorham under *T. imperator*, the insect having been thus labelled in the *Sallé* collection. *T. sellata*, Horn, from Lower California, has somewhat similarly marked elytra.

**Trichodesma texana*.

Trichodesma texana, Schaeff., *Canad. Ent.* xxxv, p. 263 (1903); *Fall, Trans. Am. Ent. Soc.* xxxi, pp. 172, 175 (1905).

Hab. NORTH AMERICA, Texas; MEXICO, Matamoros.

This species has the elytra densely clothed with whitish pubescence to the apical fourth, which is more sparsely clothed with fulvous hairs; the thorax strongly sinuate at the sides behind and with four blackish spots on the dorsal hump; and the anterior tufts of black hairs on the elytra almost wanting, the posterior tufts small but obvious, the dark ones in a transverse line at the apical fourth. *T. sorrida*, Horn, from Texas, has also been taken at Brownsville,

on the Mexican frontier; it has numerous brush-like tufts of blackish hairs arranged in three longitudinal lines on each elytron. We are indebted to Mr. C. Schaeffer, of the Brooklyn Museum, for a specimen of each of these insects, and also for *T. pulchella*, Schaeff., and *T. gibbosa*, Say.

**Trichodesma gorhami*.

Trichodesma imperator, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 199, pl. 10, fig. 9 (*nec* Cast.).

Trichodesma gorhami, Pic, L'Echange, xvii, p. 94, nota (1901).

Elongate, piceous, the antennae and tarsi ferruginous; densely clothed with pale brown and whitish decumbent pubescence, intermixed with very long, erect, light hairs and dark setae, the whitish pubescence here and there clustered into dense fascicles, which become larger and more crowded on the apical declivity of the elytra (two on each elytron near the suture, the anterior one followed by a cluster of blackish setae, being very conspicuous) and at about the middle of the disc coalescing into two oblique streaks (the inner one reaching the suture and forming with the corresponding streak on the opposite elytron a common Λ -shaped mark), the dark setae clustered into a few small oblong or rounded widely scattered fascicles on the disc of the elytra and two on the anterior declivity of the thorax. Thorax broadly arcuato-explanate, the sides feebly sinuate towards the base, the sculpture hidden by the vestiture, the compressed dorsal hump angular as seen in profile. Elytra elongate, parallel, rather convex, granulate, very uneven, conjointly rounded at the apex, the closely-packed rows of coarse, transverse punctures interrupted by the inequalities of the surface.

Length 5-5½, breadth 2½-2¾ mm.

Hab. MEXICO, Almolonga in Puebla (*Höge*).

The above description is taken from the two examples in the "Biologia" collection, one of these having been figured by Gorham as *T. imperator*. Pic renamed the insect from this figure, but he did not describe it in any way, neither did Gorham give any characters for the specimens he referred to *T. imperator*.

**Trichodesma pictipennis*, n. sp.

Elongate, piceous, the antennae and tarsi obscure ferruginous; mottled with grey, pale brown, and whitish, decumbent pubescence, intermixed with long scattered erect hairs and black setae, the latter

clustered into four small tufts on the dorsal hump of the thorax and various fascicles on the elytra (giving the appearance of black spots), the whitish pubescence condensed into three oblique lines on each side of the thorax, some small spots or streaks on the disc of the elytra, and two, narrow, curved, transverse lines near the apex, the pale brownish hairs condensed into an indeterminate, common, post-scutellar patch. Eyes very large. Antennae with the three joints of the club very elongate, the apical joint much longer than the preceding. Thorax arcuato-explanate anteriorly, strongly sinuate at the sides behind; densely granulato-punctate, the dorsal hump very prominent, angulate as seen in profile. Elytra elongate, parallel, much wider than the thorax, conjointly rounded at the apex; with rows of coarse, closely placed, transverse punctures visible through the vestiture, the interstices narrow, faintly granulate.

Length $4\frac{1}{2}$, breadth $2\frac{1}{10}$ mm. (? ♂.)

Hab. GUATEMALA, San Gerónimo in Baja Vera Paz (*Champion*).

One specimen. Very like *T. armata*, but wanting the tooth at the sides of the thorax; the eyes larger; the elytra conjointly rounded at the tip, and with the markings differently arranged, the small scattered tufts of black setae giving a spotted appearance to their surface.

Trichodesma w-album.

Trichodesma w-album, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 200.

Described from a single ♀ from Vera Paz. A male was subsequently received from Atoyac, Mexico, and it proves to have very much longer antennae than the type.

**Trichodesma scripta*, n. sp. (Plate IV, fig. 7.)

Oblong, nigro-piceous or black, the antennae, tarsi, and abdomen rufo-ferruginous, the femora and tibiae slightly infusate; variegated with black and cinereous decumbent pubescence, intermixed with very long light and dark hairs and black setae, the cinereous pubescence on the thorax confined to the sides and anterior portion and an oblong median vitta at the base (leaving a black horseshoe-shaped mark on the disc), and that on the elytra into a common quadrate patch at the base, extending outwards along the anterior margin, a common sharply-angulated rather broad median fascia, and a transverse patch at the apex, the black setae condensed into

a large oblong fascicle on the suture of the elytra before the middle and a small one on the dorsal hump of the thorax. Antennae moderately long, comparatively slender, joints 1 and 2 of the club subequal in length, elongate-triangular, the apical joint longer and more slender than the preceding one. Thorax convex, moderately dilated anteriorly, the sides sinuate before the distinct hind angles, the anterior angles sharply produced; densely, finely granulate-punctate, the dorsal crest abrupt and very prominent. Elytra convex, much wider than the thorax, oblong-quadrate, conjointly rounded at the apex; with regular rows of closely-placed, coarse, transverse punctures, the interstices sparsely granulate.

Length 3, breadth $1\frac{1}{2}$ mm. (? ♀).

Hab. MEXICO, Atoyac in Vera Cruz (*H. H. Smith*).

Two examples. Broader than *T. albistolata*, Gorrh., from Vera Paz, the sharply-defined cinereous markings very differently arranged, the antennae ferruginous, shorter, and with a comparatively slender club. The angulate W-shaped median fascia of the elytra is suggestive of *T. w-album*, Gorrh., but the two insects are not otherwise very nearly related.

**Trichodesma mexicana*.

Trichodesma mexicana, Pic, L'Echange, xvii, p. 93 (1901).

Elongate, nigro-piceous, the antennae fusco-ferruginous; variegated with a thick clothing of whitish, grey, and fulvous, decumbent pubescence, intermixed with scattered very long, erect, pallid hairs and black and fulvous setae, the whitish pubescence predominating on the thorax and on the base of the elytra, and on the latter condensed into a large oblique patch at the middle of the sides, a common A-shaped mark at the middle of the suture, and several curved transverse lines near the apex, the fulvous setae clustered into a single fascicle on the dorsal hump of the thorax, several others on the basal third of the elytra, and some larger ones at about one-fourth from the apex, the black setae condensed into several small fascicles on the anterior declivity of the thorax and various larger ones on the elytra, one on the disc before the middle, one near the suture below the base, and one on the outer part of the disc towards the apex being more prominent than the rest. Thorax broadly arcuato-explanate anteriorly, the sides strongly sinuate towards the base, the compressed dorsal hump angular as seen in profile, a space on the disc behind it bare and granulate. Elytra elongate, parallel, much wider than the thorax, somewhat depressed, narrowly

truncate at the apex; with rows of coarse transverse punctures, the interstices feebly convex. Beneath densely clothed with whitish pubescence.

Length 6, breadth $2\frac{2}{3}$ mm.

Hab. MEXICO, "Sierra de Durango" (*coll. Pic*), Almolonga in Puebla (*Höge*).

The above description is taken from a very clean fresh example in the "Biologia" collection. This insect agrees very nearly with Pic's definition of *T. mexicana*. Compared with *T. gorhami* it is broader and less convex, the thorax is more strongly sinuate at the sides behind, and the colour and arrangement of the vestiture is very different.

**Trichodesma truncata*, n. sp.

Elongate, nigro-piceous, the antennae and tarsi ferruginous; variegated with greyish-brown, fulvous, and whitish decumbent pubescence, intermixed with scattered semi-erect hairs and black setae, the latter clustered into three small oblong fascicles on the third elytral interstice, the fulvous pubescence condensed into several spots or streaks about the base, middle, and apex of the elytra, and a large, common, saddle-shaped, subapical fascia (the pubescence here becoming whitish on the second interstice), the whitish pubescence forming a scutellar spot. Thorax arcuato-dilatate anteriorly, strongly sinuate at the sides behind, densely granulato-punctate, the dorsal hump large and subangular. Elytra elongate, parallel, much wider than the thorax, sinuato-truncate at the apex, the sutural angles sharp; with rows of closely-packed coarse transverse punctures, the interstices narrow and conspicuously granulate. Beneath pubescent, very densely punctulate, with scattered intermixed slightly coarser punctures, the spaces occupied by the latter bare, giving a mottled appearance to the surface.

Length 5, breadth $2\frac{1}{3}$ mm. (? ♂.)

Hab. GUATEMALA, Dueñas (*Champion*).

One specimen, worn, but easily recognisable by the sinuato-truncate apex of the elytra, the pallid saddle-shaped subapical fascia, the white scutellum, the conspicuously granulate upper surface, and the mottled vestiture of the ventral surface. The non-dentate sides of the thorax separate *T. truncata* from *T. armata* and the truncate apex of the elytra from *T. pictipennis*,

**Trichodesma armata*, n. sp.

Elongate, piceous, the antennae, tibiae, and tarsi ferruginous; mottled with grey, fulvous, and whitish pubescence, intermixed with a few long semi-erect hairs and black setae, the grey pubescence predominating and somewhat scattered on the elytra, the whitish pubescence on the latter condensed into a Λ -shaped mark on the shoulders and two transverse rows of small fascicles near the apex, and the fulvous hairs into various spots at the base and three narrow oblique streaks at the middle (the inner one meeting the corresponding streak on the opposite elytron at the suture, the two forming a common Λ -shaped mark, which extends some distance down the third interstice), the black setae clustered into a few small tufts, two in front of the dorsal hump of the thorax and one at about the basal fourth of the third elytral interstice being more conspicuous than the rest. Antennae rather long, the three joints of the club elongate, moderately broad, the terminal joint about one-half longer than the preceding. Thorax moderately explanate anteriorly, the sides acutely dentate behind this, and sinuously converging thence to the base; densely punctate, obliquely biplicate on each side of the angular dorsal hump, and with the triangular bare space at the base finely granulate. Elytra elongate, a little wider than the thorax, parallel, narrowly truncate at the tip; with sinuous rows of moderately coarse transverse punctures, the interstices here and there finely granulate. Beneath very densely minutely punctulate, with scattered coarser punctures intermixed, the pubescence fine, fulvous in colour.

Length 4, breadth 2 mm. (? ♂.)

Hab. GUATEMALA, Cerro Zunil, Pacific slope (*Champion*).

One specimen, in very fresh condition. Smaller and less elongate than *T. mexicana*, the elytral vestiture finer, differently coloured, and not clustered into large tufts, the thorax sharply toothed at the sides behind the middle. The clothing on the elytra and under surface does not completely hide the sculpture. *T. dentatithorax*, Pic, from Brazil, must be an allied form; it is described as having the thorax quadridentate on the disc and the elytra furnished with a pilose humeral gibbosity.

PETALIUM.

Petalium, Leconte, *Class. Coleopt. N. Am.* p. 204 (1861), and *Proc. Acad. Phil.* 1865, p. 234; Fall, *Trans. Am. Ent. Soc.* xxxi, pp. 211–213 (1905); Pic, *Cat. Anobiidae*, p. 58 (1912).

Rhadine, Baudi, Berl. ent. Zeitschr. 1873, p. 331.

Micranobium, Gorham, Biol. Centr.-Am., Coleopt. iii, 2, p. 202 (1883) (part.).

This genus includes a number of minute forms with a strongly produced and broadly expanded metasternal lobe which covers the mouth when the head is withdrawn into the mesosternal cavity. Six N.-American species are recognised by Fall, under one of which, *P. bistratum*, Say, he describes three named varieties. About a dozen Central American forms (including one from the Pearl Is.), several of which were confused by Gorham with *Micranobium pulicarium*, are represented in the "Biologia" collection, but the material at present available is too scanty for the description of these small insects. M. Pic has named various Central and S.-American and Antillean species, but, as Fall remarks (loc. cit.), his characterisations are insufficient for their acceptance unless supported by further description. Some attempt has been made by me to identify the Mexican and Antillean forms described by Pic after he purchased the Gorham collection. The changes in their synonymy are also noted.

Petalium pulicarium.

Micranobium pulicarium, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 202, pl. 10, fig. 14 (part.).

Petalium pulicarium, Fall, Trans. Am. Ent. Soc. xxxi, p. 213; Pic, Rev. d'Ent. xxiv, p. 186 (1905).

Hab. GUATEMALA, Dueñas and Capetille (*Champion*).

The examples from the other localities quoted by Gorham belong to different species. The *M. pulicarium*, too, recorded by him from the Lesser Antilles appertain to *P. antillarum*, Pic.

**Petalium striatipenne*.

Rhadine striatipennis, Pic, L'Echange, xix, p. 172 (1903); Rev. d'Ent. xxiv, p. 186 (1905).

Hab. MEXICO, Mexico city (*Flohr*).

This species is described as having "une coloration générale noire, l'aspect presque mat et les élytres plus longs que ceux de *pulicarium*, Gorh., et ses stries ponctuées fortes." Long. 2.5 mill. Four specimens from Mexico city, sent us by the late Julius Flohr, doubtless belong here.

They have deep oblique depressions on the disc of the thorax and a long deep metasternal sulcus.

**Petalium apicale.*

Rhadine apicalis, Pic, L'Echange, xix, p. 172.

Petalium apicale, Fall, Trans. Am. Ent. Soc. xxxi, p. 217, note; Pic, Rev. d'Ent. xxiv, p. 188 (1905).

Hab. MEXICO, "Sierra de Durango," Manantial, Jalapa.

"Moins allongée [que *R. striatipennis*, etc.], et très reconnaissable à sa pubescence distincte et fournie ainsi que sa particulière coloration élytrale, les élytres étant foncés avec une étroite bordure apicale rousse." Long. 1·8-2 mill. According to Fall, who has seen one of the types, *P. apicale* is exceedingly like *P. brunneum*, Horn, from Lower California. We have an abraded *Petalium* from Chilpancingo (*H. H. Smith*) that may belong here.

**Petalium gorhami.*

Micranobium pulicarium, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 202 (part.).

Rhadine gorhami, Pic, L'Echange, xix, p. 171, nota.

Petalium gorhami, Pic, Rev. d'Ent. xxiv, p. 187 (1905).

Hab. GUATEMALA, San Gerónimo, Dueñas, Cerro Zunil (*Champion*).

According to Pic, *M. gorhami*, from San Gerónimo, is "distincte [de *M. pulicarium*] par la forme plus allongée, la coloration plus claire, brunâtre, le dessus du corps orné d'une pubescence grisâtre assez rapprochée, le prothorax faiblement impressionné en dessus et à étranglement à peine marqué." Long. 2 mill.

[*Petalium antillarum.*

Micranobium pulicarium, Gorh., Proc. Zool. Soc. Lond. 1898, p. 325.

Rhadine antillarum, Pic, L'Echange, xix, p. 171 (1903).

Petalium antillarum, Pic, Rev. d'Ent. xxiv, p. 186 (1905).

Hab. ANTILLES, Grenada and Grenadines.

M. Pic characterises this species thus:—"Très voisine de *Gorhami*, Pic, par sa coloration, s'en distingue par la pubescence jaune dorée et plus serrée du dessus du corps, la ponctuation élytrale plus fine ou l'absence de stries

discales, enfin la forme moins allongée du corps, le prothorax à bord antérieur abaissé et non relevé; antennes testacées, courtes, à 1^{er} article très long, deuxième large, suivants courts avec les trois derniers longs et un peu épaissis. Long. 1.6 mill. environ." There are four Antillean specimens standing under the name *M. pulicarium* in the British Museum, probably belonging to two species, both very different from the Guatemalan type, one of which is doubtless the insect M. Pic describes. He also characterises a var. *dufau* from Guadeloupe.]

EUPACTUS.

- Eupactus*, Leconte, Class. Coleopt. N. Am., p. 203 (1861),
and Proc. Acad. Phil. 1865, pp. 235-236; Fall, Trans.
Am. Ent. Soc. xxxi, pp. 211, 218 (1905).
Lioliolius, Gorham, Biol. Centr.-Am., Coleopt. iii, 2, pp. 203
(1883), 347 (1886).
Mirosternus, Gorham, Proc. Zool. Soc. Lond. 1898, p. 327
(*nec* Sharp).

This genus is mainly characterised by the very long, parallel-sided, flattened, 3-jointed antennal club, the closely articulated apical two joints of which united are about as long as the elongate preceding joint, the club itself being sometimes much wider in the male than in the female. The metasternum is notched in front, leaving the tips of the antennae exposed when these organs are retracted into the meso- and metasternal cavities. The species are numerous in Central America and nine are recognised by Fall from the United States or Lower California. Pic, in his "Catalogue of Anobiidae," 1912, p. 64, sinks *Eupactus*, Lec., *Eutheca*, Kies., and *Thaptor*, Gorch., under *Calymmaderus*, Sol.; but in this I cannot follow him, the last named Chilian genus having a very prominent hood-like anterior prolongation to the thorax. *Thaptor* (and not *Lioliolius*), Gorch., is also sunk by Fall as synonymous with *Eupactus*, but they are here retained as distinct. The type of *Eupactus*, *E. nitidus*, Lec., is a small, oblong-oval, shining, glabrous insect; that of *Thaptor*, *T. pupatus*, Gorch., a large, subfusiform, densely pubescent insect (approaching *Calymmaderus* in shape), with a single submarginal stria to the elytra, and a dense double system of punctuation, above and beneath.

The following table will assist in the identification of the

fourteen Central American *Eupacti*, one of which is unknown to me. Gorham's descriptions, it may be observed, were mostly made from one specimen, the others placed by him under the same name often proving on examination to belong to different species. His *E. (Mirosternus) laevis* was from the Antillean island of St. Vincent.

- a. Elytra with two submarginal striae :
 surface punctuation simple.
- a¹. Submarginal striae very deep,
 abbreviated anteriorly : body
 oblong-ovate, metallic, bare
 above *punctatus*, Gorh.
- b¹. Submarginal striae shallower, punctate,
 almost complete ; elytra
 subparallel : species small.
- a². Upper surface (when fresh) very
 finely pubescent : body black *subvestitus*, n. sp.
- b². Upper surface bare : body ferruginous
 *donckieri*, Pic.
- b. Elytra with a broad deep submarginal
 groove along the apical half.
- c¹. Elytra with two abbreviated rows of
 punctures on disc : upper surface
 sparsely, minutely punctate :
 body black, head red *erythrocephalus*, n. sp.
- d¹. Elytra with one short row of punctures
 on disc near suture : upper
 surface sparsely, minutely punctate :
 body castaneous *nitescens*, n. sp.
- e¹. Elytra confusedly, sparsely, minutely
 punctate.
- c². Head, thorax, and elytra black ;
 ventral segments very densely
 punctate *glaber*, Gorh.
- d². Head and thorax rufous, the elytra
 black ; ventral segments more
 sparsely punctate *semirufus*, n. sp.
- c. Elytra with a broad submarginal groove
 at apex only, the elytra themselves
 long and subparallel. [*laevis*, Gorh.]
- d. Elytra convex, without submarginal
 striae or definite lateral groove.
- f¹. Surface punctuation single.

- e*². Elytra distinctly or faintly striate on disc; upper surface glabrous.
- a*³. Upper surface more sparsely punctate, bluish; elytral striae more distinct *striatus*, Gorh.
- b*³. Upper surface more closely punctate, piceous or black; elytral striae less distinct . . . *exiguus*, Gorh.
- f*². Elytra not or very obsolete striate on disc.
- c*¹. Upper surface pubescent.
- a*⁴. Thorax and elytra densely, rather coarsely punctate: body blue above *caeruleus*, n. sp.
- b*⁴. Thorax rather densely, the elytra more sparsely, punctate: body nigro-piceous: species very small *dejeani*, Pic.
- d*³. Upper surface glabrous; thorax and elytra sparsely, minutely punctate: body ferruginous: species very small *ovulum*, Gorh.
- g*¹. Surface punctuation double.
- g*². Upper surface very densely punctate and pubescent; vertex not carinate: species larger *pubescens*, Gorh.
- h*². Upper surface more shining and less densely punctate, pubescence long; vertex carinate: species very small *comatus*, n. sp.

Eupactus punctatus.

Lioolius punctatus, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 203 (part.) (*nec* pl. 10, fig. 15).

Oblong ovate, convex, very shining; cyaneous above, black beneath, the head, legs, apical margin of the elytra, and abdomen rufo-piceous, the antennae partly or entirely ferruginous; glabrous. Head densely, finely punctate; eyes large, angularly compressed; antennae with joints 2-8 strongly, irregularly serrate, transverse, 3 triangular, 4-8 extremely short, 9-11 very broad, 9 longer than 10 and 11 united, the latter closely articulated; thorax closely, finely punctate; elytra oblong, dilated at the sides posteriorly, broadly rounded at the tip, rather sparsely and distinctly more

coarsely punctured than the thorax, the punctures here and there arranged in lines (which give the appearance of very faint striae on the disc), the two submarginal striae confined to the apical half, the inner one very deep and sulciform and not reaching the suture, the humeral callus smooth. Beneath densely, the middle of the metasternum coarsely and more sparsely, punctate, the intercoxal process of the latter broader than long and triangularly notched in front.

Length (excl. head) $2\frac{1}{5}$ – $2\frac{3}{4}$, breadth $1\frac{2}{5}$ – $1\frac{1}{2}$ mm.

Hab. HONDURAS (*Sallé*); GUATEMALA, Panzos in Alta Vera Paz (*Champion*).

Gorham's description of *Lioolius punctatus* was taken from the three Honduras examples, and the Panama insect figured by him belongs to the different species characterised below under the name *E. caeruleus*. A fresh description, however, is required in each case.

**Eupactus subvestitus*, n. sp.

Oblong, moderately shining, nigro-piceous or black, the antennae and legs obscure ferruginous; the punctures bearing excessively fine short hairs, which are soon abraded. Head, thorax, and elytra very sparsely, excessively minutely punctate, the interspaces somewhat alutaceous, the elytra with two punctured submarginal striae, the inner one abbreviated anteriorly and not nearly reaching the suture behind; eyes moderately large; antennal club elongate, not very broad, the apical two joints united slightly longer than 9; thorax (as seen from above) obliquely narrowing from the base; elytra a little wider than the thorax, subparallel in their basal half, the humeri rather prominent. Beneath densely, minutely, the metasternum rather sparsely, punctate, the latter sulcate down the middle and deeply notched in front.

Length $2\frac{1}{10}$ – $2\frac{1}{5}$, breadth $1\frac{1}{3}$ – $1\frac{1}{2}$ mm. (? ♀.)

Hab. MEXICO, near the city (*Höge, Flohr*).

Two examples. This species and the following have the elongate form of the Antillean *E. laevis* (Gorh.), a much larger insect without submarginal striae to the elytra. Found on oak, according to Flohr.

**Eupactus donckieri*.

Eupactus donckieri, Pic, L'Echange, xx, p. 19 (1904).

Oblong-ovate, narrow, compressed, very shining, castaneous, glabrous above. Head, thorax, and elytra very sparsely, excessively

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minutely punctate, the elytra with two punctured, narrowly separated, submarginal striae, the inner one not reaching the base or apex; eyes very large; antennal club elongate, moderately broad, the apical two joints united slightly longer than 9; elytra a little wider at the base than the thorax, rather long, subparallel in their basal half, the humeri prominent.

Length $1\frac{2}{3}$, breadth $\frac{9}{10}$ mm.

Hab. MEXICO, Manantial (*Flohr*), "Sierra de Durango" (*coll. Pic*).

One specimen. Very like *E. subvestitus*, but a little less elongate, smaller, narrower, and more compressed, and uniformly castaneous in colour. The elytral punctures, seen under the microscope, are shallow and flat-bottomed. The insect described appears to be referable to *E. donckieri*, Pic, the type of which was from the Sierra de Durango; the latter is said to be 2 mm. in length.

**Eupactus erythrocephalus*, n. sp.

Lioolius glaber, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 203 (1883) (part.).

Oblong-ovate, convex, very shining, black, the head, palpi, antennae, and tarsi rufescent; glabrous above and beneath. Head, thorax, and elytra very minutely punctate, the punctures more closely placed on the thorax than on the elytra, the latter with two short irregular rows of coarser impressions on the disc below the base and with a very shallow broad submarginal groove along the apical half; eyes large; antennal club moderately broad, the apical two joints together as long as 9. Metasternum and ventral segments very sparsely and minutely, the anterior portion of the posterior coxae closely and rather coarsely, punctate; ventral sutures 3 and 4 double, sharply defined.

Length 3, breadth 2 mm.

Hab. GUATEMALA, San Gerónimo in Baja Vera Paz (*Champion*).

This is the insect doubtfully referred by Gorham to *Lioolius glaber*, the types of which came from Dueñas and Capetillo. The red head, the two short abbreviated striae on the disc of the elytra near the suture, and the very sparsely punctured glabrous ventral surface readily distinguish *E. erythrocephalus* from *E. glaber*. The length of the latter was incorrectly given as "1-3 mm.": it should be 2-2 $\frac{1}{2}$ mm. *E. glaber*, it may be noted, is extremely

like the N.-American *E. nitidus*, Lec., the type of *Eupactus*, but may be separated from that species by the densely, very finely punctured ventral surface and the non-carinate vertex.

**Eupactus nitescens*, n. sp.

Lioliolus ovulum, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 205 (1883) (part.).

♀. Oblong-ovate, rather narrow, convex, very shining, castaneous, the suture and apical margin of the elytral and the metasternum slightly infuscate, glabrous. Head, thorax, and elytra sparsely, minutely punctate, the punctures on the elytra subseriatly arranged on either side of a smooth space along the suture before the middle, the apical elytral margin explanate, leaving a broad shallow groove within; eyes extremely large; antennae with joints 4-8 very small, short, alternately serrate, the club long, moderately broad, its apical two joints united rather longer than 9. Beneath shining, very sparsely, finely punctate; metasternum grooved, the notch in front deep.

Length $1\frac{9}{10}$, breadth 1 mm.

Hab. PANAMA, Volcan de Chiriqui, 3,000 feet (*Champion*).

One specimen. More elongate and much more shining than *E. ovulum*, the eyes extremely large, the apical two joints of the antennae relatively longer, the apical margin of the elytra explanate, the upper surface much more sparsely punctate.

**Eupactus semirufus*, n. sp.

Oblong-ovate, convex, very shining, rufous, the elytra nigropiceous or black, the metasternum and posterior coxae more or less infuscate; glabrous above, the ventral segments finely pubescent. Head, thorax, and elytra sparsely, very minutely punctate; elytra subparallel in their basal half, broadly hollowed along the outer margin from about the middle to the apex, and with moderately prominent humeri; head obsoletely carinate on the vertex; eyes very large; antennae with joints 3-8 minute, irregularly serrate, the club long, moderately broad, the apical two joints together rather longer than 9. Metasternum very sparsely and irregularly, the ventral segments densely, minutely (the first more sparsely so towards the sides) punctate, the third and fourth sutures double, the metasternal process broader than long.

Length $2\frac{1}{4}$ - $2\frac{1}{2}$, breadth $1\frac{2}{3}$ - $1\frac{1}{2}$ mm.

Hab. MEXICO, Teapa in Tabasco (*H. H. Smith*).

Four specimens, possibly all females, the antennal club being rather narrow in all of them. Very like *E. glaber* (Gorh.), but with the elytra only black and the ventral segments 1-4 much less densely punctate. In *E. glaber* the entire ventral surface is extremely densely punctured and pubescent, a character not mentioned by its describer, though visible in one of the Dueñas examples dissected by him. *E. punctulatus*, Lec. (*viticola*, Schwarz), and *E. nitidus*, Lec., are closely allied larger forms, the former having a much more sparsely, and the latter a more coarsely, punctured under surface.

Eupactus striatus.

Lioolius striatus, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 204 (1883).

Described from specimens found at Chontales, Nicaragua. Additional localities are:—

MEXICO, Teapa (*H. H. Smith*); GUATEMALA, Purula (*Champion*); PANAMA, Bugaba (*Champion*).

E. striatus was treated as somewhat doubtfully distinct from *E. glaber*. The long series subsequently received shows that the species is perfectly valid: the elytra are closely, finely punctate, faintly striate on the disc, and the broad shallow marginal depression is wanting; the upper surface has a bluish tint, and would be better described as nigro-cyaneous; and the ventral segments are piceous or rufous, like the antennae. The male has the antennal club much more broadly widened than the female. The under surface is finely pubescent. The metasternal process is broader than long and the notch is deep. The length varies from 2-2½ mm.

Eupactus exiguus.

Lioolius exiguus, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 347 (1886).

Described from two examples from Honduras. Additional specimens have since been received from Teapa, Mexico, and Bugaba, Panama. This is a form of *E. striatus*, black or piceous above, with the thorax and elytra more densely and a little more distinctly punctate, and the dorsal striae of the latter almost obsolete. Gorham presumably meant to compare it with *E. striatus*, and not with *E. punctatus*, a very different species with two deeply impressed submarginal striae.

**Eupactus caeruleus*, n. sp.

Lioolius punctatus, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 203, pl. 10, figs. 15 (1883) (part.).

Ovate, very convex, shining; blue (with a greenish tint in certain lights) above, piceous beneath, the antennae, legs, and abdomen obscure ferruginous; thickly clothed with fine ashy pubescence. Head, thorax, and elytra densely, rather finely punctate; antennae with joints 3-8 small, 4-8 transverse, feebly subserrate, 9-11 very broad, 9 elongate, as long as 10 and 11 united, 10 excised on the inner side at the base; elytra with traces of very faint impressed lines on the disc, the submarginal striae entirely wanting the humeral callus smooth. Beneath densely, finely punctate, the metasternum with a narrow smooth space down the middle, the intercoxal process of the latter triangularly notched in front.

Length (excl. head) $2\frac{1}{16}$, breadth $1\frac{2}{3}$ mm.

Hab. PANAMA, David in Chiriqui (*Champion*).

One example. This is the insect figured by Gorham under the name *Lioolius punctatus*. The densely punctured cinereo-pubescent surface, the complete absence of the submarginal striae of the elytra, the almost simple intermediate joints of the antennae, and its ovate general shape distinguish *E. caeruleus* at a glance from *E. punctatus*. The legs (which were not properly seen by the artist) are shown much too long in the figure, the tarsi especially, which are not half the length of the tibiae.

**Eupactus dejeani*.

Eupactus (Thaptor) dejeani, Pic, L'Echange, xxi, p. 115 (1905).

This species is unknown to me. The description of it is as follows:—Minutus, convexus, nigro-piceus, distincte punctatus, sat dense in thorace et capite, sat sparse in elytris; antennis testaceis; elytris instriatis. Court et assez large, convexe, peu brillant, brièvement pubescent, à ponctuation forte, plus serrée sur l'avant-corps, noir de poix avec les pattes rembrunies; antennes testacées, premier article courbé, suivants petits, trois derniers gros et épaissis, les deux de l'extrémité peu détachés l'un de l'autre; tête peu convexe; prothorax assez court, progressivement atténué en avant; élytres courts et larges, à épaules marquées, un peu rétrécis au sommet avec une faible dépression latérale incomplète, mais sans aucune trace de

strie. Long. 1.5 mm. Mexique: Teapa (*coll. Pic*). Très distincte par sa petite taille jointe à sa forte punctuation.

Eupactus ovulum.

Lioolius ovulum, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 205 (1883) (part.).

♀. Ovate, convex, moderately shining, castaneous, the antennae, legs and abdomen rufo-testaceous; glabrous above. Head, thorax, and elytra closely, minutely punctate, the interspaces on the thorax closely alutaceous, those on the elytra more shining, the elytra without trace of striae or marginal depression; eyes rather small; antennae with joint 3 triangular, rather stout, 4-8 very small, transverse, the club moderately long, the apical two joints united barely as long as 9; thorax rapidly and obliquely narrowing from the base.

Length $1\frac{3}{8}$, breadth 1 mm.

Hab. NICARAGUA, Chontales (*Janson*).

Four specimens were doubtfully referred to *E. ovulum* by Gorham, belonging to three perfectly good species. The above description is taken from the example selected by him as the type. *E. ovulum* is closely related to *E. striatus* and *E. exiguus*, differing from both in the non-striate, extremely finely punctate elytra, the castaneous colour of the body, etc.

**Eupactus comatus*, n. sp.

Lioolius ovulum, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 205 (1883) (part.).

Ovate, convex, shining, rufo-castaneous, the antennae rufo-testaceous; thickly clothed with long yellow pubescence. Head, thorax, and elytra densely impressed with very small flat-bottomed punctures intermixed with excessively minute ones, the elytra without trace of striae or marginal groove; head distinctly carinate on the vertex; eyes extremely large in ♂, much smaller in ♀; antennal club elongate and very broad in ♂, narrower in ♀, the apical two joints united as long as 9; thorax (as seen from above) rapidly and obliquely narrowed from the base. Beneath densely, minutely punctate; metasternum deeply notched in front, the notch extending as far back as the posterior margin of the middle coxae.

Length $1\frac{2}{3}$ - $1\frac{1}{2}$, breadth $\frac{9}{16}$ -1 mm. (♂ ♀.)

Hab. NICARAGUA, Chontales (*Janson*).

One pair, the sexual differences in the antennae of which were noted by Gorham. The double system of punctuation is like that of *E. pubescens*, which is a much larger, duller, and more densely pubescent form.¹ The types of the latter, two females from Chiriqui and Vera Paz respectively, do not agree very well *inter se*, but as the Vera Paz specimen is not in good condition it must be included under *E. pubescens* for the present. *E. dejeani*, Pic, from Teapa, Mexico, is probably an allied form.

THAPTOR.

Thaptor, Gorham, Biol. Centr.-Am., Coleopt. iii, 2, pp. 205 (1883), 348 (1886).

This genus *Thaptor*, according to Mr. Fall [Trans. Am. Ent. Soc. xxxi, p. 219 (1905)], was created quite unnecessarily by Gorham; nevertheless it is convenient to retain it for the various Central American forms described by that author. These species, it is true, have the antennae and sterna formed as in *Eupactus* (= *Liolius*, Gorh.); but they are very different in general facies, having the dense double system of punctuation and close pubescence of *Cathorama*. They are rather large, elongate, subfusiform, or broad oblong, insects, with setose antennae, and a single submarginal stria running down the apical half of the elytra. Fall's synonymy is also quoted by Pic [L'Echange, xx, p. 31 (1904)], who had just before added (loc. cit. pp. 18, 19) three species to the genus *Thaptor*—one from Chile, one from Australia (!), and one from Mexico. The last named, *T. mexicanus*, is clearly nothing but *T. oblongus*, Gorh., the only difference mentioned being "moins brillant." The four Central American species may be tabulated thus:—

Elytra without definite rows of punctures
at the sides preceding the sub-
marginal stria.

Body somewhat fusiform.

Species larger; setae on inner edge of
antennal joints 2, 3, 5, 7 very long;
under surface more densely punctate. *pupatus*, Gorh.

¹ *E. amoenus* and *E. mixtus*, Fall, also belong to this section.

- Species smaller; antennal setae shorter;
 under surface smoother, less densely
 punctate *throscooides*, Gorh.
 Body broader, oblong; punctuation ex-
 cessively dense *sharpi*, Gorh.
 Elytra with two or three rows of punctures
 at the sides preceding the sub-
 marginal stria *oblongus*, Gorh.
(*mexicanus*, Pic.)

DORCATOMA.

Dorcatoma, Herbst, Käfer, iv, p. 103 (1790); Mulsant et Rey, Térédiles, p. 338 (1864); Leconte, Class. Coleopt. N. Am., 2nd edit., p. 226 (1883); Gorham, Biol. Centr.-Am., Coleopt. iii, 2, p. 208 (1883) (part.); Fall, Trans. Am. Ent. Soc. xxxi, pp. 212, 261 (1905); Pic, Cat. Anobiidae, p. 72 (1912).

Gorham included three Central American species under *Dorcatoma*, two of which he subsequently [op. cit. p. 350 (1886)] transferred to *Priotoma*, at the same time remarking that the third, *D. tomentosa*, would probably have also to be withdrawn from it.

Dorcatoma tomentosa.

Dorcatoma tomentosa, Gorh., loc. cit. p. 208, pl. 10, fig. 16.
Priotoma tomentosa, Pic, Cat. Anobiidae, p. 72 (1912).

A specimen of this insect has now been dissected, and it proves to have the usual, erect, ciliate process arising from each posterior angle of the intercoxal portion of the prosternum; but these processes are shorter than in the European species of *Dorcatoma* I have examined (*D. flavicornis*, F., and *D. chrysomelina*, Sturm), being simply dentiform in *D. tomentosa*. This species, which has 11-jointed antennae (as stated by its describer) and a very broad securiform apical joint to the maxillary palpus, can, therefore, quite well remain in *Dorcatoma*, the additional minute joint to the antennae being a character of no importance.

CAENOCARA.

Caenocara, Thomson, Skand. Col. i, p. 90 (1859), and v, p. 174 (1863); Leconte, Class. Coleopt. N. Am., 2nd edit., p. 226 (1883); Fall, Trans. Am. Ent. Soc. xxxi, pp. 212, 260 (1905); Pic, Cat. Anobiidae, p. 76 (1912).

Tylistus, Leconte, Class. Col. N. Am., p. 203 (1861).

Enneatoma, Mulsant et Rey, Térédiles, p. 367 (1861).

This genus, as restricted by Fall, includes various forms related to *Dorcatoma* in which the intercoxal portion of the prosternum is simply truncate behind and the long horn-like processes are altogether wanting, and the eyes are very deeply excised. In the type of *Caenocara*, *C. bovistae*, the eyes are so deeply notched as to be nearly divided into two, but in one of the new species now added, *C. flohri*, the notch extends only half-way across them. In all these forms the elytra have an additional sublateral callosity at about the middle, thus appearing constricted below the swollen humeri. The antennae are 9-jointed, and the elytra have a short subhumeral and two deep submarginal striae. Three species only are known to me from Central America, one of which, *C. bovistae*, has not previously been recorded from the New World;¹ Fall enumerates twelve from the United States, based mainly upon the form of the palpi, antennae, or eyes, in the male sex. The Central American forms may be tabulated thus:—

Eyes almost divided into two : body black.

Thorax and elytra densely punctate . . . **bovistae*, Hoffm.

Thorax and elytra more sparsely punctate . . . *quercus*, n. sp.

Eyes notched to about the middle; thorax

and elytra densely punctate: body
castaneous above *flohri*, n. sp.

**Caenocara quercus*, n. sp.

Dorcatoma contracta, Gorh., Biol. Centr.-Am., Coleopt. iii, 2,
p. 209 (part.).

Priotoma contracta, Gorh., loc cit. p. 351 (part.).

♂. Suborbicular, very shining, black, the antennae ferruginous, with the basal joint infusate, the legs piceous or rufo-piceous, the tarsi and anterior femora ferruginous; somewhat thickly clothed above and beneath with long cinereous hairs. Head closely, the rest of the upper surface more sparsely, finely punctate; eyes rather small, the antennal groove extending nearly across them; antennae 9-jointed, the dentiform first joint of the club greatly produced inwards, the two succeeding joints broad, elongate; elytra

¹ *Dorcatoma dresdensis*, Herbst (= *pallicornis*, Lec.), is recorded by Fall as rather common in the United States.

with a prominent humeral callus and also tumid in a line with this beyond the middle (thus appearing subquadrate above), the outer submarginal stria reaching the suture, the inner one a little less produced, the subhumeral stria not extending to the middle. Beneath densely, somewhat coarsely punctate, the metasternum obsolete canaliculate, the intercoxal process of the latter broad, truncate in front; ventral segments free.

Length 2, breadth $1\frac{1}{2}$ mm.

Hab. MEXICO, near the city, San Miguel del Soldado in Vera Cruz (*Flohr*), Xucumanatlan in Guerrero (*H. H. Smith*); GUATEMALA, Calderas (*Champion*).

Two very different species were confused by Gorham under the name *Dorcatoma contracta*—a larger one, from Calderas, with the eyes very deeply excised, which is absolutely congeneric with *Caenocara*, Th., and is here described under the name *C. quercus*; the other smaller form, from Capetillo and Aceituno, with the eyes feebly excised, which must be taken as the type. *C. quercus* is closely related to *C. bovistae* (Hoffm.), differing from it in the more sparsely punctured thorax and elytra, the longer and sparser pubescence, and the very shining black body. The Mexican examples received from Flohr were beaten from oaks. He has also sent us a ♀ example of a *Caenocara*, from Mexico city, which is certainly referable to *C. bovistae*.

**Caenocara flohri*, n. sp.

♂. Suborbicular, shining, castaneous above, piceous beneath, the antennae and legs ferruginous; thickly clothed with yellowish pubescence. Head, thorax, and elytra densely, finely punctate, the punctures minute on the disc of the thorax; eyes moderately large, the groove extending nearly half way across them; antennae 9-jointed, long, the dentiform first joint of the club greatly produced inwards, the two succeeding joints broad, elongate; elytra with a prominent humeral callus and also tumid in a line with this beyond the middle, the outer submarginal striae reaching the suture, the inner one a little less produced, the subhumeral stria short. Beneath densely punctate.

Length 2, breadth $1\frac{2}{3}$ – $1\frac{1}{2}$ mm.

Hab. MEXICO, Real del Monte (*Flohr*).

Two males. Larger than *C. bovistae*; the antennae and legs longer; the eyes larger, the groove not extending more than half way across them. The denser puncturing

of the upper surface and the much shorter ocular groove separate *C. flohri* from *C. quercus*.

PRIOTOMA.

Priotoma, Gorham, Biol. Centr.-Am., Coleopt. iii, 2, p. 350 (1886); Proc. Zool. Soc. Lond. 1898, p. 327; Pic. Cat. Anobiidae, p. 72 (1912).

Eutylistus, Fall, Trans. Am. Ent. Soc. xxxi, pp. 212, 264 (1905).

The species referred to *Priotoma* simply differ from *Caenocara*, Thoms., in having the eyes feebly excised, and the body more regularly convex, due to the obliteration of the latero-submedian callosities of the elytra. *Byrrhodes*, Lec.,¹ type *B. setosus*, Lec., again, is said by Fall to differ from *Eutylistus* in one character only, viz. in the sharp striation of the elytra. Some of the Central American forms with very finely striate elytra, e. g. *P. tenuistriata*, Gorh., etc., would therefore be almost as well placed in *Byrrhodes*, Lec.; these insects, however, are connected with the typical *Priotoma*, type *P. quadrimaculata*, Gorh., by intermediate forms. It is probable that, sooner or later, the whole of them will have to be included under *Caenocara*, *C. flohri* forming the connecting link between that genus and *Priotoma*. Fall enumerates eight species of this genus from the United States, and says that the European *Dorcatoma dommeri*, Rosenh., also belongs to it. The six now known from Central America, and the one before me from the Lesser Antilles, may be tabulated thus:—

- a. Antennae 11-jointed; elytra spotted,
the two submarginal striae abbreviated
anteriorly: body very convex . . . *quadrimaculata*, Gorh.
- b. Antennae 9-jointed.
- a¹. Elytra with two submarginal striae,
the subhumeral stria wanting.
- a². The two submarginal striae not
abbreviated anteriorly.
- a³. Elytra coarsely, confusedly
punctate, and obsoletely striate
throughout: body bluish-green
above *brevis*, Gorh.

¹ *Byrrhodes*, Sharp (Dascillidae), published a few months later in 1878, requires a new name: *Byrrhopsis* is here substituted for it.

- b*³. Elytra very finely punctate, distinctly striate throughout: body black above.
- a*⁴. Body oblong-ovate; elytra more distinctly striate; antennae and ventral segments red, the latter free . . . *tenuistriata*, Gorch.
- b*⁴. Body rotundate-ovate; elytra more finely striate; antennae and ventral segments black, the latter subconnate . . . *nigriventris*, n. sp.
- b*². The two submarginal striae abbreviated anteriorly, the punctures on the elytra seriatly arranged; eyes compressed: body black: species small . . . *brevilinea*, n. sp.
- b*¹. Elytra with a short subhumeral and two submarginal striae, the punctuation scattered: body black or fusco-castaneous: species very small.
- c*². Metasternum coarsely punctate; ventral segments connate at middle; eyes moderately large . *contracta*, Gorch.
- d*². Metasternum finely punctate; ventral segments free; eyes very large, less widely separated above [*insularis*, n. sp.]

**Priotoma nigriventris*, n. sp.

Priotoma tenuistriata, Gorch., Biol. Centr.-Am., Coleopt. iii, 2, p. 351 (1886) (part.).

♀. Short-ovate, broad, convex, shining, black, the head and palpi piceous, the second antennal joint and the tarsi rufo-testaceous; clothed with long, fine, cinereous pubescence. Head, thorax, and elytra closely, very minutely punctate; eyes large, feebly excised; antennae 9-jointed, the two basal joints of the club triangular, the apical one oval; elytra excessively finely striate, the two submarginal striae deeply impressed and sulciform from about the basal third, the inner one not nearly reaching the suture. Metasternum sparsely and finely, the ventral segments minutely, punctate, the latter subconnate at the middle.

Length 2, breadth $1\frac{1}{2}$ mm.

Hab. PANAMA, Volcan de Chiriqui (*Champion*).

Gorham based his description of *P. tenuistriata* upon two females from Chiriqui belonging to different species. The larger form (length $2\frac{1}{2}$, breadth $1\frac{3}{4}$ mm.), with reddish legs, antennae, and abdomen and clearly cut fine elytral striae (marked type by the author) must be taken as the type. The other form, from which the above description is taken, is smaller and subrotundate in shape, almost wholly black, and with the fine elytral striae only just traceable on the disc and the inner sulciform submarginal one less extended posteriorly; the ventral segments subconnate, and the entire surface less densely and very minutely punctate.

**Priotoma brevilinea*, n. sp.

Priotoma contracta, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 351 (part.).

♀. Short ovate, broad, convex, very shining, black, the palpi and antennae ferruginous, the basal joint of the latter slightly infusate, the femora and tibiae rufo-piceous, the tarsi ferruginous; very sparsely, finely, cinereo-pubescent. Head broad, densely, finely punctate; eyes moderately large, angularly compressed (when viewed laterally), not very deeply excised; antennae 9-jointed, the first two joints of the club triangular, the first very stout, the apical joint elongate; thorax closely, minutely punctate; elytra short, sparsely, finely, seriato-punctate, the two submarginal striae deep and confined to the apical half, the inner one not nearly reaching the suture, the short subhumeral stria wanting, the humeral callus inconspicuous. Beneath densely punctate.

Length $1\frac{3}{4}$, breadth $1\frac{1}{4}$ mm.

Hab. PANAMA, Peña Blanca (*Champion*).

One specimen. A small, short, convex, very shining, black form, broader than *P. contracta*, with angularly compressed eyes, finely seriato-punctate elytra, and the two submarginal striae of the latter abbreviated anteriorly. The ventral segments are apparently free, but this character was unfortunately not noted when the specimen was remounted. *P. brevilinea* is related to *P. brevis* and *P. tenuistriata*, Gorh., both of which have almost complete submarginal striae to the elytra.

Priotoma contracta.

Dorcatoma contracta, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 209 (part.).

Priotoma contracta, Gorh., loc. cit. p. 351 (part.).

Short ovate, convex, shining, varying in colour from black to castaneous, the antennae in some specimens wholly rufo-testaceous, in others infusate, the tarsi rufo-testaceous; sparsely clothed with rather long whitish hairs. Head and thorax very sparsely, minutely punctate; eyes moderately large, widely separated, feebly excised; antennae apparently 9-jointed—(♂) long, with the dentiform first joint of the club greatly produced inwards, and the succeeding joints broad and elongate, (♀) shorter, and with the joints of the club smaller; elytra very sparsely, finely, subseriately punctate, the punctures becoming coarser and more crowded towards the suture, the two submarginal striae deep, the subhumeral stria short, the humeral callus moderately prominent, the latero-submedian prominence wanting. Beneath finely, the middle of the metasternum coarsely, closely punctate; ventral segments connate in the centre.

Length $1\frac{1}{4}$ – $1\frac{3}{4}$, breadth 1 – $1\frac{1}{5}$ mm. (♂ ♀.)

Hab. MEXICO, Teapa in Tabasco (*H. H. Smith*); GUATEMALA, Capetillo, Aceituno, Cahabon (*Champion*); PANAMA, Tolé (*Champion*).

Eleven examples. Gorham first included *P. contracta* in his section of *Dorcatoma* with 8-jointed antennae, subsequently placing it in *Priotoma* to which he ascribed 10 joints, though the actual number of joints is nine. The feebly excised eyes, the partially connate ventral segments, the absence of the latero-submedian elytral callosities, the narrower form, and much smaller size, at once separate *P. contracta* from the other species he confused with it, which is described above under the name *Caenocara quercus*. *P. tenuistriata* and *P. brevis* (Gorh.) are larger allied forms.

[*Priotoma insularis*, n. sp.]

Priotoma brevis?, Gorh., Proc. Zool. Soc. Lond. 1898, p. 327
[nec *P. brevis*, Gorh., Biol. Centr.-Am., Coleopt. iii, 2, p. 351].

Short ovate, convex, shining, black, the antennae and tarsi rufo-testaceous, the femora and tibiae rufo-piceous; sparsely clothed with long whitish hairs. Head and thorax very sparsely, minutely punctulate; eyes very large, separated above by about the width

of one of them, feebly excised; antennae 9-jointed, 1 greatly thickened, 3-6 minute and very closely articulated, 7-9 large, 7 triangular; elytra very sparsely, finely punctate, the punctures becoming coarser, closer, and subseriately arranged towards the suture, the two submarginal striae deep, the sublumeral stria short, the humeral callus moderately prominent. Beneath sparsely, finely punctate; ventral sutures distinct.

Length $1\frac{1}{2}$, breadth 1 mm. (♀.)

Hab. ANTILLES, St. Vincent (*H. H. Smith*).

Five examples. This insect, like *P. contracta*, is so like a small immaculate *Scymnus* that it might be passed over as such. Then, again, *P. insularis* so closely resembles *P. contracta* that at first sight it appears to be referable to the same species; but the much larger, more contiguous eyes, the finely punctured metasternum, and the non-connate ventral segments readily distinguish *P. insularis*. Gorham presumably intended to write *P. contracta*?, as the present species bears no resemblance to the much larger submetallic *P. brevis*.]

Ptilinus.

Ptilinus, Geoffroy, Hist. Ins. Paris, i, p. 64 (1762); Mulsant et Rey, Térédiles, p. 226 (1864); Gorham, Biol. Centr.-Am., Coleopt. iii, 2, p. 198 (1883); Fall, Trans. Am. Ent. Soc. xxxi, pp. 277, 278 (1905); Pic, Cat. Anobiidae, p. 41 (1912).

Gorham has recorded a species of this genus from Guatemala. A second very different form, also from the same country, was subsequently detected in our collection, and a third, *P. mexicanus*, Pic, from Mexico, was added in 1901. Six are now known from the United States. The two from Guatemala are described below.

**Ptilinus sericeus*, n. sp. (Plate IV, fig. 8, ♂.)

Ptilinus sp. ?, Gorh., loc. cit.

♂. Elongate, rather broad, cylindrical, opaque, obscure ferruginous, the tibiae and the base of the femora infuscate; thickly clothed with fine, silky, brownish-cinereous pubescence, the thorax with a broad, sharply defined, anteriorly abbreviated, darker, velvety median vitta, and various curved, sinuous dark marks on either side of it, the elytral depressions also appearing darker, owing to the diverted arrangement of the vestiture. Head very broad, densely rugulose,

the eyes enormously developed; antennae with joints 4-10 each furnished with a long ramus, that on joint 4 much shorter than that on 5, joint 3 acutely, triangularly dilated. Thorax transverse, very broad, compressed at the sides anteriorly, obliquely narrowed (as seen from above) forwards; densely, rugulosely punctate, the sinuous depressions on each side of the disc interrupting the arrangement of the pubescence. Scutellum rather large. Elytra distinctly narrower than the thorax, finely, interruptedly, subseriato-punctate, the interstices rugulose; with a transverse depression on the disc below the base and various other rounded depressions on the apical half, interrupting the arrangement of the pubescence. Legs moderately elongate, the tarsi shorter than the tibiae.

Length 4, breadth $1\frac{1}{2}$ mm.

Hab. GUATEMALA, El Tumbador, Pacific slope (*Champion*).

Gorham suggested that this species was probably a known N.-American form, on what grounds I know not. The enormously developed eyes, the very broad thorax, with a sharply defined darker median vitta, and the uneven elytra are characteristic. The unique example is somewhat immature, and the elytral depressions may be in part due to the softness of the integument, but as they are symmetrical, this is not likely to be the case.

**Ptilinus maculicollis*, n. sp. (Plate IV, fig. 9, ♂.)

♂. Elongate, narrow, cylindrical, opaque, black, the thorax with a large rufous patch on each side extending forwards to the anterior angles; closely, very finely pubescent. Head broad, densely, rugulosely punctate, the eyes large; antennae with joints 3-10 each furnished with a moderately long ramus, the rami becoming gradually longer outwards, that on joint 10 nearly twice as long as that on joint 3. Thorax transverse, compressed at the sides anteriorly, obliquely narrowed (as seen from above) from about the middle to the apex, the sides and base sharply margined, the hind angles rounded, the anterior angles sharp and reaching to the middle of the eyes (when the head is in a vertical position); densely, rugulosely punctate, subgranulate on the disc towards the apex, the disc feebly canaliculate. Scutellum small. Elytra elongate, of the same width as the base of the thorax; regularly punctate-striate, the interstices narrow, feebly convex, and densely rugulose. Legs elongate, the tarsi fully as long as the tibiae.

Length 3, breadth 1 mm.

Hab. GUATEMALA, San Gerónimo in Baja Vera Paz (*Champion*).

One example only was obtained of this species, which is easily recognisable by its small size and black coloration, the thorax with a large rufous patch on each side. **P. mexicanus*, Pic [L'Echange, xvii, p. 95 (1901)], must be an allied form. It is described thus: "Allongé, subparallèle, peu brillant, revêtu d'une très fine pubescence grisâtre, entièrement noir y compris les antennes et les pattes, à l'exception seulement du labre et de la base des mandibules qui sont roussâtres; tête assez petite; antennes progressivement dentée à partir du 4^{me} article; prothorax court, fortement dilaté-arrondi en arrière, explané sur les côtes; élytres à peu près de la largeur du prothorax, très longs, faiblement striés. Long. 4-5 mill.—MEXIQUE, 'Sierra de Durango' (*coll. Pic*)."

CIOIDAE.

Cis.

Cis, Latreille, Préc. Car. Gen. Ins. p. 90 (1796); Gorham, Biol. Centr.-Am., Coleopt. iii, 2, pp. 220 (1883), 357 (1886).

Gorham enumerated sixteen species of this genus from Central America, three of which he did not name. One other is here added, received some time after his work was published.

**Cis M-nigrum*, n. sp.

Elongate, convex, shining; piceous, the elytra fusco-testaceous, with a common sharply-angulate, post-median, nigro-piceous fascia, the labrum, base of antennae, and legs testaceous; the entire upper surface densely, somewhat coarsely punctate, each puncture (seen under the microscope) bearing an excessively minute squamiform hair. Head broad, unarmed, the transverse, arcuate, inter-antennal groove deep, the epistoma very short, truncate in front; eyes small; antennae 10-jointed, 3 elongate, 4-7 small, the 3-jointed club moderately stout. Thorax ample, broader than long, longitudinally convex, a little narrower at the base than at the apex, rounded at the sides, the margins narrowly explanate and very prominent. Elytra about twice as long as the thorax, narrowed at the base and there considerably narrower than the latter.

Length $2\frac{1}{2}$, breadth 1 mm.

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Hab. MEXICO, Omilteme in Guerrero, 8,000 feet (*H. H. Smith*).

One specimen. This is so different from any of the previously known Mexican species of the genus that it is worthy of a name. The common angulate elytral fascia is somewhat M-shaped, as seen from above. *C. M-nigrum* has the general shape of the European *C. alni*. The Hawaiian *C. signatus*, Perkins, has somewhat similar elytral markings.

TENEBRIONIDAE.

CORTICEUS.

Corticeus, Piller and Mitterpacher, *Iter per Pos. Slav.* p. 87 (1783); Champion, *Biol. Centr.-Am., Coleopt.* iv, 1, p. 171 (1886).

Hypophloeus, Fabricius, in Schneider's *Neu Mag. Ent.* i, 1, p. 24 (1791).

Six species of this genus were recorded by myself from Central America in 1886. The one now added approaches *C. mexicanus*, Reitt.

**Corticeus sordidus*, n. sp.

Elongate, narrow, cylindrical, shining, testaceous, the eyes black. Head densely, finely punctate, the transverse frontal groove deep, the eyes very large and coarsely faceted; antennae with joints 6-11 very stout, 6-10 strongly transverse. Thorax convex, longer than broad, finely margined at the sides and base, the sides very feebly rounded and constricted immediately before the hind angles, the latter just visible; closely, minutely punctate. Elytra elongate, parallel, about as wide as the thorax; alutaceous, with rows of fine punctures, the interstices flat, each with a single irregular row of scattered punctures, which are very little smaller than those of the striae.

Length $3\frac{3}{4}$, breadth $\frac{7}{8}$ mm.

Hab. GUATEMALA, near the city (*Champion*).

This small species is very different from any of the other described Central American forms, and is more like some of the Palaearctic members of the genus (*C. linearis*, etc.) found in pines. The single example obtained was placed by mistake amongst our unnamed *Clavicornia*, and was thus overlooked.

LORELUS.

Lorelus, Sharp, Ent. Monthly Mag. xiii, p. 76 (1876).

The typical species of this genus were obtained in New Zealand, an Antillean form, *L. brevicornis*, Ch., having subsequently been added by myself (Trans. Ent. Soc. Lond. 1896, p. 14). Seven other tropical American representatives are now known to me; two of these, *L. rugifrons* and *L. trapeziderus*, approach *Lorelopsis* (type *L. pilosus*, Ch., from St. Vincent, Antilles), but they have a less developed penultimate tarsal joint. *L. priscus* has been found on tree ferns; *L. brevicornis* in rotten cacao-husks and stems of *Cissus*. It is probable that some of them are carried about in commercial products. The American forms may be tabulated thus:—

Thorax subquadrate, a little narrowed posteriorly; elytra parallel.

Thorax sharply margined laterally; body glabrous above.

Posterior tibiae of ♂ bowed *curvipes*, n. sp.

Posterior tibiae of ♂ simple *curticollis*, n. sp.

Thorax more finely margined laterally.

Species larger; body glabrous above.

Body somewhat depressed.

Eyes smaller; thoracic punctuation coarser; elytra more elongate . [brevicornis, Ch.]

Eyes larger; thoracic punctuation finer; elytra shorter *breviusculus*, n. sp.

Body more convex *angustulus*, n. sp.

Species very small, narrow; body pubescent above *exilis*, n. sp.

Thorax trapezoidal, much narrowed behind; elytra widened posteriorly; body pilose above.

Head rugosely punctate; antennae stouter; penultimate tarsal joint small, feebly lobed *rugifrons*, n. sp.

Head closely punctate; antennae not so stout, with more abrupt club; penultimate tarsal joint larger, lobed . . . *trapeziderus*, n. sp.

**Lorelus curvipes*, n. sp. (Plate IV, fig. 10, ♂)

Moderately elongate, rather convex, shining, glabrous; nigropiceous, the elytra fusco-castaneous, the antennae, palpi, legs, and

under surface in part, ferruginous; the upper surface closely, confusedly punctate, the punctures on the elytra much coarser than those on the head and thorax. Head transversely grooved in front; antennae moderately stout, reaching to a little beyond the base of the thorax, the last three joints abruptly widened. Thorax convex, transverse, slightly narrowed posteriorly, sharply margined and feebly crenulate at the sides, and also margined at the base, the anterior angles obtuse, the hind angles rectangular. Elytra a little wider than the thorax, moderately long, parallel in their basal half. Beneath very finely, the head and prosternum more coarsely, punctate. Legs short; posterior femora distinctly hollowed on the lower side near the apex; posterior tibiae in ♂ sinuate at the base and arcuately bowed thence to the apex.

Length 3 mm. (♂ ♀.)

Hab. GUATEMALA, Cerro Zunil, Pacific slope (*Champion*).

Two males and two females. Distinguishable from all its allies by the peculiarly formed posterior tibiae of the male. The posterior femora appear to be feebly dentate, owing to the slight hollowing of the lower surface near the tip.

**Lorelus curticolis*, n. sp.

Moderately elongate, somewhat depressed, feebly shining, glabrous; black or piceous, with the elytra wholly or in part (leaving a broad common dark sutural stripe) castaneous, and the antennae, palpi, and legs ferruginous, the legs in one example infuscate; the upper surface closely, confusedly punctate; the punctures coarse on the elytra and much finer on the head and thorax. Antennae rather stout, reaching to a little beyond the base of the thorax, the last three joints abruptly widened. Eyes rather small. Thorax transversely subquadrate, much broader than long, distinctly narrowed towards the base, sharply margined and crenulate at the sides, and also margined at the base, the hind angles subrectangular, the surface alutaceous. Elytra considerably wider than the thorax, parallel in their basal half, somewhat flattened on the disc. Beneath very finely, the head and prosternum more coarsely, punctate; prosternal process narrow. Legs short.

Length 3-4½ mm.

Hab. MEXICO, Cordova (*Sallé*); GUATEMALA, El Tumbador, Las Mercedes, Cerro Zunil (*Champion*); PANAMA, Volcan de Chiriquí (*Champion*).

Twelve examples, doubtless including both sexes, varying a good deal in size and colour. Very like *L. curvipes*, and

at first confused by me with that species; but differing from it in the less convex, duller, and more finely punctured thorax, the less convex elytra, and the simple posterior tibiae of the male. The thorax is more sharply margined at the sides than in *L. brevicornis*. The legs are shorter than in the New Zealand *L. priscus*, *crassicornis*, and *pubescens*. In the Fry collection at the British Museum there are two specimens that apparently belong to *L. curticollis*—one labelled “Pacific, N. Cal.” (? = New Caledonia), and the other (wholly rufo-testaceous in colour) “Brazil, Parana.”

**Lorelus brevisculus*, n. sp.

Moderately elongate, shining, glabrous, uniformly ferruginous; the upper surface closely, confusedly punctate, the punctures on the head and thorax rather fine, those on the elytra much coarser. Head rather convex, without definite groove in front; eyes large, transverse, somewhat prominent; antennae reaching the base of the thorax, joints 6–8 transverse, 8–11 much broader and stouter, together forming an abrupt club. Thorax rather convex, strongly transverse, narrowing posteriorly, narrowly margined at the sides and also distinctly margined at the base, the hind angles rectangular. Elytra comparatively short, a little wider than the thorax, subparallel in their basal half. Legs short.

Length $2\frac{1}{2}$ mm. (? ♀.)

Hab. PANAMA, Bugaba (*Champion*).

Two specimens. Closely related to *L. curticollis*, uniformly ferruginous in colour, the eyes larger, the thorax more finely punctate, the elytra less elongate, the surface a little more shining.

**Lorelus angustulus*, n. sp.

Elongate, narrow, rather convex, shining, glabrous, varying in colour from obscure castaneous with the humeri rufescent to entirely ferruginous; the upper surface closely punctate, the punctures on the elytra very coarse and confusedly arranged, those on the head and thorax finer. Head truncate and margined in front; antennae reaching to a little beyond the humeri, rather stout, the last three joints abruptly widened; eyes rather small. Thorax subquadrate, a little narrower at the base than at the apex, the sides finely margined and obsolete crenulate, the hind angles sharp, the anterior angles obtuse, the base finely margined. Elytra elongate, much wider

than the thorax, parallel in their basal half. Beneath coarsely and closely, the ventral segments sparsely and finely, punctate; prosternal process narrow.

Length $2\frac{1}{3}$ –3 mm. (? ♂.)

Hab. GUATEMALA, Livingston, Atlantic coast (*Barber and Schwarz, in U.S. Nat. Mus.*).

Four specimens. Two females found by Mr. Schwarz at Tampico, in N.E. Mexico, may belong to the same species; they are larger and broader than the others, and have the epistoma immarginate in front and the prosternal process broader. More convex than the Antillean *L. brevicornis*, Ch., the thorax subquadrate (♂), the eyes a little smaller. The simple posterior tibiae, etc., separate *L. angustulus* from *L. curvipes*. This insect might easily be mistaken for a Cryptophagid.

**Lorelus exilis*, n. sp. (Plate IV, fig. 11.)

Elongate, very narrow, depressed, shining, finely pubescent; varying in colour from piceous with the elytra castaneous to wholly rufo-testaceous; the upper surface densely, confusedly punctate, the punctures on the elytra a little coarser than those on the head and thorax. Head deeply transversely grooved behind the epistoma, the groove reaching the antennary orbits (in one specimen reduced to two lateral impressions); eyes small, rather prominent; antennae barely reaching the base of the thorax, joints 4–8 strongly transverse, 9–11 moderately widened. Thorax as long as broad, subquadrate, very narrowly margined, the sides obliquely constricted before the rectangular hind angles; the disc with a shallow, transverse, arcuate depression before the base, on either side of which a basal fovea is just traceable. Elytra elongate, a little wider than the thorax, subparallel in ♂, broader and slightly widened posteriorly in ♀. Legs very short.

Length $1\frac{7}{8}$ – $2\frac{1}{4}$ mm.

Hab. GUATEMALA, El Tumbador and Las Mercedes, Pacific slope (*Champion*), Trece Aguas in Alta Vera Paz (*Barber and Schwarz, in U.S. Nat. Mus.*).

Six examples, assumed to include both sexes. A very small, narrow, pubescent form, with the head transversely grooved across the front, the eyes small, and the thorax oblongo-quadrate. In the single specimen from Vera Paz the transverse frontal groove is interrupted at the middle.

[*Lorelus rugifrons*, n. sp.]

Elongate, shining, obscure ferruginous, the legs testaceous, clothed with long, fine, yellow hairs; the upper surface closely, confusedly punctate, the punctures on the elytra much coarser than those on the thorax, those on the head confluent. Head shallowly, transversely grooved behind the epistoma, the antennary orbits feebly developed; eyes transverse, rather small; antennae stout, barely reaching the base of the thorax, joint 3 longer and stouter than 2, 4-8 transverse, 9-11 moderately thickened. Thorax convex, trapezoidal, rather small, very narrowly margined, the anterior angles obtuse, the hind angles rectangular. Elytra moderately elongate, depressed, much wider than the thorax, widening posteriorly. Legs short.

Length 4 mm. (? ♀.)

Hab. BRAZIL, Rio de Janeiro (coll. Fry, in Mus. Brit.).

Two specimens. Distinguishable by the rugose head; the small antennary orbits; the stout antennae, with thickened third joint and moderately dilated club; the trapezoidal, convex, feebly margined thorax; and the pubescent, uniformly coloured surface. *L. rugifrons* approaches *Lorelopsis pilosus*, but it has the thorax much more widened anteriorly, the antennae stouter, and the penultimate joint of the tarsi smaller.]

**Lorelus trapeziderus*, n. sp. (Plate IV, fig. 12, ♀.)

Elongate, depressed, varying in colour from piceous to testaceous, shining, clothed with long fine yellow hairs; the upper surface closely confusedly punctate, the punctures on the elytra coarser than those on the head and thorax. Head transversely grooved in front, the antennary orbits well developed; eyes transverse; antennae moderately stout, joints 2 and 3 equal in length, 4-8 short, 9-11 abruptly widened. Thorax trapezoidal, nearly as long as broad, truncate in front, sharply margined at the sides and also feebly margined at the base, the anterior angles prominent, the hind angles rectangular. Elytra moderately elongate, a little wider than the thorax, widening posteriorly. Legs short; penultimate tarsal joint somewhat strongly lobed.

Length $3\frac{3}{4}$ -4 mm. (♀.)

Hab. GUATEMALA, Senahu in Alta Vera Paz (*Champion*), Trece Aguas (*Barber and Schwarz*, in *U.S. Nat. Mus.*).

Eight specimens. Differs from *L. rugifrons* in its less rugose, broader head; the prominent antennary orbits;

the more abrupt club of the antennae, with less thickened basal joints; the sharply margined, larger thorax; and the more strongly lobed penultimate tarsal joint, the insect in this respect more nearly approaching *Lorelopsis*.

OTHNIIDAE.

OTHNIUS.

Othnius, Leconte, Class. Col. N. Am., p. 103 (1861); Horn, Trans. Am. Ent. Soc. ii, p. 132 (1868); Champion, Biol. Centr.-Am., Coleopt. iv, 1, p. 466 (1888).

Six species of this genus from Central America were known to me in 1888; two others, one from Mexico, have since been found in the Fry collection.

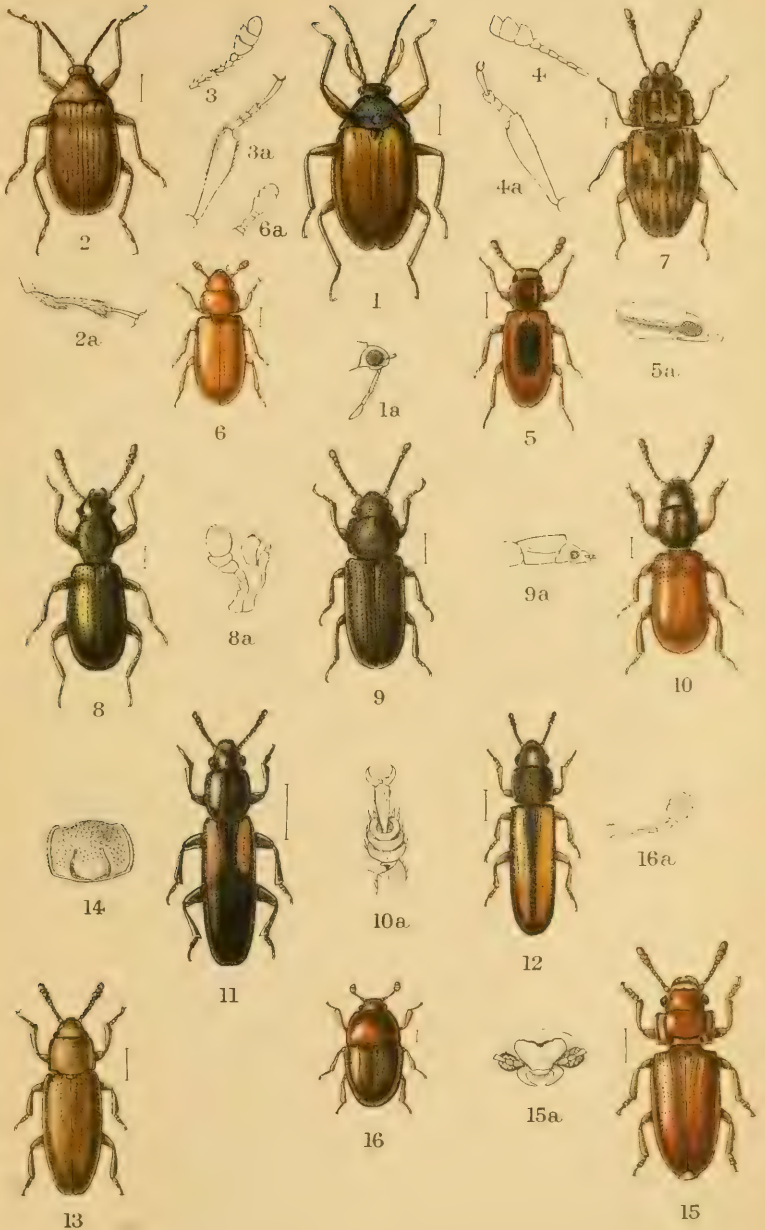
**Othnius immaculatus*, n. sp. (Plate IV, fig. 13, ♀.)

Elongate, depressed, shining, aeneo-piceous, the elytra brown, the antennae, palpi, and tarsi, and sometimes the under surface also, ferruginous, the femora and tibiae reddish-brown; thickly clothed with brownish hairs. Head, thorax, and elytra densely, rather coarsely punctate; antennae (♂) reaching the base of the thorax, and with the three widened terminal joints distinctly longer than broad, (♀) shorter and with the tenth joint transverse; head with the eyes slightly broader than (♂), or as broad as (♀), the thorax, the eyes very large; thorax a little broader than long, about equal in width at the base and apex, the sides rounded and unarmed, the marginal carina becoming obsolete towards the apex, the hind angles subrectangular; elytra long, wider than the thorax, subparallel in their basal half, the base depressed within the humeri. Beneath densely, minutely punctate, the coriaceous ventral sutures 1-4 very conspicuous.

Length $5\frac{1}{2}$ - $6\frac{1}{2}$, breadth $1\frac{1}{2}$ -2 mm. (♂ ♀.)

Hab. MEXICO (*Truqui*, in *Mus. Brit.*, ex coll. *Fry*).

Four specimens, the two with broader head and longer antennae (both injured by pinning) assumed to be males. This species and the following, *O. planatus*, differ from the known Central American forms in having the sides of the thorax completely unarmed and the upper surface of the body immaculate. *O. umbrosus*, Lec., from Nebraska, seems to be similarly coloured, but it is said to have the sides of the thorax feebly serrate.



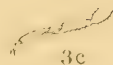
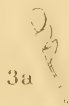
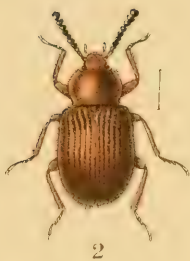
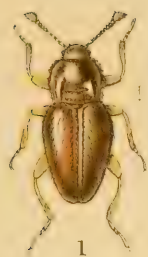
Edwin Wilson del. et lith.

EXPLANATION OF PLATE III.

- FIG. 1. *Psephenus palpalis*, ♂: 1a, profile of head, to show maxillary palpus.
2. *Psephenops grouvellei*, ♀: 2a, posterior tarsus, in profile.
3. *Cybocephalus aciculatus*: 3, antenna; 3a, anterior tibia and tarsus.
4. *Cybocephalus flavicornis*: 4, antenna; 4a, anterior tibia and tarsus.
5. *Pseudaulonium discolor*, ♂: 5a, profile of head and thorax.
6. *Tyrtaeus rufus*: 6a, antenna.
7. *Laemophloeus quadridentatus*, ♂.
8. *Salpingomimus deceptor*, ♂: 8a, maxilla and maxillary palpus.
9. *Truquiella gibbifera*, ♂: 9a, profile of head and thorax.
10. *Cleridopsis latimanus*, ♂: 10a, anterior tarsus.
11. *Hapalips perlongus*, ♂.
12. ,, *suturalis*, ♀.
13. ,, *obliteratus*.
14. ,, *sculpticollis*: thorax.
15. *Pseudhapalips lamellifer*, ♂: 15a, head from in front, to show vertical transverse ridge.
16. *Pseudevlocera atomarioides*: 16a, antenna.

EXPLANATION OF PLATE IV.

- FIG. 1. *Lycoperdinella subcaeca*: 1a, antenna; 1b, profile of head.
2. *Pseudescarcus villosus*.
3. *Micropsephodes serraticornis*: 3a, antenna; 3b, maxillary palpus; 3c, tarsus.
4. *Lioscymnus diversipes*: 4a, antenna; 4b, maxillary palpus.
5. *Microscymnus calvus*: 5, anterior leg; 5a, antenna; 5b, maxillary palpus.
6. *Eucymbolus cyaneus*.
7. *Trichodesma scripta*.
8. *Ptilinus sericeus*, ♂.
9. ,, *maculicollis*, ♂.
10. *Lorelus curvipes*, ♂.
11. ,, *exilis*.
12. ,, *trapeziderus*, ♀.
13. *Othnius immaculatus*, ♀.



1b

1a

3a

3c



4a



4



6

3b



3



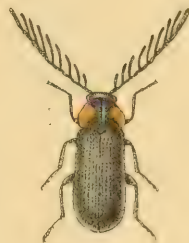
8



5



5a



9

5b



10



11



12



13

Edwin Wilson del. et lith.

**Othnius planatus*, n. sp.

Elongate, very depressed, moderately shining, nigro-piceous with a faint aeneous lustre, the labrum, palpi, and antennae ferruginous, the femora and tibiae reddish-brown, the tarsi rufo-testaceous; thickly clothed with fuscous hairs. Head and thorax very densely and finely, the elytra more coarsely and less closely, punctate; antennae barely reaching the base of the thorax, joints 9 and 11 moderately widened, 9 and 10 transversely subquadrate; head with the eyes as wide as the thorax, the eyes large; thorax transversely subquadrate, slightly narrowed posteriorly, longitudinally depressed on each side of the disc, the sides unarmed, the hind angles rectangular; elytra wider than the thorax, subparallel in their basal half.

Length 4, breadth $1\frac{1}{5}$ mm. (? ♀.)

Hab. MEXICO (*Truqui*, in *Mus Brit.*, ex coll. *Fry*).

One specimen. Smaller and still more depressed than *O. immaculatus*, the head and thorax very densely, finely punctate, the upper surface almost uniformly nigro-piceous, the elytra being very little paler than the thorax. *O. lugubris*, Horn, from Oregon, seems to be an allied form, with a more coarsely punctured thorax, the sides of which are armed with two indistinct teeth.

IV. *Descriptions of South American Micro-Lepidoptera*
By E. MEYRICK, B.A., F.R.S.

[Read December 4th, 1912.]

THE following genera and species are described from examples in my own collection. Five genera and sixty-one species are described as new.

PTEROPHORIDAE.

Pterophorus salticola, n. sp.

♂. 22-23 mm. Head brown, with a white fillet between antennae. Palpi $1\frac{1}{2}$, slender, white. Thorax brown, anterior half white. Abdomen whitish, infuscated towards base and in middle, sides with a brownish line towards base and tinged with pale yellow posteriorly. Forewings cleft to $\frac{2}{3}$, segments rather narrow, subequal, apex acutely pointed, termen of second segment very oblique; rather dark brown; a shining white streak along costa from its base to middle of first segment, interrupted by a dark brown bar opposite base of cleft; a short indistinct longitudinal streak of whitish suffusion in middle of disc; a shining white spot on base of cleft, extended into upper part of basal third of second segment: cilia whitish-ochreous, with brownish patches at apex and tornus, and on base of cleft. Hindwings grey; cilia ochreous-grey-whitish.

PERU, Chanchamayo; two specimens.

TORTRICIDAE.

MNESIPYRGA, n. g.

Head with tolerably appressed scales. Palpi moderate, curved, ascending, with appressed scales, terminal joint rather short. Thorax with large double posterior crest. Forewings with 3 from angle, 7 and 8 out of 9, 7 to termen. Hindwings without basal pecten; 3 and 4 stalked, 5 absent, 6 and 7 connate, 8 so closely approximated to cell on basal half as to appear coincident.

An interesting form, undoubtedly allied to *Pyrgotis*, yet very distinct.

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Mnesipyrga trichostota, n. sp.

♀. 18 mm. Head and thorax rather dark fuscous, face and palpi light brownish, thoracic crest brown. Abdomen dark grey. Forewings elongate-triangular, costa hardly arched, apex obtuse, termen slightly rounded, somewhat oblique; dark ashy-purple-fuscous, strewn with whitish-yellowish hair-scales, more densely towards termen, towards dorsum suffusedly mixed with brown; obscure undefined patches of darker suffusion in middle of disc, and on costa at $\frac{3}{4}$; a spot of whitish-ochreous suffusion on costa before apex: cilia fuscous mixed with whitish-ochreous, with a patch of whitish-ochreous suffusion on upper part of termen. Hindwings rather dark fuscous; cilia grey, outer half grey-whitish.

PERU, Chanchamayo; one specimen.

Atteria pavimentata, n. sp.

♂. 39 mm. Head blue-black, with whitish lateral stripes. Palpi 3, blue-black, upper and lower edges whitish. Thorax blue-black, with an orange spot on each side. Abdomen blackish, segmental margins whitish. Forewings oblong, costa anteriorly strongly arched, posteriorly nearly straight, apex obtuse, termen shortly sinuate beneath apex, vertical, rounded beneath; deep reddish-orange; an indigo-blue-black costal band, occupying about $\frac{1}{4}$ of wing throughout, cut by about fourteen slender yellow-whitish bars, of which about four beyond middle are partially incomplete or irregularly connected, rest entire; seven rounded-oblong blue-black spots along termen, three uppermost tending to be connected anteriorly and preceded by three other spots, of which the middle one is smaller and preceded by a fourth, all these spots separated with yellow-whitish; a series of about eleven small transverse blue-black spots along dorsum, a series of seven or eight small round blue-black spots beneath fold, two or three above fold beyond middle, one or two dots towards costal band before middle, and one before terminal band in middle: cilia blue-black barred with whitish. Hindwings deep reddish-orange; about ten moderate irregular black spots round apex and termen to tornus, three or four dots or small spots on or near costa posteriorly, one or two in disc posteriorly, and three or four towards tornus; cilia blackish, on upper part of termen with slight whitish bars.

PERU, Huancabamba; one specimen. This is a true *Atteria*, not *Pseudatteria*.

Cnephasia dryoglypta, n. sp.

♂ ♀. 14 mm. Head yellow-ochreous, sides brownish. Palpi moderate, ochreous-brownish, terminal joint short, whitish-ochreous. Thorax brownish-ochreous. Abdomen grey. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen gently rounded, somewhat oblique; brownish-ochreous; markings ochreous-brownish sprinkled with fuscous; an oblique transverse patch from dorsum before middle, and a triangular patch on dorsum beyond middle, these sometimes mixed with blackish; central fascia running from middle of costa to tornus, rather broad on upper half and broadly projecting in disc anteriorly, narrower on dorsal half; costal spot subquadrate, connected by an irregular streak with termen below middle; an irregular striga across apex: cilia light brownish-ochreous. Hindwings grey, lighter towards base; cilia grey-whitish, with light grey subbasal line.

ARGENTINA, Parana; two specimens.

Argyrotoxa melanophyta, n. sp.

♂. 16 mm. Head, palpi, thorax, and abdomen brownish-grey. Forewings elongate, costa gently arched, apex obtuse, termen nearly straight, oblique; light brownish, obscurely irrorated with grey-whitish specks, with faint indications of darker strigulae, and a few blackish scales in disc; a small black tuft beneath fold at $\frac{1}{4}$ of wing, and a minute one in disc above this; a blackish spot of raised scales about fold beneath middle of wing: cilia light brownish-ochreous. Hindwings grey, lighter anteriorly; cilia whitish-grey, darker towards base.

ARGENTINA, Tucuman; one specimen.

ARDEUTICA, n. g.

Palpi long, porrected, second joint triangularly rough-scaled, terminal joint moderate. Antennae in ♂ ciliated. Thorax with lateral and posterior erect crests. Forewings with tufts of scales, without costal fold; 3 and 4 stalked, 5 approximated, 7 to termen, 11 from middle. Hindwings without pecten; 3 and 4 connate, 5 parallel, 6 and 7 connate.

Type, *A. spumosa*. Allied to *Peronea*.

Ardeutica semipicta, n. sp.

♂. 23 mm. Head ochreous-grey-whitish. Palpi fuscous, above whitish. Thorax brownish-ochreous. Abdomen rather dark fuscous. Forewings suboblong, costa anteriorly strongly, posteriorly slightly arched, apex obtuse, termen slightly sinuate, rather oblique; fuscous; a large yellow-ochreous patch, mixed with ferruginous, with a few dark fuscous scales, occupying whole wing anteriorly except towards costa, and limited posteriorly by an obscure cloudy rather excurved whitish line running from $\frac{2}{5}$ of costa to tornus, more broadly suffused towards costa; a curved oblique-transverse ridge of scales within this patch before middle of wing, and some other scattered smaller tufts: cilia fuscous, beneath tornus pale ochreous. Hindwings rather dark fuscous; cilia fuscous.

BRAZIL, Petropolis; one specimen. Thorax without apparent crest, but possibly abraded; structure otherwise conforms to type.

Ardeutica spumosa, n. sp.

♂. 26 mm. Head and thorax white, crests tinged with fuscous. Palpi fuscous. Abdomen light fuscous. Forewings oblong, costa anteriorly strongly, posteriorly hardly arched, apex obtuse-pointed, termen faintly sinuate, rather oblique; bronzy-fuscous, partially suffused with light purplish-grey; a broad whitish-ochreous streak edged with white from base of dorsum, reaching costa at $\frac{1}{3}$, thence narrower and curved downwards through middle of disc to costa just before apex; a white line runs from this streak in disc nearly to tornus; four or five tufts towards costa anteriorly, three beneath fold, and several in disc posteriorly: cilia light fuscous, suffusedly barred with darker bronzy-fuscous. Hindwings fuscous, paler anteriorly; a long hairpencil lying in submedian groove from base; cilia light fuscous, becoming pale greyish-ochreous towards dorsum.

PERU, Huancabamba; one specimen.

EUCOSMIDAE.

Laspeyresia guttifera, n. sp.

♂. 15 mm. Head and palpi fuscous. Thorax rather dark lilac-fuscous. Abdomen dark fuscous. Forewings elongate, rather dilated posteriorly, costa slightly arched, apex rounded, termen rounded, little oblique, somewhat indented in middle; rather dark

purplish-fuscous; eight small blackish spots on costa between $\frac{1}{3}$ and apex, first six separated by pairs of short obscure whitish strigulae suffused beneath with ochreous-orange, first, third, and fifth of these pairs giving rise to short very oblique blue-leaden-metallic strigae, partially edged with ochreous-orange, last three spots separated by ochreous-orange interspaces; apical margin irregularly ochreous-orange; tornal area irregularly marked with ochreous-orange, enclosing a thick purplish-leaden-metallic transverse streak, beyond upper part of which is a black dot towards middle of termen: cilia purplish-fuscous. Hindwings dark fuscous; cilia light grey.

PARAGUAY; one specimen.

GELECHIADAE.

CRAMBODOXA, n. g.

Head loosely rough-haired on crown (somewhat injured); tongue short. Antennae $\frac{3}{4}$, in ♂ moderately ciliated, basal joint moderate, without pecten. Labial palpi long, curved, ascending, second joint rather short, thickened with scales, in ♂ with very long expansible projecting apical pencil of very fine hairs above, terminal joint in ♂ much longer than second, thickened with appressed scales, hardly pointed. Maxillary palpi imperceptible. Posterior tibiae clothed with long fine hairs above. Forewings with 2 from $\frac{1}{4}$, 3 from angle, 7 and 8 stalked, 7 to costa, 9 absent, 11 from $\frac{3}{4}$ of cell. Hindwings 1, elongate-trapezoidal, termen faintly sinuate beneath apex, cilia 1; 2 widely remote, 3-5 slightly approximated towards base, 6 and 7 parallel.

Probably related to *Polyhymno*.

Crambodoxa platyaula, n. sp.

♂. 23 mm. Head white. Palpi rather dark fuscous, hairpencil and apex of second joint white. Thorax fuscous, patagia white. Abdomen grey. Forewings elongate, very narrow, costa nearly straight, towards apex moderately arched, apex obtuse, termen very obliquely rounded; brownish, dorsum and anterior half of costa suffused with darker brown; a broad silvery-white supra-median streak from base to apex, edged beneath with blackish-brown, lower edge angular-prominent in middle, whence a streak of blackish-brown suffusion runs to tornus: cilia pale brownish, somewhat mixed with whitish, with two undefined interrupted

dark fuscous lines, at apex with a white bar. Hindwings grey; cilia whitish-ochreous.

COLOMBIA, San Antonio, 5,800 feet, in November; one specimen.

Anisoplaca praesignis, n. sp.

♀. 30 mm. Head, palpi, and thorax pale greyish-ochreous, shoulders fuscous; palpi with scales of second joint brushlike beneath, not tufted, terminal joint considerably thickened with scales. Antennae light greyish-ochreous, towards base dark fuscous. Forewings elongate, very narrow, costa slightly arched, apex rounded-obtuse, termen obliquely rounded; light greyish-ochreous with a faint pinkish tinge, faintly strigulated with grey; first discal stigma indicated by a minute linear fuscous mark with two or three blackish scales; a small roundish blackish apical spot: cilia light greyish-ochreous. Hindwings bronzy-grey; cilia light grey.

PERU, Chanchamayo; one specimen. Agrees exactly in structure with the single New Zealand species, except in details of palpi as specified, and is also very similar superficially.

Trichotaphe macrosphena, n. sp.

♂. 18 mm. Head bronzy-fuscous. Palpi dark fuscous, second joint with dense rough projecting scales beneath, and triangularly projecting long rough scales above, terminal joint ochreous-whitish except base and anterior edge. Thorax dark purple-fuscous. Abdomen fuscous, anal tuft whitish-ochreous. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa gently arched, apex obtuse, termen straight, somewhat oblique; dark ashy-fuscous; a pale ochreous costal streak from base to $\frac{2}{3}$, with some scattered dark fuscous scales, on costal edge brownish, rather wide at base and dilated to before middle of disc, where it reaches more than half across wing, thence attenuated to extremity, edged beneath throughout by a streak of dark brown suffusion; second discal stigma transverse, suffused, dark brownish; a slightly incurved dark brown suffused transverse line at $\frac{3}{4}$. Hindwings rather dark fuscous; cilia fuscous.

BRAZIL, Sao Paulo; one specimen.

Trichotaphe themelia, n. sp.

♂. 17 mm. Head pale brownish-ochreous. Palpi ochreous-whitish, second joint dark fuscous except apex, above with rough

projecting scales towards apex. Antennal ciliations 1. Thorax light fuscous. Abdomen grey. Forewings elongate, rather narrow, costa gently arched, apex rounded-obtuse, termen slightly rounded, somewhat oblique; rather dark purplish-fuscous; a pale brownish-ochreous patch occupying costal half of wing from base to $\frac{3}{4}$, indented by a large irregular-trapezoidal blackish blotch from dorsum before middle reaching $\frac{2}{3}$ across wing, and an irregular trilobed blackish blotch in disc at $\frac{2}{3}$. Hindwings and cilia fuscous.

BRAZIL, Sao Paulo; two specimens.

Trichotaphe meconitis, n. sp.

♂. 14 mm. Head and palpi fuscous, second joint of palpi compressed, thickened, with scales somewhat rough towards apex above. Thorax rather dark fuscous, patagia pale ochreous. Abdomen greyish-ochreous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, apex rounded-obtuse, termen slightly rounded, somewhat oblique; fuscous, slightly purplish-tinged; some whitish-ochreous suffusion towards base of dorsum, above which is a short dark fuscous dash; discal stigmata undefined, dark fuscous, each followed by a pale ochreous dot; plical stigma represented by an elongate blackish dash, edged beneath with whitish-ochreous; veins posteriorly partially marked with ferruginous-brownish lines and scattered blackish scales; a patch of whitish-ochreous irroration extending from costa before apex downwards to disc; a terminal series of cloudy blackish dots edged anteriorly with whitish-ochreous; cilia fuscous with two whitish-ochreous shades. Hindwings light fuscous; cilia whitish-ochreous, with light fuscous subbasal line.

ARGENTINA, Parana; one specimen.

Trichotaphe memnonia, n. sp.

♀. 15 mm. Head, thorax, and abdomen dark ashy-fuscous. Palpi ochreous-whitish, second joint externally suffused with purplish-fuscous, anteriorly dark fuscous, above with triangularly projecting rough scales towards middle, terminal joint with anterior edge blackish. Forewings elongate, narrow, posteriorly somewhat dilated, costa sinuate in middle, arched posteriorly and appearing bent at $\frac{3}{4}$ through cilia, apex pointed, termen concave, rather oblique; dark ashy-purplish-fuscous; markings bronzy-blackish; an oblique transverse bar in disc at $\frac{1}{2}$, not reaching margins; a broad cloudy transverse median fascia; a moderately broad fascia

from $\frac{1}{2}$ of costa to tornus; a narrow terminal fascia: cilia purplish-fuscous, on basal half obscurely barred with whitish. Hindwings dark fuscous; cilia grey, basal third darker.

BRAZIL, Petropolis; one specimen.

OECOPHORIDAE.

STRUTHOSCELIS, n. g.

Head with dense loosely appressed hairs, sidetufts spreading; ocelli present; tongue roughly scaled. Antennae over 1, in ♂ serrate, shortly and unevenly ciliated, basal joint stout, thickened with scales, without pecten. Labial palpi very long, recurved, second joint thickened with scales, terminal joint somewhat longer than second, scaled, acute. Maxillary palpi very short, drooping, loosely scaled. Anterior and middle tibiae and first joint of tarsi densely tufted with long rough projecting hairscales above, posterior tibiae very long, densely rough-haired beneath and on basal half above, tarsi excessively long, rough-haired beneath towards base. Forewings with cell very short, lower margin strongly retracted, secondary cell strongly developed, 2 and 3 long-stalked from angle, 4 absent, 5 somewhat approximated, 6 parallel, 7 and 8 stalked, 7 to apex, 9 absent, 10 from towards angle, 11 from middle. Hindwings 1, elongate-ovate, cilia $\frac{1}{2}$; 3 and 4 stalked, 5-7 parallel.

Probably allied to *Cryptolechia*, but highly modified. The peculiar distortion of the veins in the forewings may perhaps be due to the alteration of stress involved in the excessive development of the posterior legs.

Struthoscelis acrobatica, n. sp.

♂. 23-24 mm. Head and palpi ochreous-whitish. Thorax ochreous-whitish sprinkled with pale greyish-ochreous. (Abdomen broken.) Posterior legs whitish, tarsi suffused with greyish towards base, tibiae 8 mm., tarsi 12 mm. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; ochreous-whitish, irregularly clouded with light greyish-ochreous, especially on several indefinite patches in disc, a streak along dorsum, and towards termen; a patch of fuscous suffusion in disc at $\frac{2}{3}$ below middle: cilia white, on basal half obscurely barred with pale whitish-ochreous suffusion. Hindwings light grey; cilia whitish.

PERU, Chanchamayo; two specimens.

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Coptotelia orthochaeta, n. sp.

♂. 23 mm. Head and thorax dark brown, scales of crown forming an erect ridgelike tuft, posterior edge of thorax yellow marked with crimson. Palpi with second joint very long, thickened with scales gradually expanded towards apex, crimson-fuscous sprinkled with blackish and ochreous-whitish, terminal joint $\frac{1}{3}$ of second, ochreous-whitish suffused with deep crimson towards base, without perceptible projection. Abdomen pale greyish-ochreous. Forewings moderately broad, suboblong, costa anteriorly rather strongly arched, slightly sinuate beyond middle, apex obtuse, termen almost straight, vertical; 7 to termen, 9 separate; dark brown, somewhat mixed with blackish-grey irroration tending to form suffused strigulae, costal edge blackish; dorsum marked with crimson suffusion towards base; obscure dots of crimson suffusion in disc at $\frac{1}{5}$, and on fold beyond this; stigmata represented by suffused crimson spots, plical beyond first discal, second discal largest; small white wedgeshaped costal spots at $\frac{2}{5}$ and $\frac{3}{5}$, and three white costal dots posteriorly: cilia dark brown, tips ochreous-whitish from apex to near tornus. Hindwings pale whitish-ochreous, posterior half suffused with pale brownish; cilia pale brownish, more whitish towards tips round apex.

PERU, Huancabamba; one specimen. Allied to *amphicrena*, but that species is without the crimson spots.

Coptotelia oligarcha, n. sp.

♂. 21 mm. Head and thorax light fuscous. Palpi light fuscous suffused with pink and slightly sprinkled with blackish, second joint thickened with dense scales triangularly projecting above towards middle, apex suffused with blackish, terminal joint half second, thickened with scales, with large posterior median scale-projection, suffused with blackish except at tip and towards base. Abdomen dark grey. Forewings moderately broad, suboblong, costa anteriorly strongly, posteriorly slightly arched, apex rounded-obtuse, termen rounded, rather oblique; 7 to apex, 9 separate; pinkish-brown, irregularly mixed with dark grey; costa narrowly suffused with ochreous-yellowish except towards base, costal edge fuscous towards base, whitish posteriorly; stigmata blackish, plical beyond first discal, second discal placed in a round rosy-pink spot; a curved row of small blackish-grey spots partly suffused and confluent near termen, and a terminal series of cloudy blackish dots: cilia pale brownish, round apex suffused with dark grey. Hindwings dark grey; cilia whitish-grey, with grey subbasal shade.

PERU, Huancabamba; one specimen.

Coptotelia vexillata, n. sp.

♂. 21–22 mm. Head, palpi, and thorax ochreous-yellow mixed with bright crimson, second joint of palpi fuscous-crimson except towards apex, scales somewhat expanded above towards apex, terminal joint somewhat more than half second, thickened posteriorly with dense rather projecting scales except towards apex. Abdomen dark grey, anal tuft grey-whitish. Forewings rather broad, oblong, costa anteriorly strongly arched, posteriorly straight, apex obtuse, termen rounded, nearly vertical; 7 to termen, 9 separate; brown tinged with purple, dorsal edge sometimes suffused with dark purplish-fuscous; an elongate deep yellow patch suffusedly mixed with bright crimson extending from base of dorsum along costa to middle and thence projecting downwards to end of cell, marked with purplish-fuscous towards base of costa and twice interrupted posteriorly; first discal stigma indistinct, blackish; costal edge white for a short distance towards $\frac{2}{3}$, edged beneath with rosy suffusion: cilia dark grey, round apex brown tipped with rosy-whitish. Hindwings dark fuscous; cilia grey, basal half fuscous.

PERU, Chanchamayo, Huancabamba; two specimens.

Coptotelia cyathopa, n. sp.

♂. 22 mm. Head yellowish mixed with crimson, with dense projecting frontal scales. Palpi light crimson sprinkled with dark fuscous, apex of joints yellowish, terminal joint $\frac{2}{3}$ of second, thickened with rather projecting scales posteriorly except towards apex. Thorax fuscous, tinged with pinkish. Abdomen ochreous-whitish. Forewings moderately broad, posteriorly dilated, costa moderately arched, apex obtuse, termen slightly sinuate, somewhat oblique; 7 to termen, 9 out of 7; yellow, streaked with crimson-red on veins; a rather dark purplish-fuscous streak edged with crimson from base of dorsum along costa to $\frac{1}{3}$, thence bent abruptly down to middle of disc and again angulated upwards to costa beyond middle, discal angle truncate, preceded and followed by round semitransparent white spots edged with crimson, and sending a slender streak to dorsum at $\frac{1}{3}$, dilated on dorsum; a rather dark fuscous transverse mark in disc at $\frac{1}{4}$; a slender curved crimson streak mixed with fuscous running from extremity of costal streak to a spot of dark fuscous suffusion above dorsum towards tornus; costal edge shortly white beyond this; a moderate lilac-brown fascia running round apical portion of costa and termen to tornus, its costal portion including three small spots of crimson and yellow: cilia rather dark fuscous, on termen with outer half spotted with

crimson and yellowish, mixed in middle with whitish, on costa with a patch of crimson towards apex. Hindwings whitish, on posterior half tinged with yellowish, and towards upper half of termen with pale rosy; cilia whitish, faintly rosy-tinged.

COLOMBIA, San Antonio, 5,800 feet, in November; two specimens.

Coptotelia prominula, n. sp.

♂. 19–20 mm. Head pale yellowish mixed with crimson, with strong projecting frontal tuft. Palpi pale yellowish irrorated with crimson and dark fuscous, scales of second joint somewhat expanded at apex above, terminal joint half second, thickened with projecting scales posteriorly except towards apex, which is whitish. Thorax fuscous, more or less mixed with crimson posteriorly. Abdomen whitish. Forewings moderately broad, posteriorly dilated, costa moderately arched, apex obtuse, termen rather oblique, rounded-prominent on vein 4, concave between this and apex; 7 to termen, 9 out of 7; crimson, suffusedly spotted with yellow between veins; a rather dark lilac-fuscous band along costa from base to $\frac{2}{3}$, thence abruptly bent down to middle of disc, and again angulated to costa beyond middle, its median section including a subcostal spot of groundcolour, and an oval semitransparent white crimson-edged spot in disc; costal edge shortly white before middle and at $\frac{3}{4}$; dorsal area more or less spotted indistinctly with fuscous, sometimes with a streak from disc to dorsum at $\frac{1}{3}$; an oval semitransparent white spot in disc beyond the dark band, followed by three round similar spots placed transversely, median one smallest, and a narrow oblique similar spot beneath discal extremity of band; a broad rather dark lilac-fuscous terminal fascia extending to costa, connected above by two cloudy oblique streaks with costal band, below middle with a broad projection occupied by a blotch of blackish suffusion; three pale yellow dots on costa within this fascia: cilia ochreous barred with white, basal third dark brown, at apex, middle, and tornus with dark fuscous spots. Hindwings whitish, faintly tinged with yellowish and towards dorsum with rosy; a broad light brown terminal fascia not reaching tornus; cilia fuscous, towards tips whitish, round dorsum and tornus wholly whitish.

COLOMBIA, Naranjito, R. Dagua, 3,900 feet, in June; two specimens.

Coptotelia chaldaica, n. sp.

♂. 19 mm. Head pale ochreous-yellowish, face sprinkled with fuscous, crown posteriorly mixed with crimson. Palpi pale yellowish sprinkled with crimson and dark fuscous, terminal joint somewhat more than half second, thickened with scales but without distinct projection, apex whitish. Thorax whitish-ochreous suffusedly mixed with light rosy, shoulders fuscous. Forewings moderately broad, posteriorly somewhat dilated, costa moderately arched, apex obtuse, termen faintly sinuate, little oblique; 7 to termen, 9 separate; pale ochreous-yellowish, suffusedly reticulated with crimson; a brown streak along basal $\frac{2}{3}$ of costa; an irregular brown streak from beyond middle of costa to before middle of dorsum, preceded and followed in disc by round semitransparent silvery-white spots, second followed by a smaller similar spot; a lilac-brown terminal fascia, enclosing a pale yellowish praeapical spot, and on lower half broadly dilated and marked anteriorly with a suffused spot of blackish irroration. Hindwings whitish, apical fourth very pale rosy-ochreous.

ARGENTINA, Parana, in September; one specimen.

STENOMIDAE.

Antaeotricha nuclearis, n. sp.

♂. 25-26 mm. Head whitish, crown partially tinged with fuscous. Palpi whitish, second joint tinged with grey, with a dark grey lateral streak, terminal joint shorter than second, extreme base dark grey. Thorax whitish irregularly mixed with fuscous and dark fuscous, crest dark fuscous. Abdomen ochreous-whitish. Forewings elongate, rather narrow, widest in middle, costa gently arched, apex rounded, termen rounded, little oblique; white, dorsal half suffused with pale fuscous, obscurely spotted with darker; a fuscous basal patch occupying $\frac{1}{4}$ of wing, irregularly spotted with blackish irroration, terminated on dorsum by a ferruginous mark; a faint pale fuscous cloud towards costa in middle; second discal stigma represented by a triangular-crescentic blackish mark, surrounded posteriorly by a semicircle of five cloudy dots of blackish irroration, fourth tinged with yellowish; apical area beyond second discal stigma wholly suffused with light fuscous and sprinkled with blackish, crossed by a nearly straight whitish line from a triangular spot on costa at $\frac{2}{3}$ to tornus: cilia white, basal half spotted with fuscous suffusion. Hindwings whitish-fuscous, becoming light fuscous posteriorly; costa anteriorly broadly dilated

and tufted with grey and white projecting scales towards $\frac{1}{3}$, above with long dark grey hairpencil from base lying in a subcostal groove, clothed with whitish hairs; cilia whitish, basal third pale fuscous.

PERU, Chanchamayo; two specimens.

AGRIOPHARA, Ros.

I propose to maintain this as a distinct genus from *Stenoma*, differing from it by the possession of more or less developed tufts or ridges of raised scales on the disc of forewings; it is a natural division, and its separation will assist the comprehension of this extensive group. It includes *morbida* Zell., *acronitis* Busek, *mendoron* Busck, *epophrysta* Meyr., *monastra* Meyr., *inscita* Busck, *gemina* Zell., *tritupa* Meyr., and other South American species, besides the group of Australian species on which it was originally founded.

Agriophara discors, n. sp.

♂. 23 mm. Head lilac-fuscous, face mixed with ochreous and whitish. Palpi fuscous, terminal joint shorter than second. Thorax fuscous, posteriorly mixed with ferruginous-ochreous. Abdomen fuscous, median third whitish-ochreous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa anteriorly slightly arched, faintly sinuate beyond middle, apex rounded, termen rounded, little oblique; lilac-fuscous, mixed with brown, with some scattered blackish scales; several tufts of scales on or near fold anteriorly; two oblique obtusely angulated series of brown tufts crossing wing from before middle of costa to $\frac{3}{4}$ of dorsum, first including in disc a small blackish-mixed spot partially outlined with whitish; beyond these the terminal third of wing is wholly ochreous-white, crossed by a strongly sinuate line of grey dots from a small spot on costa to tornus, a cloudy grey dentate line near termen, and a series of minute indistinct blackish dots suffused with ferruginous-ochreous just before termen: cilia grey, towards tornus whitish. Hindwings grey, apical margin suffused with whitish; cilia grey, towards tips whitish-tinged.

PERU, Chanchamayo; one specimen.

Agriophara batrachopis, n. sp.

♂. 34 mm. Head and thorax whitish mixed with light olive-brownish. Palpi stout, white, basal $\frac{2}{3}$ of second joint dark fuscous, terminal joint little more than half second, base and an anterior

spot beneath apex dark fuscous. Antennal ciliations $1\frac{2}{3}$. Abdomen dark grey. Forewings moderately broad, slightly dilated posteriorly, costa slightly arched, apex rounded, termen rounded, little oblique; pale dull olive-ochreous mixed with whitish; four dull olive-ochreous fasciae mixed with fuscous, appearing greenish-tinged, first at $\frac{1}{4}$, slender, irregular, second reduced to costal, discal, and submedian spots, third from $\frac{3}{4}$ of costa to before tornus, very narrow between a costal blotch and middle, fourth terminal on lower half and forming four praeterterminal spots on upper half; second discal stigma forming an oblique black transverse mark; a transverse tuft of scales in disc near before this, and another on fold before middle: cilia olive-ochreous sprinkled with fuscous, with dark fuscous antemedian line, barred with whitish on upper part of termen. Hindwings dark grey; cilia grey, with dark grey subbasal shade.

PERU, Chanchamayo, 3,500 feet; one specimen.

Agriophara forcipata, n. sp.

♂. 23 mm. Head and thorax whitish, thoracic crest mixed with dark fuscous. Palpi whitish, lower $\frac{2}{3}$ of second joint dark fuscous, terminal joint $\frac{2}{3}$ of second, base and apex suffused with dark fuscous. Antennal ciliations $2\frac{1}{4}$. Abdomen whitish-ochreous. Forewings moderate, costa gently arched, apex rounded-obtuse, termen rounded, somewhat oblique; white, sprinkled with brown and a few black scales; brown costal spots at $\frac{1}{5}$ and $\frac{2}{3}$, and a larger one at $\frac{3}{4}$; a small subcostal tuft of black and brown scales beyond first of these; a brown median longitudinal streak from base to end of cell, where it expands into a brown cloud surrounding posteriorly the blackish white-centred second discal stigma, first discal stigma black, placed on upper edge of this streak; a rather irregular series of indistinct blackish dots suffused with brown from third costal spot to before tornus, and a row of more distinct blackish dots near termen: cilia whitish-ochreous, basal half chequered with light brownish. Hindwings and cilia ochreous-whitish.

COLOMBIA, Naranjito, R. Dagua, 3,900 feet; one specimen.

Agriophara ptilopa, n. sp.

♂ ♀. 22-26 mm. Head and thorax whitish-fuscous. Palpi whitish mixed with grey, second joint with a dark fuscous lateral streak on basal $\frac{2}{3}$, terminal joint somewhat over half second, base and a subapical ring suffusedly dark fuscous. Antennal ciliations $2\frac{1}{4}$. Abdomen dark grey. Forewings moderate, posteriorly slightly dilated, costa gently arched, apex rounded-obtuse, termen rounded,

somewhat oblique; pale fuscous sprinkled with dark fuscous; a short oblique dark fuscous line from base of costa; four transverse series of blackish-fuscous dots sometimes connected by fuscous suffusion, angulated in disc, fourth very near apical portion of costa and termen; plical and second discal stigmata raised, whitish, edged with dark fuscous, forming the angles of first and second series respectively; fourth series sometimes preceded and followed by a series of suffused whitish spots: cilia pale fuscous, basal half whitish spotted with fuscous. Hindwings dark fuscous; cilia whitish-fuscous, with two dark fuscous shades.

COLOMBIA, San Antonio, 5,000 feet, in November; five specimens.

Agriophara lithograptæ, n. sp.

♂. 25 mm. Head, palpi, and thorax ochreous-white, palpi with lower half of second joint dark fuscous, terminal joint $\frac{2}{3}$ of second, with a few grey specks, thorax sprinkled with greyish-ochreous. Antennal ciliations 2. Abdomen grey. Forewings elongate, posteriorly somewhat dilated, costa gently arched, apex rounded-obtuse, termen rounded, little oblique; ochreous-white, sprinkled with light greyish-ochreous; three small blackish spots on costa at $\frac{1}{4}$, before middle, and at $\frac{2}{3}$; first discal stigma small, black, with an arched pale greyish-ochreous cloud adjacent to it beneath; plical and second discal represented by white transverse ridge-tufts, latter followed by a round pale greyish-ochreous cloud; a rather curved cloudy waved pale greyish-ochreous line from third costal spot to tornus, and a similar line between this and termen; two cloudy dark fuscous dots on costa posteriorly: cilia white, towards base with a few greyish-ochreous specks. Hindwings grey; cilia white, basal third light greyish-ochreous.

PERU, Chanchamayo; one specimen.

Agriophara chlorosticta, n. sp.

♂. 30 mm. Head brown. Palpi fuscous, terminal joint $\frac{2}{3}$ of second, rather densely scaled, extreme apex whitish. Antennal ciliations $1\frac{1}{2}$. Thorax very stout, fuscous with a few olive-greenish scales, collar and thoracic crest brownish. Abdomen stout, grey. Forewings moderate, costa gently arched, apex rounded-obtuse, termen rounded, little oblique; ashy-fuscous, longitudinally streaked with darker fuscous, these streaks running into costa anteriorly; a short fine greenish dash towards costa at $\frac{1}{3}$; two small greenish spots obliquely placed towards dorsum before middle; a submarginal row of greenish dots running near and parallel to posterior half of

costa and termen; a row of small brown marginal spots round apex and termen: cilia purplish-fuscous, with three darker lines. Hindwings dark fuscous; cilia grey, with darker subbasal line.

PERU, Chanchamayo; one specimen.

Agriophara truncatula, n. sp.

♂ ♀. 15-17 mm. Head whitish-ochreous, sides of crown brownish. Palpi whitish, second joint brown on basal half, with a dark brown subapical ring, base of terminal joint dark brown. Antennal ciliations in ♂ 3. Thorax ochreous-whitish, patagia brown. Abdomen whitish-grey. Forewings elongate, costa strongly arched towards base, slightly sinuate in middle, apex obtuse, termen straight, somewhat oblique; pale ochreous, sometimes brownish-tinged on dorsal half; a small suffused brown basal patch, darker and more defined towards costa; three oblique dark brown marks on costa between this and middle; an irregular brown fascia at $\frac{3}{4}$, on costal half irregularly dilated anteriorly and edged posteriorly with whitish, on dorsum preceded by a suffused blackish spot; disc sometimes marked with indistinct longitudinal brownish lines; a tuft of scales on fascia indicating second discal stigma; terminal area sometimes sprinkled with dark fuscous; a suffused brown streak along posterior part of costa and termen, sometimes obscurely spotted with dark fuscous or blackish: cilia whitish-ochreous mixed with grey and fuscous, on termen with two dark fuscous shades. Hindwings in ♂ pale greyish, in ♀ grey; cilia whitish-grey, with grey subbasal line.

VENEZUELA, Ciudad Bolivar, in May; four specimens.

Stenoma amphiptera, n. sp.

♂. 25 mm. Head whitish, centrally suffused with fuscous. Palpi white, second joint fuscous except apex, terminal joint mixed with fuscous anteriorly. Antennal ciliations $\frac{3}{2}$. Thorax dark fuscous, patagia forming long raised tufts tipped with whitish. Abdomen dark grey. Forewings elongate, posteriorly somewhat dilated, costa gently arched, faintly sinuate in middle, apex rounded-obtuse, termen slightly rounded, hardly oblique; dark purplish-fuscous; a light brownish blotch occupying basal fourth of costa, crossed near base by a dark fuscous shade, terminated posteriorly by a small black costal mark, and including a blackish dash in its lower portion; two ochreous-whitish dots above and below fold at $\frac{1}{4}$; a white dot indicating plical stigma, and an ochreous-whitish ring resting on dorsum beneath this; an indistinct very oblique brownish line from a slight whitish mark on costal edge

beyond basal blotch to an obscure brownish cloud in disc beyond middle, followed on costa by a very narrow flattened-triangular blackish mark; a whitish mark on costa at $\frac{2}{3}$, and a group of fine whitish dots beneath this; traces of a curved series of darker dots accompanied with some whitish scales running from these to tornus; a suffused brownish streak round apical margin; some indistinct whitish terminal dots separated by darker spots: cilia dark fuscous, tips whitish. Hindwings rather dark fuscous; cilia fuscous, tips whitish.

PERU, Chanchamayo; one specimen.

Stenoma glaphyroides, n. sp.

♀. 26-27 mm. Head whitish, crown posteriorly suffused with grey. Palpi white, second joint with a dark fuscous lateral streak towards base, terminal joint suffused with grey towards apex. Thorax grey, patagia yellow-ochreous except towards shoulders. Abdomen grey. Forewings elongate, widest beyond middle, costa strongly arched, apex rounded, termen rounded, little oblique; glossy light greyish-ochreous; costal edge whitish; a transverse blotch of blackish suffusion on dorsum before middle, reaching to submedian fold; sometimes a faint spot of fuscous suffusion towards dorsum before tornus: cilia whitish-ochreous. Hindwings rather light grey; cilia pale greyish.

FRENCH GUIANA, St. Laurient; BRAZIL, Iquitos; two specimens.

Stenoma capnobola, n. sp.

♀. 26 mm. Head and thorax light fuscous, face ochreous-whitish. Palpi ochreous-white, second joint grey laterally on basal $\frac{2}{3}$, base of terminal joint grey. Abdomen grey. Forewings elongate, costa moderately arched, apex rounded, termen rounded, somewhat oblique; glossy pale fuscous; costal edge whitish-ochreous; a small suffused rather dark purplish-fuscous spot towards dorsum beyond middle: cilia ochreous-whitish, suffused with pale fuscous towards base. Hindwings grey; cilia whitish-grey.

DUTCH GUIANA, Paramaribo; one specimen.

Stenoma actista, n. sp.

♀. 33-34 mm. Head pale fuscous. Palpi fuscous-whitish, second joint more fuscous-tinged. Thorax light fuscous. Abdomen grey. Forewings elongate, costa anteriorly strongly, posteriorly slightly

arched, apex rounded, termen rounded, hardly oblique; light fuscous, somewhat sprinkled with darker; dorsum indistinctly suffused with darker fuscous from near base to near tornus; second discal stigma minute, dark fuscous: cilia pale fuscous. Hindwings fuscous; cilia pale greyish-ochreous, with two suffused fuscous shades.

VENEZUELA, Palma Sola; BRITISH GUIANA, R. Demerara; two specimens.

Stenoma phaeoneura, n. sp.

♀. 29 mm. Head ochreous-whitish. Palpi whitish, second joint suffused with grey posteriorly, base of terminal joint grey. Thorax pale whitish-ochreous, patagia with a spot of ochreous-yellowish suffusion adjacent to a blackish external dot. Abdomen whitish-ochreous tinged with grey. Forewings elongate, costa anteriorly moderately, posteriorly gently arched, apex rounded, termen rounded, hardly oblique; ochreous-white; all veins marked with fuscous lines; submedian space tinged with pale greyish-ochreous, dorsal space suffused with ochreous-grey: cilia ochreous-white. Hindwings pale grey; cilia whitish, basal third pale grey.

BRITISH GUIANA; one specimen.

Stenoma heteropa, n. sp.

♂ ♀. 27-30 mm. Head whitish, crown suffused with pale greyish-ochreous. Palpi whitish, second joint in ♂ with ochreous-grey or dark fuscous streak above on basal $\frac{2}{3}$, terminal joint in ♂ shorter. Antennal ciliations in ♂ $1\frac{2}{3}$. Thorax greyish-ochreous. Abdomen grey. Forewings elongate, posteriorly somewhat dilated, costa slightly arched, faintly sinuate in middle, apex rounded, termen rounded, hardly oblique; greyish-ochreous; base, costa towards middle, and a curved transverse fascia from $\frac{1}{3}$ of costa to tornus obscurely suffused with whitish; first discal stigma represented by a dark grey or blackish-grey cloudy spot, second by an obscure whitish dot: cilia whitish-ochreous. Hindwings grey; cilia ochreous-whitish, basal third suffused with greyish.

BRITISH GUIANA, R. Demerara; DUTCH GUIANA, Paramaribo; FRENCH GUIANA, St. Laurient; PARAGUAY; seven specimens.

Stenoma canonias, n. sp.

♀. 21 mm. (Head broken.) Thorax pale fleshcolour. Abdomen pale ochreous-yellowish. Forewings elongate, costa anteriorly

gently arched, faintly sinuate in middle, apex rounded, termen slightly rounded, hardly oblique; pale fleshcolour, more rosy towards costa, tinged with purplish-fuscous on dorsal $\frac{2}{3}$; a straight dark brown streak from $\frac{1}{4}$ of costa to $\frac{3}{4}$ of dorsum; a flattened-triangular dark brown spot on costa somewhat beyond middle; two dark brown dots transversely placed on end of cell; a faint brownish curved transverse line at $\frac{5}{6}$; a row of dark fuscous dots round apex and termen: cilia pale fleshcolour tinged with fuscous on basal half. Hindwings pale yellowish, apical third suffused with pale rosy; cilia whitish-yellowish, round apex rosy-tinged.

FRENCH GUIANA, St. Laurient; one specimen.

Stenoma xylurga, n. sp.

♂. 17 mm. Head and thorax rather dark fuscous, face lighter. Palpi fuscous, terminal joint fuscous-whitish except extreme base. Antennal ciliations 1. Abdomen dark grey. Forewings elongate, costa anteriorly moderately, posteriorly gently arched, apex rounded, termen rounded, hardly oblique; rather light fuscous; a patch of dark fuscous suffusion occupying basal third of wing on dorsal half, extended at base to costa, and as a dark fuscous line on fold nearly to middle of wing; a narrow slightly curved suffused dark fuscous fascia from middle of costa to dorsum before tornus; a faint curved darker shade from $\frac{1}{3}$ of costa to tornus; an obscurely interrupted dark fuscous line round apex and termen: cilia fuscous. Hindwings dark grey; cilia grey, with darker subbasal shade.

PERU, Chanchamayo; one specimen.

Stenoma futura, n. sp.

♂ ♀. 32-38 mm. Head and thorax rather light fuscous, face light greyish-ochreous. Palpi ochreous-whitish, more or less infuscated except towards apex of second joint. Antennal ciliations in ♂ 2. Abdomen whitish-ochreous mixed with grey. Forewings elongate, posteriorly rather dilated, costa gently arched, apex obtuse, termen slightly rounded, little oblique; rather light fuscous, with faint lilac tinge; costal edge whitish-ochreous; stigmata dark fuscous, plical and first discal very indistinct or almost obsolete, plical somewhat beyond first discal, second discal small, distinct; a very faint slightly bent shade of darker irroration crossing wing just beyond second discal; a series of indistinct dots of dark fuscous irroration from $\frac{2}{3}$ of costa to dorsum before tornus, strongly curved outwards in disc, somewhat sinuate inwards towards extremities; a series of dark fuscous dots round apex and termen: cilia pale

fuscous, towards tips mixed with ochreous-whitish. Hindwings grey, somewhat lighter anteriorly; cilia ochreous-whitish, with grey subbasal line.

PERU, Chanchamayo; three specimens.

Stenoma tetrabola, n. sp.

♂. 33 mm. Head and thorax pale whitish-ochreous tinged with grey. Palpi whitish, lower $\frac{3}{4}$ of second joint dark ochreous-grey, apex of terminal joint grey. Antennal ciliations $1\frac{1}{2}$. Abdomen pale greyish. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse-angled, termen slightly rounded, hardly oblique; pale greyish-ochreous; costal edge blackish towards base; a small black spot near base in middle; stigmata forming round black spots, plical and second discal largest, plical very obliquely beyond first discal; a rather irregular strongly curved series of indistinct sub-crescentic dots of blackish irroration from $\frac{2}{3}$ of costa to dorsum before tornus, approaching termen in middle; a terminal row of black dots: cilia whitish-ochreous. Hindwings grey; cilia whitish-grey, with dark grey subbasal line.

PERU, Huancabamba; one specimen.

Stenoma patens, n. sp.

♂. 34-43 mm. Head whitish, crown more or less slightly tinged with pale fuscous. Palpi white, lower $\frac{2}{3}$ of second joint dark fuscous. Antennal ciliations 2. Thorax whitish-fuscous. Abdomen greyish, anal tuft whitish-ochreous. Forewings elongate, posteriorly somewhat dilated, costa slightly arched, apex nearly rectangular, termen faintly sinuate, vertical; glossy light greyish-ochreous; costal edge whitish; stigmata small, dark fuscous, plical very obliquely beyond first discal; very faint traces of a curved darker transverse series of cloudy dots at $\frac{2}{3}$; a curved series of sub-crescentic dark fuscous dots from $\frac{3}{4}$ of costa to dorsum before tornus, sinuate inwards towards costa; a terminal row of blackish dots: cilia whitish, basal third light greyish-ochreous. Hindwings light fuscous, on apical third obscurely suffused with whitish-ochreous; cilia whitish-ochreous, with grey subbasal line.

PERU, Huancabamba, Chanchamayo; four specimens. Allied to *immunda*.

Stenoma trichoneura, n. sp.

♂ ♀. 18-21 mm. Head and thorax light greyish-ochreous, face sometimes ochreous-whitish. Palpi whitish, second joint rosy-grey

except apex. Antennal ciliations of ♂ 2. Abdomen ochreous-whitish, slightly rosy-tinged. Forewings elongate, posteriorly slightly dilated, costa gently arched, apex obtuse, termen nearly straight, vertical; rosy-brownish-ochreous; costal edge whitish-ochreous from near base to near apex; stigmata small, very indistinct, fuscous, plical obliquely beyond first discal; an unevenly curved series of indistinct fuscous dots or line from $\frac{2}{3}$ of costa to tornus; a series of indistinct fuscous dots round apex and termen: cilia rosy-ochreous. Hindwings in ♂ whitish-grey-ochreous, in ♀ light grey; cilia ochreous-grey-whitish, sometimes slightly rosy-tinged. Forewings in ♂ beneath with a fringe of very long whitish-yellowish hairs extending along vein 1b from $\frac{1}{4}$ to $\frac{3}{4}$.

VENEZUELA, Ciudad Bolivar, in May and June; eleven specimens.

HYPONOMEUTIDAE.

Trichostibas cyanombra, n. sp.

♀. 23 mm. Head, palpi, antennae, thorax, and abdomen blue-blackish, antennae densely thickened with rough scales from base almost to apex. Forewings elongate, costa anteriorly gently, posteriorly moderately arched, apex obtuse, termen rather obliquely rounded; dark indigo-bluish-grey: cilia concolorous. Hindwings grey, thinly haired and semitransparent on anterior $\frac{2}{3}$, posteriorly dark grey, opaque; cilia grey.

ARGENTINA, Parana; one specimen.

Trichostibas favigera, n. sp.

♀. 36 mm. Head, palpi, and thorax dark bluish-grey, thorax with four very obscure patches of grey-whitish suffusion, posterior most distinct. Antennae deep purple, somewhat thickened with appressed scales towards base, shortly ciliated. Abdomen dark grey. Forewings elongate, rather narrow anteriorly, posteriorly dilated, costa moderately arched, apex obtuse, termen rounded, rather oblique; dark purplish-grey; three moderate irregular grey-whitish fasciae cut into spots by dark veins, first at $\frac{1}{3}$, curved, not reaching costa, forming four spots, discal longest, second postmedian, straight, third running round apical portion of costa and termen, almost or quite reaching second at both extremities, widest below apex, narrowed and less distinct on costal portion: cilia bronzy-fuscous, becoming dark purplish-grey on costa and tornus. Hind-

wings grey, thinly haired and subhyaline, becoming dark grey and opaque on apical third; cilia grey, darker towards base.

PERU, Chanchamayo; one specimen.

TINEIDAE.

OROTHYNTIS, n. g.

Head loosely rough-scaled; ocelli absent; tongue absent. Antennae $\frac{3}{5}$, basal joint elongate, thickened with dense scales projecting anteriorly towards apex. Labial palpi rather long, porrected, second joint tufted with dense rough projecting scales beneath, terminal joint shorter, thickened with scales, obtuse. Maxillary palpi moderate, ascending, filiform, pointed. Posterior tibiae clothed with hairs above. Forewings with tufts of scales on surface; 2 from angle, 2-4 approximated at base, 7 to apex, 11 from $\frac{1}{4}$ of cell, secondary cell defined. Hindwings 1, ovate, cilia $\frac{2}{3}$; 2 widely remote, 3-7 parallel.

Allied to *Scardia*.

Orothyntis scrupulata, n. sp.

♀. 27 mm. Head and thorax whitish-ochreous mixed with brown. Palpi ochreous-whitish, second joint suffusedly irrorated with dark brown. Abdomen dark grey. Forewings elongate, costa moderately arched, apex nearly rectangular, termen very faintly sinuate, oblique; brown irregularly sprinkled with black, with numerous very irregular pale whitish-ochreous marks and marbling, terminated posteriorly by a series near and parallel to posterior part of costa and termen; three raised tufts towards dorsum, and one on end of cell; a series of whitish dots round apex and termen: cilia brownish, with indistinct paler bars becoming whitish at base. Hindwings rather dark fuscous; several suffused whitish dots round apex and upper part of termen; cilia whitish-fuscous, round apex brown, with traces of pale bars.

COLOMBIA, Popayan; one specimen.

ACROLOPHUS, Poey.

I unite under this name *Anaphora* Clem., *Bazira* Walk., *Eddara* Walk., *Urbara* Walk., *Eutheca* Grote, and Walsingham's genera *Atopocera*, *Ankistrophorus*, *Caenogenes*, *Eulepiste*, *Felderia*, *Hypoclopus*, *Neolophus*, *Ortholophus*, *Pilanaphora*, *Pseudanaphora*, and *Thysanoscelis*, all of

which are in my judgment based on characters which are in this genus of specific value only, and indeed in part unreliable even for that. I may add that I treat the generic name as feminine, which is permissible, regarding it as a Greek compound adjective of two terminations, that is, with the masculine and feminine forms identical. I regard the uncus as always double, though the two parts are sometimes closely appressed.

Acrolophus schistodes, n. sp.

♂. 26-28 mm. Head whitish-ochreous. Palpi moderate, recurved, reaching to base of antennae, basal joint elongate, second and terminal joints together shorter than basal, subequal, whitish-ochreous, basal joint suffused laterally with dark fuscous, scales of the other joints readily denuded. Antennae flat-dentate, dentations distinct. Thorax whitish-ochreous, longitudinally suffused towards middle with ferruginous-brown. Abdomen dark grey, clothed with long hairs, anal tuft ochreous-whitish, uncus short, stout, slightly curved, pointed, appressed, claspers greatly dilated posteriorly, apex rounded but with its lower angle forming a slight pointed prominence. Basal joint of posterior tarsi with appressed hairs above. Forewings elongate, moderate, costa almost straight, apex rounded, termen almost straight, oblique; 8 and 9 stalked; whitish-ochreous, more or less distinctly marked with fine brown lines on and between veins; costa irregularly marked with short fine oblique dark brown strigulae; a very undefined longitudinal median streak of whitish suffusion from base to apex, interrupted by an irregular dark brown longitudinal streak through median third of wing, which is enlarged anteriorly and lined with black on veins; a broad streak of brown suffusion along dorsum from $\frac{1}{4}$ to near tornus; an irregular submedian brown streak, marked with dark brown or blackish, running from $\frac{1}{3}$ to termen below middle, where it is shortly furcate; a similar subcostal streak from $\frac{2}{3}$ to apex: cilia whitish barred with brown. Hindwings reddish-fuscous, paler towards base; cilia whitish-brownish.

VENEZUELA, Palma Sola; two specimens.

Acrolophus ridicula, n. sp.

♂. 12 mm. Head, palpi, and thorax fuscous-whitish, shoulders fuscous; palpi moderate, not rising much above crown, basal joint dark fuscous externally. Antennae simple, moderately ciliated. abdomen dark fuscous, uncus moderate, slender, closely appressed

throughout, slightly curved downwards, claspers narrow, rather abruptly curved downwards towards apex, obtuse. Posterior tarsi with basal joint slightly rough-scaled above. Forewings elongate, costa gently arched, apex rounded, termen rounded, rather oblique; 8 and 9 stalked; fuscous-whitish, irregularly and suffusedly mixed with dark fuscous, with a few black scales; a group of black scales beneath disc before middle, and one in disc at $\frac{2}{3}$. Hindwings blackish.

DUTCH GUIANA, Paramaribo, in January; one specimen. The forewings are partially rubbed, but the species is easily recognisable by the structural characters, small size, and blackish hindwings.

Acrolophus punicea, n. sp.

♂. 28 mm., ♀. 34 mm. Head, palpi, and thorax greyish-ochreous; palpi in ♂ rather long, ascending, rising considerably above crown, thickened with loose scales, basal joint rather long, second and terminal joints together longer than basal. Antennae in ♂ shortly bipectinated. Abdomen in ♀ light fuscous (in ♂ broken). Forewings elongate, posteriorly dilated, costa slightly arched, apex rounded, termen rounded, rather oblique; all veins separate; greyish-ochreous, more or less sprinkled with brown; in ♂ a dark fuscous dot, in ♀ a very small fuscous spot on end of cell: cilia whitish, speckled with fuscous, with traces of darker bars. Hindwings grey; cilia light grey, becoming whitish towards tips.

PARAGUAY; two specimens.

Acrolophus practica, n. sp.

♂. 24-26 mm., ♀. 30-37 mm. Head, palpi, and thorax light brownish or fuscous, palpi in ♂ extremely long, strongly recurved, not quite reaching end of thorax, clothed with dense roughly projecting scales, especially on terminal joint and apex of second. Antennae in ♂ flatly dentate, dentations closely appressed, hardly distinguishable. Abdomen fuscous, in ♂ with uncus moderately long, closely appressed throughout, curved, claspers moderate, uniform, apex rounded, penis very long, fine, very acute. Posterior tarsi not rough-scaled. Forewings elongate, more so in ♀, in ♂ slightly dilated posteriorly, costa slightly arched, apex rounded, termen rounded, somewhat oblique, more so in ♀; all veins separate; light brownish, sometimes strigulated or suffused with fuscous, margins more or less strigulated with dark fuscous; a more or less developed oblique blackish mark towards dorsum at $\frac{1}{3}$; a flattened-triangular

dark fuscous blotch beneath disc before middle, darker and more sharply marked in ♂; an indistinct suffused dark fuscous spot in disc at $\frac{2}{3}$, and sometimes a smaller one between this and termen: cilia brownish, sometimes obscurely barred with darker. Hindwings and cilia fuscous.

BRAZIL, Entre Rios, Sao Paulo; PARAGUAY, Sapucay; ARGENTINA, Parana, Tucuman; from December to February; sixteen specimens.

Acrolophus tricausta, n. sp.

♂. 20–23 mm. Head, palpi, and thorax greyish-ochreous or light fuscous sprinkled with darker; palpi extremely long, strongly recurved, extending to extremity of thorax, thickened with dense slightly rough scales. Antennae strongly flat-dentate. Abdomen fuscous, uncus slender, diverging towards apex, curved, claspers long, narrow, with rounded apex, on middle of lower margin with a strong acute tooth having a prominence on its inner edge, penis obtuse-pointed. Posterior tarsi not rough-scaled. Forewings elongate, moderate, costa moderately arched, apex rounded, termen rounded, somewhat oblique; all veins separate; brownish-ochreous or brownish, more or less strigulated with dark fuscous, especially on costa; an oblique-transverse mark towards dorsum at $\frac{1}{4}$, a triangular submedian blotch before middle, and a spot in disc at $\frac{2}{3}$ blackish-fuscous: cilia brownish-ochreous. Hindwings and cilia fuscous.

ARGENTINA, Parana; seven specimens.

Acrolophus spinifera, n. sp.

♂. 27 mm. Head, palpi, and thorax fuscous; palpi extremely long, strongly recurved, reaching to end of thorax, thickened with dense scales roughly projecting anteriorly throughout. Antennae flat-dentate. Abdomen fuscous, uncus moderately long, curved, branches nearly approximated but not touching each other, claspers narrow, uniform, at apex rounded beneath but with upper angle terminating in a long fine projecting spine. Posterior tarsi not rough-scaled. Forewings elongate, posteriorly dilated, costa gently arched, apex rounded, termen rounded, somewhat oblique; all veins separate; brown, with some scattered dark fuscous strigulae, costa spotted and strigulated with darker fuscous; a semioval dark fuscous blotch extending beneath disc from $\frac{1}{4}$ to beyond middle, where it coalesces with a rather dark brown oblique blotch extending from disc at $\frac{2}{3}$ towards tornus but gradually becoming obsolete, its upper angle dark fuscous and followed by two or three ochreous-whitish

scales, beyond this is a roundish patch somewhat lighter than groundcolour: cilia brownish. Hindwings and cilia fuscous.

PARAGUAY; one specimen.

Acrolophus tetrancyla, n. sp.

♂. 24-26 mm. Head, palpi, and thorax fuscous; palpi extremely long, recurved, clothed with dense somewhat rough scales throughout. Antennae strongly dentate, dentations well separated. Abdomen fuscous, uncus curved, branches remote at base but appressed at tips, claspers very long and slender, pointed, strongly curved downwards, thus each forming a long hook and resembling a larger uncus. Posterior tarsi not rough-scaled. Forewings moderately elongate, posteriorly dilated, costa gently arched, apex rounded, termen rounded, rather oblique; all veins separate; fuscous, obscurely strigulated with darker, on costa more distinctly; a small blackish spot or mark towards dorsum at $\frac{1}{4}$; a triangular dark fuscous submedian patch before middle, suffused above but well-defined and angular beneath; an indistinct darker spot in disc at $\frac{2}{3}$: cilia fuscous. Hindwings and cilia fuscous.

PERU, Chanchamayo; three specimens.

Acrolophus seminigera, n. sp.

♂. 18-21 mm., ♀. 26-30 mm. Head, palpi, and thorax varying from greyish-ochreous to rather dark fuscous; palpi in ♂ extremely long, more or less strongly recurved, not quite reaching to extremity of thorax, thickened with dense appressed scales, more or less roughly projecting on posterior surface of terminal joint, which varies somewhat in length. Antennae in ♂ flatly dentate. Abdomen fuscous, in ♂ with uncus curved, branches moderately and evenly remote throughout, claspers moderate, apex rounded. Posterior tarsi in ♂ not rough-scaled. Forewings elongate, posteriorly dilated, more elongate in ♀, costa gently arched, apex rounded, termen somewhat rounded, rather oblique, in ♀ more oblique; all veins separate; varying from brownish to rather dark purplish-fuscous, strewn with indistinct darker strigulae, costa distinctly spotted or strigulated with dark fuscous; a dark fuscous crescentic submedian patch before middle, suffused above but convex and well-defined beneath; an indistinct suffused darker spot in disc at $\frac{2}{3}$, in ♂ followed by several (2-6) variable minute whitish specks, in ♀ these are hardly indicated: cilia fuscous. Hindwings and cilia fuscous.

VENEZUELA, Ciudad Bolivar, from May to September; twelve specimens.

Acrolophus scopodes, n. sp.

♂. 24-25 mm., ♀. 30 mm. Head, palpi, and thorax brownish-ochreous or brown; palpi in ♂ extremely long, strongly recurved, reaching to extremity of thorax, strongly thickened with dense scales roughly expanded towards apex. Antennae in ♂ flatly dentate. Abdomen fuscous, uncus curved, points appressed, claspers rather narrow, nearly uniform, apex rounded. Posterior tarsi in ♂ with dense roughly projecting scales above almost to apex. Forewings elongate, more so in ♀, somewhat dilated posteriorly, costal gently arched, apex rounded, termen rounded, somewhat oblique; all veins separate; brownish-ochreous or brown, more or less mixed with darker brown, and variably irrorated or strigulated with dark fuscous, sometimes partially suffused with dark brown or fuscous; a suffused dark fuscous spot beneath middle of disc, and one in disc at $\frac{2}{3}$: cilia brownish, sometimes obscurely barred with darker. Hindwings rather dark fuscous; cilia brownish, darker towards base.

VENEZUELA, Ciudad Bolivar, from June to September; thirteen specimens.

Acrolophus perpetua, n. sp.

♂. 28-31 mm. Head, palpi, and thorax brownish-grey; palpi extremely long, more or less recurved, reaching nearly to extremity of thorax, thickened with dense tolerably appressed scales expanded at apex into a rough tuft. Antennae flatly dentate. Abdomen hairy, ochreous-greyish; uncus moderate, curved, points appressed, claspers slender, slightly dilated towards tips, apex obliquely truncate, lower angle forming an acute spine. Posterior tarsi with rough projecting scales above almost to apex. Forewings rather elongate, posteriorly somewhat dilated, costa slightly arched, apex rounded, termen rounded, somewhat oblique; all veins separate; brownish-grey, indistinctly strigulated with dark fuscous; costa posteriorly more or less dotted with whitish-ochreous; a small subquadrate dark fuscous spot beneath middle of disc, preceded and followed by pale suffusion, and one in disc at $\frac{2}{3}$, followed by a small whitish-ochreous spot; sometimes a few whitish-ochreous specks towards termen: cilia brownish-grey, more or less barred with ochreous-whitish. Hindwings light fuscous or greyish-ochreous; cilia ochreous-grey, outer half grey-whitish.

PARAGUAY, Sapucay, in November and December; two specimens.

Acrolophus pachynta, n. sp.

♂. 33 mm. Head, palpi, and thorax dark brown; palpi extremely long, recurved, reaching to extremity of thorax, strongly thickened throughout with dense projecting scales. Antennae flatly dentate. Abdomen densely hairy, rather dark fuscous; uncus long, curved, points appressed, claspers rather narrow, hardly expanded, apex rounded. Posterior tarsi with basal joint rough-scaled above. Forewings moderately broad, somewhat dilated, costa gently arched, apex rounded, termen rounded, somewhat oblique; all veins separate; deep brown with slight purplish tinge, with small scattered dark fuscous dots; costa dotted with dark fuscous; suffused subquadrate dark fuscous spots in disc at $\frac{1}{3}$ and $\frac{2}{3}$, and a triangular blotch beneath and between these: cilia brown, tips reddish-tinged. Hindwings rather dark fuscous; cilia fuscous, towards tips fuscous-whitish.

COLOMBIA, Rio Bitaco, 4,400 feet, in April; one specimen.

Acrolophus particeps, n. sp.

♂. 16-17 mm. Head, palpi, and thorax light greyish-ochreous or fuscous; palpi extremely long, more or less strongly recurved, not reaching to extremity of thorax, thickened with dense appressed scales. Antennae flatly dentate. Abdomen light fuscous, uncus long, abruptly curved downwards, points closely appressed, claspers moderate, rather dilated, apex rounded. Posterior tarsi not rough-scaled. Forewings elongate, hardly dilated, costa gently arched, apex rounded, termen slightly rounded, rather oblique; all veins separate; pale greyish-ochreous, sometimes much suffused with fuscous; costa spotted or strigulated with dark fuscous; a dark fuscous suffused patch beneath middle of disc, and a spot in disc at $\frac{2}{3}$, these sometimes forming part of a large triangular area of fuscous suffusion and dark fuscous strigulation extending along costa from $\frac{1}{4}$ to $\frac{5}{8}$; sometimes some irregular spots of dark fuscous suffusion towards middle of termen: cilia pale brownish, indistinctly barred with dark fuscous irroration. Hindwings and cilia fuscous.

VENEZUELA, Ciudad Bolivar, in July and September; two specimens.

Acrolophus infida, n. sp.

♂. 16-18 mm. Head, palpi, and thorax fuscous, sprinkled with dark fuscous; palpi extremely long, recurved, reaching to extremity of thorax, thickened with dense somewhat rough scales. Antennae strongly bipectinated, pectinations slender. Abdomen fuscous,

uncus curved, points appressed, claspers moderately broad, somewhat dilated, apex rounded. Posterior tarsi not rough-scaled. Forewings moderately elongate, somewhat dilated, costa gently arched, apex rounded, termen rounded, somewhat oblique; 8 and 9 stalked; pale greyish-ochreous; basal area and anterior half of dorsum suffusedly mixed with dark fuscous; a large triangular patch of subconfluent dark fuscous maculation extending along costa from $\frac{1}{4}$ to $\frac{5}{8}$, its apex reaching $\frac{2}{3}$ across wing in middle; an irregular subterminal series of small dark fuscous spots: cilia light brownish, indistinctly barred with dark fuscous suffusion. Hindwings rather dark fuscous; cilia pale fuscous, with darker subbasal shade.

VENEZUELA, Ciudad Bolivar, in June and July. Superficially excessively similar to *particeps* from the same locality, but structurally abundantly distinct.

Acrolophus subfusca, n. sp.

♂. 26–28 mm. Head, palpi, and thorax rather dark fuscous; palpi extremely long, strongly recurved, reaching to extremity of thorax, strongly thickened with dense scales projecting roughly above on two apical segments. Antennae with short thick pectinations. Abdomen fuscous, uncus short, closely appressed throughout, abruptly bent at base, claspers moderate, slightly expanded, apex rounded. Posterior tarsi not rough-scaled. Forewings rather elongate, moderate, somewhat dilated posteriorly, costa gently arched, apex rounded, termen rounded, somewhat oblique; all veins separate; rather dark fuscous; some costal strigulae, and cloudy spots in disc below middle and at $\frac{2}{3}$ faintly darker or obsolete: cilia fuscous. Hindwings and cilia fuscous.

ARGENTINA, Tucuman; two specimens.

Acrolophus phaeomalla, n. sp.

♂. 15–17 mm., ♀. 20 mm. Head, palpi, and thorax brown, darker in ♂; palpi in ♂ extremely long, recurved, reaching extremity of thorax, thickened with dense rough scales, roughly expanded towards apex; posterior extremity of thorax whitish. Antennae in ♂ strongly bipectinated. Abdomen rather dark fuscous, uncus moderate, directed downwards, appressed throughout, claspers moderate, with prominent tooth above before middle, extremity rather obliquely subtruncate. Posterior tibiae and tarsi smooth-scaled. Forewings in ♂ moderate, posteriorly dilated, in ♀ elongate, costa in ♂ moderately, in ♀ gently arched, apex rounded, termen

rounded, somewhat oblique, more so in ♀; all veins separate; brown, darker in ♂, obscurely and suffusedly strigulated with rather dark fuscous; a small obscure dark fuscous spot beneath middle of disc; a suffused dark fuscous spot in disc at $\frac{2}{3}$, followed by some ochreous-whitish suffusion: cilia brown, darker in ♂. Hindwings rather dark fuscous; cilia fuscous.

ARGENTINA, Parana; three specimens. Allied to *pygmaea*, Wals.

Acrolophus sarista, n. sp.

♂. 19-20 mm. Head, palpi, thorax, and abdomen fuscous; palpi very long, erect, appressed in middle and then diverging laterally, basal joint greatly thickened with dense scales, second and terminal joints shorter, subequal, densely scaled but much less thickened than basal, each expanded with loose rough scales towards apex; uncus slightly curved, appressed throughout, claspers narrow, rather expanded, apex rounded. Antennae rather strongly bipectinated. Posterior tarsi with rough projecting scales on basal joint above. Forewings moderate, somewhat dilated, costa gently arched, apex rounded, termen rounded, somewhat oblique; 8 and 9 stalked; fuscous, somewhat sprinkled with dark fuscous; costa marked with about ten small dark fuscous spots or dots, one at $\frac{1}{3}$ larger; a sub-triangular dark fuscous submedian blotch in disc at $\frac{1}{3}$; a dark fuscous fascia from dorsum beyond middle directed towards a dark fuscous spot in disc at $\frac{2}{3}$, but becoming more or less obsolete before reaching it: cilia fuscous. Hindwings and cilia fuscous.

VENEZUELA, Ciudad Bolivar, in May; two specimens

ARRHENOPHANIDAE

ARRHENOPHANES, Wals.

Arrhenophanes inca, n. sp.

♀. 54 mm. Head, thorax, and abdomen pale whitish-grey-ochreous, thoracic crest mixed with dark fuscous spatulate scales. Antennae stoutly bipectinated. Forewings elongate, moderately broad, posteriorly dilated, costa gently arched, apex rounded, termen somewhat rounded, rather oblique; 8 and 9 stalked; whitish-grey-ochreous; a semioval yellow-brown spot edged with blackish occupying median third of cell, posterior third occupied by a hyaline spot of about equal area; median third of wing from cell to dorsum occupied by a large roundish suffused fuscous patch, in which is an oblique

central spot of violet-blue suffusion; posterior margin of cell marked with blackish, beyond and beneath this some dark fuscous suffusion, marked with a pale bar between veins 2 and 3 near base, another between 3-5, and one between 5-8 at base; three or four slightly waved and irregular transverse blackish lines between this and termen. Hindwings whitish-grey-ochreous; posterior $\frac{2}{3}$ of wing marked with about six irregular waved dark fuscous lines tending to anastomose in rings; a small blackish spot at tornus.

PERU, El Porvenir, 3,000 feet; one specimen.

V. *Comparative notes on Chilades galba, Led., and phiala, Gr. Gr.* By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

[Read December 4th, 1912.]

PLATE V.

THE specific distinction of *Chilades galba* has always been more or less obscure in our collections, and it is only since the Elwes collection has been incorporated at South Kensington that its definite position has been made possible. Lederer described the species in 1855 (Z. b. V., 1855, p. 190, taf. 1, fig. 4) from Beirut, and he also stated that Kotschy obtained it at Senaar. He then compared the underside with *trochilus*, though the upperside was blue. *Phiala* was described in 1890 ("Romanoff's Memoires," IV. p. 366, t. 21, f. 4) by Groum-Grshimaïlo from Kabadian, who stated that it was very close to *galba*. The figure given in those Memoires is not very accurate, the lighter spots being decidedly too dark.

In examining these specimens the first question that arose was their generic position; they certainly had nothing to do with *lysimon*, with which I found *galba* mixed up, and they appeared to be more nearly related to *trochilus* than to anything else, though probably to be distinct from the genus containing that species. The only way to solve the difficulty was to examine the genitalia. Permission having been obtained for this to be done, it soon became evident that the two species before us occupied a peculiar position. The clasps are nearest to *Lycaena charybdis* and are very similar to those of that species; from this character its natural position would therefore be in the *arion* section in its broad sense, but the tegumen is quite Plebeid, being highly bifid and is extremely close to *Chilades laius* in its structure; the falces (hooks), however, are not quite typical of the genus *Plebeius*, whilst the aedeagus is also very closely allied to *Chilades laius*.

It appeared to me evident at first that a new genus should be raised for the two species we are considering, but as I cannot find any structural character apart from the genitalia I am rather unwillingly constrained to place

them in *Chilades*, as I am unable to bring myself to raise genera on the male appendages only.

Having thus given a summary of the position as I now find it, it only remains to describe and figure the specimens, so as to make the information available for collectors generally.

Chilades galba, Led.

♂. Both wings above darkish bright blue with the termen broadly brown, in each wing near the anal angle of the secondaries there is a trace of a marginal series of three or four dark spots. Under-surface creamy grey with spots edged with white. Primaries with spots slightly darker than the ground edged with white, a narrow spot closing the cell, a series of six more or less confluent spots well beyond the cell, a double series of crescent-shaped terminal spots. Secondaries with a series of three black basal spots and one black subcostal encircled with white, the latter one being well beyond the middle of the costa and lying between veins 7 and 8; there are also two black spots at the anal angle edged with bright greenish metallic scales; the other spots are only slightly darker than the ground and are edged with white, one of which closes the cell; a series of seven irregularly placed spots beyond the cell, the first being placed below and slightly beyond the black subcostal spot, the second far out detached from the first but touching the third which is shifted slightly inwards, fourth very small, its outer white edging almost confluent with the inner white edging of the third, fifth right in again, sixth somewhat outwards, seventh right in, detached from the sixth and placed on the inner margin, a subterminal series of crescentic marks followed by a series of terminal spots. Between the irregular series and the crescentic marks the ground is more or less suffused white.

The genitalia as previously referred to are very specialised. The claspers are long and very broad for the apical half, gradually increasing in width from their origin, the upper margin being slightly arched and the lower margin waved; the apex itself is evenly excavated out for nearly all the front edge, and at the upper apex is bent round to form a long hook. The girdle is moderately upright, very narrow at first, and then expanding somewhat rapidly to its fusion with the tegumen, which is very deeply bifid, its two arms being very narrow, narrower even than the falces that are attached high up to them; these have a sharp shortly curved hook at the extremity. The fulcrum

is unusually long, inclined forwards, and rather broad; the aedoeagus irregular tapering more narrowly at the tip with a long orifice. The clasps are copiously furnished with bristles, many being very long; the arms of the tegumen have them also, but shorter, finer and much less plentifully.

Chilades phiala, Gr. Gr.

♂. Both wings violet blue. Primaries with the termen very narrowly brown, secondaries with the termen broadish with the marginal row of dark spots moderately distinct. Underside both wings creamy grey with the spots edged with white; primaries with a spot closing the cell, a series of six more or less confluent spots beyond the cell, not so far beyond as in *galba*, a double series of crescent-shaped terminal spots, the outer row being indefinite. Secondaries with a series of three black basal spots and one subcostal, the latter one being well beyond the middle of the costa and lying between veins 7 and 8; there are also two black spots at the anal angle edged with metallic blue scales; a spot closes the cell, a series of seven irregularly placed spots just beyond the cell, the first below and beyond the black subcostal spot, the second shifted well beyond the first, its inner white edge being confluent with the outer white edge of the first, third inwards, fourth small and shifted inwards, fifth further in, sixth slightly out, seventh well in but not detached; a series of four terminal spots which are preceded by a series of defined, sharply crescentic lunules extending from the anal angle to the costa, a very slight suffusion of white in the radial area. All the spots in both wings except the five specially mentioned are but slightly darker than the ground-colour.

The genitalia are very closely similar to those of *galba*; the front edge of the clasps instead of being evenly hollowed inside the hook is curved outwards. The tegumen is slightly longer as to its bifid processes and more hairy; the aedoeagus is decidedly stouter than in *galba*, though of the same shape; a reference to the figures will, however, show that it is about one-third broader.

Comparing the genitalia with those of *Chilades laius* (Pl. V, figs. 1—3) it will be seen that the clasps have no near affinity at all, but that the tegumen is very closely allied; in each case the tegumen is highly reduced and very highly bifid, consisting of two long thin arms, almost as narrow as the falces, ending in a fine point. In *laius* the hairs are long and very fine, the spicules from which

they arise being so fine and minute that they are invisible except under a high-power objective; in *galba* and also in *phiala*, but particularly in the latter, they are coarser, and the hairs are shorter and denser. The falces in *laius* are longer and finer than in either of the other two species, but they all have the same short, sharply upturned little hook at the tip; in *laius*, however, they are fixed well below the arms of the tegumen, whilst in both *galba* and *phiala* they are fixed so close beneath the arms as to be practically almost attached to them. The slight differences of the aedoeagus are best seen from the figure, being little more than relative size and length of the taper.

A comparison of the underside of the perfect insects at once shows the relationship with the Indian *laius*, the general pattern being very similar.

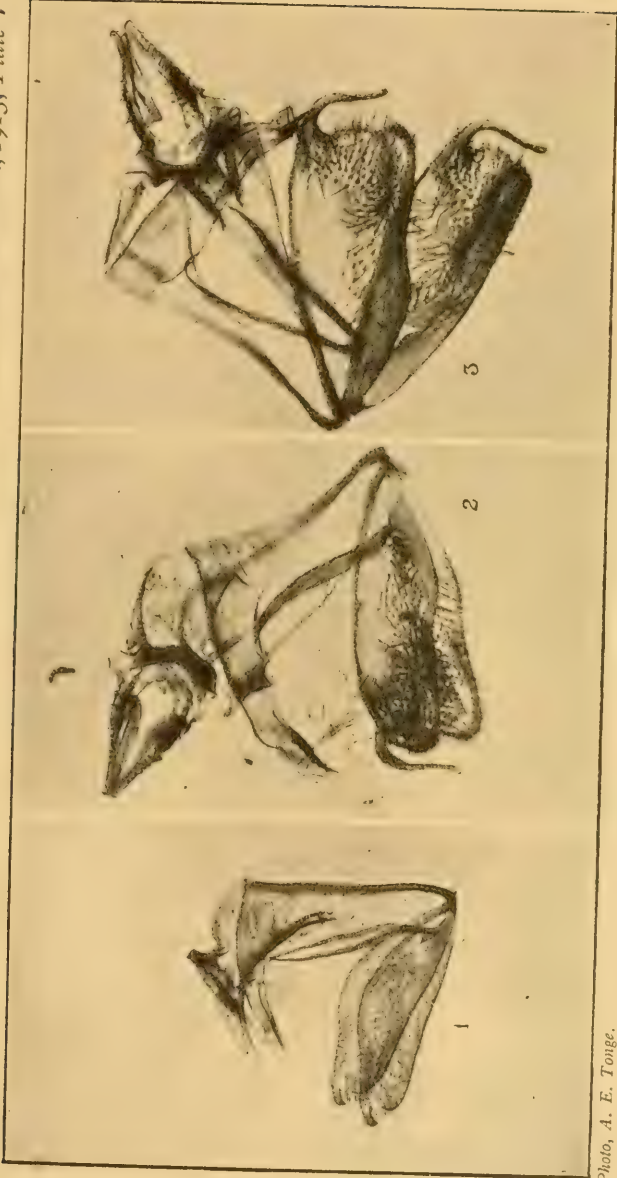
My descriptions and figures are taken from specimens in the British Museum, the one being a specimen taken in the Plain of Jenin, Palestine, by Miss Fountaine and agreeing exactly with the coloured figure of *galba* given by Lederer, and the other is from Groun-Grshimailo's type of *phiala* out of the Elwes collection and now also in the National Collection.

In the course of my examination of these specimens I found mixed with them several others which were evidently belonging to the genus *Zizeeria*, Chapman, and were either *lysimon* or *karsandra*: of one of these from Beirut I have mounted the genitalia, and it turns out to be *karsandra*. This led me to examine several in my own collection from Egypt and Algeria, all of which are *karsandra*; the range of this species will therefore be thus extended westward to this extent.

EXPLANATION OF PLATE V.

- FIG. 1. *Chilades laius*.
 2. *Chilades galba* (with the upper part of one clasp removed).
 3. *Chilades phiala*.

All magnified $\times 30$.



Photo, A. E. Tonge.

Male armature of species of the genus *Chilades*.

C. Hentschel.

VI. *Notes on the specific distinction of certain species in the orbitulus and pheretiades section of the genus Plebeius.*
By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

[Read December 4th, 1912.]

PLATES VI, VII, VIII.

FOR many years I have felt that the varieties placed in Staudinger's "Catalog" under the two species *orbitulus* and *pheretiades* were not probably in their right positions, but other matters prevented me from settling the question until now.

In October last I was looking up various points connected with the Lycaenidae in the British Museum, when I came across the species *jaloka*, Moore, which was placed as a form of *orbitulus*; a short examination convinced me that it was not a race of that species, and this was confirmed by the genitalia. This incident made me go carefully into all the Eastern forms allied to those species, and has thus enabled me to elucidate various differences that I had previously believed to exist.

My investigations have, I think, proved that *jaloka* and *ægagrus* are not forms of *orbitulus*, but are distinct species, both being nearer to *pheretiades* than to the European species. Dr. Chapman has already shown (Trans. Ent. Soc. 1908, p. 314) that *pyrenaica* is also a distinct species. Staudinger catalogues under *pheretiades* two forms which he calls v. *pheres* and v. *pheretulus*; the genitalia show that whilst *pheretulus* is correctly placed where it is, *pheres*, Stgr. (*nec* Boisduval), is distinct and that it is closest to *jaloka*, Moore.

In the year 1890 Groum-Grshimaïlo ("Romanoff's Memoires," iv, p. 391) suggests the name *phereclus* for a certain race found in the Trans-Alai, retaining *pheretulus* for the Pamir race and giving the name *pherecydes* to Staudinger's *pheres*—a name preoccupied by Boisduval for a North-American species quite distinct from those now under consideration. He supposes that *phereclus* is the primitive form of this small assemblage of allied species, and considers that *dardanus* and *ægagrus* have developed off on the one hand, that *pheres-pheretiades* and *pheretulus*

have been evolved on the other hand, and that the descendants of the latter (*pheretulus*) are *orbitulus aquilo*, *pyrenaica* and *wosnesenskii*.

It appears very much more probable to me that *orbitulus* is the Stirps of this group; the colour is less developed, the sexual dimorphism is less marked, and its dominance in high altitudes (though mere dominance unaccompanied by other points is no sign of primitiveness) makes this species more likely to be the primitive race. Groum-Grshimaïlo says, (*l. c.*) and says rightly, that *pheres*, Stgr. (which hereafter I will call *pherecydes*), is brighter blue, and that *pheretulus* is darker blue, and he goes on to state that in certain of the southern slopes of the Alai Mountains the two forms amalgamate, and that it is impossible to distinguish the one from the other, whilst almost immediately after stating this he proposes the name *phereclus* for the Trans-Alai form. I fear I am quite unable to follow his lead in this particular, and shall treat the name (*phereclus*) as Staudinger has done in his 1901 "Catalog," placing it under *pherecydes*. Neither can I adopt his evolution of the different races: *dardanus* he makes go off directly from *phereclus*, whilst *pyrenaica* he considers is evolved from *orbitulus*, which descends from his suggested primitive *phereclus*. I have no doubt whatever that *dardanus* and *pyrenaica* went off directly on the same line; the one finding a suitable home in the mountains of Asia Minor, the other in the Pyrenees and the mountains of Spain. *Aegagrus* I find by the genitalia to be nearer to *pheretiades*, but the author referred to considers they go off from the Stirps in quite divergent lines.

It will now be well to treat with the forms individually. It is probably unnecessary to say that the whole of these insects are high Alpine species; *orbitulus* is too well known to need reference. The *pheretiades-pherecydes* group is said by the author already quoted not to occur below 9,000 feet and to go up to 10,000 feet. *Aegagrus* occurs only in the high mountains of Persia, and *jaloka* in the mountains of Kashmir, and *ellisi* and *leela* at an elevation of 12,000 and 11,000 feet respectively in the Sanch Pass, Pangi and in Ladak, etc.; of these the three last are without doubt the same species.

Taking them in the order they are placed in in Staudinger's "Catalog," the first form that I make as a good species is—

Plebeius aegagrus, Chr., sp. bon. (Plates VI and VII, figs. 2 on each plate.)

A beautiful species very similar in colour to quite fresh *pyrenaica*, but more transparent; it has a large black spot closing the cell in the primaries and a waved series of postmedian black spots usually, these are occasionally obsolescent, and I have one specimen in which they are absent; below it is of the *pyrenaica* type, only paler. Staudinger, I believe, sent me some of the first specimens that he received of this insect, certainly the first he received when he obtained enough to dispose of, and he wrote me that he considered it a pretty variety of *orbitulus*. I was young in the study of Entomology then, and accepted the dictum of so experienced a collector; my days of lumping species as I did then have gone, and I have for long looked upon this as a good species; time failed me then to examine critically my preparations of the genitalia, and now that I have more to do I have had to make time for their examination. I give at fig. 1, Plate VI, a profile view of *orbitulus*; at fig. 2, a similar view of *aegagrus*, and also the apex of the clasps, in each case showing the teeth, on Plate VII. It will at once be seen that the clasp of *orbitulus* is longer and narrower proportionately, the teeth at the upper apex of *orbitulus* are much further apart and might be likened to the teeth of a large circular saw, whilst those of *aegagrus* are small and even like the teeth of a tenon saw. Again, the fulcrum (the bifid arms arising at the base of the clasp) has a very distinct angle at a third from the apex, which is entirely lacking in *orbitulus*; the tegumen is rather shorter and broader and the falces are slightly shorter also. The aedoeagus of *aegagrus* is rather stouter and less tapering.

The species has only been recorded from Persia, and it might be expected in its isolation to have set up special characteristics as it has done.

Plebeius jaloka, Moore, sp. bon. (Plate VI, fig. 3; Plate VIII, fig. 2.)

The genitalia show perhaps more decidedly than in the preceding species that it is distinct from *orbitulus*.

The suffusion of blue is bright and darker, quite a distinct colour from *orbitulus* and *pheretiades*; it has also a distinct postmedian row of spots in both wings which is never entirely absent; underneath it is often almost white and

of the *pheretiades* type, with a bright blue basal suffusion. In the genitalia the clasps are slightly shorter and also slightly broader than in *orbitulus* or *pheretiades*, whilst the teeth at the apex of the clasps are quite different to either; they are long strong teeth, not mere serrations as in both the species referred to. The falces are slightly more slender, and the aedoeagus is much stouter and quite short, the figure, Pl. VI, f. 3, showing vesica considerably extended.

When examining the specimens in the British Museum it was evident to me that the insect was more nearly allied to *pheretiades* than to *orbitulus*; the pattern and general appearance led to this conclusion in the first instance, whilst subsequent examination of the genitalia confirmed this view. I have no doubt, therefore, that the species is distinct from either, and should come between them.

Referring to *ellisi*, Marshall, and *leela*, de N., I am quite unable to separate these from Moore's species, which is a variable insect. In some specimens there is no discal series of spots, in others there are traces more or less distinct, whilst in the typical form the discal series is specially mentioned. In both Marshall's and de Nicéville's species this series is also distinct. De Nicéville points out in his "Butterflies of India," vol. iii, p. 88, that the three are perhaps at best local races only, and if a larger series could be obtained it might be found that they would be completely connected by intermediate gradations; this has been done, and de Nicéville's surmise has proved correct, hereafter *ellisi* and *leela* must appear as synonyms of *jaloka*.

Plebeius pherecydes, Gr. Gr. (Plate VI, fig. 5; Plate VIII, fig. 3.)

This butterfly was first described by Staudinger as *pheres* as a variety of *pheretiades*, he having overlooked Boisduval's preoccupation of that name; Groum-Grshimaïlo as already mentioned pointed out the oversight and proposed the name I have adopted. The species appears to me to be distinct from Eversmann's insect, and from the genitalia to be more nearly allied to *jaloka*; its position will therefore be between the two. It seems that Groum-Grshimaïlo has confused the local races somewhat. Staudinger is quite explicit in his descriptions and localities; he described from the mountains near Osch the species he called *pheretulus*; this he also received later from his collector in

the Alai Mountains. I have examples from both places and they are alike, and there is no difficulty in separating them from the species from Namangan, which he called *pheres* (*pherecydes*, Gr. Gr.). I have this latter also from Bokhara and a good series from the Pamir; it is quite impossible to separate the specimens from the three localities, but they are all easily separable from the Osch and Alai ones. *Phereclus*, Gr. Gr., will therefore fall as a synonym of *pherecydes*. The species is very close to *pheretiades*, but it can be recognised by the tone of colour being of a more delicate greener blue than that insect, and the dark borders are much narrower; it is very difficult to separate them from the undersides. One character in the genitalia, however, shows strongly the difference between the two; the upper hard chitinous part of the end of the clasp is more elongated, or perhaps the lower soft lobe is shorter in *pherecydes*, whilst the upper apex itself is furnished with long strong teeth as in *jaloka*, the central teeth being the longest. This is a marked and good character in all Plebeids, and I have found it constant. In *pheretiades* these teeth are nothing more than fine very short even serrations. The tegumen also has slight differences, the bifid arms in *pheretiades* are produced upwards so as to form a high saddle rather beyond the middle, descending suddenly rearwards in a sharp short curve and rising slightly again at the hindermost bridge; in *pherecydes* the saddle is not nearly so high, there is very little curve at the back, the hinderpart being little more than an inclined plane; the aedoeagus is shorter than in *pheretiades*, more even in structure and slightly stouter.

Plebeius pheretiades, Ev. (Plate VI, fig. 4; Plate VIII, fig. 1.)

I have already shown the difference in colour between this and the preceding species, these two being the closest so far as colour relation is concerned; the genitalia and the apex of the clasp are figured for comparison.

Plebeius pheretiades pheretulus, Stgr.

In colour it is not difficult to separate this local race from both its parent form and from *pherecydes*; it is very much greyer, almost less blue than the form of *orbitulus* that occurs plentifully about 1,000 feet below the top of

Canigou (in this locality I took last summer the bluest form of *orbitulus* that I have yet seen, and all were of the same colour); the brown borders are decidedly broader and are very indefinite; the black spot closing the cell in the primaries is much smaller, and below there is an almost complete obsolescence of the black pupilled spots of the secondaries. I have no doubt that this is merely a variety of Eversmann's insect, as the genitalia agree entirely with it, and the serrations at the apex of the clasp are precisely as in that species.

Groum-Grshimailo states (*l. c.*) that he has placed all the *pheretiades* from the Pamir in his collection under the name *phetulus*, and presumably the same has been done in the collection of the Grand Duke Nicolas, but I have no doubt whatever that is a mistake. I have not seen this species from the Pamir at all, whilst *pherecydes* is evidently common in that region; the specimens belonging to the former collection are in the British Museum, and those from the Pamir are certainly not *phetulus* but *pherecydes*.

v. *tekessana*, Alph.

Were it not for the fact that Alphéraky is much too careful a worker to have forgotten Staudinger's description of *phetulus*, I should have thought that this had taken place; he only compares it with *pheretiades*, and I have no doubt whatever that it is *phetulus*. Seven specimens were taken, six males and a female, on the river Tékesse in the Thian-Chan.

Plebeius dis, Gr. Gr.

The type of this species is now in the British Museum; it is a female not a male, as stated in Staudinger's "Catalog," and is entirely blackish-brown with a prominent white spot closing the cell in each wing. Below at the first glance it has a certain resemblance to *pheretes*, Hb., but on further examination it is soon seen that it occupies an intermediate position between the species we have been considering and Hübner's insect; the spots below are white without the black pupils, and occupy positions combining somewhat the characteristics of the two insects just named.

It is a thoroughly good species described originally from Amdo south-east of the Kuku-noor, but it has also recently been received from Thibet; there are at present, I believe, only four specimens known.

Before closing these notes I should like to make a few brief remarks on the species *orbitulus*.

Orbona, Gr. Gr., (1891), Hor. xxv, p. 453.
Syn. *orbitulinus*, Stgr. (1892), Iris, v, p. 318.
,, *oberthuri*, Stgr. (1901), "Catalog," p. 81.

It is curious and interesting to find precisely the same large form of this well-known European species occurring in the Pyrenees, in South-East Siberia, Mongolia and Amdo. I have specimens that if unlabelled and mixed up it would be absolutely impossible to separate out again. Groum-Grshimailo's name has priority, and the other two so far as I am concerned must sink as synonyms to it.

Menetries' form *wosnesenskii* from Kamschatka is described from a ♀; of this I have very little doubt. The form from that region is slightly larger perhaps than European specimens, though it shows very little if any difference when compared with the other Far Eastern and the Pyrenean races; it is very doubtful if the white spots shown in the figure would persist, and, when it is remembered that they do not appear in any of the few males that I have seen from that district, it would seem almost well to discard the name. I am, however, loth to do it on insufficient material, and therefore propose to retain it until more collections come to hand from that somewhat remote region. *Plebeius orbitulus* is a variable species; I have specimens of the ♀ with white dots as in *wosnesenskii* from several districts, and on Mount Canigou (Pyrenees) last summer I obtained many specimens which were also excessively dark.

EXPLANATION OF PLATES VI, VII, VIII.

PLATE VI.

- FIG. 1. *Plebeius orbitulus*.
2. *Plebeius aegagrus*.
3. *Plebeius jaloka*.
4. *Plebeius pheretiades*.
5. *Plebeius pherecydes*.

All magnified $\times 25$.

PLATE VII.

- FIG. 1. *Plebeius orbitulus* (upper apex of clasp showing the teeth).
2. *Plebeius aegagrus* (upper apex of clasp showing the teeth).

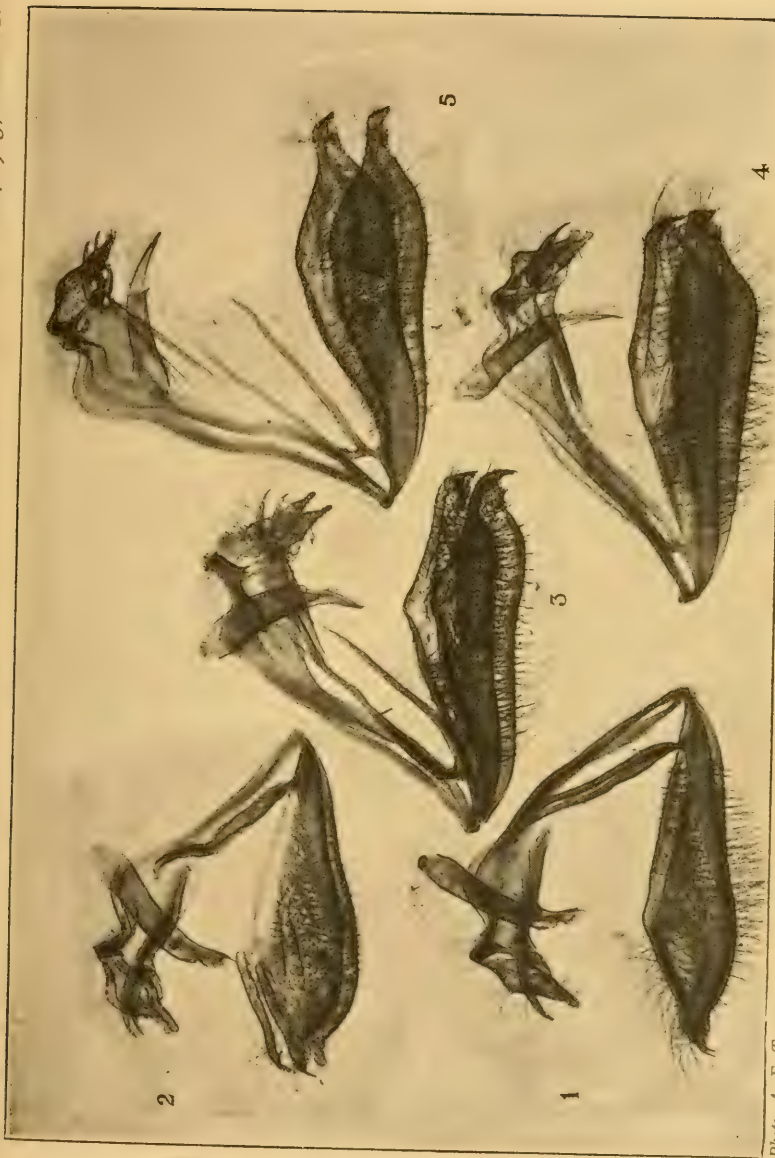
Originally magnified $\times 90$, but reduced slightly to bring it within the regulation size of the plate.

PLATE VIII.

- FIG. 1. *Plebeius pheretiades* (upper apex of clasp showing the teeth).
2. *Plebeius jaloka* (upper apex of clasp showing the teeth).
3. *Plebeius pherecydes* (upper apex of clasp showing the teeth).

Fig. 1 was magnified $\times 250$, figs. 2 and 3 $\times 90$, but these have been reduced slightly to bring them within the regulation size of the plate.

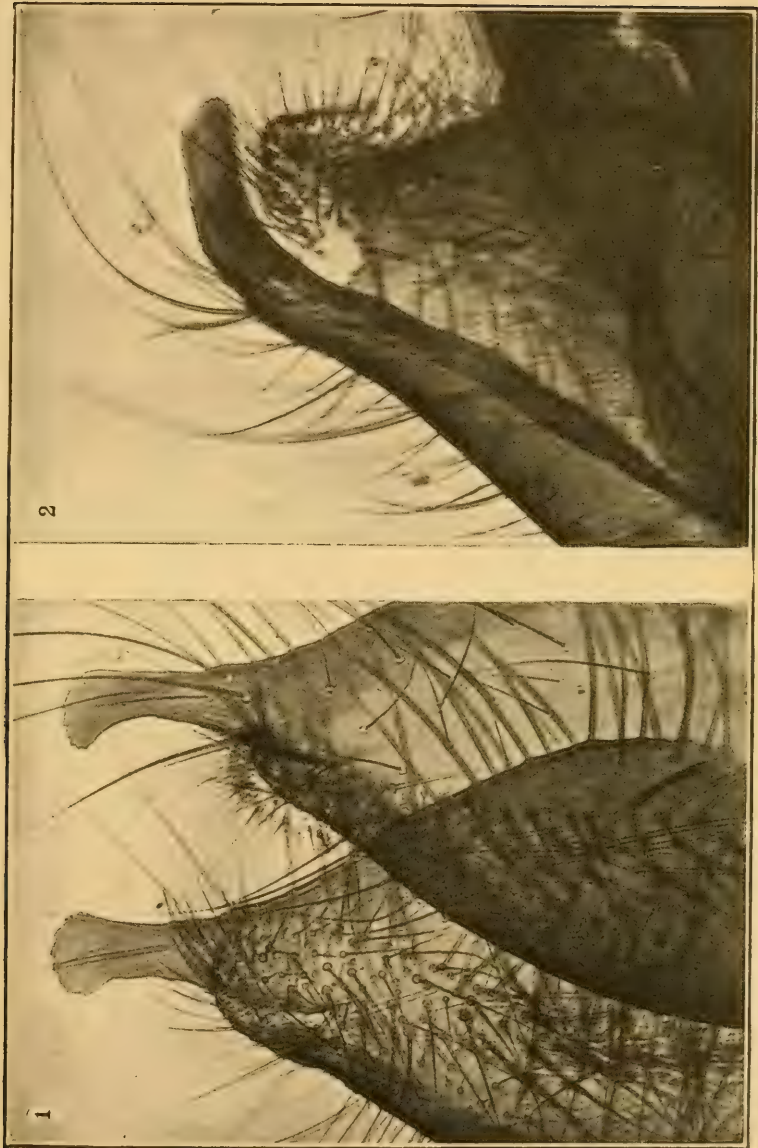
JUNE 13, 1913.



Photo, A. E. Tonge.

Male armature of the Orbitulus group of the genus Plebeius.

C. Heitschel.



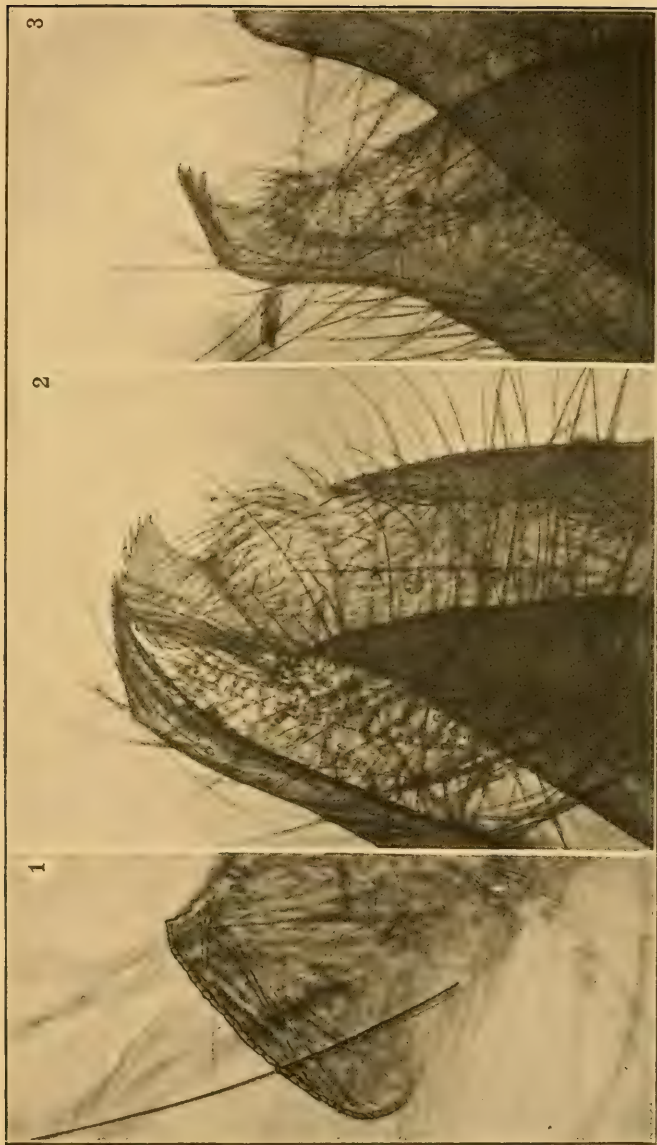
1. Orbitulus.

2. Aegagrus.

Male armature—ends of clasps to show the difference in the teeth.

Photo, A. E. Tonge.

C. Hentischel.



Photo, A. E. Tonge.

1. Pheretiades.

2. Jaloka.

3. Pherecydes.

Male armature—ends of claspers to show the difference in the teeth.

C. Hentschel.

VII. *Note sur Lucanides conservés dans les collections de l'Université d'Oxford et du British Museum.* Par M. H. BOILEAU, F.E.S.

[Read October 16th, 1912.]

PLATE IX.

Parmi les auteurs qui se sont spécialement occupés de l'étude des Lucanides, il faut citer au premier rang le Professeur Westwood et le Major Parry auxquels on doit un très grand nombre de descriptions et de remarques utiles.

Beaucoup d'autres descriptions plus anciennes sont indiquées dans les publications sous le nom du Révérend Hope, mais il est juste de dire que certaines d'entre elles paraissent en réalité devoir être attribuées à Westwood. Il semble que l'on puisse, en particulier, considérer comme telles les descriptions des *n. sp.* insérées dans le Catalogue publié en 1845 sous le titre: "A Catalogue of the Lucanoid Coleoptera in the Collection of the Rev. F. W. Hope." Cette brochure porte en effet un sous-titre: "With descriptions of the new species therein contained," au dessous duquel, sur certains exemplaires,* se trouve la mention manuscrite, de la main de Westwood, "by J. O. Westwood." Il est extrêmement probable que ces descriptions, qui ne sont guère que de courtes diagnoses, sont bien dûes à Westwood et que la mention "Hope" qui suit le nom des *n. sp.* décrites est une simple indication de catalogue, n'ayant pas plus de valeur que la mention "Catalogue Dejean" donnée pour certaines espèces également citées dans cet opuscule.

Quoi qu'il en soit, l'ensemble des descriptions de Hope, Westwood et Parry constitue encore maintenant une des bases importantes de l'étude des Lucanides, aussi ai-je été particulièrement heureux en 1906, de profiter d'un court voyage en Angleterre pour examiner le plus grand nombre possible des types décrits par ces auteurs. Ceux auxquels

* Un de ces exemplaires, ayant été envoyé à Snellen von Vollenhoven par Westwood a été mentionné par Albers (Deutsch. Ent. Zeitschr., 1884, p. 301) qui a signalé le fait et ses conséquences. Je possède également un de ces catalogues à titre modifié par Westwood et je présume qu'il en existe d'autres.

le nom de Hope a été attaché sont, pour la plupart, conservés au musée de l'Université d'Oxford. M. le Professeur Poulton, que je ne saurais assez remercier de son excellent accueil, a poussé l'obligeance jusqu'à me confier quelques-uns de ces précieux spécimens que j'ai ainsi pu étudier avec tout le soin désirable. Dans ce même musée et dans les riches collections du British Museum, où j'ai trouvé, grâce à MM. Waterhouse et G. Arrow, les plus grandes facilités d'étude, se trouvent également de nombreux types de Westwood et de Parry, ainsi que plusieurs espèces remarquables, décrites par M. Waterhouse.

Beaucoup de ces espèces sont, en fait, restées tout à fait inconnues de la plupart des spécialistes, les anciennes diagnoses étant absolument insuffisantes pour les caractériser, aussi ai-je pensé qu'il ne serait pas inutile de résumer les résultats de l'étude que j'en ai pu faire, quelque incomplète qu'elle soit en raison du peu de temps dont j'ai disposé à Londres et à Oxford. J'ai joint à ces notes, quelques-uns des croquis faits sur place, bien qu'ils ne soient pas ce que j'aurais désiré donner ici. Une revision analogue, mais d'une tout autre importance, a été faite par le Major Parry au moment de l'établissement de son premier Catalogue.* Il est évident que pour ce travail considérable et de haute valeur, Parry a dû examiner les types conservés à Oxford, vraisemblablement avec l'aide de Westwood. A ce moment, les matériaux d'étude dont on disposait, lui permirent déjà de très nombreuses rectifications. Mais, pour plusieurs espèces, des doutes ont subsisté, et j'aurai plus loin l'occasion de montrer que dans certains cas la synonymie adoptée d'après Parry est erronée et doit être rectifiée. Nous avons en effet maintenant, non pour toutes, mais pour la plupart des espèces anciennes, des éléments de comparaison bien plus considérables que ceux auxquels avaient recours les anciens descripteurs et il nous est ainsi devenue possible de reconnaître leurs erreurs. Celles-ci sont d'ailleurs bien excusables quand il s'agit d'insectes tellement variables dans leur forme et leur taille qu'à plusieurs reprises les spécialistes les plus autorisés ont réuni des espèces très distinctes, ou séparé sous deux, trois et même quatre noms les différents développements de la même espèce.

Les observations dont je donne ici le résumé, portent sur tous les types qu'il m'a été possible de reconnaître en

* A Catalogue of Lucanoid Coleoptera, etc. etc., Trans. Ent. Soc. Lond., 1864.

examinant les collections. La plupart de ceux-ci ont d'ailleurs été identifiés depuis longtemps par les entomologistes éminents qui ont eu la charge des collections et se trouvent très correctement étiquetés. Ces précieux spécimens sont, en général, tant à Londres qu'à Oxford, dans un état de conservation des plus satisfaisants. Leurs anciennes étiquettes ont, le plus souvent, été scrupuleusement conservées, précaution qui a une importance considérable et qui permet, dans bien des cas, de reconnaître si tel ou tel spécimen se rapporte ou non aux descriptions anciennes et constitue un type ou tout au moins un cotype de l'espèce. J'ai également mentionné certains exemplaires qui, sans être des types, appartiennent à des espèces rares ou intéressantes.

Pour plus de simplicité j'ai suivi, dans ces notes, l'ordre approximatif de la classification adoptée par Parry, qui n'a d'ailleurs pas été modifiée sensiblement par les récents auteurs. Je me borne à mentionner les types revus en 1906, sur lesquels aucune observation ne me paraît utile à présenter, en indiquant par les lettres B. M. (British Museum) et U. O. (Université d'Oxford) les collections dans lesquels ils sont conservés.

Sphenognathus higginsi Parry, Ent. Monthl. Mag., 1876, p. 174. Le mâle de cette espèce est jusqu'à présent fort rare. Outre le type, qui fait partie de la collection de M. R. Oberthür, et un exemplaire de la collection Van de Poll, actuellement dans ma collection, je ne connais que le spécimen du British Museum. Ces trois insectes sont absolument différents du *S. garleppi* que j'ai décrit, et la synonymie qui figure fréquemment sur les catalogues des marchands allemands et dont je ne connais pas l'auteur, est erronée. *S. higginsi* est un insecte de plus petite taille que *S. garleppi*, ses mandibules sont plus rectilignes; les angles antérieurs et surtout les angles postérieurs du prothorax sont arrondis, la saillie humérale des élytres est coupée obliquement. Tous ces caractères n'existent pas chez *S. garleppi*.

Sphenognathus canaliculatus Parry, Trans. Ent. Soc. Lond., 1874, p. 368, pl. 4, fig. 2.—Le type, conservé au British Museum, ressemble beaucoup à un petit mâle de *S. feisthameli* Guérin; les angles antérieurs de la tête sont très aigus; la couleur est celle du *S. feisthameli*; la double épine des angles postérieurs du prothorax est peu développée. Pour affirmer la synonymie il serait nécessaire de comparer

le type à plusieurs exemplaires de même développement du *S. feisthameli*, mais elle me paraît au moins vraisemblable.

Dendroblox earlei White, Voyage Ereb. and Terror, 1846, Ent., p. 9, pl. 2, figs. 9-10. Le type conservé au British Museum paraît être un mâle d'après ses antennes.

Rhyssonotus jugularis Westwood, Trans. Ent. Soc. Lond., 1863, p. 429, pl. 14, fig. 1. Le type, présumé être une femelle, mais qui me paraît plutôt être un mâle, est conservé au British Museum.

Lamprima schreibersi Hope in litt. L'insecte type est un mâle de taille moyenne de *L. aurata* Latr., de couleur verte, avec la tête vert doré un peu rougeâtre.

Lamprima coerulea Donovan, Ins. Nov. Holl., 1805, tab. 1. Il existe, au musée d'Oxford et au British Museum, quelques exemplaires d'une *Lamprima* d'un vert plus ou moins bleu, parfois bleu violacé, ayant la tête d'un vert bronzé, à peine un peu rougeâtre sur les carènes céphaliques, qui présentent, outre leur couleur spéciale, une légère modification de la forme habituelle des mandibules, surtout pour celle de gauche. L'extrémité des mandibules se trouve en effet plus ou moins nettement quadridentée au lieu d'être, comme d'ordinaire, tridentée, ce qui est réalisé par l'existence d'une petite dent supplémentaire placée entre la dent supérieure simple et la dent apicale bifurquée. Ces insectes paraissent être des *L. latreillei* M. L., faiblement modifiés et peuvent être considérés comme appartenant à une variété ou sous-variété de cette espèce. Je n'en ai vu des spécimens que dans des collections anciennes où ils sont en général étiquetés : "*Coerulea* Donovan." Leur provenance exacte m'est inconnue. Il y a huit spécimens à Oxford dont un beau mâle, très typique, venant de la collection Hope et deux autres grands exemplaires bien caractérisés, provenant de la collection Westwood. Trois autres sont au British Museum. (Pl. IX, fig. 5, *L. coerulea*, mandibules.)

Lamprima fulgida Dupont (type ou cotype ?). Sous le nom de *puncticollis* Hope, *fulgida*, Dupont, sont conservées à Oxford plusieurs femelles, dont l'une porte une étiquette visiblement très ancienne, sur laquelle se trouvent tracés, d'une écriture allongée, les mots : "*fulgida mihi*." C'est une *L. aurata* Latr.

Lamprima puncticollis Dejean, Hope in litt. Le spécimen qui porte la mention : "*puncticollis* Dej." est également une *L. aurata* Latr. (U. O.).

Lamprima insularis Hope in litt. Le spécimen de Hope est un mâle de *L. micardi* Reiche, assez grand exemplaire de couleur bronzée, à pointe sternale assez forte. (U. O.)

Lamprima purpurascens Hope, type, Cat., p. 28. L'insecte ainsi désigné est également un mâle de *L. micardi* Reiche, assez grand, de couleur bronzée rosâtre (U. O.). Espèce omise par Parry dans son Catalogue.

Lamprima tasmaniae Hope, type, Cat., p. 27. Le type paraît être un petit exemplaire, vert foncé, à courtes mandibules, de *L. latreillei* MacLeay. Cette synonymie a été indiquée par Parry (Cat. 1864, p. 69). (U. O.)

Lamprima subrugosa Hope, type, Cat., p. 28. Le type est un mâle moyen de *L. aenea* Fabr., comme l'a indiqué Parry (Cat. 1864, p. 70). (U. O.)

Lamprima sumptuosa Hope, type, Cat., p. 28. Le type est un petit spécimen, assez étroit, parallèle, de couleur dorée cuivreuse, de *L. micardi* Reiche. Parry a considéré dans son premier Catalogue (Cat. 1864, p. 7 et p. 70) cette espèce comme distincte, mais elle ne se sépare de *L. micardi* par aucun caractère valable (U. O.).

Lamprima nigricollis Hope, type, Cat., p. 28. Cette espèce n'a pas été mentionnée par Parry dans son Catalogue de 1864. Le type conservé à Oxford est une femelle d'un noir glacé bleu, avec la tête vert doré nuancée de rouge cuivre. Les pattes sont presque noires. La saillie du prosternum est presque nulle. L'insecte porte une étiquette: "*Nigricollis* Hope, *micardi* teste Parry," qui prouve que cette *Lamprima*, quoique non inscrite au Catalogue de 1864, a été examinée par Parry. Je rapporte également ce spécimen à *L. micardi* Reiche.

Streptocerus speciosus Fairmaire, Ann. Soc. Ent. Fr., 1850, p. 53. La femelle, figurée par Westwood (Tr. Ent. Soc., ser. 2, vol. iii., 1853-56, p. 204, pl. xi., figs. 1, 1a, 1b, 1c, 1d), est conservée à Oxford.

Colophon thunbergi Westwood, Trans. Ent. Soc. Lond., 1855, p. 198, pl. 10, fig. 2 type. L'exemplaire, conservé à Oxford, correspond bien à la figure donnée par Westwood, mais les étiquettes sont récentes. Le type du *C. westwoodi* Gray, figure également dans la collection. L'examen de ces spécimens est d'autant plus intéressant que M. Péringuey a cru devoir mettre en doute la validité de l'espèce et a affirmé, un peu légèrement, que le *C. thunbergi* était simplement la femelle du *C. westwoodi*. Je ne sais sur quels documents est basée la conviction de M. Péringuey, mais il

me paraît certain qu'elle n'est pas exacte. Le *C. thunbergi* du Musée d'Oxford est un spécimen dont les parties génitales et la mâchoire de gauche ont été disséquées. Ces mêmes organes se retrouvent sur un carton où se trouve la mention: "Genitalia et max. *Colophonbuffonii*, Wd." Ce dernier nom était probablement celui que Westwood s'était d'abord proposé de donner à l'espèce. Les organes génitaux sont ceux d'un mâle. *C. thunbergi* doit donc être considéré comme distinct de *C. westwoodi*.

Il est à noter d'ailleurs que Westwood a formellement affirmé que le type du *C. thunbergi* était un mâle et non comme on pourrait le supposer, l'autre sexe du *C. westwoodi*.

Colophon westwoodi Gray, in Griff. Anim. Kingd., 1832, p. 534., pl. 46, fig. 5, type. L'insecte porte deux étiquettes anciennes: "*Colophon lethroides* Hope, *westwoodi* G." avec l'indication ajoutée au crayon "♂" et "*Colophon westwoodi*, Gray in Griff., Westw. in Ann. Sc. Nat." Sur un carton se trouvent l'organe génital, qui est celui d'un mâle, et le dernier segment abdominal, côté dorsal. Ce carton porte: "Genitalia *Colophonis westwoodi*." Le spécimen, conservé au British Museum, est également un mâle. D'après ce qui précède, les hypothèses de M. Péringuey doivent être rejetées.

Phalacrognathus westwoodi Shipp., Trans. Ent. Soc. Lond., 1893, p. 223. Le type est un mâle de *Ph. muelleri* M. L., appartenant à la forme majeure, mais non au maximum de son développement.

Pseudolucanus atratus Hope, in Gray, Zool. Miscell., 1831, p. 22, Cat., p. 10. Le type est un mâle de faible développement, à mandibules simples, provenant du Nepaul (U. O.).

Lucanus lusitanicus Hope, type, Cat., p. 9. C'est un mâle de très grande taille, de la forme un peu spéciale, allongée et élégante, qui se trouve dans la péninsule et se rencontre déjà dans les Pyrénées. Cette race ressemble à celle de Syrie, mais les antennes ne diffèrent pas de celles du *L. cervus* ordinaire.

Lucanus lunifer Hope, in Royle Ill. Nat. Hist. Hymal. Ins., 1833, p. 55, pl. 9, fig. 4, Cat. p. 9. Le mâle type est de grande taille, la fourche des mandibules est pointue et ne présente pas l'élargissement apical que l'on remarque sur certains exemplaires. La femelle type, *L. rugifrons* Hope, est petite, elle se rapporte bien à cette espèce (U. O.).

Lucanus cantori Hope, Proc. Ent. Soc. Lond., 1842, p. 83,

types. Le mâle est un exemplaire moyen, la femelle type existe également dans la collection (U. O.).

Lucanus villosus Hope, in Gray, Zool. Miscell., 1831, p. 22. Un mâle de cette rare espèce existe au British Museum, il n'est pas impossible que ce soit le type de Hope. D'après le Catalogue Hope, p. 4, le *L. villosus* n'existait pas dans la collection Hope. Je ne l'ai pas retrouvé à Oxford. L'espèce était représentée dans la collection Parry par un couple, actuellement conservé dans la collection de M. R. Oberthür, mais ce couple, d'après le Catalogue dressé au moment de la vente de la collection Parry, ne comprenait pas de type.

L'insecte du British Museum, très voisin du *L. lunifer* par les mandibules, se rapproche également beaucoup de cette espèce par la tête, le thorax et les pattes.

Lucanus mearesi Hope, Proc. Ent. Soc. Lond., 1842, p. 83, Cat., p. 10. Le type est un grand mâle dont la fourche mandibulaire ne présente pas d'élargissement sur la dent apicale (U. O.).

Lucanus nigripes Hope, Cat., p. 10. Parry a signalé (Cat., 1864, p. 72) que cet insecte était la femelle du précédent, ce qui avait déjà été indiqué comme possible dans la diagnose originale. Le spécimen étiqueté comme type est une femelle de taille médiocre, sans étiquette ancienne. Cet insecte doit bien être rapporté au *L. mearesi*. Une autre femelle, de plus grande taille, qui porte l'étiquette ancienne : "Mearse, India," appartient également à cette espèce. L'attribution du type à l'une ou à l'autre des deux femelles peut être douteuse, mais la synonymie demeure, de toute façon, correcte (U. O.).

Lucanus westermanni Hope, Cat., p. 10. Le type est un mâle moyen, ne présentant aucune particularité (U. O.).

Lucanus vicinus Hope, Cat., p. 10. Cette espèce est une de celles qui ont donné lieu à des discussions. Elle a été admise par Parry (Cat. 1864, p. 73), et ce spécialiste possédait un spécimen passé ensuite dans la collection Barton et actuellement conservé dans ma propre collection, qu'il considérait comme un *L. vicinus*. Cet exemplaire porte, de la main de Parry, une étiquette ainsi libellée : "*L. vicinus*, Hope, from his coll. Ind. O. Burm., says good sp. from Poonah but ? a sp. very close to *cervus*." L'insecte présente tous les caractères d'un *L. cervus* de forme mineure, légèrement déformé par un accident, aussi la synonymie : *L. vicinus* Hope = *L. smithi* Parry, donnée par M. Planet

dans sa monographie * (vol. ii, p. 63) d'après l'examen du type du *L. vicinus* par M. R. Oberthür, m'avait toujours semblée fort douteuse. La diagnose du Catalogue Hope dit en effet expressément que le type ressemble à un *L. cervus* de petite taille et appartient peut-être à une simple variété géographique. L'examen fait par M. R. Oberthür a dû être des plus superficiels, ou aura porté sur un autre exemplaire que le type, car, après avoir étudié ce spécimen, je ne puis lui trouver aucune parenté avec *L. smithi*. Il ressemble au contraire beaucoup à l'exemplaire de Parry que j'avais emporté à Oxford, mais est plus grand et sans déféctuosité. Il n'y a pour moi aucun doute sur l'attribution de ces insectes, qui sont des *L. cervus* de forme mineure. Quant à leur provenance, l'hypothèse la plus vraisemblable est que ces deux seuls spécimens connus du *L. vicinus* sont des *L. cervus* européens, emportés ou envoyés aux Indes et qui auront été réexpédiés sans indication de provenance, soit volontairement, soit par erreur. Des confusions de ce genre se sont produites plusieurs fois et se produisent encore assez fréquemment; j'ai reçu, pour ma part, un *Dorcus parallelipipedus* de Sumatra et des *Figulus* de l'Amérique du Sud, sans parler des erreurs nombreuses de provenance que l'on trouve dans toutes les anciennes collections.

Lucanus americanus Hope, Cat., p. 10. Cet insecte a été considéré par Parry comme synonyme du *L. cervus*. Le type est d'un aspect très singulier. C'est évidemment un insecte immature. Les élytres sont presque complètement décolorées et les tarses sont jaunes. La forme elle-même est assez spéciale. L'insecte paraît être un *L. cervus* mineur, mais très fort pour son développement mandibulaire, et beaucoup plus massif que cela n'est habituel pour ceux de ces insectes qui proviennent de l'Europe occidentale. J'ai reçu récemment un lucane de cette forme, mais plus petit, provenant de Sarepta (Russie Méridionale) et, dans l'état actuel de nos connaissances, on peut admettre que c'est à une race locale analogue qu'appartient le *L. americanus* Hope.

Je dois cependant dire que, d'après des spécimens femelles qui se trouvent dans plusieurs collections, il

* "Généralement désigné dans les collections sous le nom de *Smithii* que lui a donné Parry, ce Lucane n'est autre que la *Luc. vicinus*, ainsi que M. R. Oberthür a pu le constater l'année dernière à Oxford, en examinant la collection de Hope." Planet, *loc. cit.*

semblerait exister, dans l'Amérique du Nord, un *Lucanus* plus grand que le *L. elaphus*. Mais ces femelles, dont il existe deux exemplaires au British Museum, sont très distinctes de celles du *L. cervus* et il paraît bien peu vraisemblable que leurs mâles se rapportent au *L. americanus* Hope.

Lucanus laminifer Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 33. Les types existent au British Museum; ils comprenaient un mâle d'une espèce distincte, que j'ai séparé et décrit sous le nom de *L. dohertyi*.

Lucanus swinhoei Parry, Trans. Ent. Soc. Lond., 1874, p. 370, pl. 4, fig. 4. Les types, mâle et femelle, sont au British Museum.

Lucanus sp. ? Planet, Essai Monographique, vol. ii, p. 124, fig. 75. M. Planet a figuré (*loc. cit.*) d'après un croquis de l'album de Parry conservé chez M. R. Oberthür, un singulier mâle de *Lucanus* provenant du Liban, et l'a rapproché, avec quelque doute, du *Lucanus* qu'il a décrit, dans le même travail, sous le nom de *L. cervus*, var. *akbesiana* Planet, Essai Monogr. vol. i, p. 62. Pl. 14, fig. 2. J'ai retrouvé cet exemplaire dans la collection du British Museum. Il porte les étiquettes anciennes: "*Macrophyllus*? Reiche, Syria, Lebanon, n. sp. Dr. Meryon."

L'insecte est un spécimen défectueux. Les deux mandibules ont été arrachées et mal rentrées dans leurs alvéoles, ce qui leur donne l'aspect falciforme reproduit par le croquis de Parry. En examinant l'insecte, on voit extérieurement, à la base de la mandibule, l'apophyse sortie de son logement. La tête et le corps sont ceux d'un *L. ibericus* Motsch. (*orientalis* Kraatz) assez fort et assez plat. [Pl. IX, fig. 14].

Rhaetus westwoodi Parry, Proc. Ent. Soc. Lond., 1862, p. 108, type mâle, conservé au British Museum.

Hexarthrius longipennis Hope, Cat., pp. 10, 11. Cet insecte est indiqué, dans la diagnose, comme provenant de Java et de l'Assam et comme pouvant être la femelle de l'*Hexarthrius rhinoceros* Ol. Parry, (Cat. 1864, p. 74) a admis cette hypothèse et, dans la collection d'Oxford, le type a été réuni aux spécimens de *H. rhinoceros*. Les étiquettes que porte cet insecte sont: 1° "Java." 2° "*longipennis* Hope." 3° "*longipennis* Hope Assam." La provenance Assam doit être considérée comme erronée. L'insecte, étroit avec des élytres longues, une tête très bombée et des canthus oculaires arrondis extérieurement, me paraît être

une femelle de l'*Hexarthrius buqueti* Hope. *Hexarthrius rhinoceros* Ol. est rarement reçu de Java et, de plus, la structure de *H. rhinoceros* femelle est plus courte et plus robuste que celle du type de *H. longipennis*.

Hexarthrius falciger Hope, Cat., p. 11. Cet insecte a également été réuni à *H. rhinoceros* Ol. par Parry (Cat., 1864, p. 74) comme appartenant à la forme mineure de cette espèce. Le type provient de Java et porte les mêmes étiquettes de provenance que le spécimen type de *H. longipennis*, toutefois au lieu d'"Assam" la troisième étiquette indique "Java." L'insecte est de très faible développement et difficile à déterminer à vue, il me paraît cependant être un *H. buqueti* Hope (U. O.).

Hexarthrius forsteri Hope, Trans. Linn. Soc. Lond., 1841, p. 587, pl. 40, fig. 1. Cat., p. 11. Cette espèce est représentée par trois spécimens anciens. Des deux plus grands, qui portent l'étiquette "*Calanus*, Hope," le second pour la taille correspond très bien avec la figure donnée par le descripteur (Linn. Trans. 18, 588, tab. 40, fig. 1). Le plus petit porte l'étiquette "*Cantori* Hope." (U. O.) *Hexarthrius serricollis* Hope, Cat., p. 11, est bien, comme l'a indiqué Parry (Cat. 1864, p. 74), la femelle de *H. forsteri* (U. O.).

Hexarthrius davisoni Waterhouse, Ann. Mag. Nat. Hist., 1888, p. 250. Cette espèce, dont les types sont conservés au British Museum, a bien pour synonymes *H. cotesi* Nonfried et *H. castetsi* Boileau.

Cladognathus confucius Hope, Proc. Ent. Soc. Lond., 1842, p. 60, Cat., p. 18. J'espérais trouver dans les collections de l'Université d'Oxford le type de Hope, mais je l'ai cherché inutilement. Par contre, les exemplaires indiqués par la diagnose comme se rapportant à cette espèce et autrefois nommés *L. whithillii* Hope existent dans la collection; mais ce sont sans aucun doute des *C. giraffa* Fabr. ainsi que l'a indiqué Parry.

Les deux plus grands exemplaires mesurent l'un 34 lignes, l'autre 31. Le premier porte les indications: "Withill, Bombay" et "*Confucius* var. *Withillii* Hope," le second: "*Withillii* Hope" et "Khasyah Hills." Deux autres mesurent 26½ et 25 lignes, et ont simplement les étiquettes de provenance: "Poona" pour le premier, "Bombay" pour le deuxième. Ils représentent probablement le *C. brahminus* Hope.

Le *C. confucius* type est indiqué comme ayant eu 28

lignes ; il ne correspond donc à aucun de ces spécimens ; on voit d'ailleurs qu'il s'agit d'un petit exemplaire. Le provenance " Chusan " me porte à croire que le type doit bien être un *C. confucius* tel que nous le comprenons maintenant ; la confusion faite par Hope (ou Westwood) entre les deux espèces voisines s'explique par le faible développement du type du *C. confucius*.

C. downesi Hope, Cat. p. 19, type, existe dans la collection d'Oxford ; c'est une femelle courte et large, dont l'étiquette de provenance est Bombay ; on doit la considérer comme étant une femelle de *C. giraffa* Fabr.

Psalidoremus motschulskyi Waterhouse, Trans. Ent. Soc. Lond., 1869, p. 16. Le type de cette espèce est conservé au British Museum. Dans la description, la provenance est indiquée " Japon ou Archipel Indien." Je possède, de cette espèce, deux exemplaires qui se trouvaient dans la collection Barton et venaient de la collection Parry, comme aussi le type de la description. Tous deux sont de la forme mineure mais se rapportent bien au *P. motschulskyi* et ont été déterminés comme tels par Parry. Le plus grand porte l'indication : " I. Formose," l'autre : " Coll. Saunders Formosa." La provenance Formose me paraît donc certaine ; elle est d'ailleurs tout à fait vraisemblable [Pl. IX, fig. 13].

Metopodontus downesi Hope, Trans. Zool. Soc. Lond., 1835, p. 99, pl. 13, fig. 7, Cat., p. 11. Très exactement représenté par la figure donnée par le descripteur (Zool. Trans. i, p. 99, pl. 13, fig. 7), le type est conservé à Oxford.

Metopodontus savagei Hope, Ann. Mag. Nat. Hist., 1842, p. 494, Cat., pp. 11, 12. Deux mâles et une femelle sont indiqués comme étant les types. La femelle seule porte une indication un peu précise de localité : " Palmas."

Metopodontus unguulatus Hope, Ann. Mag. Nat. Hist., 1842, p. 494, Cat., p. 12. Le type, conservé comme les précédents à Oxford, est, comme l'a indiqué Parry (Cat. 1864, p. 82) un *M. savagei* de forme mineure. Ses mandibules sont inermes.

Metopodontus castaneus, Hope, Cat., p. 12. Cette espèce a toujours été considérée comme valable. L'insecte indiqué comme type dans la collection d'Oxford mesure exactement les 24 lignes indiquées par la description. Il porte deux étiquettes anciennes : " *Castanea*," " *Castaneus* Sn. P. Walker." Les mandibules sont celles d'un exemplaire

appartenant à la forme moyenne des *Metopodontus* de cette section (*Metopodontus* vrais); elles présentent une dent basale trituberculée, aucune dent médiane, et trois denticules anté-apicaux. Par la forme générale, la coloration, surtout celle des pattes et des élytres, et par l'angle médian du prothorax cet insecte se rattache, sans aucun doute possible, au *M. cinnamomeus* Guérin, de Java. Le *M. castaneus*, Hope, doit donc passer en synonymie. Comme je l'indique plus loin les espèces que l'on reçoit habituellement de l'Inde et que l'on désigne dans les collections sous le nom de *M. castaneus* sont, en réalité, des *M. foveatus* Hope, ou des *M. poultoni* Boileau.

Metopodontus omissus Hope, Trans. Linn. Soc., 1842, p. 591, Cat., p. 12. Ainsi que l'a indiqué Parry (Cat. 1864, p. 79) le type est un *M. foveatus* Hope. L'exemplaire étiqueté comme type appartient à la forme moyenne. Les mandibules, dépourvues de dent médiane, ont une double dent basale. Il existe un autre exemplaire, qui semble ancien; un peu moins développé, contrairement à l'indication donnée par Parry (*loc. cit.*) et conformément à la diagnose.

Metopodontus foveatus Hope, Trans. Linn. Soc., 1842, p. 590, Cat., p. 12. Comme je viens de l'indiquer, c'est le *M. castaneus* Hope de la plupart des collections. Le nom de *M. foveatus* est seul valable, la description du *M. omissus* suivant celle du *M. foveatus* et étant relative à un plus petit exemplaire de la même espèce. Le type est un mâle intermédiaire entre la forme moyenne et la forme majeure. Les mandibules ont une dent médiane simple, à gauche, mais celle-ci est seulement aux deux cinquièmes de la longueur à partir de la base. A droite, la dent est bifide. L'insecte vient de Sylhet. L'indication "Java" qui suit la provenance correcte "Assam" dans le Catalogue, vient évidemment d'une confusion avec d'autres exemplaires appartenant au *M. cinnamomeus* Guérin, qui auront sans doute été vus par Hope ou Westwood dans d'autres collections.

Metopodontus astacoides Hope, Trans. Linn. Soc. 1842, p. 590, Cat., p. 12. Parry a déjà indiqué que cet insecte était un *M. foveatus* minor (Cat. 1864, p. 79). Le type est un exemplaire à mandibules entièrement denticulées.

Metopodontus fraternus Hope, Cat., pp. 12, 13. La même synonymie correcte a été donnée par Parry (*loc. cit.*). Le type ne diffère du précédent que par ses mandibules

incomplètement denticulées ; il appartient à un développement plus fort.

Metopodontus (Hoplitocranum) maccllelandi Hope, Proc. Ent. Soc. Lond., 1842, p. 83, Cat., p. 13. Le type est un petit exemplaire à mandibules entièrement denticulées. Les pattes postérieures ne portent pas les pinceaux soyeux de l'espèce voisine, généralement connue sous le nom de *M. calcaratus* Jakowleff et que je considère comme étant en réalité le *M. jenkinsi* Westwood.

Metopodontus fulvipes Hope, Cat., p. 13. La synonymie donnée par Parry (Cat., 1864, p. 79) : *fulvipes* = *cinnamomeus* var. min. est exacte. Le type est un mâle de très petite dimension du *M. cinnamomeus*. Il porte l'étiquette : "*fulvipes*" au verso de laquelle se trouve l'indication "*rafflesii* Hope," qui a été barrée. Le *M. rafflesii* Hope (Proc. Ent. Soc. Lond., 1844, p. 106), est, suivant Parry, (Cat. 1864, p. 79) la femelle du *M. cinnamomeus* ; je n'ai pas retrouvé ce type à Oxford, par contre celui du *M. pallidipennis* Hope (Trans. Linn. Soc., 1842, p. 590) s'y trouve conservé ; c'est un grand mâle du *M. cinnamomeus*, dont la seule particularité à signaler est l'existence d'une dent médiane double à la mandibule de droite. Il résulte de ce qui précède que le *M. cinnamomeus* Guérin a été décrit quatre fois par Hope et Westwood sous les noms de *pallidipennis*, *castaneus*, *fulvipes* et *rafflesii*.

Metopodontus impressus Waterhouse, Trans. Ent. Soc. Lond., 1864, p. 17, types conservés au British Museum. Cette espèce est intéressante, peu connue ; sa provenance exacte est ignorée. Elle se rapproche des espèces pour lesquelles Jakowleff avait créé le sous-genre *Hoplitocranum* ; les femelles, en particulier, sont fortement ponctuées et rappellent celles de ce groupe, dont elles ont à peu près la taille. Je ne considère pas comme absolument certain que le plus grand mâle appartienne à la même espèce que les autres.

Metopodontus limbatus Waterhouse, Ann. Mag. Nat. Hist., ser. 5, xix, p. 381, types mâle et femelle, British Museum. Cette espèce est tantôt considérée comme distincte, tantôt comme synonyme de *M. cinctus* Montrouzier. En général les exemplaires que l'on rapporte au *M. limbatus* forment passage entre le *M. cinctus* et le *M. torrensensis* ; ils sont assez allongés, un peu cylindriques, avec une large bordure jaune aux élytres et semblent former une sous-variété ou une race locale. Dans le

collection du British Museum, il y a bien, sous la désignation *cinctus*, quelques spécimens de cette forme, provenant des Iles Murray, Cornwallis et du Cap York. Mais les véritables types viennent des Iles Thursday et ne me paraissent pas différer des *M. cinctus* de Nouvelle Guinée et des îles voisines. Le *M. cinctus* lui-même peut difficilement être séparé du *M. bison*, qui varie suivant les provenances et dont il constitue une variété.

Metopodontus roepstorffi Waterhouse, Ann. Mag. Nat. Hist., ser. 6, v, p. 35, dont les types sont également au British Museum, ne peut guère être considéré que comme une variété du *M. occipitalis* Hope, dont la répartition géographique est fort étendue et qui varie sensiblement suivant les provenances. Les marques noires de la femelle, plus fortes que d'habitude, n'ont pas grande importance; on retrouve d'ailleurs sur des femelles du *M. occipitalis* de diverses localités la forte macule élytrale portée par les femelles du *M. roepstorffi*.

Metopodontus occipitalis Hope, Cat., p. 13. Le type mâle est un spécimen de forme moyenne, à mandibules symétriques; la femelle, brillante, présente une suture élytrale et des macules thoraciques très nettes; les macules céphaliques sont peu développées. Ces insectes n'ont conservé aucune étiquette d'origine, mais la diagnose indique qu'ils proviennent des Philippines, ce qui concorde bien avec leur structure.

Metopodontus inquinatus Westwood, Cab. Or. Ent., p. 18, pl. 8., fig. 4. Je pense que le couple conservé au British Museum est formé par les deux types. Cet insecte est resté très rare dans les collections; il est étroitement apparenté au *M. biplagiatus* Westwood. Comme dans cette espèce, mais d'une manière moins nette, le mâle du *M. inquinatus* porte trois carènes sur la face inférieure des joues.

Prosopocoelus cavifrons Hope, Cat., p. 13. Le type est un spécimen de forme majeure (U. O.).

Prosopocoelus lateralis Hope, Cat., p. 13. Il existe deux types mâles, le premier est un exemplaire de forme majeure, dont les mandibules sont dépourvues de dent médiane, le second appartient à la forme mineure. La femelle type est également conservée à Oxford. Quelques spécimens de la collection portent le nom *exaratus* Dejean.

Prosopocoelus quadridens Hope, Cat., p. 14. Cette espèce, et les quatre suivantes, sont restées très douteuses

et l'examen que j'en ai fait ne m'a pas permis de déterminer aussi exactement que je l'aurais désiré, leur synonymie véritable. La question se complique du fait que l'attribution réelle du *P. antilopus*, Swederus, est également restée problématique. Enfin il semble que les *Prosopocoelus* africains de ce groupe soient à la fois très proches et assez variables, ce qui rend encore plus difficile leur délimitation et leur synonymie.

Le *P. quadridens* type [Pl. IX, Fig. 8. mandibule] est un insecte d'un roux obscur, plus foncé sur la tête et le thorax. Les mandibules, la tête, le pronotum, sont finement et régulièrement granuleux; les élytres sont dépolies, avec la région suturale noircie et assez brillante; il existe de faibles traces de côtes. L'exemplaire est un mâle de forme majeure, dont les mandibules, légèrement élargies à la base, inermes sur la plus grande partie de leur longueur, portent chacune deux dents antéapicales, dont la plus voisine de l'apex est la plus forte. Ce sont donc les deux mandibules considérées ensemble qui portent quatre dents. Cet insecte est étiqueté comme venant de Sierra Leone. Un autre, presque pareil, est indiqué de "Cape Palmas." Ces deux exemplaires sont conservés au Musée d'Oxford. Je possède des spécimens tout à fait analogues venant de Sierra Leone, d'Assinie, du Dahomey, et même du Congo; je considère également que le *Prosopocoelus* que l'on reçoit du Cameroun, et qui est de couleur un peu plus claire, ne diffère pas de cette espèce, c'est, je pense, cette variété qui a été décrite par M. Kolbe sous le nom de *P. camarunus* (Ent. Nachr., 1897, p. 12).

Tous ces insectes, et spécialement certains spécimens du Cameroun, semblent devoir être rapportés au *P. antilopus* Swederus, quoique la description et le dessin ne permettent pas une affirmation absolue sur ce point. De toute façon, il est certain que le *P. quadridens* est identique au suivant :

Prosopocoelus sayersi Hope, Cat., p. 14. Le type [Pl. IX, fig. 9, mandibule], qui est également un mâle de grand développement, a une dent de plus aux mandibules et l'extrémité fourchue de celles-ci est un peu plus plate. La dent supplémentaire, qui est assez faible, est voisine du milieu, et se trouve implantée dans le plan de la face inférieure de la mandibule qui est, comme chez *quadridens*, de section plutôt carrée qu'arrondie. Or si l'on regarde bien les mandibules du *quadridens*, on voit qu'il existe une faible carène formant un rudiment de denticule au dessous

de la première dent et un peu plus près de celle-ci que chez le *P. sayersi*. Sauf des différences insignifiantes, les deux spécimens sont identiques comme forme et couleur et le nom de *sayersi* doit, de toute façon, ainsi que l'avait déjà indiqué Parry (Cat. 1864, p. 83) être considéré comme un simple synonyme de *quadridens*.

Prosopocoelus speculifer Hope, Cat., p. 14. Le mâle et la femelle, qui sont les types de Hope, sont des spécimens de petite taille. La couleur est sombre, avec la région suturale rembrunie et noirâtre. Les joues sont creuses, la saillie de l'épistome est simple. Cette espèce, qui est certainement identique à la suivante, *P. piceipennis* Hope, décrite antérieurement, me paraît pouvoir être également assimilée au *P. camarunus* Kolbe qui n'en diffère guère que par une coloration plus claire. Les types du *P. speculifer* sont de Cape Palmas.

Prosopocoelus piceipennis Hope, Cat., p. 14. Le type est un insecte de forme élégante et de couleur sombre, appartenant à un développement moyen. Les mandibules sont relativement assez grêles. Les bords du pronotum ne sont pas droits, mais légèrement concaves avant l'angle médian. La tête et le prothorax sont granuleux. La provenance, d'après l'étiquette ancienne, est Sierra Leone. Parry a admis que les *P. piceipennis* et *speculifer* représentaient respectivement la forme moyenne et la forme mineure du *P. quadridens*. S'il en est bien ainsi, comme je suis aussi disposé à le croire, le nom de *piceipennis* aurait la priorité sur les autres, mais ne serait valable que si la description du *P. antilopus* Swed. devait être rapportée à une autre espèce, ce qui semble vraiment peu probable.

En résumé, dans l'état actuel de nos connaissances, on peut considérer les *P. piceipennis*, *quadridens*, *sayersi* et *speculifer* Hope, ainsi que le *P. camarunus* Kolbe, comme synonymes du *P. antilopus* Swederus.

Prosopocoelus martini Hope, Cat., p. 14. Parry a admis (Cat., 1864, p. 82) que cet insecte représentait une forme du *P. senegalensis* Klug. L'insecte conservé à Oxford diffère certainement du *P. piceipennis*; il est encore plus foncé comme couleur, la suture élytrale est largement teintée de noir. Les canthus oculaires sont droits; les côtés du prothorax sont concaves derrière l'angle médian. Les tibias postérieurs sont inermes, comme l'indique la diagnose, mais portent un renflement indiquant que des exemplaires plus petits et les femelles ont une épine à

cette paire de pattes comme à la précédente. L'épistome forme une saillie simple, peu prononcée. Tous ces caractères se retrouvent chez le *P. senegalensis* et la synonymie donnée par Parry me semble exacte.

Prosopocoelus hanningtoni Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 34. Cette espèce, dont les types sont au British Museum, se rattache au groupe du *P. serricornis* Latr.; elle ne diffère que par des caractères sans importance de l'espèce, largement répandue dans l'Afrique orientale allemande, qui a été ensuite décrite par M. Nonfried sous le nom de *P. brunneus* (Ent. Nachr., 1892), et que ce dernier considérait comme une variété du *P. serricornis* Latr. de Madagascar.

Prosopocoelus oweni Hope, Cat., pp. 14, 15. Le type est un petit mâle. Les mandibules présentent chacune un tubercule inférieur, plus développé à droite, mais bien distinct aussi à gauche. Il se rapporte bien aux spécimens ordinairement déterminés comme *P. oweni* dans les collections.

Prosopocoelus subangulatus, Hope, Cat., p. 24. Cet insecte est conservé à Oxford, comme le précédent. Ainsi que l'a indiqué Parry (Cat. 1864, p. 82), c'est la femelle du *P. oweni*.

Prosopocoelus bulbosus Hope, Trans. Linn. Soc., xviii, p. 589, tab. xi, fig. 2, nec. *P. bulbosus* Hope, Cat., p. 20. Parry a signalé (A Revised Catalogue of the Lucanoid Col. etc. Trans. Ent. Soc. Lond., 1870, p. 84) que le *P. bulbosus* Hope, Cat., p., 20, était un autre insecte que le *P. bulbosus* Hope antérieurement décrit dans les Trans. Linn. Soc. Le vrai *P. bulbosus*, tel qu'il a été figuré (*loc. cit.*) a la saillie de l'épistome simple et le *P. bulbosus* du Catalogue a cette saillie bituberculée. Je reviendrai, en parlant du *P. spencei* Hope, sur les conclusions que Parry a cru devoir tirer de cette constatation.

Le *P. bulbosus* type, conservé à Oxford, est certainement celui qui a été décrit dans les Trans. Linn. Soc., 1841, p. 589. Il est bien conforme au dessin donné dans cette publication (tab. xi, fig. 2). La saillie de l'épistome est simple.

Par contre, je n'ai pas vu les spécimens ayant servi de base à la description du Catalogue, mais il est très possible qu'ils existent dans la collection d'Oxford, mon attention ne s'étant pas portée sur l'intérêt que présentait, en réalité, leur recherche.

Prosopocoelus punctiger Hope, Cat., p. 24. C'est une femelle, qui appartient certainement à ce groupe. Il serait nécessaire de l'examiner avec beaucoup de soin pour pourvoir la rapporter à l'une ou l'autre des espèces connues et la synonymie (= *spencei* ♀) donnée par Parry (Trans. Ent. Soc. Lond., 1870, p. 85), est basée sur l'hypothèse incorrecte de l'identité du *P. bulbosus* Hope (Trans. Linn. Soc.) et du *P. spencei*.

Prosopocoelus spencei Hope, Cat., p. 19. Cette espèce qui a été décrite par Hope (Trans. Linn. Soc., xviii, p. 589) d'après un mâle unique de développement maximum, de la collection Cantor, est en réalité peu connue et a donné lieu à des discussions anciennes, ainsi qu'à des confusions nombreuses. L'étude du type, conservé à Oxford, est donc particulièrement intéressante.

Dans son premier Catalogue (1864, p. 37) Parry a exposé les motifs pour lesquels il croyait devoir considérer *P. spencei* comme étant la forme maxima, très rare, du *P. bulbosus* ; malgré l'aspect très différent des mandibules, il avait aisément reconnu la parenté des deux insectes.

Ultérieurement, dans son deuxième Catalogue (1870, p. 84), comme je l'ai dit plus haut. Parry a signalé qu'il y avait, en réalité, deux *P. bulbosus* distincts, l'un décrit par Hope dans les Trans. Linn. Soc. en 1841 en même temps que le *P. spencei*, l'autre décrit dans le Catalogue des Lucanides de la collection Hope en 1845. Les deux espèces diffèrent par la saillie de l'épistome, qui est simple chez le premier et bituberculée chez le second ; de plus on peut remarquer que la taille indiquée pour les deux spécimens types n'est pas exactement la même : unc. 1, lin. 6 pour le premier, lin. 17 pour le second. Dans son travail, Parry a admis à nouveau l'identité spécifique du *P. bulbosus* décrit en 1841 et du *P. spencei* ; il a considéré, de plus, que la *P. crenicollis* Thomson, Ann. Soc. Ent. Trans., 1862, p. 418, était également assimilable au *P. spencei* ; enfin il a laissé le nom de *P. bulbosus* à l'espèce décrite dans le Catalogue Hope de 1845.

Plus tard encore, Parry semble avoir eu quelques doutes sur l'identification du *P. crenicollis* Thomson, puisque dans son troisième Catalogue, publié en 1875, le *P. crenicollis* est rétabli au nombre des espèces distinctes et signalé, en même temps comme manquant à sa collection ; cette espèce n'est d'ailleurs pas indiquée dans le Catalogue de la vente de la collection en 1885. Il me paraît probable que, dans

l'intervalle écoulé entre la publication de son deuxième et de son troisième Catalogue, Parry aura eu l'occasion de voir en nature le *P. crenicollis* et qu'il aura reconnu qu'il différerait notablement du *P. bulbosus* Hope (Trans. Linn. Soc.) qu'il considérerait toujours comme étant la forme mineure du *P. spencei*.

Le fait que Parry n'a pas eu à sa disposition un spécimen du *P. crenicollis* et n'a pu, par suite, le comparer au type resté unique du *P. spencei* explique bien qu'il ait persisté à identifier le *P. bulbosus* à cette dernière espèce. La grande forme des deux *P. bulbosus* n'a d'ailleurs été reçue qu'une dizaine d'années plus tard. Si, à ce moment, la synonymie véritable n'a pu être établie, malgré le bon dessin du *P. spencei* donné par Parry (Cat., 1870, pl. 2. fig. 1), cela tient à ce que ce dessin laisse un petit doute sur la position et la grandeur de la dent médiane. On peut en effet supposer qu'il existe une dent supérieure dressée, dont les contours auraient été faiblement indiqués, analogue à celle des exemplaires de la forme maxima des *P. bulbosus*. La description est d'ailleurs encore moins explicite que le dessin sur ce point particulier.

En réalité, il n'y a aucune dent supérieure [Pl. IX, fig. 6 *a, b, c*, mandibule; *d* menton], et la petite dent que l'on voit sur le dessin de Parry et qu'on pourrait prendre pour la projection de l'extrémité de la dent supérieure, est un denticule placé sur la carène interne inférieure. Cette disposition est absolument différente de ce qui existe chez *P. bulbosus* et suffit à séparer immédiatement les mâles de développement majeur. Un autre caractère réside dans la forme de la carène suturale du menton, qui est simple chez *P. spencei* et trilobée chez les deux *P. bulbosus*; ce caractère est d'autant plus marqué que le développement est plus grand, les mâles de la forme mineure proprement dite ont la carène suturale simple pour les trois espèces. Enfin les canthus oculaires du *P. spencei* sont plus élargis en arrière que ceux des deux *P. bulbosus*, les crénelures thoraciques sont plus marquées et la forme est plus élégante.

Il faut conclure de ces différences que *P. spencei* n'est pas la forme majeure de *P. bulbosus* Hope (Trans. Linn. Soc.), qui constitue une espèce distincte.

Il en résulte immédiatement que *P. bulbosus* Hope, Cat., p. 20 qui constitue également une bonne espèce, doit recevoir un nouveau nom. Il me paraît bien juste de lui

donner celui de Parry, qui a reconnu le premier la différence des deux *P. bulbosus* décrits par Hope.

Quant au *P. crenicollis* Thomson, je n'ai pas de notes sur les types de cette espèce, qui doivent faire partie de la collection de M. R. Oberthür, mais si je m'en rapporte à l'examen d'un spécimen qui faisait partie de la collection Mniszech et que j'ai trouvé dans la collection van de Poll avec l'étiquette "*Crenicollis*, comparé" il serait identique à l'insecte que j'ai décrit en 1904 (*Le Naturaliste*, 15, xii, p. 285) sous le nom de *P. mordax*. La description de Thomson, assez médiocre, s'applique à peu près à cet insecte. J'ai peu de doutes que le *P. laticeps* Möllenkamp dont la description a paru à la même date (*Ins. Börse*, 15, xii, p. 402) soit une espèce distincte de celle-ci, mais sa description est trop sommaire pour que je puisse l'affirmer absolument.

En étudiant le type du *P. mordax*, et le spécimen du *P. crenicollis* mentionné ci-dessus, ainsi qu'un exemplaire de la même espèce qui se trouve conservé au British Museum et porte l'indication "*spencei* Hope, *crenicollis* Thomson," il m'a paru probable que ces trois insectes appartiennent à des formes mineures plus ou moins développées du *P. spencei*. Le passage de la forme mineure de grande taille à la forme maxima, étant très brusque dans ce groupe, il est difficile d'arriver à une certitude complète tant qu'on n'a pas vu une série suffisante de spécimens de taille variée, mais la synonymie me paraît d'autant plus vraisemblable qu'on ne connaît aucun autre insecte pouvant représenter la forme mineure du *P. spencei*.

Si mes conclusions sont correctes, on peut donner le tableau suivant des quatre espèces affines qui constituent ce petit groupe :

A. Saillie de l'épistome simple.

a. Suture du menton formant une carène lobée chez les exemplaires de grand et moyen développement.

b. Une dent supérieure médiane chez les mâles de développement maximum.—1.

1. *P. bulbosus* Hope *Trans. Linn. Soc.*, 1841, p. 589, pl. 40, fig. 2.

c. Suture du menton formant une carène simple chez les exemplaires de grand et moyen développement.

d. Pas de dent supérieure médiane chez les mâles de développement maximum.—2.

2. *P. spencei* Hope Trans. Linn. Soc., 1841, p. 589.—
 Synonymes : *P. crenicollis* Thomson, Ann. Soc. Ent. Fr., 1862,
 p. 418.
P. mordax, Boileau, Le Naturaliste, 1904, p. 285.
 ? *P. laticeps*, Möllenkamp, Ins. Börse, 1904, p. 402.
- B. Saillie de l'épistome bituberculée.
- a. Une dent supérieure médiane chez les mâles de développement maximum.
- b. Suture du menton formant une carène lobée chez les exemplaires de grand et moyen développement.—3.
3. *P. parryi* n.n. (= *P. bulbosus*) Hope, Cat., p. 20.
- c. Suture du menton formant une carène simple chez les exemplaires de grand et moyen développement.—4.
4. *P. dentifer* H. Deyrolle, Ann. Soc. Ent. Belg., 1865, p. 29, tab. 1, fig. 5.

Pour cette dernière espèce, très rare jusqu'à présent, j'ajouterai que la taille est plus petite et que les côtés du prothorax sont très faiblement crénelés.

Prosopocoelus tenuipes Hope, Cat., p. 18. Le type du musée d'Oxford est une femelle brillante, appartenant évidemment à un *Prosopocoelus* de la section du *P. buddha* Hope. D'après les étiquettes anciennes, elle aurait été envoyée des Philippines, par Cuming. La synonymie donnée par Parry (Cat., 1864, p. 81) = *cavifrons* ♀, paraît exacte.

Prosopocoelus curvipes Hope, Cat., p. 25. Le type d'Oxford est une femelle de très petite taille, noire et très brillante, ayant un aspect bien distinct de celui des autres femelles du groupe. Outre l'étiquette d'origine "Poona" cet insecte porte l'indication suivante : "*Figuloides* Parry, ♀, allied to *bulbosus*." Parry a décrit (Cat. 1864, p. 35) le mâle de cette curieuse petite espèce dont les rares exemplaires ne se trouvent que dans les anciennes collections. Quoique très distincte, c'est en effet du groupe du *P. bulbosus*, plus spécialement du *P. spencei* qu'on peut la rapprocher. Le grand développement est inconnu. Il existe au British Museum deux mâles, dont l'un porte une note de Parry "not in Hope's coll." Ce n'est pas le type, qui doit se trouver actuellement dans la collection de M. R. Oberthür. L'autre mâle est intéressant comme appartenant à une forme minima de l'espèce.

Aulacostethus archeri Waterhouse, Trans. Ent. Soc. Lond., 1869, p. 14 pl. iii, figs. 1, 1 a, 1 b.—L'insecte paradoxal.

difficile à classer, très exactement décrit par M. Waterhouse, est, à ma connaissance, resté unique jusqu'à présent. Il présente un curieux mélange de caractères dont plusieurs peuvent faire supposer une adaptation à une vie partiellement souterraine: réduction des yeux, position de ces organes, gracilité et brièveté des tarsi, élargissement considérable des extrémités des tibia médians et postérieurs qui semblent disposés pour pousser en arrière [B.M.] [Pl. IX, fig. 12 a, antenne; 12 b, extrémité du tibia postérieur.]

Homoderus johnstoni Waterhouse (in Johnston, Uganda Protectorate, 1902, i, p. 460). Un spécimen femelle, conservé au British Museum, sans doute le type de l'espèce. Elle porte l'indication de localité "Entebbe. Oct. 1900." et une étiquette "Sir H. H. Johnston, 1901, 281." C'est une femelle de forte taille qui a la couleur d'un rouge obscur de l'*H. gladiator* Jakowleff. Elle ressemble extrêmement à la femelle du *preussi* Kolbe. Sa validité spécifique me semble très douteuse.

Prismognathus platycephalus Hope, Proc. Ent. Soc. Lond., 1842, p. 83. Le type, conservé à Oxford, grand exemplaire mâle.

Cantharolethrus buckleyi Parry, Trans. Ent. Soc. Lond., 1872, p. 77, tab. 1, fig. 1 ♂, fig. 2 ♀. Le musée d'Oxford possède deux mâles et une femelle de cette rare espèce. Le grand mâle et la femelle sont les types de Parry.

Cyclommatus strigiceps Westwood, Cab. Or. Ent., p. 18, tab. 8, fig. 5. Le type, conservé à Oxford, bien conforme au dessin donné par Westwood: c'est un mâle de grand développement, ne présentant aucune macule sur le disque du pronotum.

Cyclommatus multidentatus Westwood, Cab. Or. Ent., p. 18, tab. 8, fig. 3. Cette espèce a été considérée par Parry (Cat., 1864, p. 84) comme étant synonyme de la précédente (*strigiceps* var. min.). L'exemplaire décrit par Westwood doit être celui qui se trouve dans la série du British Museum avec l'étiquette ancienne "E. India" "Type *Cyclophthalmus multidentatus* locat. in Or. Entomology." Ce mâle, qui appartient à la forme mineure, se distingue immédiatement des autres *C. strigiceps* de développement analogue par sa taille notablement plus forte, sa couleur plus rougeâtre, les côtés du prothorax plus parallèles avec l'angle médian moins épineux, les élytres plus striées. Je ne puis le considérer comme appartenant à la même espèce; il en est

voisin, mais distinct. Il serait utile de le comparer à des *C. mniszehi* de même développement.

Cyclommatus affinis Parry, Trans. Ent. Soc. Lond., 1864, p. 40. Le type de Parry est conservé au British Museum; c'est un spécimen de forme moyenne, dont le dent basale est quadridentée; l'épistome est un pentagone dont les quatre côtés libres sont légèrement concaves. Avec ce mâle s'en trouve un autre, de plus grand développement, qui paraît aussi provenir de la collection Parry. Chez celui-ci la dent basale est simple et le triangle curviligne antérieur de l'épistome forme des pointes aiguës aux angles; le lobe interne de la région latérale antérieure de la tête, contre la mandibule, est très relevé.

M. Ritsema a admis la synonymie *C. affinis* Parry = *C. de haani* Westwood. Je n'ai pas assez d'éléments pour discuter actuellement cette question, je dois dire toutefois que les *C. de haani* de Sumatra, déterminés par M. Ritsema, que je possède, me paraissent différer sensiblement du type du *C. affinis* conservé au British Museum. La question de provenance des deux espèces devrait être tout d'abord bien éclaircie. D'après Westwood, le *C. de haani* était de Java. Il se trouve ainsi indiqué dans le Catalogue Hope, p. 5, et dans les trois Catalogues de Parry. Dans le Cabinet Oriental, il est donné comme provenant de Bornéo, mais on peut se demander si ce n'est pas à la suite de son identification présumée (et d'ailleurs inexacte) avec le *C. rangifer* Schönherr (= *tarandus* Thunberg). Le *C. macrognathus* White MSS. cité par Westwood comme étant un grand exemplaire du *C. de haani* paraît bien être un *C. tarandus*, et c'est à lui certainement que s'applique le renseignement de la capture faite par M. Hugh Lowe à Bornéo.

Outre cet exemplaire qui aurait fait partie des collections du British Museum, et que je n'ai pas remarqué, Westwood indique que l'espèce existait dans la collection Hope et dans la collection Melly. Je ne puis rien dire de celle-ci, où paraît être le type véritable. L'exemplaire de la collection Hope, conservé à Oxford, porte l'étiquette suivante : "*de haani* ♂ var. minor." "Sumatra." "Mus. Melly for type." Ce spécimen est un mâle de faible taille (28 mm.) dont les mandibules présentent un groupe basal et un groupe terminal de plusieurs denticules, les deux groupes étant séparés par un large intervalle inerme. Son aspect est celui d'un *C. canaliculatus* Ritsema, var. minor. Avec

lui sont trois spécimens, qui semblent intermédiaires entre le *C. canaliculatus* typique et le *C. frey-gessneri* Ritsema. Les exemplaires de *C. de haani* du British Museum sont des *C. frey-gessneri*, *canaliculatus* et *consanguineus*, les seuls exemplaires qui se rapprochent du *C. de haani*, tel que nous le comprenons, sont les spécimens de *C. affinis* venant de la collection Parry, cités plus haut.

Cyclommatus faunicolor Hope, Proc. Ent. Soc. Lond., 1844, p. 106. L'exemplaire conservé au musée d'Oxford, avec l'étiquette ancienne *C. faunicolor*, semble pareil à celui figuré par Westwood (Trans. Ent. Soc., 1847, pl. 20, fig. 1) mais ne porte aucune indication de type.

Leptinopterus polyodontus Hope, Cat., p. 15. Les deux spécimens d'Oxford sont très vraisemblablement les types de Hope. Le mâle porte la provenance "Bz." (Brazil) la femelle l'étiquette "*polyodontus*." Ce sont deux *L. ibex* Billberg, un grand mâle nettement caractérisé, une belle femelle.

Parry, dans son travail de 1864, n'a pas signalé cette synonymie et a laissé subsister le *L. polyodontus* Hope comme espèce distincte. Il est à remarquer, cependant, qu'il a donné, comme synonyme du *L. ibex* le *L. polyodontus* Dejean, d'après Reiche, Ann. Soc. Ent. Fr., ser. 3, i, p. 78.— Or dans le Catalogue Hope, l'indication "Dej. inédit" est donnée en tête de la description de l'espèce. Le *Leptinopterus polyodontus* Hope n'existe donc pas comme espèce. C'est Burmeister qui a réellement décrit le *L. polyodontus* tel que nous le comprenons (Handbuch, vol. v, p. 381).

Leptinopterus rufifemoratus Hope, Cat., p. 5, est bien la femelle de *L. femoratus* Fab., comme l'ont indiqué Hope lui-même (*loc. cit.*) et Parry. (Cat. 1864, p. 85). U. O.

Leptinopterus melanarius Hope, Cat., p. 15. Le type est un mâle de grand développement, qui correspond bien à la description du Catalogue. La mandibule porte une double dent basale peu développée, une forte dent intermédiaire, et se termine par trois denticules [pl. IX, fig. 4, mandibules]. Il porte simplement l'indication de provenance "Bz." et l'étiquette "*melanarius* Hope Bz." Le British Museum possède plusieurs spécimens tout à fait pareils dont deux indiqués de "São Paulo." Il n'y a pas de doute d'après la description de Burmeister (Handbuch, v, p. 379) que son *L. morio* ne soit identique au *L. melanarius*.

Leptinopterus funereus Hope, Cat., p. 15. Les types sont

un mâle moyen et une femelle. Il y a, de plus, un mâle minimum. Le plus grand des deux mâles a des mandibules assez développées, dépourvues de dent médiane, mais l'extrémité est formée par trois denticules comme chez le *L. melanarius*. Les tibias médians, chez ces deux types, portent une épine, précédée d'une autre très petite. La ponctuation est analogue. L'identité spécifique, admise par Parry (Cat., 1864, p. 85) me semble très probable. U. O.

Leptinopterus politus Hope MSS., localité "Bz." (Brazil) conservé à Oxford, est une femelle de *L. ibex* Billberg.

Leptinopterus ochropterus Hope MSS., spécimen portant les indications "Mex." et "*Ochropterus mihi*" est un mâle moyen de *L. tibialis* Eschscholtz. U. O.

Leptinopterus v-niger Hope, Cat., p. 15. Plusieurs mâles, et probablement une seule femelle ont servi à établir la diagnose. Le mâle portant l'étiquette type, à Oxford, est un spécimen de taille moyenne, de forme majeure, étiqueté "*v-niger* Hope." Il existe d'autres mâles étiquetés *Psalicerus cuspidatus*. La femelle ne porte aucune étiquette ancienne.

Leptinopterus fraternus Westwood, Trans. Ent. Soc. Lond., 1874, p. 359, tab. 3, fig. 3, ♂. Les types, mâle et femelle, sont conservés au British Museum.

Leptinopterus erythrocnemus Burmeister, Handbuch, v, p. 378. Le British Museum possède plusieurs spécimens de cet insecte. Chez un mâle et deux femelles, on constate le passage à la forme typique, qui est le *L. tibialis* Eschscholtz, dont le *L. erythrocnemus* ne doit être considéré, à mon avis, que comme une variété.

Macrocrates bucephalus Hope, Cat., p. 15. Le type, conservé à Oxford, est un beau spécimen mâle. Il existe également, dans la collection, sous les noms inédits de *Psalicerus rotundicollis* Gory, *nigripes* Dej. une femelle appartenant à la même espèce.

Odontolabis burmeisteri Hope, Trans. Ent. Soc. Lond., 1839, p. 279, tab. 13, fig. 3. Cat., p. 16. Le type est un mâle de forme majeure, bel exemplaire, mais plus grêle que ceux ordinairement conservés dans les anciennes collections. Il porte l'indication de provenance "Assam" qui est erronée et en désaccord avec la diagnose qui donne "Mysore." U. O.

Odontolabis cuvera Hope, Trans. Linn. Soc., 1843, p. 105, tab. 10, fig. 3. Le type est bien conforme au dessin mais

ne porte plus aucune étiquette ancienne. C'est un spécimen de forme majeure, de taille plutôt faible. U. O.

Odontolabis prinseppi Hope, Cat., p. 16. Comme l'a indiqué Parry (Cat., 1864, p. 75) le type est un mâle de forme moyenne (f. mesodont Leuthner). U. O.

Odontolabis saundersi Hope, Trans. Linn. Soc., 1843, p. 105. Cat. p. 16. Le Catalogue mentionne sous le nom de *O. delesserti* Guérin (= *O. saundersi* Hope, Cat. p. 5) un couple. La collection d'Oxford contient une femelle qui, comme l'a indiqué Parry (Cat., 1864, p. 75) est *O. cuvera*; ce spécimen provient de Khasyah-Hills. Deux mâles sont étiquetés comme *O. saundersi* Hope. Le plus grand porte une étiquette rouge, de Hope, "*Saundersii* Hope" et une autre blanche: "*bicolor*." D'après l'étiquette du Musée ce serait le type d'*O. bicolor* Saunders, Trans. Ent. Soc. Lond., ii, p. 177, tab. 16, fig. 3. Toutefois, le deuxième mâle, plus petit, tout à fait de la forme priodont, porte une étiquette ancienne: "described by Saunders," probablement de Hope. Il y a un petit doute sur la question de savoir lequel est le type du *bicolor* Saunders et lequel du *delesserti* Hope, mais aucun sur le fait que ce sont tous deux des *O. cuvera*. Hope ne semble pas avoir possédé le véritable *O. delesserti* Guérin: tous les spécimens de sa collection sont des *O. cuvera* venant de "Khasyah-Hills."

Odontolabis sinensis Westwood, Cab. Or. Ent., p. 54, tab. 26, fig. 2, 3, ♂; fig. 4, ♀. Les types figurés par Westwood sont conservés à Oxford.

Odontolabis dux Westwood, Ann. Mag. Nat. Hist., 1846, p. 124. L'énorme exemplaire sur lequel a été fondée cette espèce (= *alces* Fabr. f. telodont) et qui a été figuré par Westwood (Cab. Or. Ent., p. 17, tab. 8, fig. 1) est conservé au British Museum.

Odontolabis cuningi Hope, Cat., p. 17. Le type, exemplaire de forme moyenne (amphiodont) d'*O. alces* porte de très nombreuses étiquettes anciennes. Il a été disséqué pour vérifier son sexe. Sa provenance est Manille. U. O. C'est au British Museum que se trouve conservée la curieuse série des têtes d'*O. alces*, figurée par Leuthner (Monographie, p. 399) à l'appui de sa distinction des quatre principales formes mandibulaires des lucanides de ce groupe. Cette division ne s'applique d'ailleurs qu'à un nombre restreint d'espèces; elle est en discordance avec ce qu'on remarque dans d'autres genres.

Odontolabis siva Hope, Cat., p. 16. Le mâle type est un

petit amphiodont. Il a été envoyé par le Dr. Cantor, d'après l'ancienne étiquette. La femelle type est également conservée à Oxford. Ainsi que l'a reconnu Leuthner (Monographie, p. 438) l'indication Java, donnée par Hope, Cat., p. 16, en contradiction avec celle donnée Cat., p. 5, est erronée. L'erreur commise provient sans doute de ce que cette espèce a été confondue avec *O. bellicosus*, Castelnau, qui en est assez voisine et vient de Java.

Odontolabis vishnu Hope, Cat., p. 17. Le type est un mâle amphiodont de *O. bellicosus* Castelnau, ainsi que l'a reconnu Parry. (Cat. 1864, p. 76.) L'étiquette ancienne indique la provenance "Java" et porte la mention "*Gazella* ♂ Hope" au dessus de laquelle est écrit: "*Vishnu*." Cette indication concorde avec celle du Catalogue, p. 5. "*Vishnu* Hope, Java, an. *L. Gazella* mes. Fabr." qui est d'ailleurs erronée. U. O.

Odontolabis serrifer Hope, Cat., p. 17. Sous ce nom sont conservés deux petits exemplaires de forme mineure (pseudodont), qui paraissent être des *O. bellicosus*, comme l'a indiqué Parry (Cat., 1864, p. 76). U. O.

Odontolabis dalmani Hope, Cat., p. 17. Le type est un assez grand mâle qui ressemble, comme forme, aux exemplaires de cette espèce provenant de Sumatra. La diagnose indique comme provenance "Tenasserim," ce qui est possible. Aucune étiquette ancienne n'a été conservé pour cet insecte. U. O.

Odontolabis platynotus Hope, Cat., p. 18. Les spécimens considérés comme types par le musée d'Oxford sont deux femelles, dont l'une porte une étiquette ancienne "*glabratus*" et la provenance: "East India." Cette dernière, un peu plus courte que l'autre, paraît être le type véritable.

Odontolabis emarginatus Saunders, Trans. Ent. Soc. Lond., 1854, p. 49, pl. 3, figs. 4, 5. Trois exemplaires, deux mâles, une femelle, sont conservés sous ce nom à Oxford, mais sans indication de type. Il n'est pas impossible que le plus grand des deux mâles soit un des exemplaires de la collection Saunders. Son étiquette, analogue à celle des autres lucanides provenant de cette collection, porte les indications: "*Odontolabis emarginatus* (Reiche MS.) ♂ minor. W.W.S. Trans. Ent. Soc., n. s., vol. 3, pl. 3, fig. 5 ♂ minor nec ♀." Parry a donné (Cat., 1864, p. 77) la synonymie *O. platynotus* Hope. Leuthner (Monographie, p. 436) a émis l'hypothèse que la provenance indiquée par Hope était inexacte. En réalité, la distribution géographique de

O. platynotus paraît étendue, cette espèce, généralement reçue de Chine, se trouve aussi en Indo-Chine, au Tonkin, et Fea en a rapporté un exemplaire de Birmanie. J'ai vu plusieurs exemplaires indiqués de l'Inde, mais sans localité précise.

Odontolabis femoralis Waterhouse, Ann. Mag. Nat. Hist., 1887, p. 486.—Cette espèce, dont les types, provenant de Perak, ont été rapportés par M. Doherty et se trouvent au British Museum, n'est pas autre chose que l'énorme espèce retrouvée à Kina-Balu par M. Waterstradt, et décrite, sous le nom de *O. waterstradti*, par M. von Rothenburg, Deutsche Ent. Zeitschr., 1900, p. 84.

Les deux mâles de Perak ont le pronotum rougeâtre, l'un d'eux a même les angles latéraux marqués de jaune. Une femelle de Perak figure également dans la collection.

Cette espèce a dû être reçue antérieurement à 1887, car j'en ai trouvé, dans la collection Armitage, un mâle, visiblement ancien, indiqué "*Odontolabis* n. sp. Penang." Le pronotum de ce spécimen est légèrement rougeâtre.

Il est intéressant, au point de vue de la distribution géographique des espèces, de voir cette espèce de Malacca se retrouver dans la région nord de Bornéo.

Au sujet de cet *Odontolabis*, il est utile de faire remarquer que M. Möllenkamp a cru devoir considérer que *O. waterstradti* n'était pas la forme typique de l'espèce mais une variété, et a décrit, en conséquence, comme forme typique, son *O. kinabaluensis* (Ins. Börse, 1904, p. 341). Il convient de faire toutes réserves sur ces appréciations de ce qui est ou n'est pas la forme typique d'une espèce encore fort peu connue. On peut évidemment concevoir la forme typique comme représentant la moyenne des formes variables de l'espèce. Mais la détermination de cette moyenne est excessivement délicate et, actuellement au moins, la seule règle logique à suivre pour la nomenclature consiste à respecter les antériorités.

Partant de là, le nom véritable de l'espèce est *O. femoralis* Waterhouse; la forme typique est celle de Perak à pronotum légèrement rougeâtre et même marqué de jaune aux angles latéraux. *O. waterstradti* Rothenburg et *O. kinabaluensis* Möllenkamp ne représentent que deux variétés, la première est même très douteuse comme validité, et doit plutôt être considérée comme une sous-variété ou race locale.

Odontolabis latipennis Hope, Cat., p. 17. Le type, conservé à Oxford, est une femelle étiquetée "*Dejeanii* Reiche,

latipennis Hope verus" "Pr. Wales." (Prince of Wales Isl.)

Odontolabis cephalotes Leuthner, monographie, p. 478. Le spécimen, jusqu'à présent, je crois, seul connu de cette espèce, est conservé au British Museum.

C'est un grand mâle, entièrement différent de l'*O. striatus* Deyr. et qui appartient, sans aucun doute, à une espèce bien distincte.

L'hypothèse faite par M. van Roon dans son Catalogue des Lucanides (Tijdschr. v. Ent., i, 1907, pp. 58-70).—Tirage à part p. 63, reproduite d'ailleurs dans la Pars 8 du Coleopterorum Catalogus de Junk, du même auteur, p. 39 (*O. cephalotes* Leuthner, placé avec un peu de doute dans le genre *Eulepidius*) est d'ailleurs sans fondement. L'insecte n'a rien de commun avec *Eulepidius luridus* Westw., type du genre, qui est un proche parent des *Gnaphaloryx*, et il appartient bien aux *Odontolabis*. La différence la plus frappante entre *O. cephalotes* et *O. striatus* est dans la forme de la tête et des mandibules. Ces dernières, aplaties en largeur chez *O. striatus*, sont au contraire comprimées latéralement chez *O. cephalotes*. La dent basale est simple au lieu d'être double comme chez *striatus* et il existe une forte carène, surplombant le front, qui fait défaut, même chez les plus grands mâles connus de *striatus*.

Il convient de remarquer que cette forme, assez spéciale pour le genre, se retrouve, autant qu'on en peut juger par la figure publiée, chez *O. sarasinorum* Heller, espèce des Célèbes, également de petite taille, vraisemblablement apparentée à *O. cephalotes* Leuthner.

Odontolabis elegans Möllenkamp, Ins. Börse, 1902, p. 363.—Je crois utile de signaler ici qu'il existe au British Museum une femelle provenant de Malacca, ex collection Atkinson, sous le nom de *O. gazella*, qui ressemble tout à fait à la femelle de *O. elegans*. M. Zang a soutenu que *O. elegans* Möll. devait être considéré comme un simple synonyme de *O. mouhoti* Parry, hypothèse qui a été repoussée avec une véritable indignation par M. Möllenkamp, qui s'est basé sur les "800,000 kilomètres carrés" qui existent entre Carin Cheba (Birmanie), patrie de *O. elegans*, et le Cambodge, patrie de *O. mouhoti*, et sur ses "25 années d'études sur les Lucanides" pour déclarer que M. Zang manquait de toute preuve à l'appui de son affirmation.

Je dois dire que je ne puis partager cette manière de voir, et qu'ayant reçu, de M. Gestro, les chasses de M. Fea, en

Birmanie, d'où proviennent tous les exemplaires connus de *O. elegans*, je n'ai pas cru pouvoir décrire cette espèce, tant elle me paraissait proche de *O. mouhoti*. M. Möllenkamp déclare que *O. elegans* est "un petit lucanide gracieux," tandis que *O. mouhoti* a la tête large, et que les élytres de *O. elegans* ne sont pas aussi longues que celles de *O. mouhoti* sont larges. En réalité *O. mouhoti* est un peu plus grand que les spécimens connus de *O. elegans*, cependant le plus grand mâle (telodont) du Musée de Gênes mesure 66 mm. (mand. incl.); les élytres ont 26 mm. de long., la tête a 20·5 de large. *O. mouhoti* mesure 64 mm., avec des élytres de 28 mm. et une tête de 22·5. La couleur ne semble pas différer sensiblement et, sur une des excellentes planches photographiques exécutées d'après quelques-unes des boîtes de la collection R. Oberthür, on peut se rendre compte que l'aspect général n'est pas très différent. D'après la figure de Leuthner, le dessin des élytres est tout à fait pareil. Si nous retrouvons, à Malacca, la femelle de *O. elegans*, l'objection des "800,000 kilomètres carrés" qui justifient, aux yeux de M. Möllenkamp, la séparation, sans comparaison, de deux espèces aussi voisines se trouve également très affaiblie, car il y a une bonne distance, me semble-t-il, entre Carin Cheba et Malacca.

Sans affirmer l'identité ou la différence des deux espèces, ce que l'examen du type de *O. mouhoti* permettrait seul de faire, je tiens à dire que l'opinion de M. Zang paraît au moins aussi fondée que celle de son contradicteur.

Odontolabis lowei Parry, Trans. Ent. Soc. Lond., 1873, p. 336, pl. 5, fig. 1.—Le type figuré, conservé au British Museum, ne diffère pas des spécimens reçus de Kina-Balu à une époque récente.

Chalcodes carinatus Linn., Syst. Nat., i, 2, 1735, p. 560. On sait que H. Deyrolle a cru pouvoir séparer en trois espèces distinctes le *C. carinatus* L. : *C. cingalensis* Parry, *C. intermedius* Deyr. et *C. nigrinus* Deyr. Les collections du British Museum contiennent un bon nombre de spécimens de ces diverses formes, qui ne sont d'ailleurs pas rares dans les collections, quoique *C. nigrinus* soit certainement moins répandu que *C. cingalensis*. Une carte est jointe à cette série et donne la distribution géographique des trois espèces présumées distinctes. D'après ce document, *C. nigrinus* et *C. intermedius* seraient propres à Ceylan, tandis que *C. carinatus*, également représenté à Ceylan, se retrouverait sur toute la côte de Calcutta à Madras.

L'examen d'un grand nombre d'exemplaires me fait admettre qu'il existe certainement deux espèces : *C. carinatus* L. (*cingalensis* Parry) qui est la grande espèce, légèrement pubescente, et *C. nigrinus* Deyr., de taille notablement plus faible, très noir, brillant, beaucoup plus anguleux comme contours. Quant au *C. intermedius* Deyr., je ne puis arriver à le considérer comme autre chose que la forme mineure du *C. carinatus*.

Le type du *C. cingalensis* Parry doit se trouver dans la série du British Museum, mais je ne l'ai pas spécialement remarqué; il n'existe d'ailleurs aucun doute sur l'identification de cette espèce à la suite du travail de Leuthner.

Chalcodes aeratus Hope, Trans. Zool. Soc., 1835, p. 99, pl. 14, fig. 2. Cat., p. 16. Deux mâles types sont conservés à Oxford. Quoique la diagnose du catalogue indique comme provenances Tenasserim et Pr. Wales Isl., un de ces exemplaires porte l'indication de localité "Khasyah Hills" qui résulte sans doute d'une confusion.

Neolucanus saundersi Parry, Trans. Ent. Soc. Lond., 1864, p. 20, pl. 9, fig. 3. Les types de cette espèce sont conservés dans la collection R. Oberthür; il existe cependant, dans la collection du British Museum un petit mâle étiqueté: "Bowring, 63, 47, India" qui porte la mention manuscrite de Parry: "*Saundersi*, priodont type." Cet insecte est un *N. lama* Ol. La femelle qui l'accompagne, provenant également des chasses de Bowring, est aussi *N. lama*.

Neolucanus baladeva Hope, Trans. Linn. Soc., 1843, p. 105. Cat. p. 17.—Les deux types mâles et le type femelle existent dans la collection d'Oxford. Ce sont des *N. lama* Olivier, ainsi qu'on l'admet d'ailleurs généralement. Le plus grand mâle vient de Khasyah Hills. Le deuxième porte la mention: "*Ursus* Lap. descriptio nec figura convenit," observation également faite dans la diagnose. (*N. ursus* Lap. est *O. bellicosus* femelle.)

Neolucanus angulatus Hope, Cat., pp. 17, 18. Cette espèce a été considérée par Parry (Cat. 1864, p. 78) comme représentant la forme mineure de *N. lama* ou *baladeva*. Cette opinion a toujours été considérée comme correcte. Le doute, cependant, était permis. Il existe certainement deux espèces, confondues dans les collections sous le nom de *lama* et qui, toutes deux, sont reçues des mêmes localités. La plus grande, plus large et plus plate, présente, chez les grands mâles, une dent supérieure dressée à l'extrémité

des mandibules. Celles-ci sont donc fourchues. La plus petite, plus étroite, plus parallèle, n'a jamais, même chez les plus forts exemplaires, aucune trace de dent apicale dressée, les mandibules sont simples à la pointe. La grande espèce a les canthus oculaires saillants, souvent très anguleux et même épineux, la tête toujours très plate, le métasternum ne porte aucune dépression. La petite espèce a les canthus plus arrondis, ne formant jamais une saillie épineuse, la tête est plus renflée en dessus et par derrière, le métasternum porte toujours une dépression en losange très marquée. Des différences analogues permettent de séparer aisément les femelles : celles de la petite espèce sont bien plus faibles, plus étroites et surtout elles présentent toujours la dépression caractéristique du métasternum.

Leuthner, dans sa remarquable monographie, a signalé qu'il y avait une différence d'aspect entre les grands et les petits spécimens de *N. lama* ; il a même figuré une femelle de la petite espèce, mais il n'a pas vu les différences constantes qui séparent les deux formes ; il se borne à dire que Hope a nommé *Lucanus angulatus* la petite forme, qu'il considérait comme une espèce distincte. (Leuthner, Monographie, p. 431.)

Ayant depuis assez longtemps reconnu l'existence des deux espèces, je m'étais toujours demandé si le type de *N. angulatus* Hope appartenait bien à la plus petite ; je pensais être immédiatement fixé à Oxford, mais il n'en a pas été tout à fait ainsi.

L'insecte indiqué comme *angulatus* type dans la collection du Musée est un petit mâle de la petite espèce ; il mesure seulement (la tête un peu inclinée) 36 mm. Ce spécimen porte l'indication : "*Angulatus* Hope" "*? baladewa* var." Ce n'est évidemment pas le spécimen mentionné dans la diagnose comme ayant 21 lignes.

Deux femelles, de la même espèce, sont avec ce mâle ; elles mesurent 36.5 mm. et sont indiquées de Khasyah Hills, étiquettes anciennes ; elles dépassent un peu la mesure de 16 lignes indiquée par la diagnose : 16 lignes.

Deux autres mâles, plus grands, conservés dans la même série que les insectes précédents, ont la même étiquette "Khasyah Hills" ; ils mesurent respectivement 41 et 45 mm. (environ $19\frac{1}{2}$ et $21\frac{1}{4}$ lignes), mais ils appartiennent à la grande espèce.

Par contre, il existe encore deux mâles de la petite espèce,

dont un seul porte une étiquette ancienne "K. Hills." L'autre paraît plus récemment reçu. Il est à remarquer que le premier a son épingle coupée de la même manière que celle du petit mâle type; c'est un insecte réparé, recollé, qui a pu perdre une partie de ses étiquettes anciennes; il mesure 45.5 mm. (environ 21½ lignes), ce qui concorde sensiblement avec l'indication du catalogue.

Leuthner indique 40 mm. comme longueur du *N. angulatus* Hope, mais il ne dit pas que la mesure s'applique au type.

Toutes les probabilités me paraissent être pour que le type véritable soit le mâle de 45.5 mm., mais il y a cependant une petite chance pour que ce soit un des mâles de l'autre espèce. Au British Museum, il existe quatre mâles anciens de la petite espèce, et les indications qu'ils portent viennent à l'appui de la première hypothèse. Un des mâles qui paraît avoir été étiqueté par Westwood porte: "*Angulatus*, Hope's Collect.": un autre, "*Angusticollis*, Hope's coll.": Le troisième, par contre, est étiqueté, "*Chalcodes?* *Baladeva* Hope."

Je crois, en définitive, que l'on peut admettre l'identification de la petite espèce au *N. angulatus* Hope (Westwood) et je propose en conséquence de lui restituer ce nom.

En plus des insectes mentionnés ci-dessus, se trouve, à Oxford, un spécimen qui correspond à la dernière phrase de la diagnose: "Varietas Assamensis mandibulis parum brevibus . . . etc." Cet insecte est un *N. saundersi* Parry, de forme mineure. Il porte d'ailleurs une mention qui paraît être de Leuthner: "*Saundersi* Parry nec Hope ♂."

Neolucanus glabratus De Haan, inédit; Hope, Cat., p. 18. Albers a parfaitement indiqué que la diagnose du *Lucanus laticollis* Thunberg ne pouvait s'appliquer à un *Neolucanus* et que la synonymie donnée par Reiche entre les deux espèces était inexacte. Cette espèce est représentée à Oxford par plusieurs spécimens, dont deux mâles indiqués comme types. Le plus grand seul correspond aux dimensions données par la diagnose, mais tous deux portent une étiquette ancienne "*Glabratus* De Haan." Un troisième mâle, plus petit, a en plus la mention "Java, Burm." Une femelle porte la même étiquette que les deux premiers mâles. La provenance Assam doit être le résultat d'une erreur.

Deux autres femelles, indiquées comme "*Dorcus puncticeps* Hope" sont aussi des *N. glabratus* Hope.

Neolucanus nitidus Saunders, Trans. Ent. Soc. Lond., 1854, pl. 4, fig. 1.—Trois de ces insectes figurent dans la collection d'Oxford et ont tous les mandibules arrachées, procédé pour tuer les insectes spécialement peu recommandable pour les lucanides. Le plus grand mâle, qui est l'exemplaire figuré, est le seul portant l'étiquette : "*Odontolabi(s) niti(dus) m(ihi)*" tronquée; c'est le vrai type, il mesure 38 mm., les deux autres ont respectivement 35 et 32 mm. Le premier a une indication de provenance : "Shangai, Mr. Fortune."

Cette espèce est restée peu commune. D'après les mâles que je possède, les mandibules sont assez courtes, elles portent une fourche à l'extrémité apicale et quatre forts denticules sur leur longueur. Mes exemplaires ne sont pas très développés, leur taille est un peu plus faible que celle du type figuré, qui n'est probablement pas lui-même un réellement grand exemplaire. La femelle est assez allongée, régulièrement ovulaire, moins brillante sur les élytres que les mâles, les angles latéraux du prothorax sont légèrement arrondis, les canthus oculaires sont très arrondis, ainsi que le contour externe des mandibules. Mes spécimens sont du Fokien.

Neolucanus championi Parry, Trans. Ent. Soc. Lond., 1864, p. 20.—La collection d'Oxford possède plusieurs spécimens de cette espèce. Le plus grand mâle est le type de Parry, il appartient à la forme majeure; les trois autres mâles, ainsi que la femelle, viennent également de la collection Parry; la femelle a été décrite et figurée par Leuthner, avec le grand mâle (Monogr. p. 428, pl. 85, figs. 8 ♂, 6 ♀).

Le grand mâle ressemble beaucoup à un *N. opacus* Boil. qui serait entièrement dépoli et de forme grêle. Les canthus sont tout à fait arrondis. La dent supérieure apicale est forte et se relie à la dent inférieure par une courbe peu concave.

Parry a indiqué (*loc. cit.*) que le type avait été envoyé de Hong-Kong par le Major Champion, mais que d'autres spécimens avaient été depuis rapportés de l'intérieur de la Chine par Mr. Fortune. Des quatre spécimens d'Oxford, le premier, le troisième et le quatrième mâle, ainsi que la femelle, sont de Hong-Kong. Le deuxième mâle a comme provenance "China or Thibet," c'est un petit spécimen et son attribution à l'espèce est peut-être un peu douteuse. Les exemplaires du *N. championi* du British Museum,

assez nombreux, sont de la provenance "Victoria Peak—Hong-Kong."

Neolucanus sinicus Saunders, Trans. Ent. Soc. Lond., 1854, p. 48, pl. 4, figs. 2, ♂, 3, ♀.—Trois mâles indiqués comme rapportés par Mr. Fortune; le plus grand est indiqué comme type; il mesure 37 mm.; un autre, un peu plus petit, porte les mêmes étiquettes anciennes. La femelle d'Oxford n'est pas le type. Je crois les vrais types au British Museum, mais ne les ai pas revus.

Neolucanus parryi Leuthner, Monographie, p. 424, pl. 85, fig. 4. Deux exemplaires, au British Museum, dont le type, qui vient de Siam. L'autre spécimen, qui vient du Laos (Mouhot) diffère légèrement du type et se rapproche davantage du *N. leuthneri* Boil.

Neolucanus marginatus Waterhouse, Ent. Monthly Mag., 1873, p. 53. La femelle type est au British Museum, ainsi que le mâle considéré par Mr. Waterhouse comme se rapportant probablement à cette espèce. Ce dernier exemplaire porte l'indication de provenance "Lacken, Sikkim. 9000 feet." J'ai déjà signalé (Bull. Soc. Ent. Fr., 1899, p. 178) à la suite d'une communication verbale de M. R. Oberthür, que cet insecte n'était certainement pas le mâle du *N. marginatus*, qui est aujourd'hui bien connu, et qui est bicolore, comme sa femelle. Mais croyant que cet insecte était distinct, j'avais proposé de lui donner le nom de son descripteur, Mr. Waterhouse, nom sous lequel il figure dans le catalogue de Van Roon. (Coleopt. Catal. Jung. pars 8, p. 16.) Après avoir examiné le type, je ne vois pas de caractère permettant de le séparer du *N. lama* Ol.; c'est, à ce qu'il me semble, un très petit exemplaire de cette espèce.

Je ne crois pas non plus que les deux petits mâles bicolores conservés au British Museum soient des *N. marginatus*.

Neolucanus castanopterus Hope, in Gray, Miscell. Zool., 1831, p. 22: Cat., p. 18.—Le type est un mâle moyen, provenant du Nepaul, envoyé par le Général Hardwicke. U. O.

Hemisodorcus nepalensis Hope, in Gray, Zool. Miscell., i, 1831, p. 22: Cat. p. 19.—Le type mâle appartient à la forme moyenne; la femelle est également conservée à Oxford.

Hemisodorcus parryi Hope, Proc. Ent. Soc. Lond., 1843, p. 94: Cat. p. 20. Le type mâle est un *H. nepalensis* de forme mineure et de petite taille; la femelle type est également très petite. U. O.

Hemisodorcus rafflesi Hope, Trans. Linn. Soc., 1842, p. 588, est un grand mâle de *H. nepalensis*, forme majeure. U. O.

Hemisodorcus similis Hope, in Gray, Zool. Miscell. i, 1831, p. 22. D'après la diagnose, le type serait au British Museum; je n'ai pu le retrouver. Au contraire, il est indiqué par le musée d'Oxford comme faisant partie de sa collection. L'insecte ainsi désigné comme type est un *H. nepalensis* plus petit mais de plus grand développement mandibulaire que le *H. nepalensis* type. Les étiquettes anciennes semblent bien indiquer que cet insecte est le type du *H. similis*.

Parry (Cat., 1864, p. 86) a indiqué toutes ces synonymies, qui prouvent, une fois de plus, combien certains descripteurs ont de facilité à fractionner les espèces.

Hemisodorcus macleayi Hope, Cat., p. 19. Le type est un mâle de très grande taille pour l'espèce, de forme majeure. U. O.

Digonophorus atkinsoni Waterhouse, Ann. Mag. Nat. Hist., 1895, p. 157.—Un mâle (type ou cotype ?) est conservé au British Museum. J'ai déjà indiqué, d'après l'avis de M. R. Oberthür, que cet insecte était *Hemisodorcus elegans* Parry (voir Bull. Soc. Ent. Fr., 1899, p. 178). Cette espèce a une certaine affinité avec *Macrodercus rubrofemoratus* Voll.

Hemisodorcus passaloides Hope, Cat., p. 24.—Le type femelle de cette petite espèce est conservé à Oxford.—Cet insecte est assez difficile à classer; il se rapproche des *Prosopocoelus* du groupe du *cilipes* Thomson par plusieurs caractères, mais ses affinités semblent plus réelles avec le *Ditomoderus mirabilis* Parry.

Ditomoderus mirabilis Parry, Trans. Ent. Soc. Lond., 1864, p. 45, pl. 12, figs. 6, 6a-6e. Le type mâle de cette intéressante espèce, certainement plus près des Cladognathides que des Dorcides vrais, se trouve au British Museum; c'est un très fort exemplaire, de Bornéo. Il est accompagné d'une instructive série de six autres spécimens, dont plusieurs de très petite taille, et de quatre femelles. Un des mâles, le quatrième comme grandeur, qui a aussi appartenu à Parry, montre une dissymétrie mandibulaire assez nette. Un mâle est de Sarawak, plusieurs de Penang.

Eurytrachelus briareus Hope, Cat., p. 20.—Cet insecte a été rapporté à *E. bucephalus* Perty par Parry (Cat., 1864,

p. 87). La description de Hope, surtout en ce qui concerne les saillies intermandibulaires et les mandibules elles-mêmes semblent en effet s'appliquer à cette espèce. J'ai bien cherché le type à Oxford. Le seul insecte portant l'étiquette "*Briareus* Hope" est un *Titan*, étalé avec les ailes ouvertes, dans la position du vol. C'est un exemplaire assez grand. Il ne porte aucune indication de provenance, mais une étiquette "Cantor" ferait supposer que c'est un exemplaire de l'Inde. Je doute beaucoup que ce soit le type, qui est probablement perdu.

Eurytrachelus tityus Hope, Proc. Ent. Soc. Lond., 1842, p. 83. Un mâle, assez grand, et bel exemplaire, est conservé à Oxford, c'est très probablement un cotype ou un exemplaire typique offert par Parry, d'après l'étiquette que porte cet insecte. Le catalogue de la vente de la collection de Parry, annoté par A. Sallé, semble indiquer que les types du *E. tityus* ont dû être acquis pour le British Museum, où je ne les ai pas remarqués.

Eurytrachelus falco Hope, Cat., p. 6.—L'insecte indiqué à Oxford comme type de cette espèce est un *E. tityus* de forme majeure qui porte les étiquettes "*falco* Laporte MSS." "*falco* Laporte?" Le *E. falco* est simplement mentionné p. 6 du Catalogue et n'a été décrit ni par Laporte de Castelnau, ni par Hope ou Westwood.

Eurytrachelus punctilabris Hope, Proc. Ent. Soc. Lond., 1842, p. 84 : Cat. p. 21. —Parry (Cat., 1864, p. 88) a rapporté cette espèce à *E. reichei* Hope. Je ne puis me ranger à son opinion. Le type, conservé à Oxford, a les mandibules grêles armées de deux dents intermédiaires à peine indiquées, qui caractérisent les mâles mineurs de *E. tityus*. Il appartient certainement à cette espèce. [Pl. IX, fig. 11, mandibule.]

Eurytrachelus reichei Hope, Proc. Ent. Soc. Lond., 1842, p. 83 : Cat., p. 21.—Trois mâles sont étiquetés comme types à Oxford; ils mesurent 52, 51 et 47 mm. et sont tous trois indiqués de "K. Hills." Un autre spécimen, mesurant 50 mm. porte aussi une étiquette de Hope "*Reichei* Hope" et la localité "Bengal."

Eurytrachelus lineatopunctatus Hope, in Gray, Zool. Miscell., i, 1831, p. 22 : Cat., p. 23.—La description de l'espèce parle de mâles et de femelles. Il n'y a, à Oxford, que des femelles indiquées comme types de cette espèce. Toutes trois paraissent être du Népal, deux sont explicitement indiquées de cette provenance. Bien qu'il soit fort

difficile de distinguer les femelles de *E. tityus* de celles de *E. reichei*, je considère comme vraisemblable qu'elles se rapportent à cette dernière espèce. Parry les a, au contraire, rapportées à *E. tityus* (Cat., 1864, p. 87). À l'appui de mon opinion vient la description donnée par Hope des mâles venus avec ces femelles : dont la phrase suivante est applicable à *E. reichei*, mais non à *E. tityus* : "mandibulis maris capitis longitudine falcatis dente parvo conico ante medium interdum fere obsoleto . . ."

Eurytrachelus blanchardi Hope, Proc. Soc. Ent. Lond., 1842, p. 84 : Cat., p. 21. Le type mâle, conservé à Oxford, est un *E. reichei* Hope, forme moyenne (et non de forme mineure comme l'a indiqué Parry, Cat., 1864, p. 88).

Eurytrachelus rugifrons Hope, Cat., p. 24.—Comme l'a indiqué Parry (Cat., 1864, p. 87) la femelle type appartient à *E. bucephalus* Perty. Elle porte les indications "rugifrons Hope," "subcostatus Dup. Java." Une autre femelle est étiquetée "subcostatus De Haan." U. O.

Eurytrachelus candezei Parry, Trans. Ent. Soc. Lond., 1870, p. 90, pl. 1, fig. 2. Le type, figuré par Parry, est conservé à Oxford. Parry a reconnu son identité avec *E. eurycephalus* Burmeister (*loc. cit.*, 1874, p. 371). Les curieuses impressions du pronotum sont parfaitement symétriques. On peut les expliquer par la déformation produite par les mandibules d'un autre mâle alors que le premier exemplaire n'était pas absolument solidifié, mais cette hypothèse est discutable. Il arrive assez souvent que les petits mâles et les femelles du *L. cervus* présentent des dépressions symétriques sur le pronotum.

Eurytrachelus chevrolati Hope, Proc. Ent. Soc. Lond., 1842, p. 84 : Cat. p. 20.—Le type est un grand mâle de *E. gypaëtus* Castelnau comme l'a indiqué Parry (qui supposait *E. saiga* identique à ces insectes). C'est un exemplaire de forme assez lourde, avec des mandibules moyennement allongées. Il porte l'étiquette de provenance "Khasyah Hills," s'accordant avec l'indication du descripteur et certainement inexacte. U. O.

Eurytrachelus dubius Hope, Cat., p. 21. Deux mâles types sont conservés à Oxford. Le plus grand mesure $19\frac{1}{2}$ lignes, l'autre 18 lignes (environ 41.5 et 38 mm.). Ce sont des *E. gypaëtus* Cast., de forme moyenne, dont les mandibules portent encore des soies, et non des spécimens de forme mineure. La provenance des deux exemplaires est "Java," contrairement à l'indication de la diagnose.

Eurytrachelus incertus Hope, Cat., p. 22. Deux mâles sont indiqués comme types à Oxford. Ils appartiennent tous deux à la forme moyenne, l'un de *E. gypaëtus* Cast., l'autre de *E. cribriceps* Chevrolat. Le premier est étiqueté "Java," le deuxième, et une femelle placée avec lui, "Manille." Le *gypaëtus* est le plus grand des deux.

Eurytrachelus indeterminatus Hope, Cat., p. 22. C'est un petit mâle de *E. gypaëtus*, appartenant à la forme *capito* Albers. Provenance "Java." U. O. Sous le nom inédit de *Dorcus megacephalus* Gory, est conservé également un autre mâle *capito* plus grand.

Eurytrachelus javanus Hope, Cat., p. 6. Cet insecte, cité, mais non décrit dans le Catalogue, se trouve à Oxford, c'est une femelle de *E. gypaëtus*.

Eurytrachelus moloschus Hope, Cat., p. 21. Trois exemplaires, deux mâles (types) et une femelle, conservés à Oxford. Ce sont des *E. cribriceps*, comme l'a reconnu Parry (Cat. 1864, p. 88). Un mâle et la femelle portent l'indication "I. Phillip. de Cuming MSS.," l'autre mâle "Manille, coll. Miers."

Eurytrachelus submolaris Hope, Cat., p. 23. Le mâle type est conservé à Oxford. C'est un exemplaire de petite taille, qui a été indiqué par Parry comme espèce distincte, dans son premier Catalogue, puis simplement supprimé dans les suivants. Il figure dans le premier sous le nom de *Dorcus submolaris* Hope et le *D. bengalensis* Hope est donné comme étant sa variété mineure. Je reviendrai sur cette deuxième espèce.

Le type du *submolaris* [pl. IX. fig. 10 mandibule] est un mâle de 31.5 mm. envoyé par Cantor, de l'Assam. C'est un insecte parfaitement distinct de *E. reichei* et de *E. tityus*, mais apparenté à ce dernier. J'ai pu en réunir une vingtaine d'exemplaires dans ma collection; ils sont très homogènes quoique variant de provenance. C'est à cette espèce que se rattache mon *Dorcus brachycerus* (Bull. Soc. Ent. Fr., 1904, p. 27) du Kaschmyr, quoiqu'il ne me paraisse pas identique aux spécimens de l'Assam. Il constitue vraisemblablement une forme locale ou une variété, ce que je ne puis affirmer absolument, n'en ayant que de petits développements. Je possède, au contraire, d'assez grands mâles de *E. submolaris*, mais non encore la forme majeure. Tous les spécimens se distinguent par une forme robuste et ramassée, les élytres sont à peine striées latéralement, même chez les plus petits mâles. Les

contours de la tête sont remarquablement arrondis. L'armature mandibulaire des mâles moyens ressemble beaucoup à celle de *E. tityus*, mais la mandibule est plus courte et plus large.

Eurytrachelus (?) *bengalensis* Hope, Cat., p. 22. Le type mâle est conservé à Oxford. C'est un petit spécimen, de la taille d'un petit *Dorcus parallelepipedus* L.; ses élytres sont presque tout à fait dépourvues de stries qui n'existent que sur les côtes; elles sont assez finement ponctuées; la tête est assez large, les mandibules ont une dent basale simple. Ces caractères suffisent pour prouver que *E. bengalensis* ne peut être *E. reichei* min., puisque les élytres ne sont pas striées; il ne peut être ni *E. tityus* ni *E. submolaris*, comme l'avait supposé Parry (Cat. 1864, p. 89), puisque chez les petits mâles de ces espèces il n'y a pas de dent basale à la mandibule.

Je pense que si cet insecte est la forme mineure d'une espèce déjà nommée, ce serait plutôt avec *D. glabripennis* Westwood qu'il conviendrait de vérifier ses affinités, mais je ne connais pas, d'une manière certaine, les petits développements de cette rare espèce.

Eurytrachelus wickhami Waterhouse, Ann. Mag. Nat. Hist., 1894, p. 283. Type mâle au British Museum.

Eurytrachelus pilosipes Waterhouse, Trans. Ent. Soc. Lond., 1883, p. 447, pl. 21, fig. 1. Les deux mâles conservés au British Museum, types de l'espèce, rappellent entièrement l'*E. intermedius* Gestro dont ils ne diffèrent que par les mandibules. D'après les spécimens de cette espèce qui ont été reçus plus récemment, elle semble co-exister aux I. Salomon avec l'*E. intermedius*.

Dorcus antaeus Hope, Proc. Ent. Soc. Lond., 1842, p. 83 : Cat., p. 20. Le type est un bel exemplaire mâle de "K. Hills." U. O.

Dorcus mercurius Hope. Sous ce nom, inédit, figurent à Oxford deux petits mâles de l'espèce précédente.

Dorcus scaritoides Hope, Cat., p. 24. La femelle type de cette espèce est un *D. antaeus* Hope de faible taille provenant, comme le mâle, de "K. Hills." Elle porte une étiquette : "*Antaeus* ♀? *tityus*?" Parry a indiqué, avec doute (Cat., 1864, p. 90), l'identité présumée de *D. scaritoides* et de *D. antaeus*. Il a simplement supprimé cette espèce dans ses deux autres Catalogues.

Dorcus de haani Hope, Trans. Linn. Soc., 1843, p. 106 : Cat. p. 22.—Le musée d'Oxford possède un mâle cotype

de cette espèce, et le type femelle. Le mâle est un petit spécimen à élytres striées régulièrement. Il porte les indications : " Khasyah Hills " et " *De Haani Hope.* " La femelle a les mêmes étiquettes.

Dorcus curvidens Hope, Trans. Linn. Soc., 1842, p. 589 : Cat. p. 22. Le type est conservé à Oxford. Il porte les indications suivantes : " Assam, S. Jones " "*Curvidens Hope* " "*Antaeus* var. ♂." Cet insecte est un mâle de *D. de haani*, de forme moyenne, avec les côtés des élytres striés. Parry a donné la synonymie : *Curvidens* = *de haani* var. min. (Cat., 1864, p. 88). En réalité, *D. curvidens* est le vrai nom de cette espèce. Non seulement la description du *D. curvidens* est antérieure d'une année à celle du *D. de haani*, mais encore, des deux spécimens décrits, c'est sans aucun doute *de haani* qui appartient à la forme la moins développée. La longueur indiquée pour *D. curvidens* est 21 lignes, celle donnée pour *de haani* est seulement 17 lignes. La description des élytres montre bien d'ailleurs que la différence signalée plus haut entre *D. curvidens* et *D. de haani* cotype existait de même avec *D. de haani* type. Le nom de *de haani* doit, régulièrement, passer en synonymie.

Dorcus glabripennis Westwood, Trans. Ent. Soc. Lond., 1871, p. 359, pl. 8, fig. 6. Le type, conservé au British Museum, ressemble peu à la figure, bien que Westwood ait été, en général, un dessinateur aussi habile qu'exact. Les côtes élytrales sont peu apparentes et les élytres sont, en réalité, assez lisses et brillantes. Un mâle plus petit, étiqueté par Parry " var. minor " de " Khasyah Hills " ressemble à un *E. brachycerus* ou *submolaris*, ses élytres sont brillantes, sans côtes ou stries plus apparentes que chez le type.

Dorcus vicinus Saunders, Trans. Ent. Soc. Lond., 1854, p. 51, pl. 4, fig. 9. Type au British Museum, où la femelle se trouve également conservée.

Dorcus suturalis Westwood, Trans. Ent. Soc. Lond., 1871, p. 358, pl. 8, fig. 5. Type mâle au British Museum. Les femelles n'appartiennent pas à cette espèce; ce sont des femelles de *E. brachycerus*. Le *D. suturalis*, qui a été récemment reçu en assez fortes séries, est apparenté à l'espèce suivante.

Dorcus ratiocinativus Westwood, Trans. Ent. Soc. Lond., 1871, p. 356, pl. 8, fig. 2.—Cette espèce a été reçue en nombre par M. R. Oberthür il y a une douzaine d'années,

ce qui a permis de connaître la femelle. Les spécimens ainsi reçus sont, d'une manière générale, plus grands que le type du British Museum, mais lui ressemblent très exactement.

Dorcus rudis Westwood, Trans. Ent. Soc. Lond., 1864, p. 35, pl. 9, fig. 4, 4a-4g. Le type femelle de cet insecte est conservé au British Museum. *D. rudis* a toujours été un peu une énigme pour les spécialistes. On en reçoit, quoique rarement, des exemplaires isolés. J'en ai vu un à Bruxelles (Museum) et j'en ai réuni quatre dans ma collection. Mais le mâle reste introuvable, soit que nous le connaissions déjà et que nous ne sachions pas reconnaître ses affinités avec sa femelle, soit qu'il n'ait pas encore été envoyé en Europe.

Le dernier catalogue des Lucanides, dû à M. van Roon, me prête une énormité dont je crois être incapable en m'attribuant la synonymie inattendue *D. rudis* = *D. derelictus* Parry. Je ne sais où M. van Roon a trouvé ce renseignement.

Dorcus derelictus Parry, Proc. Ent. Soc. Lond., 1862, p. 112.—Le type est également au British Museum. Comme *D. rudis*, *D. derelictus* a exercé la sagacité des spécialistes, mais je crois que ses affinités sont beaucoup plus certaines et, après avoir examiné le type, je maintiens entièrement l'opinion que j'ai donnée autrefois (Mem. Soc. Ent. Belg. 1902, p. 58) que cet insecte est la femelle d'un Dorcide très voisin de *Macrodorcus rubrofemoratus* Voll. Le spécimen du British Museum est d'un noir franc, avec reflets soyeux, dans le genre des femelles de *Rhaetus westwoodi*. Les pattes antérieures sont cintrées concaves extérieurement. Les fémurs ne sont pas tout à fait noirs, mais ont une faible teinte rougeâtre, l'extrémité des tibias antérieurs est tout à fait du même modèle que chez *M. rubrofemoratus*. J'ai vu deux autres spécimens, qui m'ont été communiqués par M. Möllenkamp et qui ne me paraissent pas différer du type. L'espèce est plus grande que *Macrodorcus (Hemisodorcus) rubrofemoratus*, mais voisine de cette espèce et de *H. arrowi* Boil.

Macrodorcus opacus, Waterhouse, Ent. Monthly Mag., 1870, p. 208, est bien, comme l'a indiqué Lewis, un mâle de grand développement de *M. striatipennis* Motschulsky. B. M.

Metallactulus parvulus Hope, Cat., p. 25. Les types de Hope conservés à Oxford sont deux femelles, provenance "Manille."

Gnaphaloryx squalidus Hope, Cat., p. 19. Les types, un mâle et une femelle, sont également à Oxford.

Gnaphaloryx sculptipennis Parry, Trans. Ent. Soc. Lond., 1864, p. 52. Le type mâle, qui se trouve au British Museum, est un petit exemplaire.

Eulepidius luridus Westwood, Trans. Ent. Soc. Lond., 1874, p. 357, pl. 3, fig. 1. Le type de ce rare insecte est conservé à Londres. Je pense que sa place est bien à côté des *Gnaphaloryx*, mais ceux-ci ne sont pas correctement classés dans les Dorcides.

Aegotypus trilobatus Parry, Proc. Ent. Soc. Lond., 1862, p. 113. Il a été décrit trois espèces d'*Aegotypus*. L'*Ae. trilobatus* est nettement distinct d'*Ae. armatus* Boil. Il se rapproche beaucoup plus d'*Ae. lobicollis* Jakowleff ou, tout au moins, de l'espèce de Kina-Balu qui est répandue sous ce nom. Le grand mâle d'*Ae. trilobatus* porte une crête frontale bien développée. La saillie antérieure du prothorax est lobée comme chez les exemplaires de Kina-Balu. La femelle est seulement ondulée sur les côtés du prothorax; cette forme varie un peu suivant les spécimens chez *Ae. lobicollis*. L'écart des deux espèces est très faible, s'il existe.

Aegus chelifer MacLeay, Horae Ent., 1819, p. 113.—Le British Museum possède un spécimen qui, d'après Parry (Cat. 1864, p. 54), aurait été envoyé par Mr. MacLeay lui-même, avec l'indication de l'habitat "Australia" sur son étiquette. Parry, dans la note qu'il consacre à cette espèce, identifie ce spécimen avec ceux reçus par Mniszech et lui-même du Cambodge et de la péninsule Malaise.

Au Cambodge existe une assez grande espèce, voisine d'*Ae. acuminatus* Fab. mais ayant les mandibules armées d'une dent toujours simple, assez avancée vers l'apex, et les élytres brillantes sur les côtés. Par contre cette espèce ne semble pas se trouver en Malaisie. Elle a été décrite par Jakowleff, sous le nom d'*Aegus specularis* (Horae Soc. Ent. Ross., 1900, p. 633). Une autre espèce, plus petite, répond également à la description donnée par Parry dans sa note. Elle diffère davantage que la précédente d'*Aegus acuminatus*, et a les intervalles des élytres bombés au lieu d'être plats. La distribution géographique semble assez large. Bornéo, Malacca, sont ses provenances les plus certaines. Quelques exemplaires sont indiqués de Java, sans grande certitude, et de Sumatra. J'ai décrit cette espèce sous le nom d'*Aegus nitidus* (Bull. Soc. Ent. Fr.,

1899, p. 321), pensant, d'après la provenance : "Cambodge" que le véritable *Aegus chelififer* devait être la grande espèce indo-chinoise. L'examen du spécimen cotype d'*Aegus chelififer*, conservé au British Museum, montre immédiatement que c'est à cette dernière espèce qu'il se rapporte. L'insecte porte les indications suivantes : "*Aegus chelififer* MacLeay," "Australasia, 1736," "Chelififer, 1736." Ce spécimen se rapproche davantage de ceux reçus de Singapour que de ceux reçus de Bornéo. Sans discuter l'indication "Australasia" qui reste douteuse, nous devons considérer ce cotype comme vraisemblablement correct et mettre l'*Ae. nitidus* en synonymie.

Aegus platyodon Parry, Proc. Ent. Soc. Lond., 1862, p. 112.—Le type (British Museum) de cette espèce est un assez grand mâle, provenant de Gilolo, par Wallace. Cette espèce varie un peu suivant les localités. Le type a le pronotum assez brillant, le dessous du menton et le sous-menton sont couverts d'une ponctuation cicatricielle confluyente.

Aegus blandus Parry, Trans. Ent. Soc. Lond., 1864, p. 57. Le type mâle, conservé au British Museum est, je crois, toujours l'unique exemplaire connu. C'est un insecte d'aspect très distinct, allongé, avec une grosse tête et de courtes mandibules simples, armées d'une dent basale également simple; les intervalles des élytres sont plats, lisses mais peu brillants, le pronotum assez brillant.

Aegus woodfordi Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 38. Types mâle et femelle au British Museum. Le mâle est un petit exemplaire. Les mâles majeurs de cette espèce ont un aspect assez différent. Les mandibules sont toujours velues en dessous.

Aegus glaber Parry, Trans. Ent. Soc. Lond., 1864, p. 59. Le type est un très petit mâle. B. M.

Aegus curtisi Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 36. Type au British Museum. Est apparenté à *Ae. oxygonus* Jakowleff, mais distinct.

Aegus parryi Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 37. Cette espèce est représentée par trois spécimens, qui viennent de la collection Parry et sont, vraisemblablement, d'origines distinctes. Il y a au moins deux espèces différentes sous le même nom.

Le plus grand mâle doit être considéré comme le vrai type; il a les mandibules terminées par un biseau vertical, la dent basale est bien détachée oblique, et obliquement

coupée, de sorte qu'elle forme un angle obtus vers la mandibule à laquelle elle appartient et un angle aigu à son extrémité, du côté de l'autre mandibule. Cette forme rappelle beaucoup celle des mandibules de l'*Aegus hopei* Boil., et les deux espèces sont certainement très voisines, sinon identiques, ce que je ne puis affirmer, n'ayant pu comparer les types et n'ayant rapporté qu'un croquis de l'*Ae. parryi*. [Pl. IX, fig. 15, mandibule.] Celui-ci est indiqué de Sarawak. *Hopei* est de Palembang.

Le deuxième exemplaire me semble identique à mon *Ae. westwoodi*; il en a la dent basale simple et la forte carène apicale des mandibules. [Pl. IX, fig. 16, mandibule.] Le troisième exemplaire, d'après un croquis envoyé autrefois à M. Ritsema, qui me l'avait communiqué, était un petit spécimen avec mandibules aiguës à la pointe et dent basale simple, comme les ont les petits spécimens d'*Ae. malaccus* Thomson. Ce type était réduit à l'état de débris lorsque je l'ai vu en nature. B. M.

Aegus roepstorffi Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 36. Les types, conservés au British Museum, sont des Iles Andamans. La même espèce existe aux Iles Nicobar.

Aegus subnitidus Waterhouse, Ent. Monthly Mag., 1873, p. 277. Le type est un petit mâle à dent basale aiguë. B. M.

Aegus kandiensis Hope, Cat., p. 6: Parry, Trans. Ent. Soc. Lond., 1870, p. 61, pl. 2, figs. 5-8. Cette espèce, que Parry a bien voulu considérer comme attribuable à Hope, qui l'a simplement nommée, et à tort, comme un synonyme d'*Ae. cicatricosus* Wied, lui-même forme mineure d'*Ae. acuminatus* Fab., a été, en réalité, décrite par Parry dans son deuxième Catalogue. Le vrai type doit donc être considéré comme étant le grand mâle figuré à cette occasion; il fut acquis par H. Deyrolle à la vente de la collection; peut-être se trouve-t-il actuellement dans la collection de M. R. Oberthür.

L'insecte nommé par Hope est conservé à Oxford; c'est un petit mâle, provenance "Kandy." Le pronotum est ponctué et brillant, la dent basale des mandibules est simple.

Aegus parallelus Hope, Cat., p. 22. Le type est conservé à Oxford, il m'a été communiqué et j'ai pu l'examiner avec soin. C'est certainement un petit spécimen appartenant, soit à *Aegus labilis* Westwood, soit à *Aegus platycephalus* Westwood. En raison de la provenance: "Khasyah Hills" il convient de la rapporter à la première de

ces deux espèces et, en raison des dates de description le nom de *parallelus* doit faire passer en synonymie le nom de *labilis*. Westwood a d'ailleurs lui-même admis que *Ae. parallelus* était la forme mineure d'*Ae. labilis* et que *Ae. aequalis* Westwood était très probablement identique à *Ae. parallelus*. (Vide Trans. Ent. Soc. Lond., 1864, p. 56.)

Aegus eschscholtzi Hope, Cat., p. 22. Le type mâle appartient au développement maximum. Son étiquette de provenance semble indiquer Java, contrairement à la diagnose qui donne "Tenasserim." U. O.

Aegus striatus Hope, non décrit, est représenté à Oxford par un petit mâle d'*Aegus acuminatus* sans indication de provenance.

Aegus fronticornis Hope, également non décrit, est un mâle moyen, provenance "Kandy," d'*Aegus kandiensis* Parry. U. O.

Aegus punctiger Saunders, Trans. Ent. Soc. Lond., 1854, p. 54, dont le type existe à Oxford est, comme l'a indiqué Parry (Cat. 1864, p. 92) la femelle d'*Ae. laevicollis* Saunders.

Alcimus dilatatus Fairmaire, Rev. Zool. 1849, p. 416, pl. 11, fig. 6. M. Waterhouse a décrit la grande forme de cette espèce, dont le type de Fairmaire est un petit spécimen. Le grand mâle, qui faisait partie de la collection Parry est maintenant conservé au British Museum. [Pl. IX, fig. 3.]

Paraegus listeri Gahan, Proc. Zool. Soc., 1888, p. 539. Types mâles et femelles au British Museum. Cette espèce ressemble aux *Aegus lansbergei* et *rotundatus* Boil., et rappelle également certains *Lissotes*.

Apterocyclus honoluluensis Waterhouse, Trans. Ent. Soc. Lond., 1871, p. 315, fig. ♀. Le croquis publié avec la description ne permet pas de se rendre compte de l'aspect de l'insecte, qui ressemble assez à un *Sclerostomus*, de la taille du *S. bacchus*. M. Sharp a publié les descriptions de plusieurs autres espèces dont j'ai vu les spécimens, et qui, à ce qu'il m'a semblé, sont vraiment bien voisines les unes des autres. B. M.

Sclerostomus fairmairei Parry, Trans. Ent. Soc. Lond., 1864, p. 61, type mâle. B. M.

Sclerostomus philippii Westwood, Trans. Ent. Soc. Lond., 1864, p. 61, pl. 11, fig. 5. Types mâle et femelle. Le mâle est un exemplaire moyen. La dent basale tridentée s'atténue beaucoup chez les spécimens de plus grand développement.

Sclerostomus buckleyi Waterhouse, Ann. Mag. Nat. Hist., 1886, p. 497. Les femelles, indiquées comme types n'appartiennent pas, à mon avis, à la même espèce que le mâle; elles sont très courtes et larges, ternes, d'une couleur rougeâtre nuancée de noir, avec des stries et non des stries régulières comme celles du mâle; il y a un angle postérieur épineux très net au prothorax qui n'existe nullement chez le mâle; je ne serais pas éloigné de penser que ces femelles appartiennent au genre *Aegognathus* Leuthner.

Sclerostomus darwini Hope, Ann. Mag. Nat. Hist., 1845, p. 302 : Cat., p. 25. Type mâle conservé à Oxford; paraît être, comme l'a indiqué Parry, *S. femoralis* Guérin, mais n'est pas un grand exemplaire.

Sclerostomus rubripes Hope, Cat., p. 26. La provenance du type mâle est "Magellan," c'est un *S. femoralis* de faible développement. (Parry, Cat. 1884, p. 95.) U. O.

Sclerostomus variolosus Hope, Cat., p. 25. Les types d'Oxford se rapportent bien au *S. caelatus* Blanchard, comme l'a indiqué Parry (Cat., 1864, p. 95).

Sclerostomus bacchus Hope, Cat., p. 26. Type mâle, conservé à Oxford.

Sclerostomus ditomoides Westwood, Trans. Ent. Soc. Lond., 1855, p. 208, pl. 11, fig. 4. La synonymie indiquée par Parry, Trans. Ent. Soc. Lond., 1870, p. 96, ne me paraît pas certaine. Il semble d'ailleurs que Parry ait eu lui-même des doutes à ce sujet, puisque, dans son Catalogue de 1875 il a rétabli, quoique avec doute, *S. neotragus* Westwood = *ditomoides* Westwood (*teste* Parry) comme une espèce distincte de *S. cruentus* Burmeister. U. O.

Scortizus irroratus Hope, Trans. Zool. Soc. Lond., 1835, p. 100, pl. 14, fig. 3. L'insecte conservé comme type à Oxford est un mâle de cette espèce, le vrai type doit être une femelle.

Scortizus costatus Hope, Cat. p. 27. Types mâle et femelle. U. O.

Aegognathus Waterhousei, Leuthner, Trans. Ent. Soc. Lond., 1883, p. 445, pl. 21, fig. 3. La figure qui a été donnée de cet insecte est bonne, mais les mandibules sont dans une position anormale qui en change l'aspect. Les élytres ont l'apparence pruiteuse de celles de certains *Sclerostomus*, mais la forme de l'extrémité des tibias, étroite et peu épineuse chez *Aegognathus*, éloigne ces deux genres et rapproche plutôt le dernier des *Auxicerus*, tout en restant très distinct. L'extrémité des mandibules est

coupée en biseau un peu élargi en spatule, avec une trace de denticule anté-apical. B. M.

Charagmophorus lineatus Waterhouse, Ann. Mag. Nat. Hist., 1895, p. 495. Type mâle au British Museum. [Pl. IX, fig. 2.]

Auxicerus platyceps Waterhouse, Ann. Mag. Nat. Hist. 1883, p. 387. Le type est un insecte très gracile, c'est un mâle de développement moyen. Les mandibules portent une trace de la dent d'arrêt placée sur la partie supérieure, un peu au delà du milieu. B. M.

Platycerus caucasicus Parry, Trans. Ent. Soc. Lond., 1864, p. 60. Le type mâle est conservé au British Museum.

Pseudodorcus hydrophiloides Hope, Cat., p. 23. Le mâle de cette espèce énigmatique est conservé à Oxford, la femelle au British Museum. Cet insecte est resté extrêmement rare jusqu'à présent, et peu connu. Le mâle [Pl. IX, fig. 1-1a, antenne] a tout à fait l'aspect d'une grosse femelle d'*Eurytrachelus* du groupe de *E. intermedius*, mais plus large, et avec des mandibules beaucoup plus compliquées. La femelle a la même taille que le mâle, mais la tête est un peu plus petite et les mandibules présentent une dent simple vers l'apex. Celles du mâle sont sensiblement égales à la longueur de la tête; elles sont convexes extérieurement, leur pointe est simple; il existe une dent basale double à gauche, simple et projetée vers l'avant à droite, et une dent médiane double placée un peu plus bas à droite qu'à gauche. Le front est concave et brillant, l'épistome forme une saillie conique dont la forme est celle d'une accolade à pointe assez développée, la partie qui avance est en relief sur le reste. L'antenne est bien coudée et ressemble beaucoup à celle d'un grand Dorcide. Le scape est sensiblement égal au fouet. Le 2^e article est plus long que le 3^e; celui-ci est égal au 5^e et plus long que le 4^e; le 6^e et le 7^e sont égaux au 5^e. Le 7^e est éperonné, l'éperon est conique et porte des soies courtes; les trois derniers ont leur surface feutrée, mais le 8^e a toute la région dorsale, et le 9^e la partie apicale de cette région, brillantes. Le peigne est bien développé.

Les canthus ne coupent pas plus du tiers antérieur de l'œil; celui-ci est gros, sphérique, un peu plus développé en dessous. Le menton est petit, trapézoïdal, avec les angles bien arrondis et le bord antérieur convexe. Il est brillant, avec une forte ponctuation cicatricielle.

Le prosternum est en carène saillante, aplatie, avec deux

impressions distinctes avant le milieu des hanches; il forme ensuite une pointe conique dont les génératrices sont un peu convexes. Le mésosternum est concave. Le métasternum est lisse, un peu déprimé en triangle vers les hanches postérieures.

Les pattes sont assez fines; les tibias antérieurs sont dentés et denticulés en scie entre les dents principales. La fourche apicale est peu caractérisée. Les tibias médians et les postérieurs ont une forte épine aiguë avant le milieu. Les tarsi sont assez grêles, plus courts que les tibias, le dernier article a deux fois et demie la longueur d'un des autres. Les soies inférieures sont disposées en deux pinces, moins fournies vers le dernier article.

Ce qui sépare le plus nettement, au premier examen, cet insecte des grand Dorcides auxquels on serait tenté de le réunir, c'est la forme de la lèvre supérieure et l'armature compliquée de ses courtes mandibules. A ce point de vue, il se rapproche davantage des Cladognathides. Mais la disposition des pattes, au contraire, avec les fortes épines apicales, rappelle davantage les Dorcides.

J'ai reçu, il y a quelque temps, sans provenance précise, mais venant presque certainement du Queensland, un spécimen de *Pseudodorcus* qui diffère de *P. hydrophiloides* par la dent basale des mandibules qui est double à droite et à gauche, et la dent médiane, qui est simple; son aspect est tout à fait analogue à celui du mâle de l'île Melville, mais il est un peu plus petit.

Je n'ai pu examiner la femelle du *P. hydrophiloides*, décrite par Westwood sous le nom de *carbonarius* (Trans. Ent. Soc. Lond., 1863, p. 515, pl. 21, fig. 3) avec autant de soin que le mâle, ce dernier m'ayant été très obligeamment communiqué. Elle me paraît bien, comme l'a reconnu Parry (Trans. Ent. Soc. Lond., 1870, p. 94) appartenir à la même espèce. La figure donnée par Westwood (*loc. cit.*) ne ressemble pas à l'insecte; elle est exacte comme détails, mais la position réelle de la tête est inclinée, de sorte qu'elle est peu visible et que la forme générale paraît presque régulièrement elliptique.

Lissapterus howittanus Westwood, Trans. Ent. Soc. Lond., 1863, p. 513, pl. 21, fig. 1, ♂. Le musée d'Oxford possède deux mâles et deux femelles, types de l'espèce.

Lissapterus pelorides Westwood, Trans. Ent. Soc. Lond., 1855, p. 220. La femelle type, seul spécimen connu de cette espèce, est conservée au British Museum; le dessin

qu'en a donné Westwood (*loc. cit.*, 1863, p. 514, pl. 21, fig. 2) est très exact. L'insecte est noir et lisse, à peu près comme une femelle de *Dorcus antaeus* Hope, et très distinct de *L. howittanus*.

Lissotes helmsi Sharp, Ent. Monthly Mag., 1881, p. 49, type ♂. B. M.

Lissotes capito H. Deyrolle, Trans. Ent. Soc. Lond., 1873, p. 339, pl. 5, fig. 4, ♂ : Parry, *loc. cit.*, p. 339, pl. 5, fig. 5, ♀. Les spécimens du British Museum ne sont pas les types, mais sont intéressants à comparer à l'espèce la plus voisine, *L. helmsi*, les exemplaires de *L. capito* étant fort rares. Le British Museum possède deux mâles et trois femelles. L'espèce est à peine inférieure à *L. helmsi* comme taille. La dent basale pointue des mandibules, qui est latérale chez *L. helmsi* est supérieure chez *L. capito*. Les intervalles des élytres sont plus serrés chez ce dernier et les tibias postérieurs portent une épine qui fait défaut à *L. helmsi*.

Lissotes forcipula Westwood, Trans. Ent. Soc. Lond., 1871, p. 366, pl. 9, fig. 2. Petite espèce, très courte et arrondie. Je serais très disposé à croire que la suivante, dont le type est une femelle, n'en diffère pas réellement. B. M.

Lissotes subcrenatus Westwood, Trans. Ent. Soc. Lond., 1871, p. 368, pl. 9, fig. 5. Le type femelle, originaire de Tasmanie, comme l'insecte précédent, et paraissant apparentée avec lui. B. M.

Lissotes crenatus Westwood, Trans. Ent. Soc. Lond., 1855, p. 216, pl. 12, fig. 3. Le musée d'Oxford possède un mâle et une femelle indiqués comme types. Le mâle appartient à la forme majeure et correspond bien à la description.

Quant à la femelle, qui n'est nullement mentionnée dans la description de l'espèce, je suis disposé à penser que c'est celle décrite plus tard par Westwood sous le nom de *L. forcipula*? ♀. Trans. Ent. Soc. Lond., 1871, p. 367, pl. 9, fig. 6, *a, b*. Elle correspond exactement à cette description et aura sans doute été identifiée postérieurement par Westwood avec *L. crenatus*? Il est bien certain que les *L. crenatus*, *subcrenatus*, *forcipula* constituent un petit groupe qu'il serait nécessaire de revoir avec soin. Malheureusement, ces espèces sont très mal représentées dans nos collections et nous ignorons l'étendue et la genre de leurs variations spécifiques.

M. A. M. Lea a récemment publié une intéressante étude sur le genre *Lissotes*,* dans laquelle il examine et figure les

espèces australiennes et tasmaniennes dont il a eu connaissance, mais il ne fait que citer *L. crenatus* et *L. subcrenatus* d'après les descriptions originales.

Lissotes latidens Westwood, Trans. Ent. Soc. Lond., 1871, p. 363, pl. 9, fig. 4. Le type mâle de cette rare espèce est conservé à Oxford. Il est très distinct et bien caractérisé.

Lissotes launcestoni Westwood, Trans. Ent. Soc. Lond., 1871, p. 365, pl. 9, fig. 1. Le type se trouve au musée d'Oxford. Il n'est pas explicitement indiqué mais je pense que c'est le spécimen, de taille moyenne et de forme assez étroite, qui porte les étiquettes anciennes : "*Lissotes launcestoni* Westw^d Howitt" "*Lissotes* n. sp? Tasmania, March 1866 two ♂" et "W. Dr. Howitt. N.H." Il existe d'autres spécimens, dont un grand mâle, mais ils ne correspondent pas à la figure. Cette espèce est bien connue et l'une des plus répandues dans les collections.

Lissotes cancroides Fabricius, Mant., i, 1787, p. 2. D'après Westwood, le type même de l'espèce, décrit par Fabricius, fait partie des collections du British Museum. Je ne l'ai pas vu; aucun des *L. cancroides* ne portait d'indication de type. Dans la collection d'Oxford, le spécimen étiqueté *L. cancroides*, qui m'a été communiqué, porte les indications : "*Cancroides* ♂ Mus. Hope" et une étiquette qui paraît très ancienne : "Van D. Land. Mr. Richard." Cet insecte ressemble beaucoup à un autre *Lissotes*, qui est étiqueté *Lissotes curvicornis* et m'a également été envoyé. Ce dernier porte les indications : "*Lissotes cancroides* Fab. Mount Wellington Tasmania, March 1866, ♂ and ♀"—"*L. curvicornis* Boisduval. sec. type sp. Mus. Paris"—"W. Dr. Howitt. N.H."

La femelle existe également, avec les étiquettes : "♀. *cancroides*" "*L. curvicornis*" "W. Dr. Howitt. N.H."

Ces divers spécimens appartiennent sans aucun doute à la même espèce et sont des *L. curvicornis* Boisduval.

Lissotes subtuberculatus Westwood, Trans. Ent. Soc. Lond., 1855, p. 215, pl. 12, fig. 2. Le couple de cette espèce, possédé par le musée d'Oxford, peut être considéré comme typique, mais le type véritable se trouvait unique dans la collection Chevrolat. Ces spécimens ont exactement les mêmes indications de provenance que les deux *Lissotes curvicornis* mentionnés ci-dessus. Ces insectes

* Notes on the Genus *Lissotes*, with descriptions of New Species, by Arthur M. Lea, F.E.S., Government Entomologist. Proc. Royal Soc., Tasmania, 1910, pp. 346-366, pl. viii, ix.

sont d'ailleurs très étroitement apparentés et M. A. M. Lea, dans son travail, considère *L. sub tuberculatus* comme une simple variété de *L. curvicornis*.

Oonotus adpersus Boheman, Ins. Caffr., ii., 1848, p. 384. La femelle, décrite par Westwood (Trans. Ent. Soc. Lond., 1863, p. 455, pl. 16, fig. 6) est conservée au British Museum, A défaut des exemplaires décrits par Boheman, on peut la considérer comme type. Avec cette femelle sont une autre femelle et un mâle, tous trois ayant fait partie de la collection Parry. Le mâle a la tête sensiblement plus large et les canthus plus développés; il est un peu plus grand et plus large.

Nigidius cribricollis Parry, Trans. Ent. Soc. Lond., 1873, p. 340, pl. 5, fig. 6, type. B. M.

Nigidius divergens Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 38. Forte espèce, de la taille du *N. beningseni* Kraatz, aisément reconnaissable à la fossette longitudinale du pronotum et à quatre impressions bien marquées le long du bord antérieur incliné. Type. B. M.

Nigidius welwitschi Waterhouse, Ann. Mag. Nat. Hist., 1890, p. 39, type. B. M.

Nigidius distinctus Parry, Trans. Ent. Soc. Lond., 1873, p. 341, pl. 5, fig. 7, type. B. M.

Nigidius formosanus Bates, Proc. Zool. Soc. Lond., 1866, p. 347 type. B. M.

Nigidius obesus Parry, Trans. Ent. Soc. Lond., 1864, p. 63 type. B. M.

Nigidius parryi Bates, Proc. Zool. Soc. Lond., 1866, p. 347. Le type n'est probablement pas un spécimen de la plus grande taille. Il ne présente aucune différence valable avec le *N. gigas* du Tonkin, décrit par M. Möllenkamp. *N. parryi* a seulement la tête un peu plus plate sur la partie antérieure, avec deux très légères impressions qui ne se remarquent pas sur un *N. gigas* de même taille pris comme exemplaire de comparaison. *N. gigas* me paraît être, tout au plus, une sous-variété de *N. parryi*. B. M.

Nigidius integer Westwood. Ent. Mag., 1838, p. 265. Cet insecte est conservé à Oxford. La synonymie: = *bubalus* Swederus a été donnée par Parry (Cat. 1864, p. 98).

Nigidius forcipatus Westwood, Ent. Mag., 1838, p. 267. Le type est un petit exemplaire de *N. laevicollis* Westwood. Le bord antérieur du pronotum est entièrement dépourvu de tubercule médian et il n'y a aucune fossette sur le disque;

les canthus oculaires et la dent supérieure de la mandibule sont moyennement développés. L'absence de tubercule médian au pronotum et la forme des canthus indiquent que cet exemplaire doit être une femelle. U. O.

Nigidius laevicollis Westwood, Proc. Zool. Soc. Lond., 1835, p. 128. Le type, également conservé à Oxford, est un assez grand exemplaire, plus développé comme mandibules et canthus que le précédent et possédant un petit tubercule médian à la marge antérieure du pronotum. C'est très probablement un mâle.

Je me suis assuré, sur un bon nombre d'exemplaires de cette espèce, que les mâles avaient toujours un tubercule médian au milieu du bord antérieur du pronotum et que les femelles en étaient dépourvues. Le *N. taurus*, décrit par Jakowleff, dont la distinction du *N. laevicollis* est basée sur le développement des canthus et des mandibules et sur la présence de ce tubercule qui, suivant Jakowleff, manque au *N. laevicollis* (ce que nous venons de reconnaître inexact), me paraît être simplement le mâle de cette espèce; ce nom doit passer en synonymie.

Nigidius trilobus Westwood, Ent. Mag., 1838, p. 263. Le type est conservé au British Museum. Cet insecte est certainement un *Figulus*.

Nigidius grandis Hope, Ann. Mag. Nat. Hist., 1841, p. 302. Cat., p. 26.—Le type est indiqué de Sierra Leone. C'est un exemplaire de taille moyenne. Cette espèce varie un peu comme sculpture du pronotum, mais est toujours facile à reconnaître. U. O.

Figulus binodulus Waterhouse, Ent. Monthly Mag., 1872, p. 277, type. B. M.

Figulus punctatus Waterhouse, Ent. Monthly Mag., 1872, p. 278, type. B. M.

Figulus rossi Gahan, Monogr. Christmas Isl., 1900, p. 96, type. B. M.

Figulus regularis Westwood, Ann. Sc. Nat., 1834, p. 120. Le type, conservé à Oxford, est un grand exemplaire. L'espèce semble très commune; c'est à elle que se rapportent le plus grand nombre des exemplaires reçus d'Australie.

Figulus sulcicollis Hope, Cat., p. 26. Cette espèce est peu connue, elle est décrite de Port Essington et paraît être beaucoup plus rare dans les collections. Ayant pu comparer à loisir les deux types, je crois devoir indiquer quels sont les caractères qui permettent de les distinguer.

F. sulcicollis a la tête un peu plus anguleuse en avant; les canthus sont plutôt coudés que régulièrement arrondis, soit en avant, soit en arrière. Le milieu du disque céphalique est lisse chez cette espèce, il est ponctué, surtout au bord frontal, chez *F. regularis*.

Le prothorax a à peu près la même forme, mais est sensiblement plus long chez *sulcicollis*. Le milieu du disque porte une véritable fossette avec des points enfoncés au lieu d'une série de points enfoncés chez *regularis*. Les points s'avancent jusque près de la saillie anguleuse du bord antérieur chez *regularis*, ils en restent éloignés, comme le sillon lui-même, chez *sulcicollis*.

La ponctuation générale est plus fine chez ce dernier. Les élytres ne paraissent pas différer beaucoup, mais l'angle huméral est épineux chez *regularis* et seulement assez aigu chez *sulcicollis*.

Les mandibules de ce dernier sont plus fortes, plus horizontales, moins ponctuées sur le côté externe, celles de *regularis* sont vraiment relevées à l'extrémité.

Les tibias antérieurs sont plus larges, avec la fourche plus longue chez *regularis*.

Les deux types de *F. sulcicollis* sont conservés à Oxford. Les exemplaires qui se rapprochent le plus de ces spécimens, dans les collections modernes, sont des *Figulus* du Queensland, qui ont sensiblement même forme, mais sont bien plus fortement ponctués.

Figulus subcastaneus Westwood, Ent. Mag., 1838, p. 263. C'est une petite espèce qui, comme aspect général, ressemble beaucoup au *F. marginalis* Ritsema. Il s'agit, en réalité, d'une espèce voisine mais distincte. La tête porte une bosse centrale médiane entre les yeux et le prothorax est notablement plus court, à peu près aussi large que long, avec les angles postérieurs et antérieurs arrondis. La fossette du pronotum est linéaire, ponctuée à deux rangées; elle n'atteint pas la marge antérieure, qui n'est pas tuberculée au milieu, et rejoint au contraire la postérieure. Les élytres sont remarquablement longues, striées finement, les intervalles lisses et presque plats, les stries régulièrement ponctuées. U. O.

Figulus manillarum Hope, Cat., p. 26. Le type est conservé au musée d'Oxford.

Figulus ebenus Westwood, Ann. Sc. Nat., 1834, p. 120, pl. 7, fig. 4. Le type est un grand exemplaire de Madagascar, dont les stries latérales des élytres sont bien marquées.

C'est une des formes locales du *F. sublaevis* qui est assez variable comme sculpture des élytres. U. O.

Figulus nigrinus Westwood, Ent. Mag., 1838, p. 161. Le type est un exemplaire du Sénégal, plus petit que le précédent; les stries latérales des élytres sont un peu moins prononcées. C'est une autre forme du *F. sublaevis*. U. O.

Cardanus sulcatus Westwood, Ann. Sc. Nat., 1834, p. 113, pl. 7, fig. 1. Le type, conservé à Oxford, est un exemplaire de grande taille.

Cardanus cribratus Parry, Trans. Ent. Soc. Lond., 1870, p. 98. Le type, conservé au British Museum, ressemble à un *C. sulcatus* de grandeur réduite à moitié. C'est un insecte d'un noir terne dont le prothorax a une forme plus simple que celle du *C. sulcatus*. La fovéole médiane est grande, peu profonde, à bords assez larges, formant fer à cheval ouvert en arrière. La dent des mandibules est très faible.

Hexaphyllum westwoodi Hope, Proc. Ent. Soc. Lond., 1840, p. 11. Le mâle et la femelle de Nouvelle Grenade, qui sont les types de Hope, sont conservés à Oxford. La synonymie de cette espèce et de *H. aequinoctiale* Buquet a été indiquée par Burmeister (Handb. v, p. 332).

H. aequinoctiale n'est pas une espèce répandue dans les collections, on peut la considérer comme rare. Les spécimens d'Oxford se distinguent de *H. schuberti* Perty par le pronotum entièrement ponctué, moins bombé, avec une dépression longitudinale médiane moins marquée; par les nervures élytrales étroites et ponctuées, et surtout par la forme des mandibules dont la dent latérale interne est beaucoup plus forte et la deuxième dent supérieure, à partir de la base, bien plus voisine de l'extrémité apicale.

Hexaphyllum brasiliense Gray in Griff. Anim. Kingd., Ins. i, 1832, p. 536, pl. 46, fig. 4. Un mâle et deux femelles, indiqués comme types de "*H. brasiliense* Gray = *Psilodon schuberti* Perty" sont conservés à Oxford. Ce sont trois exemplaires de grandes dimensions de l'espèce que l'on trouve habituellement dans les collections.

Aesalus neotropicalis Bates, Biol. Cent.-Amer., Col. ii, 1886, p. 2, pl. 1, figs 3, 3a. Plusieurs exemplaires types, provenance: "Guatemala City." B. M.

Aesalus smithi Bates, Biol. Cent.-Amer., Col. ii, 1886, p. 382. Un seul exemplaire type, provenance: "Chilpancingo, Guerrero, 4,000 ft., June." B. M.

Mitophyllum marmoratus Waterhouse, Ent. Monthly Mag., 1874, p. 8. Le type du British Museum porte

l'annotation "Specimen of *M. marmoratus* sent to Oberthür agrees with type of *M. parryanus* sec. Oberthür," d'après laquelle cette espèce devrait passer en synonymie.

Ceratognathus rufipennis Westwood, Trans. Ent. Soc. Lond., p. 82 pl. 2, fig. 2. Le type est conservé au British Museum. La figure donnée par Westwood n'est pas très bonne.

Ceratognathus niger Westwood, Ent. Mag., 1838, p. 261, fig. Le type, conservé à Oxford, est un fort mâle. Les pièces de la bouche ont été disséquées et conservées avec l'insecte.

Ceratognathus abdominalis, Parry, Trans. Ent. Soc. Lond., 1870, p. 99. La description de cet insecte paraît le rapprocher de *C. froggatti* Blackburn. En réalité, le type, qui existe au British Museum, appartient à une petite espèce bien distincte.

Ceratognathus areolatus Westwood, Trans. Ent. Soc. Lond. 1863, p. 430, pl. 14, fig. 2. L'exemplaire femelle, conservé à Oxford, qui sert de type à cette espèce, a été rapporté par Parry au *C. helotoides* Thomson. Le *C. helotoides* étant de Nouvelle Zélande et la *C. areolatus* étant, d'après ses étiquettes de provenance, de Nouvelle Hollande, bien que décrit de Nouvelle Zélande, il était intéressant de vérifier la synonymie proposée, d'autant plus qu'il existe, en Australie, une espèce assez voisine comme aspect du *C. helotoides*, le *C. gilesi* Blackburn. Après un examen attentif il n'y a pas de doute pour moi que *C. areolatus* est bien la femelle de *C. helotoides*. Il reste à expliquer pourquoi l'insecte porte une étiquette "W. D. Howitt N.H.," celle-ci a probablement été mise par erreur à la réception de ce spécimen, car *C. helotoides* n'a pas, jusqu'ici, été signalé d'Australie.

TYPES OU SPÉCIMENS TYPIQUES APPARTENANT AU BRITISH MUSEUM ET AU MUSÉE DE L'UNIVERSITÉ D'OXFORD ÉTUDIÉS OU CITÉS DANS LA NOTE PRÉCÉDENTE.

NOTA.—Les noms des espèces non-valables sont indiqués en italique. Les espèces pour lesquelles une modification est proposée dans la nomenclature sont indiquées par un astérisque.

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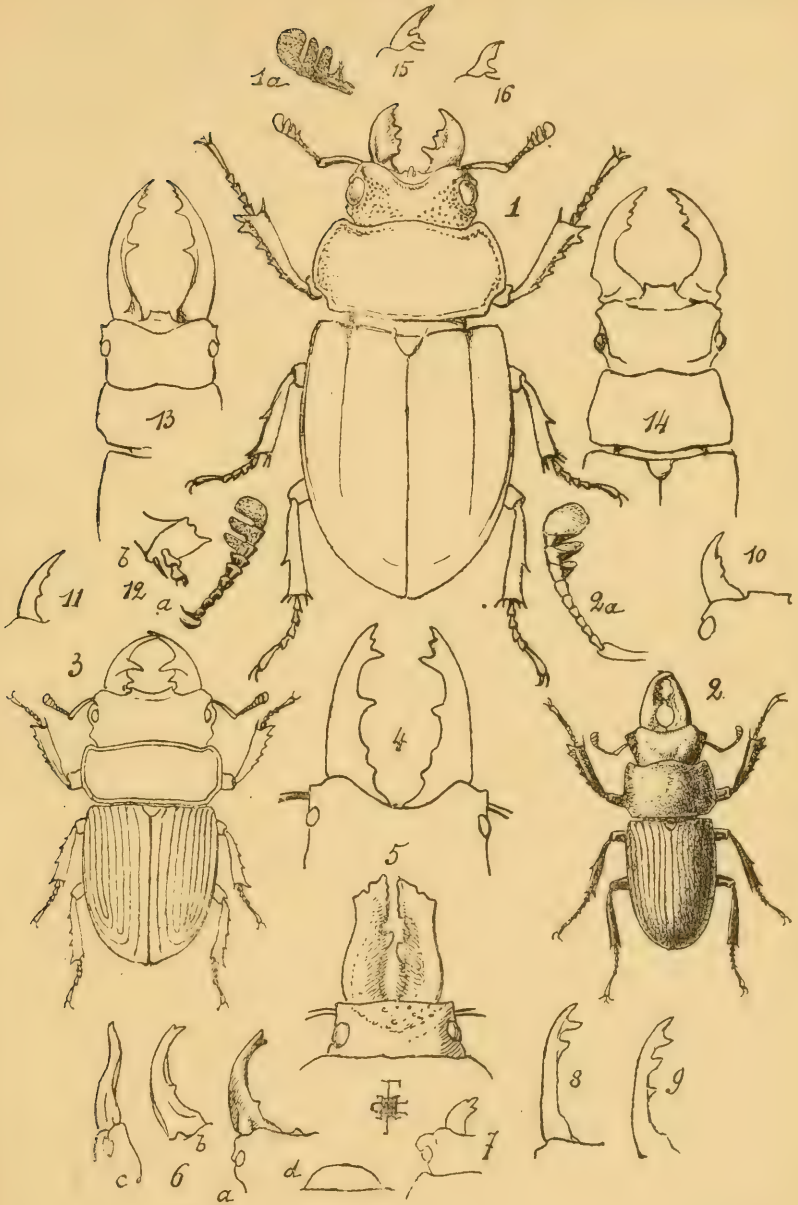
EXPLANATION OF PLATE IX.

[See *Explanation facing the PLATE.*]

[LÉGENDE DE LA PLANCHE.]

EXPLANATION OF PLATE IX.

- FIG. 1. *Pseudodorcus hydrophiloides* Hope, ♂. 1a. antenne.
2. *Charagmophorus lineatus* Waterhouse, ♂. 2a. antenne.
3. *Alcimus dilatatus* Fairmaire, ♂.
4. *Leptinopterus melanarius* Hope, ♂, mandibules.
5. *Lamprima latreillei* var. *coerulea* Donovan, ♂, mandibules.
6. *Prosopocoelus spencei* Hope, ♂, mandibules vues par dessus
(a), par dessous (b), de côté (c); menton (d).
7. *Oonotus adpersus* Boheman, ♂, tête.
8. *Prosopocoelus quadridens* Hope, ♂, mandibule.
9. *Prosopocoelus sayersi* Hope, ♂, mandibule.
10. *Eurytrachelus submolaris* Hope, ♂, mandibule.
11. *Eurytrachelus punctilabris* Hope, ♂, mandibule.
12. *Aulacostethus archeri* Waterhouse, ♂, a. antenne, b. extrémité
du tibia postérieur.
13. *Psalidoremus motschulskyi* Waterhouse, ♂.
14. *Lucanus* sp. ? = *ibericus* Motschulsky nec *Akbesiana*
Planet.
15. *Aegus parryi* Waterhouse, ♂, type, mandibule.
16. *Aegus parryi* Waterhouse, ♂ = *Ae. westwoodi*, Boileau.



C. Hentschel.

DETAILS OF LUCANIDAE.

VIII. *On some new and little-known Bornean Lycaenidae; together with a revision of the Thecline genus Thamala, Moore.* By J. C. MOULTON, F.L.S., Curator of the Sarawak Museum.

[Read December 4th, 1912.]

PLATE X.

HAVING recently published a paper on the Lycaenidae of Borneo,* it is perhaps only natural to expect further material to present itself at once, thereby necessitating modifications and additions to a work just "completed." Two interesting specimens, lent me for examination by Mr. H. H. Druce, have led me to work out the Thecline genus *Thamala*, Moore, which has been treated with much uncertainty by different authors for many years past owing to the rarity of specimens in collections; and the study of further material has brought to light some details of synonymy in other Lycaenids, so that it seems advisable to place these notes on record as soon as possible.

To the authorities of the British Museum I am much indebted for facilities accorded in studying their collections. Through Mr. F. H. Gravely of the Indian Museum I was able to examine some rare specimens belonging to that Museum. Mr. Noakes, Curator of Mr. Joicey's collection of Lepidoptera, was also kind enough to bring me specimens of *Thamala* to examine. The numbers before each species refer to the numbers used in my paper mentioned above.

The number of different species of Lycaenidae now known from Borneo is 302, of which 118 are not at present

* "A List of the Butterflies of Borneo with descriptions of New Species. Part III. Lycaenidae." Journal of the Straits Branch, Royal Asiatic Society, No. 60, 1911, pp. 73-177, with one plate.

recorded elsewhere. They are divided into seven sub-families thus :—

	<i>Gerydiinae.</i>	<i>Lycaeninae.</i>	<i>Curciinae.</i>	<i>Liphyrinae.</i>	<i>Poritiinae.</i>	<i>Arhopalidinae.</i>	<i>Thectinae.</i>	
Total recorded from Borneo	33	76	2	1	15	70	105	= 302
Confined to Borneo .	18	27	—	—	7	18	48	= 118

296b. *Lycaenopsis (Notarthrinus) boulti*, Chpmn.

Notarthrinus boulti, Chpmn., Ent. Mo. Mag., p. 103, pl. vi, figs. 1-5 (1912).

Described from two males captured on Mt. Klingkang, alt. 2,500 ft., October 1911, and one female taken near Limbang, June 1911; both localities being in Sarawak, although some 400 miles apart. These are the only three examples yet known; the types (male and female) are in the British Museum, the third specimen (male) is in the Sarawak Museum. Dr. Chapman places the species provisionally under *Notarthrinus*, and suggests that when more is known of it a new genus will probably be necessary.

316. *Lycaenopsis moultoni*, Chpmn. (Plate X, figs. 8 and 9).

This species, originally described from males only, has since been taken *in cop.* with a species described by me later as *Lycaenopsis oskewa*; this last name therefore gives way before that of Dr. Chapman, and the following synonymy becomes necessary :—

Lycaenopsis moultoni, Chpmn., Trans. Ent. Soc. Lond., p. 184, pl. xxviii, figs. 5, 6, 7 (1911).

Lycaenopsis (Neopithecops) oskewa, Moulton, Journ. Str. Br., Roy. Asiat. Soc., No. 60, p. 90 (1911).*

* Two females representing seasonal forms (one with large iridescent discal patch and the other with this patch reduced) were unfortunately described as female and male.

317. *Lycaenopsis matanga*, Chpmn. (Plate X, fig. 11).

In 1910 two *Lycaenopsis*s (representing two species as I thought) were sent to Dr. Chapman for determination. Unfortunately they were in bad condition, and Dr. Chapman finding no differences in their genitalia described them as one species (*Lycaenopsis matanga*), depositing the type in the British Museum and returning the co-type to me in Sarawak. Later, two more examples of a species agreeing well with Dr. Chapman's figure of *matanga* were obtained in Sarawak, but they were so different to the co-type, which was alone available to me for comparison, that I was induced to describe them as new under the name of *Lycaenopsis delapra*. Since returning to England I have now compared these with Dr. Chapman's type of *matanga* and find them identical, so that my species sinks before his. However, there are six more specimens in the Sarawak Museum exactly agreeing with his co-type and uniformly differing from his type. These are therefore left without a name, as, although apparently alike in genitalia, they are sufficiently constant in their differences from *matanga* to warrant separation from that species, and I now describe them as *Lycaenopsis chelaka*. The synonymy of *L. matanga* is now thus:—

Lycaenopsis matanga, Chpmn., Trans. Ent. Soc. Lond., p. 185 (*in parte*), pl. xxviii, fig. 1 (1911).

Lycaenopsis delapra, Moulton, Journ. Str. Br., Roy. Asiat. Soc., No. 60, p. 98 (1911).

318. *Lycaenopsis chelaka*, n. sp. (Plate X, fig. 10).

Lycaenopsis matanga, Chpmn., *l.c.* p. 185 (*in parte*).*

♂. *Upperside*. Dark fuscous brown; sub-discal area of fore-wing iridescent violet blue. *Fore-wing*: the violet-blue area extends from median nervure to inner margin

* The following passages in Dr. Chapman's description of *L. matanga* refer to *L. chelaka*:—"On the upper wing is an area of blue, rather violet in one specimen. . . . In one specimen it is a little more restricted. In the hind-wing there is a slight central tint in one specimen." His detailed description of the underside also refers to this species.

not quite reaching the base of wing or touching the outer third of hind margin. *Hind-wing*: a few violet-blue scales at the base of the 1st and 2nd median nervures (in some specimens hardly apparent).

Underside. Greyish-white. *Fore-wing*: a dark line closes cell; post-discal series of 6 dark spots light-edged arranged thus:—the first four in a line curved inwards towards the costa, the first and third spots sloped inwards, the second and fourth run parallel to hind margin; the fifth and sixth placed nearer the base and slightly sloping towards anal angle. Hind-marginal border of double row of small dark curved lines inwardly and outwardly edged with whitish-grey, especially towards anal angle. *Hind-wing*: dark spot below costa near base, larger spot on costa near apex; dark spot in cell, a line closing cell; post-discal row of 6 spots, the first four in line curving downwards and inwards, the fifth and sixth placed well out at anal angle. Well-marked hind-marginal border consisting of continuous series of dark lines succeeded outwardly by a line of internervular spots whitish-edged; an anteciliary dark line. Cilia of both wings fuscous. Fore-wings pointed as in *L. matanga*.

Exp. al. ♂, 26 mm.

Type ♂. Matang Road, Kuching, Sarawak, 17. vii. 11. (British Museum).

Six other examples have been taken in the vicinity of Kuching, including Dr. Chapman's co-type of *matanga*, which I have deposited in the British Museum.

L. matanga, Chpmn., has also been taken in this locality as well as on Mt. Matang.

326. *Nacaduba lugine*, H. H. Druce. (Plate X, fig. 12).

The only known female, which was described in my recent paper and figured in this paper, is now deposited in the British Museum for safe preservation and to facilitate studies necessitating the examination of types.*

* For these reasons other types of Bornean Lycaenidae have been presented now by the Sarawak Museum to the National collection at South Kensington. They include the following: *Allotinus strigatus*, Moulton, ♂ and ♀, *A. borneensis*, Moulton, ♂ and ♀, *Logania drucei*, Moulton, ♂ and ♀, *Lycaenopsis lingga*, Moulton, ♀, *L. nigerimus*, Moulton, ♂, *L. moultoni*, Chpmn., ♂ and ♀, *L. matanga*,

339. *Lampides kondulana*, Feld.

This species was recorded from Borneo with some doubt, after examining a single worn male in the Sarawak Museum. I have since seen another male from the Indian Museum which bears the label "Borneo—W. Davison."

390. *Arhopala meander*, Boisd.

Mr. Druce kindly points out a mistake I made in including New Zealand in the geographical distribution of this species. It should have been New Ireland. No *Arhopalas* occur in New Zealand.

461. *Pratapa calculus*, H. H. Druce.

This species is very near the Indian species, *Camena carmentalis*, de Nicéville, but may be separated from that species at once on comparing the anal markings on the underside of the hind-wing. In *calculus* the orange-yellow covers the anal angle, while in *carmentalis* it is restricted to a narrow edging round the two black spots at the anal angle. The difference appears constant and the merging of the two species does not therefore seem necessary.

THAMALA, Moore.

It would appear that there is considerable confusion between the two species comprising this genus (*T. marciانا*, Hew., and *T. miniata*, Moore). De Nicéville suggested that the two species were really one; however, on examining the types, it appears that there are two quite distinct species, although neither of them can stand as described by their original authors. Hewitson described a male and female belonging to two different species as *marciانا*. I propose to retain his name for the female only. Later

Chpmn., ♂, *L. chelaka*, Moulton, ♂, *L. boulti*, Chpmn., ♂ and ♀, *L. sonchus*, Druce, ♀, *Nacaduba lugine*, Druce, ♀, *N. angusta*, Druce, ♀, *Lampides vyneri*, Moulton, ♂, *L. virgulatus*, Druce, ♀, *Poritia pasira*, Moulton, ♂ and ♀, *P. philura*, Druce, ♀, *Arhopala incerta*, Moulton, ♂, *A. sarawaca*, Moulton, ♂ and ♀, *A. tembaga*, Moulton, ♂ and ♀, *A. shelfordi*, Moulton, ♀, *A. rajah*, Moulton, ♂, *Tajuria sunia*, Moulton, ♀, *Chliaria balua*, Moulton, ♂, *Charana splendida*, Moulton, ♂, *Horaga albistigmata*, Moulton, ♂, and *Deudorix strephanus*, Druce, ♀.

Moore described two males (like Hewitson's type male) as *male and female miniata*. These two I propose to regard as the male types of *miniata* and to refer Hewitson's male *marciana* to them. Eight years later Moore described a female *miniata* which should be referred in all probability to *marciana*, as it appears from the figure to differ only from the female of that species in having a greater development of fulvous in the discal region of the fore-wing upper-side. The actual specimen is in the Indian Museum and for the moment not available for comparison.

We have thus *marciana* known from females only, and *miniata* only from males. In the British Museum collection, however, there are five females quite different from Hewitson's *marciana*, which I refer to *miniata* without any hesitation. Swinhoe in his *Lepidoptera Indica* figures one of them, although in his references he accepts Moore's female as the type female of the species, which, as mentioned above, probably should be referred to Hewitson's *marciana*.

Mr. Druce has shown me lately two fine males from South Borneo—very different to the *miniata* males—which agree exactly on the underside markings with the *marciana* females, and I have no doubt that these are really the hitherto unknown males of Hewitson's species. The following descriptions, illustrated by Mr. Knight's figures, I hope will help towards a better understanding of the two species. The synonymy necessitated is rather complicated, but I trust the references given under the two names, and my note on the bibliography,* will make it clear.

* BIBLIOGRAPHICAL NOTE ON THAMALA.

- HEWITSON (1863-8?) describes and figures a male and female as *Myrina marciana*; these are now regarded as male *miniata* and female *marciana*. The actual female labelled "Sarawak" is now in the British Museum, and is regarded as the female type of *marciana*; the male is not to be found.
- MOORE (1878) describes two males as male and female *Thamala miniata*, without any reference to Hewitson's *marciana*. These two specimens are now in the British Museum, and that labelled "male" is taken as the actual male type of *miniata*.
- MOORE (1886) describes and figures a female (without reference to his previous female type) as *miniata* female. This is now regarded as a female variety of *marciana*. The actual specimen is in the Indian Museum.
- BUTLER (1877), in his list of the butterflies of Malacca, mentions a male from Malacca, and gives, as reference, Hewitson's description and figure of the female. There is only one example in the British Museum from Malacca and that is a female, so

480. *Thamala marciana*, Hew. (Plate X, figs. 1-3).

Myrina marciana, Hewitson, Ill. Diurn. Lep., p. 34, n. 22, pl. xii, figs. 12, 13, ♀, nec pl. xvi, fig. 44, ♂ (1863). Type specimen in British Museum.

Myrina marciana, Butler, Trans. Linn. Soc. Lond., Zool., i, p. 549, No. 4 (1877).

Myrina marciana, Distant, Rhop. Malay., p. 282, Tab. xxiii, fig. 15, ♀ (1885).

Thamala miniata, Moore, Journ. Linn. Soc., xxi, p. 42, pl. iv, fig. 1, ♀ (1886). Type specimen in Indian Museum.

Thamala miniata, de Nicéville, Butterflies of India, fig. 213, ♀, nec 212, ♂ (1895). Same specimen described by Moore, now in Indian Museum.

The male is now described for the first time.

♂. Plate X, fig. 1.

Upperside. Fore-wing: deep scarlet, apical half, costal and inner margins narrowly, hind margin broadly, dark fuscous. Median nervure joining apical region fuscous, 1st median nervule also marked with fuscous. Hind-wing: dark fuscous, except for scarlet patch below outer portion of costa, extending down across outer part of cell and nearly to apex, and bluish-white area extending from end of 3rd median nervule across anal region to inner margin. Dark fuscous anteciliary line, spot at base of tails and on anal lobe.

Underside. Fulvous ochreous. Sub-hind-marginal line in fore-wing barely noticeable. Hind-wing: broad white

presumably Butler's statement as to sex must be regarded as a misprint, though it should be noted that the specimen in the British Museum bears a manuscript label "*Myrina marciana*, Hewitson, ♂."

DISTANT (1883) refers to the Malaccan specimen mentioned by Butler and figures it as a female, without, however, commenting on Butler's mistake.

DE NICÉVILLE (1895) suggests *marciana* and *miniata* will prove the same species. He figures a pair as *miniata*, the female of which is probably the *marciana* var. figured by Moore and now in the Indian Museum; the male is typical *miniata*.

DOHERTY (1895), quoted by de Nicéville, regards the two species as one, "knowing them both in life."

SWINHOE (1911) figures a pair of true *miniata* from Tenasserim.

bar from inner margin to base of lobe inwardly and outwardly edged with narrow black line; the continuation of this bar can be traced to the 3rd median nervule. Anal region white with deep black spots on lobe and between 1st and 2nd median nervule, and greyish spot between these two dark spots at base of tail; thin black line between 2nd and 3rd median nervule, black anteciliary line from anal angle to end of radial nervure. Cilia white to this point; above it and in fore-wing dark fuscous.

Exp. al. ♂, 31 mm.

Described from two males from Tameang Lajang, South-West Borneo (Semper coll. 1907) in Mr. Druce's collection.

♀. Plate X, fig. 2.

Upperside. *Fore-wing*: dark fuscous, with orange fulvous spots half encircling a dark sub-discal portion which borders the median nervure extending across the 1st and 2nd median nervules to the 3rd median nervule. *Hind-wing*: upper half dark fuscous, lower half whitish-blue. This latter portion extends unevenly from end of sub-costal nervure across to inner margin. Cilia whitish in lower half of hind-wing, dark fuscous in upper half and in fore-wing. The orange fulvous marking in the fore-wing is variable in intensity.

Underside. As in male.

Distribution. Sarawak (Hewitson's type, much damaged), Singapore, Salanga Isle and Malacca (British Museum).

Thamala marciana, Hew., var. (Plate X, fig. 3).

A single female from Sumatra in the British Museum differs from typical female just described in the whitish-blue colouring at the anal angle being much reduced, not extending above the 3rd median nervule. Underside markings, however, are the same.

480a. *Thamala miniata*, Moore. (Plate X, figs. 4-7).

Myrina marciana, Hewitson, Ill. Diurn. Lep., p. 34, n. 22, pl. xvi, fig. 44, ♂ (1863) (*nec* pl. xii, figs. 12, 13 ♀).

Thamala miniata, Moore, Proc. Zool. Soc. Lond., p. 834, pl. lii, fig. 6 ♂ (1878).

Thamala miniata, de Nicéville, Butterfl. Ind., vol. iii, p. 388, pl. xxviii, fig. 212, ♂ (*nec* fig. 213, ♀) (1890).

Thamala miniata, Swinh., Lep. Ind., p. 198, pl. 740, figs. 4 ♂, 4a ♀, 4b ♂, 4c ♀ (1911).

♂. *Upperside*. *Fore-wing*: scarlet, broadly bordered with fuscous-brown along costa, hind margin and across apex of fore-wing. The median nervure, outer portions particularly of the median nervules, sub-median nervure and base of wing fuscous, but in varying intensity, thus in one example the end of cell is so marked and continued broadly below to 1st median nervule, the hind-marginal border also broadens at anal angle; in another example this band is narrower and of uniform width and other examples show intermediate stages. *Hind-wing*: scarlet, inner marginal border and anteciliary line dark fuscous. In two specimens fuscous spots are present at the base of the two tails.

Underside. Dull brown ochreous to orange ochreous. Sub-marginal line well pronounced in some, hardly noticeable in others. A small transverse whitish bar on inner margin above anal lobe edged above and below with thin fuscous line. Small fuscous markings relieved with a few light scales at base of tails in some specimens, but hardly visible in most. Tail brown ochreous, white-tipped.

♀. *Upperside*. *Fore-wing*: fulvous, with dark fuscous markings as in male, except that the hind-marginal border widens across anal angle, narrowly along inner margin to join basal region of fuscous; this last extends narrowly (broadly in some examples) along and below median nervure to base of 3rd median nervule. Cilia fulvous. *Hind-wing*: costal region fulvous, succeeded in the lower half (in lower three-quarters in some specimens) by fuscous, anal region relieved with grey. The hind-wings are extremely variable; thus the anal grey colouring is practically absent in one specimen, in another extending nearly to end of 1st median nervule. Underside as in male.

Distribution. Tenasserim, Burma, Sumatra (B.M.), Borneo (coll. Druce), Tenasserim (coll. Joicey).

T. miniata, Moore, var.

♂. Thin anteciliary white line at base of tails on upperside of hind-wing. On underside pre-anal bar slightly more pronounced; a dark spot on lobe and another between 1st and 2nd median nervules as in *marciana*. Whitish markings between these two spots, though not above them as in *marciana*. Markings and coloration otherwise agree with *miniata*.

A single example from Hewitson collection in B.M. labelled "Singapore."

The following table shows at a glance the differences by which the two species may be distinguished in each sex.

BOTH SEXES.

I. Tails on underside brown-ochreous, white-tipped, and region on underside of hind-wing showing little if any white and black marking. . . . *T. miniata*.

I¹. Tails on underside white. Anal region on underside of hind-wing well marked with white and black . . . *T. marciana*.

♂.

II. No bluish-white on upperside of hind-wing or heavy fuscous hind-margined border *T. miniata*.

II¹. Anal portion of upperside of hind-wing well marked with bluish-white with heavy fuscous border from base to hind-margin, narrowing to apex *T. marciana*.

♀.

III. Cilia of fore- and hind-wing fulvous brown. Costal region of hind-wing upperside fulvous. *T. miniata*.

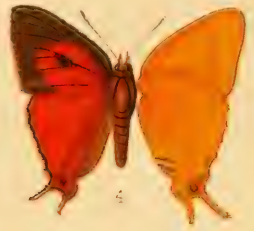
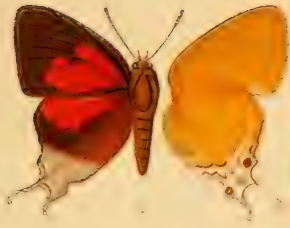
III¹. Cilia of fore-wing fuscous and lower half of hind-wing whitish. Costal region of hind-wing dark fuscous, never fulvous *T. marciana*.

492. *Purlisa gigantea*, Dist.

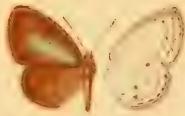
There is a male of this rare species in the Adams collection, now in the British Museum, bearing the

EXPLANATION OF PLATE X.

- FIG. 1. *Thamala marciana*, Hew. New ♂ described from Borneo (Druce coll.).
2. *Thamala marciana*, Hew. ♀, as described and figured by Hewitson.
3. *Thamala marciana*, Hew., var. ♀ variety from Sumatra.
4. *Thamala miniata*, Moore. Typical (?) ♂.
5. *Thamala miniata*, Moore. Another form of ♂.
6. *Thamala miniata*, Moore. Typical (?) ♀.
7. *Thamala miniata*, Moore. Another form of ♀.
8. *Lycaenopsis moultoni*, Chapman. ♂.
9. *Lycaenopsis moultoni*, Chapman. ♀.
10. *Lycaenopsis chelaka*, Moulton. ♂ (Type).
11. *Lycaenopsis matanga*, Chapman. ♂.
12. *Nacaduba lugine*, Druce. ♀ (Type).



3



3



label "Borneo, ex coll. Van der Poll." The only other known male has been described from the Sarawak Museum collection.

494. *Mantoides licinius*, H. H. Druce.

It has been suggested that this species might prove to be the same as *Mantoides nisibis*, described by de Nicéville from two females, one captured in Sumatra and the other in the Malay Peninsula. Through the courtesy of the authorities of the Indian Museum, I have been allowed to examine one of these females, and find that it is quite distinct from Mr. Druce's species. The principal difference which at once distinguishes *nisibis* from *licinius* is the position of the last black bar nearest the inner margin of the pre-anal line on the underside of the hind-wing; in *licinius* this is quite separate and placed outwardly considerably nearer the anal angle; in *nisibis* it is joined to and in the same straight line as the rest of the pre-anal line.

M. licinius, of which both sexes are known, is only recorded from Borneo; while *M. nisibis* is only known from the two females mentioned above, the one from Sumatra and the other from the Malay Peninsula.

538a. *Rapala albapex*, de Nicév.

Rapala albapex, de Nicéville, Journ. Asiat. Soc. Beng., vol. lxxvi, pt. 2, No. 3, p. 560, pl. iii, fig. 23, ♂ (1897).

Borneo, Labuan (coll. Druce), Sandakan (coll. Skertchly).

Apparently confined to Borneo. Allied to *R. domitia*, Hew. Left out of my original list by mistake.

EXPLANATION OF PLATE X.

[See *Explanation facing the PLATE.*]

IX. *Synoptic Table of the British Species of Aleuonota, Thoms., Atheta, Thoms., and Sipalia, Rey.* By MALCOLM CAMERON, M.B., R.N., F.E.S.

[Read December 4th, 1912.]

INTRODUCTORY REMARKS.

THERE not being in existence any table dealing with the British species of these three genera, it is hoped that the one now presented may prove useful to students of these somewhat difficult groups, but, as many of the specific characters are comparative, it is essential to have access to a certain amount of authentic material. I have endeavoured, however, to give absolute characteristics wherever possible. The two primary sections of the table are the old divisions based on a pointed or parallel-sided abdomen, and at the outset it must be confessed that it is not entirely satisfactory. Most of the species in the subgenera *Hydrosmeeta*, *Aleuonota*, *Bessobia* and *Microdota* have the abdomen very distinctly parallel-sided, whilst in *Datomicra*, *Chaetida* and *Coprothassa*, on the other hand, it is distinctly pointed; there remain, however, a number of forms with the abdomen more or less variable in shape, probably depending on the mode of death or method of mounting; yet, with experience, it is not as a rule difficult to refer any particular species to its correct division, and, without such division, it would considerably increase the difficulties in drawing up a table.

In the examination of the species I have restricted myself to the use of a 1-inch objective and a 20-diameter platyscopic lens. In examining for the presence of a metallic reflex a lens and daylight are necessary; with artificial light this character cannot be determined. I use the term "greasy lustre" for surfaces which are neither highly polished as in *A. coriaria*, nor yet quite dull as in *A. aequata*; it is the equivalent of the "fett-glanz" of German authors, and is well seen, for example, in the common *A. amacula*, Steph. (*sericea*, Rey.). In examining the joints of the antennae it is important to view them at right-angles to the lens, as when seen on a slope a false

impression of lengthening or shortening may be given. It may be noted, too, that a free use of gum in fixing the antennae to a card may, by clotting the fine hairs at the distal end of a joint, give a square appearance to one really transverse.

The phrases "elytra sinuated" or "not sinuated" refer to the presence or absence of an emargination of the posterior margin of the elytron just internal to the postero-external angle.

"Shagreening" and "puncturation."—These terms are somewhat loosely used by authors. By the former I understand a more or less fine wrinkling, the wrinkles by joining together forming a distinct pattern easily visible under a 1-inch objective. In the majority of species it is accompanied by puncturation, by which I mean small depressions in the surface usually bearing a hair and forming a simple puncturation, or, if the margin of the puncture is raised above the general surface, a rough puncturation. Examples of shagreening without puncturation are to be seen on the head and thorax of *A. angustula*, *aequata*, *puberula*, *atomaria*, and *perexigua*. Examples of rough puncturation are found on the head and thorax of *A. corvina*, *subtilis*, *mortuorum* (*atricolor*), etc.

The nomenclature is that of the last European Catalogue of Heyden, Reitter and Weise, 1906, which is based on the law of priority; no good purpose can be served and only confusion result in having well-known Continental forms figuring under names applied to them by British authors subsequent to the original descriptions. As, however, some of the names are so familiar, they are inserted in brackets.

In conclusion I must acknowledge my indebtedness for the loan of specimens to Dr. Sharp, Dr. Joy and Mr. J. H. Keys; to the latter also my best thanks are due for valuable criticisms and suggestions.

- | | |
|---|-----|
| 1. Abdomen more or less pointed at apex | 2. |
| — Abdomen more or less parallel-sided | 36. |
| 2. 2nd joint of antennae distinctly shorter than the 3rd. | 3. |
| — 2nd joint of antennae not shorter than the 3rd | 8. |
| 3. 4th joint of antennae transverse | 4. |
| — 4th joint of antennae longer than broad | 5. |
| 4. Sides of thorax with strong setae, middle and posterior tibiae with two strong and long setae. Antennae black, | |

- last joints longer than broad. Elytra shining yellow with triangular black scutellary patch reaching posterior margin, and sides more or less dark, scarcely sinuated. Abdomen strongly pointed, thickly punctured and pubescent to the extremity. ♂, 8th dorsal plate slightly emarginate. ♀, 6th ventral plate emarginate. Length 3-3.5 mm. 134 *longicornis*, Gr.
- Sides of thorax without distinct setae, middle tibiae with a short stout seta, posterior without setae. Antennae pitchy, last joints about as long as broad. Elytra not shining, yellow with dark triangular scutellary patch often reaching posterior margins, strongly sinuated. Abdomen thickly punctured and pubescent to extremity. ♂, ventral plate of 6th segment a little produced and rounded. ♀, ventral plate of 6th segment rather deeply emarginate. Length 3-3.5 mm. 137 *sordida*, Marsh.
5. Last joints of antennae transverse. Elytra scarcely longer than thorax, distinctly sinuated, yellow with large triangular black scutellary patch extending to posterior margins. Sides and postero-external angles dark. Middle and posterior tibiae each with distinct seta. ♂, ventral plate of 6th abdominal segment rounded and produced, in ♀ broadly emarginate. Length 3 mm. 136 *melanaria*, Mann.
- Last joints of antennae about as long as broad 6.
6. Elytra distinctly sinuated, reddish brown, scarcely longer than the thorax, the latter with lateral setae. Apex of abdomen reddish yellow, tibiae without distinct setae. ♂, 6th ventral segment broadly rounded and produced. Facies of *sordida*, a brightly coloured species. Length 3 mm. 135 *consanguinea*, Epp.
- Elytra feebly sinuated, distinctly longer than thorax 7.
7. Elytra yellow, broader than long, about $\frac{1}{4}$ as long again as the thorax, the latter with rather short setae at sides, middle tibiae with short indistinct seta at middle. Abdomen slightly narrowed, facies of *castanoptera*, Mann., but antennae entirely dark, last joint much shorter and posterior tibiae without distinct setae, average size smaller and abdomen more thickly punctured. ♂, 6th ventral segment narrowed and produced. Length 3-3.5 mm. 118 *intermedia*, Thoms.
- Elytra brownish yellow, longer than broad, fully half as long again as thorax, the sides of latter with long setae, and roughly punctured. Middle tibiae with rather long

- seta in middle, posterior with two fine but distinct setae one below the knee and one at middle. Antennae with first three joints yellow. Abdomen only slightly narrowed towards apex. ♂, 8th dorsal segment narrowed—slightly rounded. 6th ventral segment slightly produced. Length 3-3.5 mm. . . . 120 *marcida*, Er.
8. 2nd and 3rd joints of antennae of about equal length . . . 9.
- 3rd joint of antennae distinctly shorter than 2nd . . . 29.
9. Abdomen thickly punctured and pubescent to apex, as in *Oxyptoda* 10.
- Abdomen much less thickly punctured and pubescent at apex 13.
10. Antennae lighter at base. Elytra distinctly sinuated . . . 11.
- Antennae entirely dark. Elytra less strongly sinuated . . . 12.
11. 4th joint of antennae longer than broad, 8 to 10 as long as broad. Colour often entirely pitchy brown. Facies of an *Oxyptoda* and very similarly punctured and pubescent but readily distinguished by having two pretty distinct setae on intermediate tibiae. Length 2-2.3 mm.
- 138 *pygmaea*, Gr.
- 4th joint of antennae as long as broad, 8 to 10 distinctly transverse. Facies of *fungi*, Gr., black or brownish black. Abdomen much more thickly punctured and pubescent than in *fungi*, but considerably less pubescent at apex than *pygmaea*. Length 2-2.3 mm. . 141 *parens*, Rey.
12. Species smaller 1.6-2 mm. Last joints of antennae transverse.
- Thorax longitudinally impressed before scutellum.
- 140 *parva*, Sahlb. (*pilosiventris*, Thoms.).
- Thorax without impression . . . v. *muscorum*, Bris.
- Species larger 2-2.5 mm. Last joints of antennae as broad as long 139 *aterrima*, Gr.
13. 4th joint of antennae longer than broad 14.
- 4th joint of antennae about as long as broad or transverse . . . 20.
14. Antennae more or less dark, sometimes obscurely lighter at base 15.
- Antennae reddish testaceous with yellow base. ♂, 6th ventral segment rounded and produced. Length 2.3-2.6 mm. 143 *fungi*, Gr.
15. Facies of *fungi*, sides of thorax with feeble setae, middle tibiae with very feeble and obscure seta 16.
- Sides of thorax with distinct and strong setae, middle tibiae with strong setae (except in *cadaverina*) 17.
16. Thorax less transverse, not more than half as broad again

- as long, less shining, pubescence and punctuation closer.
Elytra as broad or almost as broad as thorax at its
greatest width. Length 2.5 mm. v. *orbata*, Er.
- Thorax more transverse, more than half as broad again
as long, more shining, with pubescence and punctuation
more sparing. Elytra distinctly narrower than thorax
at its greatest width. Length 2.3–3 mm. 144 *clientula*, Er.*
17. Species entirely shining black 18.
— Species with the elytra yellowish or brownish yellow, head
and thorax with metallic reflex 19.
18. Size larger, last joints of antennae about as long as
broad, setae on middle and posterior tibiae very feeble.
♂, 8th dorsal plate feebly emarginate posteriorly, 6th
ventral plate narrowed and slightly produced. Length
2.5–2.8 mm. 115 *cadaverina*, Bris.
— Size smaller, last joints of antennae longer than broad,
two well-marked setae on middle and posterior tibiae.
♂, 6th ventral plate slightly produced. Length 2 mm.
124 *macrocera*, Thoms.
19. Punctuation coarser, elytra darker, fore parts less bronzed,
abdomen not strongly pointed. ♂, 8th dorsal plate
posteriorly slightly emarginate. Length 2.3–2.8 mm.
117 *picipennis*, Mann.
— Punctuation finer, elytra brighter, fore parts more
bronzed, abdomen distinctly pointed. ♂, 8th dorsal
plate posteriorly feebly emarginate. Length 2.5 mm.
119 *cinnamoptera*, Thoms.
20. Fourth joint of antennae transverse. Species shining
black; thorax and elytra thickly and finely punctured,
the former without lateral setae, the latter strongly
sinuated. Penultimate joints of antennae strongly
transverse. Abdomen pretty strongly pointed. Middle
and posterior tibiae without setae. Length 2 mm.
133 *paradoxa*, Rey.
— Fourth joint of antennae as long as broad 21.
21. Species with metallic reflex on fore parts, sides of thorax,
middle and posterior tibiae with strong setae 22.
— Species without metallic reflex 23.

* *A. montivagans*, Woll. I have examined the type in the British Museum and can see no specific differences from *clientula*, a widely distributed and variable insect.

A. sharpi, Rye. This insect is probably identical with *A. clientula*, but, as the type is not accessible, it is not possible to be certain.

22. Elytra brown or brownish black with more or less bronze reflex. Legs pitchy yellow, femora dark. Thorax broader. ♂, 8th dorsal plate slightly emarginate posteriorly, the emargination bounded on each side by a small tooth. Length 2·3–3 mm. . . 116 *atramentaria*, Gyll.
- Elytra yellowish, legs yellow. Thorax narrower. ♂, 8th dorsal plate with four teeth at hinder margin, the outermost larger and only separated from the inner by a small notch, a broad shallow emargination separates the inner teeth from one another. Length 2–2·5 mm.
121 *laevana*, Rey.
23. Posterior tibiae without distinct setae, middle tibiae with at most one short seta. Lateral setae of thorax feeble . . . 24.
- Middle and posterior tibiae each with two long setae. Lateral setae of thorax strong 27.
24. Elytra yellowish, often darker about scutellum and the postero-external angles 25.
- Elytra uniform black or brownish black 26.
25. Antennae with base at least distinctly yellow, the 5th and 6th joints a little longer than broad. Thorax brownish, paler at the sides. ♂, 8th dorsal plate with four equidistant teeth at posterior margin, the outer ones longer than the inner. Length 2·3–2·9 mm. . . 146 *laticollis*, Steph.
- Antennae at most pitchy at the base, the 5th and 6th joints about as long as broad. Thorax not lighter at the sides. ♂, 8th dorsal plate slightly emarginate posteriorly, 6th ventral plate produced and rounded. ♀, 6th ventral plate slightly emarginate posteriorly. Length 2–2·9 mm. 145 *fuscipes*, Heer.
26. Size larger, antennae dark, at most pitchy at base, head small. Middle tibiae with distinct short stout seta. Facies of *fungi*. ♂, 6th ventral plate a little produced. ♀, broadly emarginate. Length 2·5–2·8 mm.
147 *subsiniuata*, Er.
- Size smaller, antennae distinctly light at base, head large. Middle tibiae without distinct seta. Facies of *fungi*. ♂, 8th dorsal plate truncate, 6th ventral plate rounded and slightly produced. Length 1·8–2 mm. . . 142 *orphana*, Er.
27. Last joints of antennae distinctly transverse. ♂, 6th ventral plate rounded posteriorly. ♀, emarginate. Length 2 mm. 122 *setigera*, Shp.
- Last joints of antennae not or but slightly transverse . . . 28.
28. Elytra scarcely sinuated, size smaller. ♂, 8th dorsal plate rounded posteriorly, 6th ventral plate rounded.

- ♀, 6th ventral plate emarginate posteriorly. Length 1.5-1.8 mm. 125 *parvula*, Mann. (*cauta*, Er.).
- Elytra distinctly sinuated, size larger. ♂, 8th dorsal plate produced and truncate in middle, on either side and separated from the produced central portion by a distinct space is a rather long slightly incurved spine. ♀, 8th dorsal plate broadly and feebly emarginate with a small tooth on either side, 6th ventral plate emarginate posteriorly in middle. Length 2-2.7 mm.
123 *nigripes*, Thoms. (*villosula*, Kr.).
29. Fourth joint of antennae as broad as long, last joints more or less transverse 30.
- Fourth joint of antennae transverse or longer than broad 34.
30. Head, thorax and elytra very shining, finely and asperately punctured, elytra with disc reddish yellow and circumference more or less pitchy. Legs yellow, femora dark. Length 1.8 mm. 85 *nitens*, Fuss.
- Species not very shining, at most with a greasy lustre, elytra uniform black or brown. Small obscure species 31.
31. Thorax very transverse, double as broad as long, without trace of lateral setae, fore parts dull, thickly deeply and roughly punctured. Last joints of antennae strongly transverse. ♂, 8th dorsal plate truncate, 6th ventral plate rounded and produced. ♀, 8th dorsal and 6th ventral plates slightly emarginate posteriorly. Length 1.3 mm. 126 *cribrata*, Kr.
- Thorax only moderately transverse, not twice as broad as long, with distinct but feeble lateral setae; last joints of antennae moderately transverse 32.
32. Head and thorax with greasy lustre, finely closely, but not roughly punctured. ♂, 8th dorsal plate at posterior margin with four small equidistant teeth. Length 1.5-2 mm. 132 *zosteræ*, Thoms. (*nigra*, Kr.).
- Head and thorax finely closely and roughly punctured 33.
33. Antennae lighter at base. Elytra brownish, legs testaceous. ♂, 8th dorsal plate with four small teeth at posterior margin. Length 1.5 mm 129 *celata*, Er.
- Antennae entirely dark. Elytra darker, legs with femora pitchy. ♂, 8th dorsal plate with four obscure teeth. Length 1.5 mm. 130 *arenicola*, Th. (*germana*, Shp.).
34. Fourth joint of antennae longer than broad, 7th to 10th longer than broad, 11th more than twice as long as 10th. Facies of *zosteræ*. ♂, 8th dorsal plate with four small teeth on posterior margin. Length 2 mm. 131 *hodierna*, Shp.

- Fourth joint of antennae transverse. Small, dull, obscure species with foreparts thickly, finely, and roughly punctured. Elytra not sinuated. Length 1·2–1·5 mm. 35.
- 35. Eleventh joint of antennae oblong, longer than the two preceding together, puncturation less strong and close, thorax more transverse, elytra not much longer than the thorax. Length 1·2–1·3 mm. . . . 128 *sordidula*, Er.
- Eleventh joint of antennae pointed, not longer than the two preceding together, puncturation stronger and closer, thorax less transverse, elytra evidently longer than the thorax. ♂, 8th dorsal plate with four indistinct teeth at posterior margin. Length 1·3 mm. 127 *canescens*, Shp.
- 36. Sides of head behind eyes diverging uniformly backwards to posterior angles. Head triangular, broadest at the posterior angles 37.
- Sides of head behind eyes not divergent, either uniformly rounded or temples more or less prominent 40.
- 37. Head not impressed in ♂ 38.
- Head impressed in ♂ 39.
- 38. 8th dorsal plate of abdomen with distinct triangular notch posteriorly in both sexes; abdomen less densely punctured. Length 1·8–2 mm. 148 *analisis*, Gr.
- 8th dorsal plate of abdomen without emargination; abdomen more densely punctured. Length 1·7–2 mm. 149 *decipiens*, Shp.
- 39. ♂, 8th dorsal plate of abdomen with distinct triangular emargination posteriorly, 6th ventral plate produced and rounded at apex. ♀, 8th dorsal plate distinctly emarginate. Length 1·7–2 mm. . . . 151 *cavifrons*, Shp.*
- ♂, 8th dorsal plate of abdomen with a deep notch posteriorly, commencing on either side near the lateral margins of the plate, its sides almost parallel and its summit gradually rounded. 6th ventral plate produced and rounded at apex. ♀, 8th dorsal plate not or very slightly emarginate. Length 2–2·3 mm. . . . 150 *soror*, Kr.
- 40. Puncturation of abdomen very coarse and close, species dull and somewhat depressed. Base of antennae reddish yellow, penultimate joints distinctly transverse. 41.
- Abdomen with normal puncturation 42.

* I have examined *A. simillima*, Shp., but am unable to see any specific distinction from this species.

41. Larger. Temples bordered. Elytra about half as long again as thorax. ♂, 8th dorsal segment in front studded with large granules, behind quite smooth with usually a distinct notch in middle of posterior margin. ♀, 8th dorsal segment in front studded with finer granules, the posterior margin not notched. Length 2·5–3 mm.
49 *incana*, Er.
- Smaller. Temples not bordered. Elytra scarcely longer than the thorax. ♂, 7th and 8th dorsal plates studded with granules, posterior margin of the 8th plate with four blunt teeth. Length 2–2·5 mm. . . . 48 *nigella*, Er.
42. 4th joint of antennae distinctly transverse, last joints transverse sometimes very strongly 43.
- 4th joint of antennae about as broad as long or longer than broad 72.
43. Species in great part testaceous or reddish testaceous 44.
- Species black or pitchy brown, elytra in some more or less testaceous 55.
44. Small species; length 1·2–1·5 mm. 45.
- Larger species; length 2·5–3 mm. 50.
45. Species testaceous 46.
- Species varying from reddish testaceous to reddish brown. (*A. exilis* often very dark) 47.
46. Elytra more or less infusate at postero-external angles, much longer than the thorax. Eyes moderate, rather prominent. Abdomen infusate before apex. Length 1·3 mm. 73 *palleola*, Er.
- Uniformly pale testaceous, elytra not longer than the thorax. Eyes very small, not prominent. Length 1·2–1·4 mm. 155 *indocilis*, Heer. (*pallens*, Redt.).
47. Head small, narrow, quadrate, much narrower than the thorax, black or dark brown. Thorax distinctly transverse, sometimes more or less reddish testaceous. Head, thorax and elytra finely shagreened, impunctate with greasy lustre, the elytra much longer than the thorax. Antennae with base yellow, infusate towards apex, 3rd joint much shorter than 2nd, the last joints about four times as broad as long. Length 1·3–1·5 mm.
74 *clavigera*, Scrib.
- Head large, orbicular, nearly as broad as thorax 48.
48. Elytra shorter than the thorax, finely punctured. Head and thorax very finely and sparingly punctured. ♂, 6th ventral abdominal plate produced and truncate. Length 1·3–1·5 mm. 157 *caesula*, Er.

- Elytra not shorter than thorax 49.
- 49. Eyes small, not prominent, thorax about $\frac{1}{3}$ broader than long. Abdomen in front finely and rather closely punctured and pubescent. Length 1.5–1.75 mm. 154 *exilis*, Er.
- Eyes moderate rather prominent, thorax about half again broader than long. Abdomen in front finely and sparingly punctured and pubescent. ♂, Head with small depression on vertex, 6th ventral plate of abdomen narrowed and produced. Length 1.5 mm.
153 *validiuscula*, Kr.
- 50. 3rd joint of antennae distinctly shorter than 2nd, thorax almost quadrate; last joints of antennae strongly transverse 51.
- 3rd joint of antennae as long as or scarcely shorter than 2nd, thorax distinctly transverse 53.
- 51. Thorax and elytra finely shagreened, not very shining, finely but distinctly punctured 52.
- Thorax and elytra very shining without visible puncturation. ♂, 8th dorsal plate of abdomen without tubercles. Length 2.5 mm. 4 *gracilentia*, Er. (*splendens*, Kr.).
- 52. Head strongly but not closely punctured. 11th joint of antennae as long as the two preceding together. ♂, 8th dorsal plate without tubercles. Length 3.3 mm.
1 *atricapilla*, Rey. (*elegantula*, Bris.).
- Head obsoletely punctured. 11th joint of antennae not as long as the two preceding together. ♂, 8th dorsal plate without tubercles. Length 2.7–3 mm.
2 *aurantiaca*, Fvl. (*rufolestacea*, Shp., Fowler *nec* Kr.).
- 53. Elytra thickly and roughly punctured. ♂, 8th dorsal plate with four teeth at posterior margin, the outer ones spiniform, the inner ones short and stout. Length 3–3.5 mm. 77 *scapularis*, Sahlb.
- Elytra finely and not thickly punctured 54.
- 54. Thorax twice as broad as long, last joints of antennae about twice as broad as long. ♂, 8th dorsal plate with four teeth at posterior margin of equal length, the inner ones blunt, the outer pointed. Length 2.2–2.8 mm.
79 *subterranea*, Rey.
- Thorax about half as broad again as long, last joints of antennae about three times as broad as long. ♂, 8th dorsal plate produced in middle, externally furnished with a slender obsolete spine, internal to which is an oblique tubercle near posterior margin. Length 2–2.5 mm. 76 *dilaticornis*, Kr.

- tion and the tooth with traces of one or two teeth.
 Length 2·2–2·5 mm. 84 *coriaria*, Kr.
- Head and thorax with greasy lustre only 62.
62. Elytra roughly punctured, strongly sinuated. Abdomen pretty finely and closely punctured and pubescent throughout 78 *clancula*, Er.
- Elytra finely punctured, not sinuated. Abdomen very sparingly and finely punctured and pubescent, especially posteriorly 63.
63. Elytra quite half as long again as thorax, distinctly longer than broad. ♂, 7th dorsal plate with two or three irregular rows of granules, 8th also with granules, the hinder margin furnished on each side with a sharp tooth. Length 2 mm. 58 *inhabilis*, Kr.
- Elytra only about one-third longer than thorax, a little broader than long. ♂, 8th dorsal plate produced in the middle and emarginate, on each side furnished with a spine. Length 1·8–2·3 mm.
 82 *basicornis*, Rey. (*autumnalis*, Shp.).
64. Punctuation of head and thorax not visible, very shining, finely shagreened 65.
- Punctuation visible, shagreened 66.
65. Larger, thorax nearly as broad as elytra, antennae stouter. ♂, 6th ventral plate produced. Length 1·3 mm. 65 *atomaria*, Kr.
- Smaller and more slender, thorax much narrower than elytra. Antennae more slender. ♂, 6th ventral plate produced. Length 1 mm. 64 *perexigua*, Shp.
66. Punctuation of head and thorax fine, not rough, surface with greasy lustre, shagreened 67.
- Punctuation fine but rough. Small obscure species 69.
67. Size smaller. Punctuation of head and thorax very fine sparing. Elytra not sinuated. ♂, 8th dorsal plate broadly emarginate scarcely visibly crenulated. Length 1·5–2 mm. 70 *amicula*, Steph. (*sericea*, Muls.).
- Larger, punctuation of head and thorax fine and close. Length 2–3 mm. 68.
68. Elytra distinctly sinuated, 3rd joint of antennae shorter than the 2nd. ♂, 8th dorsal plate with posterior margin furnished with two stout backwardly directed tubercles on each side of middle line and externally on either side a slender spine curved inwards. Length 2 mm.
 83 *oblita*, Er.
- Elytra scarcely sinuated. 2nd joint of antennae shorter

- than 3rd, facies of *crassicornis*, but 4th joint of antennae more strongly transverse, 5th to 10th much less strongly transverse. ♂, 8th dorsal plate finely crenulate with larger tubercle externally. ♀, 6th ventral plate emarginate. Length 3 mm. 91 *nitidicollis*, Fairm. (*ignobilis*, Shp.).
69. Very small, .7 mm. 68 *inquinula*, Gr.
 — Larger, 1-2 mm. 70.
70. Less robust, narrower and more shining, abdomen at base finely and sparingly punctured. Legs yellow. ♂, head and thorax broadly impressed in middle line throughout 8th dorsal plate truncate, 6th ventral plate rounded and not produced. In size intermediate between *inquinula* and *mortuorum*. Length 1-1.2 mm. . 67 *lipitata*, Bris.
 — More robust, broader, less shining, abdomen at base more coarsely and closely punctured. Legs pitchy . . . 71.
71. Head, thorax and elytra closely and distinctly punctured; species narrower, smaller. ♂, 8th dorsal plate slightly emarginate. 6th ventral plate narrowed but not produced. Length 1.5 mm. 69 *mortuorum*, Th. (*atricolor*, Shp.).
 — Head, thorax and elytra much less closely and distinctly punctured; species broader, larger. Length 2 mm.
 71 *subtilis* Scriba.*
72. 4th joint of antennae about as long as broad † . . . 73.
 — 4th joint of antennae longer than broad 117.
73. 3rd joint of antennae obviously shorter than the 2nd . . . 74.
 — 3rd joint of antennae not or scarcely shorter than the 2nd . . . 86.
74. Species entirely dull, thickly and finely punctured and pubescent all over, much as in *Oxypoda*. Last joints of antennae distinctly transverse. Length 2-2.5 mm.
 12 *pruinosa*, Kr.
 — Species with normal puncturation and pubescence . . . 75.
75. Last joints of antennae distinctly transverse 76.
 — Last joints of antennae about as broad as long or very slightly transverse, entirely testaceous. Narrow fragile species of brownish or dirty testaceous colour. Head subquadrate, thorax about as long as broad. Abdomen very finely and moderately thickly punctured and pubescent. ♂, thorax broadly impressed in the middle line. Length 1.2-1.4 mm. 5 *subtilissima*, Kr.

* I have examined specimens of *indiscreta*, Shp., but am unable to detect any specific differences. M. Fauvel also regards them as identical.

† In ♂ *diversa* the 4th joint appears slightly longer than broad.

- Smaller and more slender, elytra scarcely longer than the thorax, not sinuate, broader than long. (Much like *gemina*, Er., but in this species the antennae and elytra are longer and the latter are sinuated.) ♂, 6th ventral plate narrowed and produced. Length 2 mm.
29 *curtipennis*, Shp.
- 85. Species distinctly and rather roughly punctured. Head large and quadrate. ♂, head and thorax impressed in middle line, 8th dorsal plate truncate, 6th ventral plate produced and narrowed, 3rd joint of antennae triangularly dilated. Length 2 mm. 57 *corvina*, Th.
- Species finely shagreened not punctured on head and thorax, facies of preceding but with broader thorax. ♂, 8th dorsal plate truncate and crenulate, 6th ventral plate rounded and produced. Length 2 mm. 66 *puberula*, Shp.
- 86. Antennae with 2nd and 3rd joints of practically equal length 87.
- Antennae with 2nd joint shorter than 3rd 115.
- 87. Antennae entirely testaceous or but slightly darker near apex 88.
- Antennae not entirely testaceous, at least distinctly darker near apex, or entirely dark, at most obscurely lighter at base 91.
- 88. Thorax not transverse, as long or slightly longer than broad. Colour reddish brown. Elytra shorter than thorax. ♂, elytra each with raised tubercle at base near suture, 7th dorsal plate with a raised line in middle, 8th dorsal plate at posterior margin with two obscure teeth near middle. Length 2.5–3 mm. . . . 156 *circellaris*, Gr.
- Thorax distinctly transverse 89.
- 89. Antennae stout, the last joints twice as broad as long 90.
- Antennae slender, the last joints not twice as broad as long. Elytra yellow with large triangular area at scutellum dark and the postero-external angles largely dark, the dark markings often extending so as only to leave a yellow patch at anterior angles. Sometimes the elytra are almost entirely yellowish red. Sometimes the antennae are dark with lighter base (see 96). ♂, 8th dorsal plate finely crenulate, the outer tooth on each side more distinct. Length 2.3–2.8 mm. 88 *pallidicornis*, Th.*
- 90. Species larger, darker, elytra reddish brown, abdomen

* I have seen a mature specimen with one antenna entirely testaceous and the other dark with light base.

- black. ♂, elytra each with raised line parallel to suture: 7th dorsal plate with two raised lines converging backwards, 6th ventral plate produced. ♀, 6th ventral plate rather deeply emarginate. Length 4-4.7 mm. 51 *hepatica*, Er.
- Species smaller, brighter, elytra reddish, abdomen pitchy. ♂, each elytron with raised line at hinder margin near suture. Length 3.3 mm. 52 *exarata*, Shp.
91. Antennae with lighter base 92.
- Antennae entirely dark, at most obscurely lighter at base 101.
92. Elytra entirely reddish yellow, or yellow with dark markings 93.
- Elytra uniform reddish brown or black 97.
93. Antennae stout, with strongly transverse terminal joints. Head very coarsely and closely punctured, thorax strongly transverse, closely and coarsely punctured. Elytra yellow with postero-external angles dark. Length 2.5 mm. 158 *cribriceps*, Shp.*
- Antennae longer, much less stout, the terminal joints moderately transverse or about as broad as long. Head and thorax finely and moderately closely punctured, the latter not so strongly transverse 94.
94. Species in great part reddish testaceous, broad and rather depressed. Penultimate joints of antennae about as long as broad or very slightly transverse. ♂, 3rd joint of antennae dilated: 7th dorsal plate with a tubercle. 8th dorsal plate with four teeth at posterior margin, the inner closer together and tubercular, the outer curved. Length 3-4.5 mm. 50 *brunnea*, F.
- Species dark, at most with elytra more or less testaceous or reddish 95.
95. Elytra scarcely sinuate, yellowish with distinct triangular black scutellary patch and postero-external angles black. Coloration of *trinolata* but narrower and more parallel, and 3rd joint of antennae not longer than 2nd. ♂, 8th dorsal plate finely crenulate. Length 3 mm. 94 *xanthopus*, Th.
- Elytra distinctly sinuate 96.
96. Size smaller. Last joints of antennae distinctly transverse, elytra either entirely yellow or with large dark triangular scutellary patch and postero-external angles

* This insect is *Coenonica puncticollis*, Kr., found in both the East and West Indies and no doubt imported. See E. M. M., vol. xlix, p. 135, 1913.

dark. Sometimes the dark markings extend so as only to leave a yellow humeral patch. ♂, 8th dorsal plate finely crenulate, the outer tooth on each side more distinct. Length 2·3–2·8 mm. (See also 89.)

88 *pallidicornis*, Th.

- Size larger. Facies of large *castanoptera*, Mann. Elytra reddish yellow. Last joints of antennae as long as broad or feebly transverse. Length 4–4·5 mm. 101 ♀ *valida*, Kr.
97. Thorax scarcely broader than long: elytra sinuate . . . 98.
- Thorax distinctly transverse 100.
98. Head and thorax either shining or with distinct greasy lustre 99.
- Head and thorax completely dull, shagreened, without puncturation. Elytra brown with greasy lustre, a little longer than thorax, very finely punctured. ♂, head and thorax broadly impressed, 6th dorsal plate near hinder margin with a transverse row of two to six granules, 7th with about 8 tubercles in two transverse rows of four, each one behind the other, 8th with four small teeth at posterior margin. 6th ventral plate narrowed and produced. Length 3–3·5 mm. 46 *aequata*, Er.
99. Head and thorax with greasy lustre, shagreened not punctured. Thorax often brown, elytra reddish brown with greasy lustre, very finely punctured. ♂, head and thorax broadly impressed. 7th dorsal plate with about ten large granules, more or less irregularly disposed, 8th with a transverse row of four large granules and the hinder margin with four small teeth. Length 3·3–3·8 mm. 45 *angustula*, Gyll.
- Head and thorax shining, distinctly punctured, elytra reddish brown distinctly and roughly punctured. ♂, head broadly impressed, 6th ventral plate produced. Length 3–3·5 mm. 47 *linearis*, Gr.
100. Elytra strongly sinuate; fore parts shining. ♂, 8th dorsal plate distinctly emarginate behind. Length 2·5–3 mm. 87 *sodalis*, Er.
- Elytra feebly sinuate: fore parts with greasy lustre only. Abdomen not seldom pretty distinctly pointed. ♂, 8th dorsal plate with four teeth at posterior margin, two central broad, blunt and close together, two lateral spiniform. Length 2·2–2·5 mm. 86 *gagatina*, Baudi.
101. Elytra yellow with black markings 102.
- Elytra uniformly brown or black 103.
102. Elytra yellow with distinct black scutellary patch

- extending to posterior margins; postero-external angles black. ♂, 8th dorsal plate crenulate, the outermost crenulation on each side forming a distinct tooth. ♀, 8th dorsal and 6th ventral plates obscurely emarginate. Length 3-3.5 mm. . . . 97 *triangulum*, Kr.
- Elytra yellow with suture and circumference black. Very shining, puncturation very fine and sparing. Legs yellow. Facies of small *longiuscula* Gr. (*vicina*, Steph.). According to Fauvel ♂ with 8th dorsal plate finely crenulate at posterior border, 6th ventral plate narrowed and produced. Length 2-2.3 mm. . . . 62 *subglabra*, Shp.
103. Thorax scarcely transverse 104.
 — Thorax distinctly transverse 105.
104. Femora pitchy; species less shining, puncturation of abdomen much more sparing. ♂, 8th dorsal plate slightly emarginate, 6th ventral plate narrowed and produced. Length 1.8-2.3 mm. . . . 60 *angusticollis*, Th.
 — Femora testaceous; species more shining, puncturation of abdomen much closer. Antennae often obscurely lighter at base. ♂, 8th dorsal plate emarginate, 6th ventral plate produced. Length 2-2.5 mm. 61 *palustris*, Kies.
105. Elytra distinctly longer than broad. 106.
 — Elytra about as long as broad or transverse 107.
106. Larger. Antennae more slender, the penultimate joints less transverse. Thorax scarcely narrowed behind. ♂, Head less strongly impressed, 3rd joint of antennae thickened. 8th dorsal plate with sides and posterior margin raised, the latter broadly and obsoletely emarginate. ♀, 8th dorsal and 6th ventral plates slightly emarginate. Length 3-3.3 mm. . . . 53 *occul'a*, Er.
 — Smaller and narrower. Antennae stouter with penultimate joints more transverse. Thorax distinctly narrowed behind. ♂, head deeply and broadly impressed; other characters as in preceding. Length 2.5-3 mm. 54 *fungivora*, Thoms.
107. Elytra not longer than the thorax: black, rather shining, legs pitchy testaceous. ♂, 6th ventral plate narrowed and produced. ♀, 6th ventral plate emarginate. Length 2.3-2.8 mm. 41 *tibialis*, Heer.
 — Elytra longer than the thorax 108.
108. Small species. Shining black, very finely punctured. Legs usually pitchy. Facies of a large dark *amicula*. ♂, 8th dorsal plate distinctly crenulate at posterior margin. Length 1.5-1.7 mm. 72 *indubia*, Shp.

- Larger species. Length 2·2–3·8 mm. 109.
109. Thorax broader, about $\frac{1}{2}$ as broad again as long. Elytra yellowish brown or dark 110.
- Thorax narrower, about $\frac{1}{3}$ as broad again as long. Elytra dark brown or black sometimes reddish brown in *monticola* 113.
110. Last joint of antennae longer than the two preceding together. Elytra yellowish or reddish brown 111.
- Last joint of antennae not longer than the two preceding together. Elytra brown or black 112.
111. Larger, broader, more shining. Elytra yellowish brown, abdomen sparingly punctured in front. ♂, 8th dorsal plate crenulated posteriorly (about 8 or 10 teeth), the outermost on each side the most distinct. Length 3·5–3·8 mm. 99 *euryptera*, St.
- Smaller, narrower with greasy lustre only. Elytra reddish brown; abdomen rather closely punctured in front. ♂, head and thorax broadly impressed in middle. 8th dorsal plate broadly emarginate and very obscurely crenulate with larger tooth on either side. Length 2·2–2·5 mm. 81 *divisa*, Märk.
112. Larger, less depressed, penultimate joints of antennae less transverse. ♂, penultimate joint of antennae nearly square; 8th dorsal plate crenulated with distinct tooth externally on each side. Length 3·5 mm. 98 *diversa*, Shp.
- Smaller, depressed, penultimate joints of antennae much more transverse. ♂, penultimate joint of antennae distinctly transverse, head and thorax broadly impressed. 8th dorsal plate slightly emarginate. Length 2·2–2·5 mm. 80 *nigricornis*, Th.
113. ♂, without tubercles or raised lines on 8th dorsal plate which is simply emarginate, 6th ventral plate produced. Head and thorax rather broadly impressed. ♀, 8th dorsal plate with triangular notch posteriorly. Length 2·7–3 mm. 59 *picipes*, Th.
- ♂, with tubercles or raised lines on 8th dorsal plate 114.
114. Rather larger, more shining, thorax broader. ♂, head and thorax deeply impressed. 8th dorsal plate deeply and triangularly emarginate posteriorly, towards each side with distinct ridge commencing at the emargination on the posterior margin and curving forwards with concavity inwards. In the space thus enclosed are four shorter ridges, the two inner nearly parallel.

- ♀, 8th dorsal plate slightly emarginate. Length 3-3.5 mm. 56 *monticola*, Th.
- Rather smaller, less shining, thorax narrower. ♂, head and thorax less impressed. 8th dorsal plate broadly triangularly emarginate posteriorly and with a raised ridge on either side. In the space enclosed is a curved transverse row of four tubercles. ♀, 8th dorsal plate slightly emarginate. Length 2.5-3 mm. 55 *excellens*, Kr.
115. Elytra testaceous with darker markings. Antennae dark with base pithy 116.
- Elytra uniformly reddish brown or reddish yellow. Antennae with base lighter, the last joints distinctly transverse, head and thorax rather dull, apex of abdomen reddish. ♂, 8th dorsal plate with posterior margin thickened and feebly crenulate. ♀, 8th dorsal plate broadly emarginate with small tooth on either side, 6th ventral plate emarginate. Length 3-3.5 mm. 93 *pilicornis*, Th.
116. Elytra yellow with distinct black triangular patch at scutellum usually extending to posterior margin, postero-external angles dark. 10th joint of antennae transverse in both sexes. ♂, 8th dorsal plate crenulate posteriorly. Length 2.7-3 mm. 96 *trinotata*, Kr.
- Elytra markings less distinct, the ground-colour dirty yellow, the sutural and angular patches brownish. 10th joint of antennae square in ♂, transverse in ♀. (According to Ganglbauer ♂ with a short longitudinal keel in middle of base of 7th dorsal abdominal segment.)* Length 3 mm. 97 *hybrida*, Shp.
117. 2nd joint of antennae longer than 3rd 118.
- 2nd joint of antennae as long as 3rd or differing but slightly in length 121.
118. Penultimate joints of antennae as long as broad. Abdomen finely but distinctly punctured and pubescent to the apex. Fore parts rather shining, black, elytra brown. ♂, 6th ventral plate narrowed and produced. ♀, 6th ventral plate slightly emarginate. Length 2-2.5 mm. 33 *meridionalis*, Rey. (*littorea*, Shp.).
- Penultimate joints of antennae longer than broad, Length 1.5-2 mm. 119.

* Dr. Sharp tells me that he can see no keel in his specimens, but that the segment in question is retracted.

119. Antennae testaceous, species pitchy 120.
 — Antennae brown, species black, head broader than long. Elytra longer than broad, abdomen closely and finely punctured and pubescent throughout. Length 1·8–2 mm. 7 *longula*, Heer.*
120. Very small fragile species, head square, elytra longer than broad. Abdomen finely and closely punctured and pubescent throughout. Length 1·5 mm.
 6 *delicatula*, Shp.
 — Larger and more robust, head broader than long. Abdomen less finely and closely punctured especially at apex. ♂, antennal joints slightly longer than in ♀. 6th ventral plate much produced but not narrowed. Very like *fragilis* but antennae testaceous and insect more depressed. (See also 133 *fragilis*.) Length 2 mm. 9 *eximia*, Shp.
121. The whole upper surface densely and finely punctured and pubescent as in *Oxyptoda*: black with brown elytra, completely dull. ♂, 6th ventral plate rounded and produced. Length 2·3–2·8 mm. 11 *fallax*, Kr.
 — Species with normal puncturation and pubescence 122.
122. Penultimate joints of antennae longer than broad 123.
 — Penultimate joints of antennae as long as broad or transverse 134.
123. Elytra distinctly sinuate 124.
 — Elytra not or scarcely sinuate 130.
124. Head and thorax with metallic reflex 125.
 — Head and thorax without metallic reflex 127.
125. Elytra distinctly transverse 126.
 — Elytra scarcely transverse, distinctly longer than thorax, yellowish brown. Antennae dark, testaceous at base, the last joint not longer than the two preceding together. ♂, 8th dorsal plate with 7 or 8 distinct teeth at posterior margin, the outer on each side the largest. Length 3·5–4 mm. 102 *aquatica*, Th.
126. Elytra distinctly transverse, antennae dark, testaceous at base, last joint not longer than the two preceding. Facies of *aquatica* but broader and more depressed, the elytra scarcely longer than the thorax. Puncturation of fore parts more rugose. ♂, 8th dorsal plate more or less emarginate and more or less distinctly

* I have examined a specimen of *A. muiri*, Shp., but am unable to perceive any characters to distinguish it from this insect.

crenulate. 6th ventral plate produced. ♀, 6th ventral plate slightly emarginate. Length 3·5-4 mm.

105 *aquatilis*, Th.

- Elytra distinctly transverse, facies of large *castanoptera*. Puncturation of thorax fine, not rugose. Antennae testaceous more or less infusate towards apex, the last joint longer than the two preceding together. ♂, last joint of antennae longer, 8th dorsal plate truncate, 6th ventral plate produced and rounded. Length 4 mm. 100 *incognita*, Shp.

127. Antennae entirely dark, sculpture of elytra consisting of small granules, dark brown or black: head and thorax shining black. Legs testaceous with femora darker. ♂, granules of elytra much coarser. 7th and 8th dorsal plates studded with granules, 8th plate truncate and crenulate posteriorly, 6th ventral plate produced and slightly notched. Length 3·8-4·3 mm.

113 *graminicola*, Gr.

- Antennae with base lighter 128.

128. Thorax reddish testaceous, elytra testaceous, abdomen with base and apex pitchy. Species of bright appearance. ♂, 8th dorsal plate sprinkled with granules, on each side near apex with a short raised ridge. Length 4-4·8 mm. 107 *pagana*, Er.

- Thorax black, elytra yellowish brown 129.

129. Last joint of antennae rather longer than the two preceding together. Species more robust, more shining, head and thorax much more finely and sparingly punctured, elytra more thickly punctured. 8th dorsal plate crenulate at hinder margin, teeth about 8 in number. Length 4-4·5 mm. 101 ♂ *valida*, Kr.

- Last joint of antennae nearly as long as the three preceding together. Species less robust, less shining, head and thorax more coarsely and closely punctured, elytra more sparingly punctured. ♂, 8th dorsal plate truncate and furnished at hinder margin with about 8 crenulations. Length 3·5-4 mm.

104 *castanoptera*, Mann. (*xanthoptera*, Steph.).

130. Larger and more robust species. Length 4-4·3 mm. 131.

- Smaller and more delicate species. Length 2-3 mm. 132.

131. Thorax scarcely narrowed behind, quadrate, species pitchy brown, dull, abdomen with hind margins of segments and apex lighter, closely punctured and pubescent. ♂, 7th dorsal plate with a tubercle, 8th

- posterior margin with 6 teeth, the outer on each side larger. Length 4-4.3 mm. 20 *languida*, Er.
- Thorax distinctly narrowed behind. Black more shining, elytra often brown. Abdomen black, less closely punctured and pubescent especially behind. ♂, 7th dorsal plate in middle line with short ridge pointed behind. 8th dorsal plate at posterior margin with four small teeth, two close together near middle line and two externally, the margin between sometimes showing traces of crenulations. Length 4-4.3 mm. 14 *currax*, Kr.
132. Abdomen with all the segments pretty closely punctured and pubescent 133.
- Abdomen less closely punctured and pubescent, 7th segment smooth and shining. Pitch-black or pitch-brown, elytra often lighter, rather depressed. ♂, 7th dorsal plate with a short keel pointed behind, 8th dorsal plate at posterior margin with four teeth, two blunt median ones close together, and externally on each side with a more or less distinct pointed one. Length 2.5-3 mm. 15 *cambrica*, Woll.
133. Head quadrate; antennae dark, last joint but slightly longer than 10th; elytra half as long again as thorax, longer than broad. Pitchy-black or pitchy-brown with elytra usually lighter. ♂, 6th ventral segment slightly produced and broadly rounded. ♀, 6th ventral segment slightly emarginate. Length 2 mm. (See also 120 *eximia*) 8 *fragilis*, Kr.
- Head transversely oval, antennae testaceous, last joint equal to length of 9th and 10th together; elytra about $\frac{1}{3}$ as long again as thorax, broader than long. Pitchy-black or pitchy-brown with elytra reddish. ♂, 6th ventral plate distinctly produced and rounded. ♀, 6th ventral plate broadly emarginate. Length 2.5-2.8 mm. 32 *marina*, Rey. (*imbecilla*, Wat.).
134. Last joints of antennae scarcely transverse, about as long as broad 135.
- Last joints of antennae distinctly transverse 147.
135. Thorax about as broad as long 136.
- Thorax distinctly transverse 141.
136. Thorax distinctly narrowed behind 137.
- Thorax scarcely narrowed behind 139.
137. Larger and more robust, rather dull, temples not dilated. Abdomen pretty closely punctured and pubescent on anterior segments. Black or pitchy with elytra lighter.

- ♂, 7th dorsal plate with a tubercle, 8th dorsal plate at hinder margin with four more or less distinct teeth.
 Length 4 mm. 19 *insecta*, Th.
- Smaller, rather fragile species, head and thorax very shining, temples dilated, abdomen sparingly punctured and pubescent 138.
138. More depressed, abdomen more closely punctured, antennae more slender. ♂, 7th dorsal plate with a tubercle, 8th dorsal plate with four teeth at posterior margin, the outermost on either side being less marked.
 Length 3 mm. 17 *eichhoffi*, Scriba.
- Less depressed, abdomen very sparingly punctured, antennae stouter. ♂, characters as in preceding species. Length 3 mm. 16 *debilicornis*, Er. (*planifrons*, Wat.).
139. Species pitchy brown or reddish brown, dull with greasy lustre only. Antennae brown with yellow base. Abdomen black with margins of segments and apex reddish. Facies of small *languida*. ♂, 7th dorsal plate with a tubercle. 8th with six teeth at posterior margin, four placed near the middle. Length 3·2–3·6 mm. 21 *longicollis*, Rey.
- Species black, rather shining, elytra often brown or pitchy. Antennae dark with base lighter 140.
140. Species narrower. Abdomen often more or less pointed, finely and closely punctured and pubescent throughout. First joint of posterior tarsi much longer than second. ♂, 6th ventral plate produced and rounded. ♀, 6th ventral plate notched. Length 2·5–3 mm.
 10 *luteipes*, Er.
- Species broader and more robust. Abdomen much less closely punctured and pubescent especially towards apex. 1st joint of posterior tarsi not longer than 2nd. ♂, 6th ventral plate narrowed and produced. Length 3·5 mm. 31 *arctica*, Thoms. (*clavipes*, Shp.).
141. Elytra yellowish brown, head and thorax pitchy black or pitchy brown, abdomen with margins of segments and apex reddish. Species dull 142.
- Elytra dark brown or black, abdomen black 143.
142. Broader and more depressed. ♂, 8th dorsal plate emarginate, 6th ventral plate considerably produced, the apex turned upwards and the sides narrowed in the middle. ♀, 8th dorsal plate feebly emarginate, 6th ventral plate rounded. Length 4–4·5 mm.
 22 *luridipennis*, Mann.

- Narrower and less depressed. ♂, 6th ventral plate produced and narrowed with apex slightly emarginate. ♀, 8th dorsal and 6th ventral plates rounded. Length 3·5–4 mm. 23 *gyllenhali*, Thoms.
143. Elytra scarcely longer than the thorax, the latter strongly transverse, as broad as the former. Antennae reddish brown with lighter base. ♂, 6th ventral plate narrowed and produced. Length 3–3·5 mm.
30 *islandica*, Kr. (*eremita*, Rye.).
- Elytra distinctly longer than the thorax 144.
144. Thorax strongly transverse, about half as broad again as long, with distinct impression at base continued forwards as a fine channel. 1st and 2nd joints of antennae distinctly paler than the rest. Facies of *fungi*. ♂, 6th ventral plate produced and narrowed. Length 2·3–2·5 mm. 27 *aubei*, Bris.
- Thorax only slightly transverse 145.
145. Species larger, broader, and more depressed. Antennae dark, sometimes with first joint obscurely lighter. Facies of *currax*. ♂, 6th ventral plate produced. Length 3·5–4·5 mm. 26 *hygrotopora*, Kr.
- Species smaller, narrower, less depressed. Antennae reddish brown or dark brown, often lighter at the base 146.
146. Antennae more robust, penultimate joints about as broad as long. ♂, 6th ventral plate strongly produced and narrowed. ♀, 8th dorsal plate slightly emarginate. Length 3–3·5 mm. 25 *elongatula*, Gr.
- Antennae more slender, penultimate joints about as broad as long or slightly transverse. ♂, 6th ventral plate much less produced than in preceding, broadly rounded. ♀, 8th dorsal plate not emarginate. Length 2·5–3·5 mm. 24 *melanocera*, Thoms. (*volans*, Scrib.).
147. Elytra strongly sinuated at the postero-external angles; mandibles prominent 148.
- Elytra not or but slightly sinuated, mandibles normal 150.
148. Colour in great part reddish testaceous, head and abdomen before apex usually darker. ♂, 6th ventral segment produced and rounded. Length 2–2·5 mm.
42 *testacea*, Bris.
- Colour black or blackish 149.
149. More depressed, head more deeply punctured. 5th joint of antennae quadrate (about as long as broad) base of antennae usually reddish. ♂, 6th ventral plate narrowed and produced. Length 2·5–3 mm. 44 *puncticeps*, Th.

- Less depressed, head less deeply punctured, 5th joint of antennae longer than broad; base of antennae testaceous. ♂, 6th ventral plate produced and rounded. Length 2·5–3 mm.
 43 *flavipes*, Th.* (*halobrechta*, Shp.).
150. Thorax not, or scarcely broader than long 151.
 — Thorax distinctly transverse 153.
151. Thorax distinctly narrowed towards base, shining, head with large superficial punctures, abdomen very sparingly punctured. ♂, 6th ventral segment produced and rounded. ♀, 6th ventral segment slightly emarginate. Length 3·5 mm. 114 *vestita*, Gr.
 — Thorax distinctly narrowed towards base, not shining (greasy lustre only); head without large superficial punctures, abdomen pretty thickly punctured and pubescent 152.
152. Elytra longer than broad, abdomen much more thickly and finely punctured and pubescent. 1st joint of posterior tarsi considerably longer than 2nd. ♂, 6th ventral plate narrowed and a little produced. Length 3–3·3 mm. 13 *gregaria*, Er.
 — Elytra broader than long, abdomen much less thickly and finely punctured and pubescent. 1st and 2nd joints of posterior tarsi of equal length. ♂, 7th dorsal plate with a tubercle, 8th with four indistinct teeth at posterior margin. Length 3·5 mm. 18 *sulcifrons*, Steph.
153. Antennae dark, not lighter at base 154.
 — Antennae dark with lighter base or entirely brown 156.
154. Elytra uniformly brown or yellowish brown 155.
 — Elytra yellow, with margins more or less fuscous, legs yellow with femora dark. ♂, 3rd dorsal plate (1st visible) with tubercle (sometimes obscurely in ♀ also) 8th sprinkled with granules and shagreened, on either side with short ridge. Length 3·5–4 mm.
 109 *longiuscula*, Gr. (*vicina*, Steph.).
155. Larger and more convex, very shining, very feebly shagreened, antennae longer and more slender. ♂, 8th dorsal plate truncate and obscurely crenulate. Length 3·8–4·3 mm. 111 *nitidula*, Kr.
 — Smaller and more depressed, much less shining and very distinctly shagreened. Antennae rather shorter and

* I am unable to see in *A. princeps*, Shp., anything more than a large *flavipes*. In the Mediterranean I have taken large forms of *punciceps*.

stouter. ♂, 8th dorsal plate obscurely crenulate posteriorly. Length 3·5-4 mm.

112 *oblonga*, Er. (*oblongiuscula*, Shp.).

156. Thorax black with metallic reflex, elytra yellow, darker at scutellum and postero-external angles. ♂, 8th dorsal plate crenulate posteriorly. Length 3-3·3 mm.

103 *pertyi*, Heer. (*aeneicollis*, Shp.).

— Thorax black without metallic reflex, elytra uniformly reddish yellow or brownish 157.

157. Last joint of antennae very long and stout, equal in length to the three preceding together. Species black and shining, elytra reddish yellow. ♂, 6th ventral plate narrowed and produced. Length 4-4·5 mm.

106 *hynorum*, Kies. (*silvicola*, Fuss.).

— Last joint of antennae not longer than the two preceding together 158.

158. Elytra not or scarcely longer than the thorax. ♂, 8th dorsal plate obscurely crenulate. Length 3·5 mm.

110 *alpestris*, Heer. (*nitidiuscula*, Shp.).

— Elytra distinctly longer than the thorax 159.

159. Larger species; thorax reddish brown with large superficial scattered punctures; elytra yellowish red, abdomen with margin of segments and apex reddish. ♂, 8th dorsal plate granulate and slightly produced in middle, the granular area bounded by a little ridge on either side. Length 3·5-4 mm. 108 *granigera*, Kies. (*crassicornis*, Gyll.).

— Smaller species, 1·7-3 mm., uniformly pitchy black or pitchy brown, thorax closely and finely punctured 160.

160. Head almost as broad as the thorax, the latter distinctly narrowed behind 161.

— Head much narrower than thorax, the latter scarcely narrowed behind, with two small impressions one on either side of middle line before scutellum. ♂, 6th ventral segment a little produced and narrowed. Length 1·7-2·3 mm. 28 *gemina*, Er.

161. Fifth joint of antennae as long as broad, penultimate joints more strongly transverse. ♂, 6th ventral plate produced and rounded. ♀, 6th ventral plate furnished at posterior margin with short, closely set setae. 35 *debilis*, Er.

— Fifth joint of antennae longer than broad, penultimate joints less transverse. ♂, 6th ventral plate narrowed, produced and rounded. ♀, 6th ventral plate furnished at posterior margin with rather long, less closely set setae 36 *magniceps*, Sahlb.

A LIST OF THE BRITISH SPECIES OF ALEUONOTA,
ATHETA AND SIPALIA.

ALEUONOTA, Th.*

1. atricapilla, Rey.
rufotestacea, Kr.
elegantula, Bris.
2. aurantiaca, Fauv.
rufotestacea, Rye. (*nec* Kr.)
3. egregia, Rye.
gracilentata, Kr. (*nec* Er.)
hypogaea, Fowler (*nec* Rey.)
4. gracilentata, Er.
splendens, Kr.
hypogaea, Rey.

ATHETA, Th.

Sub.-g. HYDROSMECTINA,
Ganglb.

5. subtilissima, Kr.

Sub.-g. HYDROSMECTA, Th.

6. delicatula, Shp.
7. longula, Heer.
8. fragilis, Kr.
9. eximia, Shp.

Sub.-g. DILACRA, Th.

10. luteipes, Er.

Sub.-g. DACRILA, Rey.

11. fallax, Kr.
12. pruinosa, Kr.

Sub.-g. GLOSSOLA, Fowler.

13. gregaria, Er.

Sub.-g. ALOCONOTA, Th.

14. currax, Kr.
15. cambrica, Woll.
16. debilicornis, Er.
planifrons, Waterh.
17. eichhoffi, Scriba.
18. sulcifrons, Steph.
19. insecta, Th.

Sub.-g. DISOPORA, Th.

20. languida, Er.
21. longicollis, Rey.

Sub.-g. PELURGA, Rey.

22. luridipennis, Mann.

Sub.-g. METAXYA, Rey.

23. gyllenhali, Th.
24. melanocera, Th.
volans, Scriba.
25. elongatula, Gr.
26. hygrotopora, Kr.
27. aubei, Bris.
28. gemina, Er.
29. curtipennis, Shp.
30. islandica, Kr.
cremita, Rye.
31. arctica, Th.
clavipes, Shp.
32. marina, Rey.
imbecilla, Waterh.
33. meridionalis, Rey.
littorea, Shp.

Sub.-g. HYGROECIA, Rey.

34. fallaciosa, Shp.
35. debilis, Er.
36. magniceps, Sahlb.
37. scotica, Elliman.

Sub.-g. PARAMEOTICA, Ganglb.

38. laticeps, Th.
difficilis, Bris.
39. complana, Mann.
deformis, Kr.

Sub.-g. DRALICA, Rey.

40. vilis, Er.

Sub.-g. OREOSTIBA, Ganglb.

41. tibialis, Heer.

Sub.-g. PSEUDOPASILIA, Ganglb.

42. testacea, Bris.

Sub.-g. HALOBRECTHA, Th.

43. flavipes, Th.
halobrectha, Shp.
44. puncticeps, Th.

* The synonymy of this genus is that given by Fauvel (Rev. d'Ent., 1895, p. 95) after an examination of all the types.

- Sub.-g. DINARAEA, Th.
 45. angustula, Gyll.
 46. aequata, Er.
 47. linearis, Gr.
- Sub.-g. PACHNIDA, Rey.
 48. nigella, Er.
- Sub.-g. ALIANTA, Th.
 49. incana, Er.
- Sub.-g. PLATARAEA, Th.
 50. brunnea, F.
 depressa, Gr.
- Sub.-g. PTYCHANDRA, Ganglb.
 51. hepatica, Gr.
 52. exarata, Shp.
- Sub.-g. BESSOBIA, Th.
 53. occulta, Er.
 54. fungivora, Th.
 55. excellens, Kr.
 56. monticola, Th.
- Sub.-g. ANOPLETA, Rey.
 57. corvina, Th.
 58. inhabilis, Kr.
- Sub.-g. TRAUMOECIA, Rey.
 59. picipes, Th.
 60. angusticollis, Th.
- Sub.-g. PHILHYGRA, Rey.
 61. palustris, Kies.
 62. subglabra, Shp.
- Sub.-g. MICRODOTA, Rey.
 63. aegra, Heer.
 64. perexigua, Shp.
 65. atomaria, Kr.
 66. puberula, Shp.
 67. liliputana, Bris.
 68. inquinula, Gr.
 69. mortuorum, Th.
 atricolor, Shp.
 70. amicula, Steph.
 sericea, Rey.
 71. subtilis, Scriba.
 indiscreta, Shp.
 72. indubia, Shp.
 73. palleola, Er.
- Sub.-g. RHOPALOCERA, Ganglb.
 74. clavigera, Scriba.
- Sub.-g. CERITAXA, Rey.
 75. testaceipes, Heer.
 76. dilaticornis, Kr.
- Sub.-g. ALAOBIA, Th.
 77. scapularis, Sahlb.
- Sub.-g. DOCHMONOTA, Th.
 78. clancula, Er.
- Sub.-g. ATHETA, s. str.
 79. subterranea, Rey.
 80. nigricornis, Th.
 81. divisa, Mark.
 82. basicornis, Rey.
 autumnalis, Shp.
 83. oblita, Er.
 84. coriaria, Kr.
 85. nitens, Fuss.
 86. gagatina, Bandi.
 87. sodalis, Er.
 88. pallidicornis, Th.
 humeralis, Kr.
 89. nigrifula, Kr.
 90. liturata, Steph.
 91. nitidicollis, Fairm.
 ignobilis, Shp.
 92. crassicornis, F.
 fungicola, Kr.
 v. fulvipennis, Rey.
 93. pilicornis, Th.
 94. xanthopus, Th.
 95. hybrida, Shp.
 96. trinotata, Kr.
 97. triangulum, Kr.
 98. diversa, Shp.
 99. euryptera, Steph.
 succicola, Th.
 100. incognita, Shp.
 101. valida, Kr.
 102. aquatica, Th.
 103. pertyi, Heer.
 aeneicollis, Shp.
 104. castanoptera, Mann.
 xanthoptera, Steph.
 105. aquatilis, Th.
- Sub.-g. LIOGLUTA, Th.
 106. hypnorum, Kies.
 silvicola, Fuss.
 107. pagana, Er.
 108. granigera, Kies.
 crassicornis, Gyll.

109. longiuscula, Gr.
vicina, Steph.
110. alpestris, Heer.
nitidiuscula, Shp.
111. nitidula, Kr.
112. oblonga, Er.
oblongiuscula, Shp.
- Sub.-g. MEGISTA, Rey.
113. graminicola, Gr.
- Sub.-g. THINOBAENA, Th.
114. vestita, Gr.
- Sub.-g. DIMETROTA, Rey.
115. cadaverina, Bris.
116. atramentaria, Gyll.
117. picipennis, Mann.
118. intermedia, Th.
119. cinnamoptera, Th.
120. marcida, Er.
121. laevana, Rey.
122. setigera, Shp.
123. nigripes, Th.
villosula, Kr.
- Sub.-g. BADURA, Rey.
124. macrocera, Th.
125. parvula, Mann.
cauta, Er.
- Sub.-g. DATOMICRA, Rey.
126. cribata, Kr.
127. canescens, Shp.
128. sordidula, Er.
129. celata, Er.
130. arenicola, Th.
germana, Shp.
131. hodierna, Shp.
132. zosterac, Thp.
nigra, Kr.
- Sub.-g. PYCNOTA, Rey.
133. paradoxa, Rey.
- Sub.-g. CHAETIDA, Rey.
134. longicornis, Gr.
- Sub.-g. COPROTHASSA, Th.
135. consanguinea, Epp.
136. melanaria, Mann.
testudinea, Er.
137. sordida, Marsh.
- Sub.-g. ACROTONA, Th.
138. pygmaea, Gr.
139. aterrima, Gr.
140. parva, Sahlb.
pilosiventris, Th.
v. muscorum, Bris.
141. parens, Rey.
142. orphana, Er.
143. fungi, Gr.
v. orbata, Er.
144. clientula, Er.
145. fuscipes, Heer.
146. laticollis, Steph.
147. subsinuata, Er.
- Sub.-g. AMISCHA, Th.
148. analis, Gr.
149. decipiens, Shp.
150. soror, Kr.
151. cavifrons, Shp.
- Sub.-g. AMIDOBIA, Th.
152. talpa, Heer.
parallela, Mann.
153. validiuscula, Kr.
- Sub.-g. MEOTICA, Rey.
154. exilis, Er.
155. indocilis, Heer.
pallens, Redt.
- SIPALIA, Rey.
156. circellaris, Gr.
157. caesula, Er.
- SPECIES OF UNCERTAIN POSITION
158. cribriceps, Shp.*

* This species is *Coenonica puncticollis*, Kr., and no doubt imported. Cf. Ent. Mo. Mag., vol. xlix, p. 135 (1913).

X. *On the Life-history of Lonchaea chorea, Fabricius.* By ALFRED E. CAMERON, M.A., B.Sc., Government Research Scholar, and Honorary Research Fellow, the University of Manchester.

[Read October 18th, 1912.]

PLATE XI.

INTRODUCTORY AND HISTORICAL.

TOWARDS the end of the year 1911 some cow-dung amongst which small white Muscid larvae had been observed feeding, was received by me from Mr. Saunders of the Agricultural College, Holmes Chapel. The adults were reared, and Mr. Collin kindly identified them as *Lonchaea chorea*, F. The larvae were transferred to wire-gauze breeding-cages with a fresh supply of cow-dung and the temperature kept fairly high, ranging from 70° to 78° F. Under those favourable conditions of food and temperature the life-history was soon completed, pupation occurring in about twelve days and the adults appearing about ten days later. In the laboratory the whole development from the egg to the imago occupied about thirty days at the outside, where temperature and other conditions of nutriment and humidity were favourable.

Bouché* in 1834 was the first to give an account of the life-history of *L. chorea*, and it might be useful to repeat his brief description.

“Die Larve ist walzig, vorn verjüngt, glatt, weiss. Bauchgelenkstücke gerieselte. Prothorax = Stigmata gelb, sieben- bis zehnthellig. Afterabschnitt schief, nach unten gestutzt. Die gelbbraunen erhöhten Stigmenträger sitzen an der obern Kante der Abstutzungsfläche und haben gebreite Stigmen. —Länge 3 Linien. —Man findet sie den Herbst und Winter hindurch unter fauler Baumrinde.

“Ich habe noch bei keiner Fliegenlarve eine so schöne und zusammengesetzte Luftröhren-Verbindung gesehen, wie bei dieser. Um sie anschaulich zu machen, füge ich auf Taf. vi, Fig. 1. eine Zeichnung davon bei.

* Bouché, P. Fr., *Naturgeschichte der Insckten, besonders in Hinsicht ihrer ersten Zustände und Puppen*, p. 94, Taf. vi, fig. 1,

“Die Puppe ist ein längliches, quergestricheltes, hellroth-braunes Tönnchen. Der Thorax ist gerieselt. Der Afterabschnitt porkat, mit vorstehender, schwarzbraunen Stigmentträgern.—Länge $1\frac{1}{2}$ Linien.—Nymphenzeit vierzehn Tage.”

Bouché gives but one figure, an admirable representation of the branching tracheal system of the larva, to which he refers in his text. As regards the breeding habitat, Bouché says he found the larva under the bark of trees, whilst Scholtz * discovered it amongst cow-dung. Mr. Austen informs me that he has bred the imago from larvae feeding on diseased bulbs of *Crinum* and *Brunsvigea cooperi*, to which it would seem they are rather partial, and also from others in a rotten cabbage. Farsky † discovered the larvae in a crop of beetroot suffering from so-called “*Kernfaule*” or core-rot.

THE EGG.

The egg of *L. chorea* is very similar in size and appearance to that of many of the *Anthomyiidae*, bearing on its outer delicate case a pretty ornamental sculpturing composed of minute hexagonal areas. By reason of their pure white colour they were easily recognisable in the breeding-cage amongst the cow-dung, where they were deposited by the imagines. Farsky gives their accurate measurement, stating their size to be 0.8670 mm. long and 0.2500 mm. broad. After a period of about eight to ten days under ordinary conditions, the larva bursts the chorion longitudinally and emerges. In the laboratory, probably on account of the high temperature, only about half that time elapsed between the act of oviposition and the appearance of the larvae.

THE LARVA.

A certain number of the larvae were placed in a cool-house where the temperature did not rise above 50° F., and usually, indeed, the temperature remained a few degrees below this—during the night often falling well below 40° F. It was observed that the larvae under these conditions continued to feed, and pupation did not begin until as many as sixty to seventy-two days had passed. It would thus

* Scholtz, Ent. Zeit. Breslau, 1-3 Bd., p. 10.

† Farsky, Verh. zool.-bot. Ges. Wien (1879), pp. 101-107, pl. iii, figs. 1-7.

appear that a lowering of the temperature effects a retardation of development, the larval stage at higher temperatures (70°–78° F.) occupying but ten to fourteen days. Again, it seems rather anomalous that although the period of feeding is five to six times as long, the larvae never attain the same size, but always remain somewhat smaller, the pupae and imagines being correspondingly diminutive. Several other authors have experienced like results in the case of other Muscid larvae. Another factor associated with development is humidity. Variations in humidity have a similar effect to variations of temperature, a large amount of moisture acting as a check on development, just like a low temperature. Where there is little moisture development is hastened to a remarkable extent; but it must be also observed that a certain amount of moisture is always necessary to the larva for the proper assimilation of its food.

Farsky observed that the larvae feeding on decaying beetroot in the open, required six to eight weeks for their development according to the weather conditions.

The full-grown larva (figs. 1 and 2) measures 9 mm. in length, and is of the cylindrical form usual in Muscid larvae, gradually tapering postero-anteriorly, the posterior end rounded and rather obliquely truncate. The colour is dull white, the cuticle being perfectly smooth, devoid of hairs and exhibiting a faint iridescence in specimens preserved in alcohol. There are in all twelve very distinct segments, including the head or most anterior. The organs of locomotion consist of small ellipsoidal areas (figs. 1 and 2, kw.) interposed between each two segments, commencing between the third and fourth. These are beset with transverse rows of minute, closely-set spines, which give the larva a grip on any roughnesses of the surface over which it may chance to be travelling. They are the "Kriechwülste" or "Kriechschwien" of German authors as opposed to the "Zwischensegmente" or tween-segments by which are meant small intercalary segments between any two true adjacent segments. At the posterior end (fig. 3) the larva of *L. chorea* is devoid of tubercles or protuberances of any kind and herein differs from the larvae of other members of the *Sapromyzidae* which possess a transverse row of four conical tubercles on the penultimate segment, whilst many of the *Lonchaeinae* have small wart-like projections on the last segment behind the stigmata. The two dark-brown, almost sessile posterior spiracles (figs. 3 and 4, p. sp.) are of the shape of equilateral triangles with the angles rounded off

They are situated rather dorsally on the terminal segment and consist of a comparatively broad, circular, chitinous band enclosing a small space in which lie three slits situated almost at right angles to each other. The larvae of the Sapromyzids proper are distinguished from those of *Lonchaea* by the presence on the posterior aspect of the last segment, of two 3-segmented tubercles. Between these is situated the pair of cylindrical projections bearing the spiracles at their extremities. Brauer* describes small wart-shaped processes behind the spiracles of the larvae of *Lonchaea*. The palmate funnel-shaped prothoracic stigmata (figs. 1 and 2, pt. sp) of a pale yellow colour, are provided with nine circular orifices; but the number may vary from seven to ten (Bouché), eight to ten (Brauer).

Farsky gives a very interesting account of the behaviour of the larva which he observed attacking the roots of diseased sugar-beet previously encroached upon by a nematode worm. In fact, it was the investigation of the diseased conditions caused by the nematode, which led him to detect the presence of the maggot. The eggs are laid at the base of the leaf-petiole in small clusters; the larva on emerging penetrates the petiole and instinctively it seems, following the course of the leaf-traces downwards, makes its way into the root, attracted in some curious way to the decaying tissue where the nematode has previously been at work. How the larva is made aware of the internal decay consequent on the presence of the nematode, is rather puzzling, seeing that no trace of the internal putrescence may be apparent on the periphery of the root.

The same author carried out a series of experiments which go to prove the wonderful vitality of the larva. The delightful unconcern and apathy which it showed under most trying conditions, would seem to be scarcely credible. Taking a larva, he plunged it three times running into a watch-glass containing absolute alcohol which was then allowed to evaporate; but the unhappy larva successfully faced the ordeal and came through it alive. Having recovered uninjured from the hardening effect of this unwonted medium, the succeeding attempts to deprive it of life seem comparatively trivial. Keeping it in water for four hours had no effect, as was amply demonstrated on its subsequent removal, by its vigorous movements. Even

* Brauer, *Die Zweiflügler des kaiserlichen Museums zu Wien*, p. 41, 1883.

fourteen hours of an aquatic life did not trouble it much. An all-night sojourn in a weak solution of alcohol consisting of water mixed with beer, also failed to disturb its equanimity; for it became as active as ever when withdrawn. Granted a short rest and allowed some nourishment, the larva refreshed, successfully tackled the final test, a day's submersion in undiluted beer. Having emerged with flying colours, or, should we say, retaining all its cuticular iridescence, it was restored to a diet of decaying beetroot, when it shortly afterwards pupated and completed its metamorphosis. Such a tenacity of life is not, I should imagine, shared by many larvae.

THE PUPA.

After becoming full grown the larva rests for a short time previous to pupating, when it undergoes contraction from 9 mm. to 5 mm., assuming the barrel shape characteristic of Muscid pupae. The pupae vary in size, the average size being 5 mm. in length by 1.9 mm. broad. During the process of pupation, which occupies about a couple of hours, the colour changes from a creamy white to a reddish brown, and as the development of the imago proceeds within, the puparium gradually becomes darker. Most of the larval characters are discernible in the pupa; but owing to the shrinkage which has occurred, the relative position of organs has been affected. The prothoracic, lateral spiracles are now situated almost quite at the anterior end of the pupa, and two small projections posteriorly, denote the position of the posterior spiracles. Inside the breeding-cages the larvae pupated in the drier portions of the cow-dung.

At the termination of twelve to fourteen days under the laboratory conditions employed, the imagines were ready to emerge, and they made their exit from the pupa cases by a T-shaped split at the anterior end,—the fly employing the ptilinum to push the valves apart.

Under ordinary natural conditions Farsky states that the pupal period of development lasts for three and a half to five weeks, and in moist, damp weather it may be even more prolonged. It must be always borne in mind that a difference in the nature of the food of the larva may be of radical importance in determining the length of the period occupied by the insect in its metamorphosis, where other conditions of temperature and moisture are equal. In

Farsky's experiments the development occupied a rather longer time than I experienced in mine. This may be in part, I think, associated with the fact that the food on which he reared his larvae, consisted of pieces of decayed beetroot, whilst in my experiments, the larvae may have found a richer diet in the nutritious cow-dung. On this account their development may have been greatly hastened, all the more so when we take into consideration the high temperature prevailing in the laboratory where my breeding-cages were kept. The complete metamorphosis was gone through in not more than four to five weeks; whereas, Farsky states that the time required is ten to fourteen weeks. But I must add that this agrees very well with the time occupied in the development of the imagines which I reared in the cool house at the lower temperature of 50° F. In this case, at least ten weeks passed between the act of oviposition and the appearance of the adult.

BUCCAL APPARATUS OF LARVA.

The elaborate mouth-parts (fig. 7) consist of a number of pairs of sclerites which become more strongly chitinised and tend to fuse, as the larva matures. Projecting through the oral aperture and surrounded by the rugose areas of the mouth, is a pair of parallel, robust, sickle-shaped hooks (md. s.) to which there articulates distally the hypostomal sclerite (h. s.) bearing two small teeth on its ventral aspect. Vento-posteriorly a pair of small irregular dentate sclerites (d. s.) articulates with the falciform hooks. The hypostomal sclerite has two arms connected by a slender cross-bar, each arm fitting into a space between two anterior ventral processes of the corresponding cephalo-pharyngeal sclerite (c. p.). These paired cephalo-pharyngeal sclerites have attached to their anterior dorsal extremities, a small perforate sclerite (pf. s.) which serves to unite them; whilst posteriorly, a deep bifurcation divides each sclerite into a slender dorsal (d. p.) and a broad ventral process (v. p.). The whole of the mouth-apparatus is left behind, attached to the dorsal anterior valve of the puparium, when the imago emerges.

THE IMAGO.

From the very full descriptions of Farsky and Schiner *

* Schiner, *Fauna Austriaca*. Die Fliegen, vol. ii, p. 91.

the imago may be easily identified by the aid of my figure. The ovipositor is rather characteristic.



A. E. C. del.

LONCHAEA CHOREA ♀ × 10 (*amount magnified*).

Many authors consider that *Lonchaea chorea*, F., is merely a variety of *vaginalis*, Flh. Schiner says in his account: "*L. chorea* is very closely related to *L. vaginalis*, in fact they may be considered as varieties of one and the same species: at least, no author has been able to give any definite characters which will delimit the one from the other. . . . *L. chorea* is smaller than *L. vaginalis*; wings transparent, with weak veins. . . . Quite similar to the preceding species (*L. vaginalis*), from which it differs only in the relatively shorter ovipositor, and also apparently in the fact that the humeral cross-vein lies nearly opposite to the origin of the anterior branch of the auxiliary, whilst in *L. vaginalis* the humeral cross-vein is decidedly anterior." In my opinion *Lonchaea chorea*, F., and *vaginalis*, Flh., are merely synonymous names for one and the same species, and in the "Katalog der Palaarktischen Dipteren," Bd. iv, pp. 86-87 (1905), they are regarded as such. Mr. Austen kindly refers me to the fact that this synonymy is shown on the labels attached to the species of *Lonchaea*, in the Diptera collection of the Natural History Museum, South Kensington. I have had the opportunity of examining the specimens there.

POSITION OF THE LONCHAEIDAE.

As regards the systematic position of the *Lonchaeidae* there would appear to be some difficulty. Originally united with the *Sapromyzidae*, they have been more recently separated off by Loew, Becker and other authors as a distinct family because of certain small differences. But Williston in his "Manual of North-American Diptera" (1908) includes in the *Sapromyzidae* the sub-families *Sapromyzinae* and *Lonchaeinae*.

ECONOMIC STATUS.

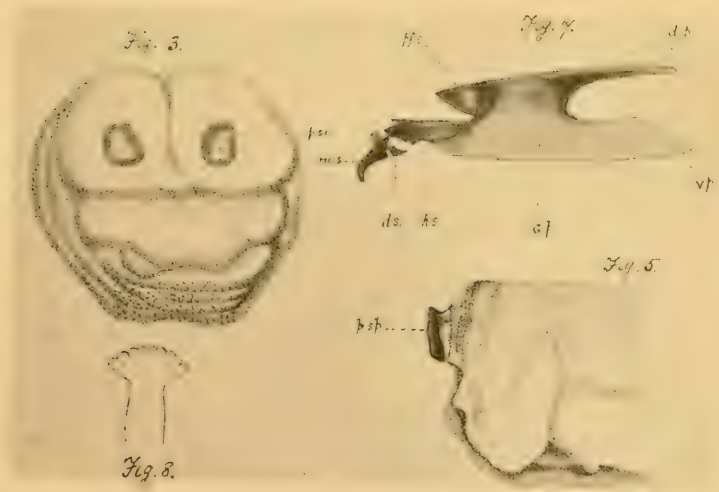
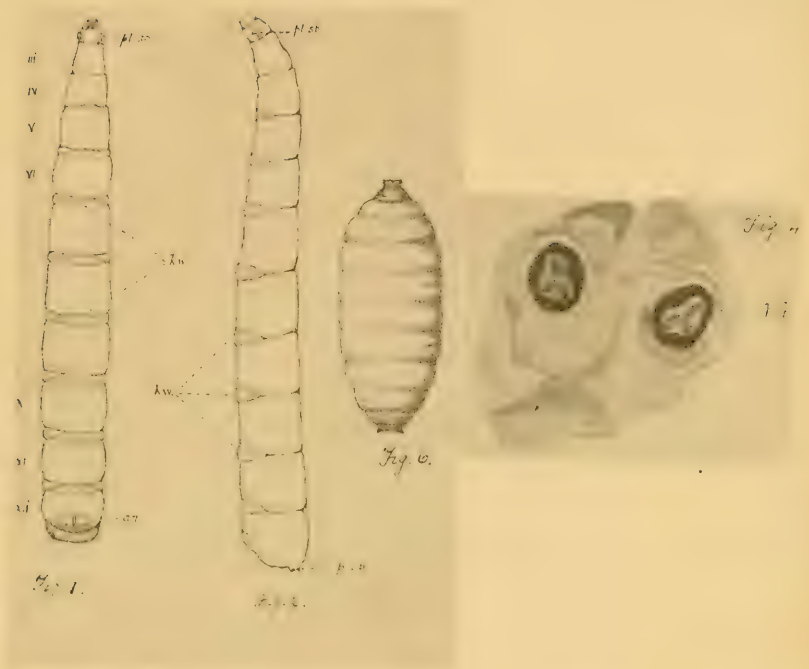
L. chorea is not known to cause much damage, although it may be very extensively found at times attacking crops of diseased beetroot. It does not frequent human habitations; so that it could not be classed with the disease-carrying house-fly which it resembles to a certain extent in its breeding habits. Rather should we class it in that large group in which are included all "followers of decay," in that plants, such as beetroot and certain Monocotyledons, which have been previously attacked by fungus or other destructive agencies, are liable to have the injury accentuated by the larvae of this fly. The larvae may be transmitted by the use of infected dung for the manuring of soils in which the crops liable to attack, are cultivated.

If the dung be mixed with a small quantity of some chemical soil-fertiliser, such as commercial sulphate of ammonia, the larvae will be killed off; and at the same time the percentage of available nitrogen will be increased by the admixture of the chemical. Other dressings may be used with equal effect, such as the potash salts, superphosphate of lime, etc.; but care must be taken to use them in fertilising quantities, otherwise serious damage might be done to the plants. The use of fertilisers as insecticides is by no means new, and in America at least, they have been long known to be effective against cut-worms, wireworms, scale-insects and aphides

EXPLANATION OF PLATE XI.

- FIG. 1. Ventral aspect of larva of *Lonchaea chorea*; numerals denote number of segment.
 pt. sp. prothoracic spiracle; lw. locomotory areas (Kriechwülste); an. anus.

2. Lateral aspect of same to show the position of posterior spiracles (p. sp.).
3. Posterior aspect of same showing posterior spiracles (p. sp.) greatly magnified.
4. Camera lucida sketch of posterior end of larva of *L. chorea* to show structure of posterior spiracles (p. sp.). Canada balsam preparation.
5. This figure makes clear the relation of the posterior spiracles (p. sp.) to the last segment.
6. Pupa of *L. chorea*—dorsal view.
7. Camera lucida sketch of the mouth armature of the mature larva after treatment with caustic potash.
md. s. mandibular sclerite; d. s. dentate sclerite; h. s. hypostomal sclerite; pf. s. perforate sclerite; c. p. cephalopharyngeal sclerite; d. p. dorsal process of cephalopharyngeal sclerite; v. p. ventral process of same.
8. Prothoracic stigma of mature larva



A. E. C. del.

C. Hentschel.

LONCHAEA CHOREA, Fab.

XI. *Descriptions of new species of the Syrphid genus Callicera* (Diptera). By the late G. H. VERRALL, F.E.S.
 Edited by J. E. COLLIN, F.Z.S., F.E.S.

[Read April 2nd, 1913.]

THE following descriptions of new species of *Callicera* (one Palaearctic, two from the Oriental Region, and one from Central America), together with a detailed description of the British *C. yerburyi*, Verr., and a re-description of *C. erratica*, Walk., were written by the late Mr. Verrall some years ago, but were kept in MS. until such time as he could complete an elaborate paper upon the whole genus. This unfortunately he had not finished at the time of his death, and a critical examination of the unfinished MS. showed that it was not in a state for publication without so much editing as would practically make it cease to be the late author's work, therefore it has been thought best to publish only the following descriptions.

J. E. C.

C. LOEWI, n. sp. ♂.

A rather small species, with no black hairs at tip of abdomen, second antennal joint half the length of first, third joint more than twice the length of first two together, thorax with 3-5 conspicuous black stripes, abdomen with nearly all the first two segments and a large triangle on third segment, black.

Face shining black with abundant golden pubescence, leaving bare a broad but not well-margined middle part which becomes narrow near the upper mouth edge. Frons all shining black extending down the sides to below antennae and across under antennae, side-margins of face below this with a tolerably broad line of grey dust extending nearly to lower angle of eye, frons and antennal prominence all absolutely bare. Jowls shining black and bare, lower half of back of head with dense yellow conspicuous pubescence, but upper part of back of head with a shining aeneous rim narrowed at vertex, and with more sparse dark brown pubescence, but all upper part with abundant tolerably long orange pubescence. Vertex with dense black pubescence almost lost amidst dense dark pubescence of eyes. Eyes viewed from above with all the middle, extending nearly to front, clothed with very dense brownish-black pubescence and the hind third apparently bare but really with long

rather dense sparse blackish pubescence above, greyish-white about middle and below; the eye-margin itself however bare, rather broadly so all about middle of eye. Antennae with the third joint hardly dilated, equal in width for two-thirds then slightly attenuated; style white, one-third the length of third joint, hardly blackened at base and moderately pointed.

Thorax and scutellum clothed all over with dense tawny pubescence which does not conceal the shining aeneous-black ground-colour, this pubescence is rather longer on fore part than on rest, and is still denser and more conspicuous at sides and on mesopleurae; middle of thorax in front with a conspicuous rather narrow dull black line fading away after reaching half-way down, well separated from this line are two broad dull black stripes each of which throws out at suture a dull black line which in its turn connects with an undefined black stripe along the sides of thorax, and this and the broad stripe converge and coalesce further down thorax and reach hind-margin rather narrowly near postalar calli.

Abdomen brighter aeneous but rather obscured by the very dense equal erect tawny pubescence, this is slightly but inconspicuously longer on the two basal segments, and distinctly longer about the sides near the base; first segment all dull black, second segment dull black with a large shining aeneous triangle at basal corners, a point of which nearly reaches the hind-corners of segment, third segment bright aeneous with a dull black dorsal triangle which begins at a point very near middle of base of segment and slopes out nearly to side corners leaving all actual hind-margin rather narrowly shining aeneous, fourth segment all shining aeneous only obscured by dense pubescence and without any trace of dull markings. Genitalia black but with only tawny pubescence. Belly shining aeneous with less dense tawny pubescence.

Legs black with the tip sixth or eighth of femora, all the tibiae absolutely, and basal joint of all tarsi except at the tip, clear orange; pubescence behind anterior femora and in front of hind femora rather long, dense, and conspicuous, all tawny; pubescence on tibiae longer and denser than usual and all tawny, but that on four last joints of tarsi black except on the soles of second and third joints; tarsi, especially front ones, dilated; claws black but obscurely orange about base, pulvilli blackish orange.

Wings rather smoky with a brownish orange tinge on fore part which is hardly defined except on the long stigma; cross-vein at two-fifths the discal cell; upper marginal cross-vein with a rather sharp angle. Squamae glassy orange with orange fringes. Halteres orange.

Length $12\frac{1}{2}$ mm. Antennae about 4 mm.

Described from a male in the British Museum taken by Miss D. M. A. Bate at Troodos (about 4,500 feet) in Cyprus, some time between July and October 1902.

C. YERBURYI, Verrall, Ent. Month. Mag., xl, 229 (1904). ♀.

Aeneous black, brightly shining but rather obscured on the thorax and base of abdomen by abundant reddish-orange pubescence. Second antennal joint less than half the length of first. Thorax not striped. Abdomen black haired at the tip and with dark transverse bands on the first and second segments. Femora almost entirely yellow.

Head black, moderately shining; frons below the ocelli with abundant pubescence, which ranges from being brownish-orange with a band of black hairs crossing the ocelli and pointing more forwards to being blackish on the upper and middle part or even all dark blackish brown or mainly black, behind this, dense longer orange pubescence extends sideways a little beyond the upper angle of the eye; space across the antennal knob shining black from eye to eye and almost bare; face with rather abundant shorter slightly drooping pale greyish-yellow or orange pubescence which leaves a middle line all the way down shining black and bare; space between the eyes at the vertex more than one-third the width of the head, and slightly widening all down to the mouth; before the jowls there is a shining black rather wide bare space; jowls with reddish-orange pubescence, which becomes denser though shorter on the lower part of the back of the head, and then decreases rapidly in length until it dies out before the middle of the back of the head; all about the flat of the back of the head the pubescence is very short and insignificant, brownish-orange until it meets the longer orange occipital pubescence; all the upper part of the back of the head brightly shining aeneous black, but the lower third slightly dusted whitish; close against the eyes on almost all the upper two-thirds it is polished and impunctate; proboscis large and black with small black palpi. Eyes with dense pubescence on almost all the fore part conspicuous and mainly dark brown, but becoming greyer and less dense below, while on all the back half of the eye it is very short inconspicuous and very sparse, and all the middle part of the back of the disc of the eye is bare. Antennae distinctly longer than the head is from the back of the vertex to the tip of the antennal knob; antennal knob polished black and quite bare; second antennal joint less than half the length of the first, and the third about two and a half times as long as the two basal ones together; third joint for about two-fifths of its length forming the deepest part of the antennae, but thence gently shelving off for a short distance

after which the rest of the joint remains equal in depth; style yellow with the basal quarter blackish, pointed at the tip; the basal joint of the antennae is slightly shining, but the third joint is dull blackish and quite bare, while the two basal joints are rough with tiny bristles.

Thorax shining aeneous black with no trace of grey or black stripes, and with the mesopleurae and the scutellum entirely and almost equally covered with rather long dense but not crowded reddish-orange pubescence, but this pubescence does not much obscure the ground-colour on the whole disc of the thorax and on the scutellum; on the mesopleurae the pubescence is more dense and tangled and more reddish, on the back-margin of the thorax it is slightly longer, and on the scutellum it is longer and less reddish.

Abdomen with the basal segment hardly visible, but the second segment dull black on the middle quarter of the base, extending into a wide dull black cross-band a little before the hind-margin which is fairly broad at its middle but becomes narrower towards, and does not reach by a fair distance, the sides; third segment with a dull black band, narrowly interrupted at its middle, occupying about one-sixth the segment and nearly reaching the sides. Pubescence about the base and sides similar to that on the thorax, but longer about the basal corners and shorter at the sides of the third and part of the fourth segments, shorter and more brownish-orange on the disc of the third segment, and extending slightly (ranging from an eighth to more than half) on to the disc of the fourth segment, or *vice versa*, the pubescence on the rest of the fourth segment including all the tip black and slightly longer, extending slightly on to the hind part of the disc of the third segment. Belly shining aeneous black on the disc but with wide lateral margins up to the dorsal plates; second segment with rather abundant and rather long orange pubescence; third segment with shorter similar pubescence; fourth segment with much shorter dull brownish pubescence about its base but all black on the rest; fifth segment (concealed under the fourth dorsal segment) triangular and shining black with entirely black pubescence.

Legs reddish-orange; coxae and trochanters black and moderately shining, and the last two joints of the tarsi black; femora more reddish, hind pair slightly obscured above near the base or, in one specimen, all the femora blackish at the base and the posterior pairs even to the basal third; hind tibiae sometimes with a blackish speck outside just before the middle, and always with a kink inside at about three-quarters of their length. Pubescence on the front femora beneath towards behind dense, equal, and all orange; on the middle femora shorter, especially on the tip half, slighter, and

rather less dense; on the hind femora mainly on the front part, but some beneath near the base, and there are some black hairs beneath about the tip; the tiny pubescence on the tibiae and tarsi is all orange, even on the black joints of the tarsi, but the soles of the anterior tarsi bear several short black bristles and there are a few on the soles of the hind tarsi, after the basal joint and the base of the second joint; claws black at the tip; pulvilli dull glassy yellowish.

Wings with an orange tinge on the base and the fore part, and the stigma orange though blackish at its extreme base; veins on the basal half orange, and the costal vein orange almost to the tip of the subcostal vein, other veins blackish; cubital vein slightly arched; upper marginal cross-vein never far from the wing-margin, but about twice as far at its slight bend as at its top or bottom, and ending in the cubital vein at an acute angle near the wing-tip; discal cross-vein placed before the basal third of the discal cell and moderately sloping. Squamae dark glassy yellow, with a yellow or orange margin, the alar pair with a short dense matted yellow or orange fringe, the thoracal pair with a long orange or dark orange fringe and with some rather long orange pubescence on the outer part of the disc. Halteres small, brownish-orange.

Length without antennae about 12 mm. Antennae 3 mm.

Four female specimens of this beautiful fly were taken by Col. J. H. Yerbury near Nethy Bridge in Inverness, from August 8th to 21st 1904.* Altogether he saw about ten specimens, but found them very difficult to follow with the eye when they were on the wing; he saw the first specimen on August 3rd, but only as a strange reddish insect paying fleeting visits to the pine-stumps; this insect, however, attracted him so much that he made special search for it, and on August 8th after a long day's work he was returning home, and while hesitating about taking shelter from a shower under a big pine-tree he became aware that an *Eristalis*-like fly was flying up and down the trunk; after one abortive attempt at capturing it, the fly returned and was boxed while sitting on the trunk; on August 16th he missed two specimens which appeared to be yellower in colour and which might have been males, but he took another female. He mentions in a letter to me an interesting chain, "hunting for the headquarters of *Laphria flava* showed me where *Xylota florum* occurred in numbers.

* At the same locality, on August 9th, 1911, Col. Yerbury took two more females.—J. E. C.

hunting for *X. florum* showed me where *Callicera* paid fleeting visits, hunting for *Callicera* showed me where *Palloptera usta* occurred in some numbers, while catching *P. usta* put me on the track of a *Drosophila* which sat on the stumps and flicked its wings about almost exactly like *Palloptera*."

I have had much pleasure in naming this fine species after Col. Yerbury, especially as the species of this genus and of the allied genus *Ceria* have been very extensively used for association with their original captors or with well-known Dipterologists.

C. DOLESCHALLI, n. sp. ♂.

♂. Head wider than thorax and seen in profile nearly two-thirds as long as deep; face shining black slightly obscured with brownish-grey dust and with rather abundant pale brownish-grey pubescence, hanging down or sloping rather inwards, leaving bare a broad shining black middle line all down the face; eye-margins broadly dusted brownish-grey, seen from above there is a line of dark pubescence running down the sides of face from the base of antennae parallel with eye-margin; frontal prominence broad and rounded all polished black; upper part of face under antennae bulging; a rather broad black space across front part of jowls from eyes to mouth, jowls with long brownish-grey pale pubescence like that on face; lower half of back of head a little inflated and all the same brownish-grey colour as facial eye-margins but with only short brownish-yellow pubescence, upper half blackish, reduced in width and hollowed out towards vertex, with a brownish post-ocular ciliation on upper part ending in much longer hairs on vertex. Eyes with dense brown pubescence longest on front part of eye, shorter, rather sparser and paler below and behind, but no dark band visible. Antennae with the basal joint long, rather ferruginous, second joint dark-brown about two-thirds the length of first, third joint dark-brown and nearly so long as the first two together, about as thick as end of second joint for half its length then gradually tapering to a moderate point, arista not quite so long as the third antennal joint, blackish and moderately thick on basal quarter then not conspicuously white but slightly brownish-white and ending in a very sharp point, the basal antennal joint with unusually conspicuous bristly pubescence on end three-quarters above, and on end half beneath, second joint with very minute, hardly noticeable pubescence.

Thorax dark aeneous, appearing darker behind because of black pubescence, on the disc may be traced with difficulty a broad middle

black stripe and apparently four more broad lines the two outer ones on each side connected in front just about the suture. Pubescence fairly dense but not very long except at sides and nearly erect on the disc, brownish-grey on all fore part but black on all hind part becoming long and rather conspicuous on and about postalar calli. Scutellum moderately bright aeneous, large, rather inflated and semi-circular, pubescence round margin forming a long conspicuous whitish fringe but on disc not quite so long and tinged with brown.

Abdomen much spoilt by damp, pubescence on two basal segments long, pale-brownish on first segment (almost whitish at sides, similar to that round margin of scutellum, but rusty on disc), black and conspicuous on all second segment (but rusty on disc), erect abundant and whitish-yellow on third and fourth segments. I think the first segment is deep black and that there is on the second segment well after the aeneous base a broad transverse deep black band which is extended down the middle to the hind-margin. Belly aeneous with rather abundant brownish-orange pubescence.

Legs orange-red with nearly the basal half of femora indeterminate black, tarsi blackish after most of basal joint, the last three joints of tarsi appear to be a little dilated. Femora all with abundant greyish-white pubescence but front pair with a few inconspicuous black hairs behind above. Front tibiae behind on more than tip half with a conspicuous whitish fringe which occurs (though much less conspicuous) on middle tibiae, hind tibiae also with some inconspicuous short whitish pubescence about the middle.

Wings rather tinged with brownish about the base and especially about the middle and on the stigma, discal cross-vein before one-quarter the length of discal cell, upper marginal cross-vein with a rounded angle. Alar squamae blackish-brown with fringes of the same colour, thoracal squamae more orange-brown with large conspicuous fringes of the same colour. Halteres orange.

Length about 12 mm. without antennae, which measures 2.75 mm.

Described from a male in the British Museum taken by Lieut. E. Y. Watson in the N. Chin Hills (5,000 feet) in March 1893.

C. ERRATICA, Walker, List Dipt. Brit. Mus., iii. 543 (1849). ♀.

Second antennal joint on the outer side slightly more, but on the inner side distinctly less, than half the length of first; first joint obscurely tawny, paler at the base than at the tip, bearing scattered, all short, black bristles on the end two-thirds, second and third

joints dull black the former densely clothed with short bristles, first joint and basal third of third joint dusted with red pollen, third joint a little dilated for basal two-fifths then gradually tapering to a blunt end. Style missing in the specimen examined. Face nearly all covered with orange pubescence hardly obscuring the ground-colour and leaving bare only a narrow shining black middle line; the black line against jowls narrow; jowls and lower half of back of head with long orange pubescence, which becomes shorter and browner on the upper part of back of head but is longer, bent forward and orange on the vertex as far forward as the top ocelli, in front of which the frontal pubescence is dense, soft and rather upturned and when viewed from in front is very inconspicuous, frons moderately shining blue-black but slightly obscured by dust, lower half of sides of frons with an eye-stripe of whitish-grey dust continued (but yellower in colour) all down sides of face. Eyes when viewed from in front with a narrow conspicuous black band of pubescence running down just in front of the middle, and with long rather dense whitish pubescence before and behind it; this pale pubescence extends all over the rest of eye leaving only just the middle of back part bare, and is most dense against the black band. The facial pubescence creeps up the sides of the frontal prominence leaving only just the prominence bare, and there is no sign of a black band of pubescence across frons.

Thorax dull black (apparently having been cleaned), but probably of an aeneous colour in life because the sides are aeneous black, scutellum moderately shining black with a tinge of aeneous. Pubescence equal, all tawny. It is impossible to tell whether stripes are present or not.

Abdomen moderately shining black tinged with aeneous; basal segment and a semi-circular depression at the middle of the base of second segment, dull black; across the middle of second and third segments (just after middle of second and probably interrupted on third segment) there may be indications of a very narrow dull black band. Pubescence all tawny and short except about basal corners of second segment.

Legs red-tawny, coxae black but even tips of tarsi only a little obscured, pubescence abundant on femora, moderate but noticeable behind anterior tibiae, and all orange.

Wings with brownish-orange infuscation about the veins on the front part even to tip of wing, also along discal vein to almost end of discal cell; discal cross-vein at two-fifths the discal cell; upper marginal cross-vein with a slight angle. Squamae glassy whitish-yellow, with long yellow fringes. Halteres brownish-orange.

Length 11 mm. without antennae, which measures 4 mm.

This description was made from the original type specimen of *Chrysotoxum erraticum* in the British Museum.

C. SACKENI. n. sp. ♂.

♂. Head dilated and nearly two-thirds as long as broad, pubescence of face greyish-orange and hardly leaving a bare middle line but bare only just about middle of facial knob, a good deal of yellow dust along upper sides of face, pubescence similar to the facial is present all round under eyes and up lower part of back of head which is very little inflated; jowls aeneous. Eyes densely clothed with pubescence and I think I can trace a dark line of pubescence down eyes in the usual place. Frons shining black, almost or quite bare. Antennae without style not so long as head, both the basal segments short and third segment quite three times as long as the other two together, considerably dilated on the basal half and ferruginous beneath at the base, but tapering on the end half; style long, white and thin, but blackish and thickened at base, about half as long as the third joint.

Thorax with brownish-orange dense pubescence, but more than hind half of disc with mainly black pubescence intermixed, and scutellum on disc with practically all rather conspicuous black pubescence, though beneath and round margin the pubescence is longer and all brownish-orange. Pleurae with brownish-orange pubescence.

Abdomen bright aeneous though I can trace nearly all the second segment dull black and a broad dull black band right across the disc of third segment, it is on this latter segment that the bright aeneous colour is most conspicuous on the fore- and hind-margins, broader at the sides than at middle; the fourth segment appears coppery aeneous. Pubescence equal and dense of a more ruddy hue than on thorax with no trace of black hairs at tip. Belly with dense brownish-orange pubescence. Genitalia black.

Legs rufous orange, femora black except on the tip quarter when they become indeterminately rufous orange, tarsi rather darkened above on the last two or three joints. Pubescence behind anterior, and in front of hind femora, dense, not very long, brownish-orange; hind tibiae rather darkened above for a considerable space after the middle; coxae, trochanters, and base of femora conspicuously black haired, especially the coxae and trochanters.

Wings rather brownish about base and fore part just past discal cross-vein and more so about costa to end of long subcostal vein, discal cross-vein at two-fifths of discal cell, upper marginal cross-vein a little angulated. Squamae dark brownish glassy, fringes of thora-

cal squamae long brownish-orange. Halteres with small blackish-brown knobs.

Length without antennae 13 mm. Antennae 3·5 mm.

Described from one male in the British Museum from Burma (Fort White, N. Chin Hills, 7,000 feet, April 1893), collected by Lieut. E. Y. Watson.

C. POULTONI, n. sp. ♀.

♀. Face with dense golden pile leaving middle line bare, frons (? partly rubbed) with a patch of golden pile on each side a little above antennae then about middle with a cross-band of longer erect black hairs, and a few black hairs about ocellar space and some long ones at back of vertex; all back of head from jowls to vertex with dense golden pile but there is a rather wide bare shining black space between jowls and face. Eyes with fairly abundant pubescence, brown on upper part but pale on lower part, and there is apparently a broad dark brown band of pubescence running down the eye from about a quarter from top to about middle, after which the same band seems to be composed of whitish pubescence behind and brown in front (the whitish predominating)—the top and back part of the eye may be bare (perhaps rubbed). Antennae with the second joint half the length of first, but both short, and the third joint more than three times as long as the first two together, very moderately dilated for about half its length then gradually diminishing but altogether rather slender, style long about one-third the length of third joint, basal joint black then orange, style long pure white and rather thick from dense white pubescence; base of antennae and top of antennal prominence brownish.

Thorax apparently dull slaty black (much rubbed and apparently having been wetted) with three conspicuous rather narrow black lines down the disc well apart, and of these the two side ones widen a little above the suture, while none extend more than half-way between suture and hind-margin. Scutellum similar in colour to thorax, but I can see traces of bright aeneous round margin (which tends to confirm my suspicions of discoloration), the pubescence as left is mainly a dense golden one round margin. All about disc of thorax, especially behind the humeri and possibly on disc of scutellum are a few scattered, erect, thin, blackish hairs, which may well exist though inconspicuous amidst a dense golden pile and might remain even when that pile had been rubbed off, but in this specimen the dense golden pubescence remains only on sides after base of wings and along hind-margin.

Abdomen dull black (possibly having been wetted) with traces of


shining on the front quarter of the second segment and narrowly along the hind-margin, while the third segment at the middle has a pair of brilliant aeneous, narrow, transverse bands well separated in the middle, widening upwards at sides towards basal corners and quite reaching the side-margins, the side-margins below them and the hind-margin narrowly are also rather bright aeneous; the fourth segment has a pair of similar transverse bands slightly sloping upwards and nearly meeting at the middle. Pubescence (as left in specimen examined) forming a dense bright golden band on hind-margin of the second, third and fourth segments, but there are indications of golden pubescence all over the abdomen but no sign of any apical black hairs. Belly with rather universal golden pubescence (long on hind half of second and third segments), which tends to prove that upper side should be all covered.

Legs, after the black coxae and trochanters, all fulvous except at tips of tarsi, pubescence as far as traceable all clear orange, no pubescence noticeable on front tibiae or any long pubescence visible behind anterior or in front of hind femora (probably, however, rubbed off).

Wings with a strong fulvous tinge mainly caused by the orange-red anterior veins, but still the anterior part is all so tinged and it only gradually dies away towards tip and hind-margin; discal cross-vein at two-fifths discal cell, upper marginal cross-vein with a very slight angle, in fact only slightly rounded. Squamae pale yellow with long red-orange fringes. Halteres apparently with a brownish knob and pale stem.

Length without antennae 12 mm. Antennae 4 mm.

Described from a single specimen in the Hope Department of the University Museum of Oxford with a label "Mexico," a small square coloured label [74] and a diamond

shaped label 

XII. *Notes on British Mycetophilidae.* By F. W. EDWARDS,
B.A., F.E.S.

[Read May 7th, 1913.]

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PLATES XII–XVIII.

IN the preface to his List of British *Diptera*, published in 1901, the late Mr. G. H. Verrall said of the British *Mycetophilidae*, “this family, though much improved, is still in a most unfinished condition.” The truth of this remark will be appreciated when it is stated that in the following notes no fewer than 124 species are introduced as new to the list, while nearly 50 names have been proved to be synonyms or wrongly identified; so that the net total of additions is about 70. But Mr. Verrall’s remark is still true to some extent, for several genera remain more or less unworked, while even in those which have been studied most, it is evident that many more species remain to be found in Britain, since so many of those now known are represented by single specimens only.

The large increase in the number of British species here made would hardly have been possible from the study of a single collection, and the writer desires to express his thanks to all those to whom he is indebted for the loan of specimens, for the gift of material to the National Collection, and for help in other ways. Of these gentlemen particular mention must be made of Mr. F. Jenkinson of Cambridge, who has very kindly read the proofs of this paper and contributed many useful suggestions, besides giving the writer access to the whole of his very extensive collections.

In the following notes an asterisk has been placed against each species or genus recorded for the first time as British, and the initials of the collector are placed in brackets after each record. The collectors, with the localities from which they have mainly obtained their material, are as follows:—

F.C.A.	Mr. F. C. Adams.	New Forest.
E.A.A.	Mr. E. A. Atmore.	King’s Lynn.
A.E.J.C.	Mr. A. E. J. Carter.	Perthshire.
J.E.C.	Mr. J. E. Collin.	Various localities.

F.J.	Mr. F. Jenkinson.	Logie (Elgin); Crowborough (Sussex), etc.
C.G.L.	Mr. C. G. Lamb.	New Forest; Nethy Bridge (Inverness), etc.
C.M.	Mr. Claude Morley.	Suffolk.
A.P.	The late Mr. A. Piffard.	Felden (Herts).
D.S.	Dr. D. Sharp.	New Forest; Nethy Bridge, etc.
H.S.	Mr. Hugh Scott.	Henley-on-Thames.
G.H.V.	The late Mr. G. H. Verrall.	Newmarket (Suffolk), etc.
J.H.W.	Dr. J. H. Wood.	Herefordshire.
J.W.Y.	Lt.-Col. J. W. Yerbury.	Sutherland; Inverness; Cornwall, etc.

A considerable amount of new synonymy is given, mainly rendered necessary by the identification of a number of Walker's types in the British Museum collections. It is most unfortunate that under the existing rules some of these names have to take precedence over others which have been better founded and are in general use. Although no believer in the rigid application of the "rule of priority," which seems to me mainly to tend to put a premium on bad work, I have adopted these names for the sake of conformity to rules.

Certain other changes proposed by Coquillett and Johannsen have not been adopted in their entirety. Since Rondani was the first to divide Meigen's *Sciophila*, I have with great reluctance replaced *Lasiosoma* by *Sciophila*, and *Sciophila* by *Mycomyia*, though I cannot agree to spell this last name as Rondani did, "Mycomya." The replacing of *Anaclinia* by *Neuratelia*, Rond., seems to be wrong, for since Rondani included his genus in his section BB, "venae transversariae non adsunt vel inter primam et secundam longitudinales, vel inter secundam et tertiam," meaning that the subcostal cross-vein was absent, it is evident that he had wrongly identified Meigen's *Mycetophila nemoralis*, which has a subcostal cross-vein. Whether Rondani's *Neuratelia nemoralis* was a species of *Leia* or *Paraneuratelia* it is impossible to say, and therefore, fortunately, there is no excuse for not placing his genus on the scrap-heap.

According to the zoological rules in force at the time when Winnertz's monograph was published "when the evidence as to the *original* type of a genus is not perfectly clear and

indisputable, then the person who first *subdivides the genus* may affix the original name to any portion of it at his discretion, and no later author has a right to transfer that name to any other part of the original genus."* Curtis specified *L. fascipennis* as the type of the genus *Leia*, but did not subdivide it; Rondani specified *L. bimaculata* as the type and renamed the genus *Lejomya*, but Winnertz was the person who first subdivided *Leia*, and his interpretation therefore takes precedence above all others. The attempt to use the name *Leia* in another sense arises entirely from a misinterpretation of the rule quoted through ignoring the word "original." Rondani's *Leiomya* (the corrected form of *Lejomya*) is evidently the same as Winnertz's *Glaphyroptera*, and so must be used, both because it is the older and because *Glaphyroptera* is preoccupied.†

Although these notes are far from complete, it is hoped that they will enable collectors roughly to place their specimens, and at least in the genera *Bolitophila*, *Macrocera*, *Platyura*, *Sciophila*, and *Mycetophila*, to determine them with some degree of accuracy. Certain species of these genera, and the majority of those in the other genera, can only be properly differentiated by a microscopic examination of the male hypopygium, and it is frequently necessary (particularly in the genus *Boletina*) to remove this organ and mount it in balsam (after clearing with potash) before its structure can be properly ascertained. The figures of hypopygia here given have been prepared from specimens mounted in small drops of stiff balsam, placed (without cover-slip) on small strips of transparent celluloid, which are kept on the same pin which bears the remainder of the insect.

The table of genera may be useful to those who do not possess Johannsen's monograph in the *Genera Insectorum*. In this key an attempt has been made to use only those characters which will group the genera according to natural relationships, but as Johannsen has suggested, it is highly probable that the *Mycetophilinae* is of polyphyletic origin and therefore in a strictly scientific arrangement should be divided into two or more groups or else united with the

* Brit. Ass. Rept. 1842, p. 111. Although the wording of this rule was altered in 1905, the general sense remains the same and the words italicised here are still retained.

† This is not the case with *Leia*. The coleopterous genus of the same name was not published until 1821.

Sciophilinae; our knowledge, however, is not yet sufficiently advanced for this, though it seems probable that *Acnemia* may have arisen directly from *Monoclona*, and *Anaclinia* from *Polylepta*. In this key some new characters have been used, while others, such as the presence or absence of a subcostal cross-vein or a median ocellus, have been discarded as useless for separating genera, since they are not infrequently variable within the limits of a species. The Comstock-Needham nomenclature of venation has been adopted, and should readily be understood with the aid of the three figures of wings which are given. For the sake of convenience the genera are separately dealt with in the order in which they appear in Kertész's catalogue, but it may be pointed out that this is not entirely a natural arrangement; for example, there is, I feel convinced, only a superficial resemblance between the genera *Phronia* and *Exechia*; the former is closely allied to *Trichonta*, the latter to *Rhymosia*.

Several papers, containing figures of the hypopygia of very many of our species, have recently been issued, and the student of British *Mycetophilidae* will find these absolutely indispensable. The most important are as follows:—

- DZIEDZICKI, H. [On the genus *Mycetophila*, etc.] Pam. Fyzj., Warsaw, tom. iv, pp. 298–324, pls. v–ix (1884).
[On *Boletina*, *Sciophila*, etc.] Pam. Fyzj., tom. v, pp. 164–194, pls. iv–ix (1885).
Revue des espèces européennes du genre *Phronia*. . . .
Horae Soc. Ent. Ross., 23, pp. 404–532, pls. xii–xxi (1889).
Zur Monographie der Gattung *Rhymosia*. Winn. Horae Soc. Ent. Ross., 39, pp. 89–104, pls. i–vi (1910).
- LUNDSTRÖM, C. Neue oder wenig bekannte europäische Mycetophiliden. Ann. Mus. Nat. Hung., 1911, No. ix, and 1912, No. x.
Beiträge zur Kenntniss der Dipteren Finlands. Acta Soc. pro Fauna et Flora Fennica, Helsingfors. Vol. 29, No. 1 (1906); vol. 32, No. 2 (1909); vol. 36, No. 1 (1912).
- LANDROCK, K. Neue oder seltene Mycetophiliden aus Mähren. Wien. Ent. Zeit. 1912, pp. 27–39.
Neue oder wenig bekannte Pilzmücken. Wien. Ent. Zeit. 1912, pp. 175–185.

Zur Monographie der Gattung *Bolitophila*, Meig. Berl. Ent. Zeit. 1912, pp. 33-51.

In addition to these papers, some helpful notes on many of the British species have been given by JENKINSON (*Ent. Mo. Mag.*, 1908, pp. 129-133, 151-154); reference to these will be made subsequently.

The following types of Walker's still exist in the British Museum, and have been determined by me as follows:—

<i>Symmerus ferrugineus.</i>	↘ <i>Plesiastina annulata</i> , Mg.
<i>Platyura vitripennis.</i>	↘ <i>Platyura semirufa</i> , Mg.
,, <i>mycetophiloides.</i>	,, <i>dorsalis</i> , Staeg.
,, <i>nigriceps.</i>	,, <i>nigriceps</i> , Winn.
,, <i>antica.</i>	,, <i>nigricornis</i> , F.
,, <i>conclisa.</i>	,, <i>zonata</i> , Zett.
,, <i>servula.</i>	<i>Helladepichoria servula.</i>
<i>Sciophila tenuis.</i>	<i>Sciophila apicalis</i> , Winn.
,, <i>maura.</i>	,, <i>lugubris</i> , Winn.
,, <i>compressa.</i>	<i>Tetragoneura sylvatica</i> , Curt.
,, <i>aliena.</i>	,, <i>hirta</i> , Winn.
,, <i>rufilatera.</i>	<i>Monoclona ? unicolorata</i> , Dz.
↙ <i>Boletina plana.</i>	<i>Boletina grzegorzekii</i> , Dz.
<i>Leptomorphus elongatus.</i>	↘ <i>Anaclinia nemoralis</i> , Mg.
<i>Azana scotopsoides.</i>	↘ <i>Azana anomala</i> (Staeg.).
↙ <i>Leia basalis.</i>	<i>Docosia valida</i> , Winn.
,, <i>parallela.</i>	<i>Trichonta</i> (?) <i>atricauda</i> , Zett.
,, <i>defecta.</i>	↘ <i>Aenemia nitidicollis</i> , Mg.
,, <i>pubescens.</i>	<i>Docosia valida</i> , Winn.
<i>Mycetophila binotata.</i>	<i>Zygomyia pictipennis</i> , Staeg.
,, <i>stolida.</i>	<i>M. stolida</i> , Winn.
,, <i>nigritula.</i>	<i>Zygomyia notata</i> , Stan.
,, <i>sobria</i> .*	↘ <i>Allodia crassicornis</i> , Stan.
,, <i>conformis</i> .†	<i>Phronia girschneri</i> , Dz.
,, <i>terminalis.</i>	<i>Trichonta funebris</i> , Lundstr. (? Winn.).
,, <i>finalis.</i>	↘ <i>Empalia vitripennis</i> , Mg.
,, <i>longicornis.</i>	↘ <i>Allodia lugens</i> , Wied.
,, <i>leioides.</i>	<i>Phronia crassipes</i> , Winn.
,, <i>reciproca.</i>	<i>Dynatosoma nigricoxa</i> , Ztt.
,, <i>ocellus.</i>	<i>Mycothera dimidiata</i> , Staeg.
,, <i>flava.</i>	<i>Coelosia flava</i> , Staeg.

* A second specimen is a female *Boletina* (?) *inermis*, Lundstr.).

† A second specimen under the same name is *P. forcipata*, Winn.

The following species are among those wrongly identified by Walker, and should therefore be struck off the list, as they have not since been discovered in this country: Walker's

<i>Mycetophila paludosa</i>	was	<i>Zygomylia valida</i> .
„ <i>lutescens</i>	„	<i>M. rufescens</i> , Ztt.
„ <i>uninotata</i>	„	<i>M. linda</i> , Mg.
„ <i>maculosa</i>	„	<i>Rhymosia fenestralis</i> , Mg.
„ <i>sericea</i>	„	<i>Brachycampta</i> ? <i>caudata</i> , Winn.
„ <i>fuscula</i>	„	<i>Exechia</i> ? <i>lateralis</i> , Mg., and <i>Brachycampta</i> , sp.
„ <i>tarsata</i> .	„	<i>Phronia signata</i> and <i>Monoclona</i> ? <i>halterata</i> .
<i>Platyura atrata</i> .	„	<i>P. semirufa</i> , Mg.

TABLE OF RECENT EUROPEAN GENERA OF MYCETOPHILIDAE.

[Genera which have not yet been found in Britain are enclosed in brackets. The dubious genera *Synapha*, *Agaromyia*, and *Piotepalpus* are omitted. The genera *Parastemma*, *Rutrophora*, *Telmaphilus*, *Brachycampta*, and *Mycothera* have been sunk as they appear to me to be insufficiently distinguished from *Megophthalmidia* (the first two), *Phronia*, *Allodia*, and *Mycetophila* respectively.]

1. Cu_1 connected with M either by contact or by the M-Cu cross-vein 2.
- Cu_1 and M not connected 3.
2. Cross-vein R-M distinct 4.
- Cross-vein R-M obliterated by the contact of R_s with M (*Ceroplastinae*) 10.
3. R_{2+3} distinct, short, ending in R_1 (*Sciophilinae*) 14.
- R_{2+3} not separated from R_{1+5} , i. e. R_s unbranched (*Mycetophilinae*) 28.
4. R_s branched 5.
- R_s unbranched (*Diadocidinae*) DIADOCIDIA, Ruthe.
5. Cross-veins (R-M and M-Cu) close together; usually only one basal cell 6.
- Cross-veins widely separated; two basal cells (*Bolitophilinae*) 7.
6. R_s with three branches (*Pachyneurinae*) [PACHYNEURA, Zett.]
- R_s with two branches, R_{2+3} and R_{1+5} (*Mycetobiinae*) 8.

BOLITOPHILINAE.

7. Antennae 17 jointed, slender BOLITOPHILA, Mg.
- Antennae 12 jointed [HESPERINUS, Walk.]

MYCETOBINAE.

8. Sc_1 long, ending in costa MYCETOBIA, Mg.
 Sc_1 very short, not reaching costa 9.
 9. R_s forks before base of fork of M DITOMYIA, Winn.
 R_s forks beyond base of fork of M SYMMERUS, Wlk.

CEROPLATINAE.*

10. Antennae at least as long as the whole body MACROCERA, Mg.
 Antennae much shorter, usually not longer than the head and
 thorax 11.
 11. Proboscis produced (as long as the head or longer) 12.
 Proboscis not distinctly produced 13.
 12. Sc rather long, reaching costa; first joint of palpi roundish
 ASINDULUM, Ltr.
 Sc short, not reaching costa; first joint of palpi much elongated
 HELLADEPICHORIA, Beck.
 13. Antennae flattened; palpi very short and thick
 CEROPLATUS, Bosc.
 Antennae not or scarcely flattened; palpi rather long and thin
 PLATYURA, Mg.

SCIOPHILINAE.

14. Lateral ocelli contiguous with the eye margins
 [EUDICRANA, Lw.].
 Lateral ocelli remote from the eye margins 15.
 15. Wings, at least towards the apex, with a distinct though short
 pubescence 16.
 Pubescence of wings microscopic 0
 16. Cu not forked MONOCLONA, Mik.
 Cu forked as usual 17.
 17. M forks at or scarcely beyond cross-vein $R-M$, *i. e.* upper fork
 almost or quite sessile SCIOPHILA, Mg. (*Lasiozoma*, Winn.).
 M forks far beyond cross-vein $R-M$ 18.
 18. Cell R_1 (the Sciophilina cell) large; wings hairy only towards
 apex PARATINIA, Mik.
 Cell R_1 very small; wing pubescence very short but uniform 19.
 19. R_{4+5} wavy; Cu forks beyond the cross-vein $R-M$
 POLYLEPTA, Winn.
 R_{4+5} straight; Cu forks below the cross-vein $R-M$
 LOEWIELLA, Meun.
 20. Cross-vein $R-M$ very long and almost horizontal. 21.
 Cross-vein $R-M$ moderately short and very far from hori-
 zontal 22.

* Including *Macrocerinae*.

21. Cu forks close to base of wing ECTREPESTHONEURA, End.
 Cu forks beyond cross-vein R-M TETRAGONEURA, Winn.
22. Costa not reaching beyond tip of R_{4+5}
 MYCOMYIA, Rnd. (*Sciophila*, Winn.).
 Costa extending at least slightly beyond tip of R_{4+5} 23.
23. Sc_1 ends in R_1 24.
 Sc_1 ends in costa 25.
24. Proboscis produced, nearly as long as the head
 [HADRONEURA, Lundstr.]
 Proboscis not produced DZIEDZICKIA, Joh.
25. Sc_2 (subcostal cross-vein) absent APOLIPHITHISA, Grzeg.
 Sc_2 present 26.
26. Cu forks under slightly before base of fork of M; wings clear
 EMPALIA, Winn.
 Cu forks considerably before fork of M 27.
27. Sc_2 before base of R_3 ; wings not banded
 [PALAEOEMPALIA, Meun.]
 Sc_2 above or beyond base of R_3 ; wings banded
 NEOEMPHERIA, O.-S.

MYCETOPHILINAE.

28. Lateral ocelli remote from the eye margins 29.
 Lateral ocelli contiguous with the eye margins or nearly so 44.
29. Cu simple, not forked 30.
 Cu forked 31.
30. Sc_1 long and distinct; M forked ACNEMIA, Winn.
 Sc_1 very short; M simple AZANA, Wlk.
31. Sc_1 long 32.
 Sc_1 short, not reaching costa 43.
32. Sc_1 terminating in R_1 SYSTEMNA, Winn.
 Sc_1 terminating in the costa 33.
33. Proboscis very much elongated GNORISTE, Mg.
 Proboscis shorter than the head if produced at all 34.
34. Wings with a distinct short pubescence (compare also
Phthiria) 35.
 Wings with only microscopic pubescence 38.
35. M_1 almost or quite complete; wings marked 36.
 M_1 obviously defective at the base; wings unmarked 37.
36. Sc_2 placed rather near tip of Sc_1 ; large species
 LEPTOMORPHUS, Curt.
 Sc_2 placed before middle of Sc_1 ; rather small species
 ALLOCOTOCERA, Mik.
37. Costa produced only slightly beyond tip of R_{4+5}
 ANACLINIA, Winn.

- Costa produced much beyond tip of R_{4+5}
 PARANEUROTETIA, Landr.
38. Cu forks under or beyond the R-M cross-vein; tibial setae weak. 39.
 Cu forks considerably before the R-M cross-vein; tibial setae strong 42.
39. Base of fork of Cu below or before that of M 40.
 Base of fork of Cu much beyond that of M 41.
40. Sc_2 (when present) placed near middle of Sc_1 BOLETINA, Mg.
 Sc_2 placed near tip of Sc_1 . . . EMPALIA, Winn. (part).
41. Front metatarsus much longer than the tibia; Cu_2 wavy
 PHTHINIA, Winn.
 Front metatarsus scarcely as long as the tibia; Cu- not wavy
 COELOSIA, Winn.
42. M_1 and Cu_1 both interrupted at base; costa exceeding R_8
 LEIA, Mg.
 M_1 not interrupted at base; costa not exceeding apex of R_8
 LEIOMYIA, Rnd. (*Glaphyroptera*, Winn.).
43. Base of fork of Cu nearer base of wing than that of M
 MEGOPHTHALMIDIA, Dz.*
44. Cu simple 58.
 Cu branched 45.
45. Second joint of palpi greatly enlarged (first minute)
 CORDYLA, Mg.
 Second joint of palpi not conspicuously enlarged . . . 46.
46. Costa extending distinctly beyond the tip of R_3 . . . 47.
 Costa not extending beyond the tip of R_3 51.
47. Bases of forks of M and Cu about level 48.
 Base of fork of Cu distinctly nearer apex of wing than that of M 49.
48. Sc_1 long; axillary vein wanting DOCOSIA, Winn.
 Sc_1 short; axillary vein distinct EPICYPTA, Winn.
49. Fork of Cu much shorter than that of M 50.
 Fork of Cu only a little shorter than that of M
 ANATELLA, Winn.
50. Costa only slightly produced beyond tip of R_3 ; anal vein weak
 PHRONIA, Winn.
 Costa considerably produced beyond tip of R_3 ; anal vein strong
 [MACROBRACHIUS, Dz.].
51. Sc_1 reaching beyond middle of basal cell and (except in *T. submaculata*) ending in R_1 TRICHONTA, Winn.

* Including *Parastemma* and *Rutrophora*.

- Sc₁ not reaching middle of basal cell or if rather longer not ending in R₁ 52.
52. Cu₁ and Cu₂ obviously divergent in their terminal portions; tibial setae nearly always weak; wings generally unmarked 53.
- Cu₁ and Cu₂ parallel or slightly convergent in their terminal portions; tibial setae strong and conspicuous; wings nearly always spotted 59.
53. Base of fork of Cu nearer apex of wing than that of M; tibial setae always weak 54.
- Base of fork of Cu nearer base of wing than that of M; if not, then with strong tibial setae 55.
54. R₁ slightly indented at origin of R₂; M forks beyond origin of R₂
PIRONIA, Winn.*
- R₁ straight except towards tip; M forks before origin of R₂
EXECHIA, Winn.
55. Anal vein long and conspicuous 56.
- Anal vein short and inconspicuous or altogether wanting 57.
56. Base of fork of Cu nearer apex of wing than that of M; tibial setae strong; wings with dark clouds DYNATOSOMA, Winn.
- Base of fork of Cu nearer base of wing than that of M; tibial setae weak; wings unmarked RHYMOSIA, Winn.
57. A very long vein-like fold simulating the anal vein, lying close up against Cu and extending nearly to the middle of the fork
BRACHYPEZA, Winn.
- This fold if present at all is very much shorter ALLODIA, Winn.†
58. R₁ and R₂ closely approximated to one another and to the costa
SCEPTONIA, Winn.
- R₁ and R₂ not closely approximated to one another or to the costa
ZYGOMYIA, Winn.
59. Male genitalia not enlarged; female without distinct setae on the ventral side of the sixth abdominal segment
MYCETOPHILA, Mg.‡
- Male genitalia very large; female with a few setae on the ventral side of the sixth abdominal segment OPISTHOLOBA, Mik

BOLITOPHILA, Mg.

1. R₂₊₃ ending in the costa 2.
- R₂₊₃ ending in R₁ 5.

* Including *Telmophilus*, Beck.

† Including *Brachycampta*, Winn.

‡ Including *Mycothera*, Winn.

2. Cu_1 ending in tip of Cu_2 *occlusa*, sp. n.
 Cu_1 ending in the hind margin remote from tip of Cu_2 3.
3. Thorax with three shining blackish stripes; Cu_1 and Cu_2 considerably approximated at their tips *glabrata*, Lw.
 Thorax dull brownish, striped or almost unicolorous; Cu_1 and Cu_2 very little approximated 4.
4. Wings with two distinct dark spots. *bimaculata*, Zett.
 Wings not distinctly spotted
hybrida, Mg.; *pseudohybrida*, Landr.
5. Cross-vein M-Cu obliterated by contact of Cu_1 with M
tenella, Winn.
 Cross-vein M-Cu not obliterated 6.
6. Male antennae long, clothed with long hair *saundersi*, Curt.
 Male antennae shorter, clothed with short hair *cinerea*, Mg.

**B. occlusa*, sp. n.

Fusca; *vena brachiali in costam exeunte: cellula posteriori quinta (Cu²) apice occlusa.*

♂. Dingy brownish; thorax more ochreous with three dark brown stripes. Antennae short haired, shorter than the whole body, with the first three joints yellowish. Legs dingy ochreous, tarsi dark, trochanters and knees black. Wings transparent, only the stigma darker; R_{2+3} ends in the costa close to the tip of R_1 ; cross-vein M-Cu absent as in *B. tenella*; Cu_2 terminating in the tip of A. Genitalia, fig. 1. Length about 6 mm.

One male from Brockenhurst, Hants, 22. v. 1910 (*Lt.-Col. Yerbury*). Type in Mr. Collin's collection.

**B. bimaculata*, Zett. Logie (F.J.); Nethy Bridge (C.G.L.); New Forest (D.S.); Stoke Wood, Hereford (J.H.W.); Aviemore (J.W.Y.).

**B. glabrata*, Lw. A single specimen, much damaged, from Blythburgh, Suffolk (C.M.); Wells, Somerset. 1 ♂ (C.G.L.); New Forest, 1 ♀ (D.S.). The shining thorax and distinctive neuration render its identification certain. It seems to be very rare on the Continent.

B. hybrida, Mg. This is the species generally known as *B. fusca*, Mg. It is not uncommon.

**B. pseudohybrida*, Landrock. Cambridge (F.J., D.S.)

B. tenella, Winn. Of this rare species I have seen only one male in Mr. Collin's collection and one female from Aviemore (J.W.Y.). As in *B. hybrida*, Mg. and *B.*

pseudohybrida, Landr., the middle joints of the front tarsi of the female are distinctly thickened.

B. saundersii, Curt. This species has been erroneously referred to as synonymous with *B. hybrida* (= *fusca*), even Landrock in his recent monograph of the genus assigning that position to it. In reality it belongs to the *cinerea* group, and differs from *B. cinerea* in the long hairs of the male antennae and in the genitalia of the male. It is a fairly common species. Hypopygium, fig. 2.

B. cinerea, Mg. Mr. A. E. Cameron, of Manchester University, has sent me larvae of this species from Manchester and from Delamere Forest. In the latter case they were feeding on a decaying *Agaricus*; "the larvae pupated Nov. 29th and following days, and the imagos began to emerge December 3rd."

MACROCERA, Mg.

- | | |
|--|------------------------|
| 1. Wings microscopically pubescent | 2. |
| Wings distinctly pubescent when viewed through a lens | 8. |
| 2. Wings quite unspotted | 3. |
| Wings with at least a central dark spot | 5. |
| 3. Hind margins of abdominal segments conspicuously lighter than the basal portions. | |
| Hind margins of abdominal segments not lighter than the basal portions | <i>lutea</i> , Mg. |
| 4. Large species; hind coxae with a dark spot; antennae somewhat thickened at the base | <i>fascia'ta</i> , Mg. |
| Small species; hind coxae without dark spot; antennae not thickened. | <i>pusilla</i> , Mg. |
| 5. Wings with dark central markings only | 6. |
| Wings with dark central markings and a dark apex | 7. |
| 6. Wings with a small central spot only; resembles <i>M. fascia'ta grandis</i> , Lundstr. | |
| Wings with a central fascia which reaches the costa | <i>centralis</i> , Mg. |
| 7. Thorax with two black stripes; central fascia interrupted and not nearly reaching R_{2+3} | <i>maculata</i> , Mg. |
| Thorax all yellowish; central fascia irregular but uninterrupted and reaching R_{2+3} | <i>angulata</i> , Mg. |
| 8. Wings with a dark central fascia and dark apex | <i>phalerata</i> , Mg. |
| Wings without distinct dark markings except at the tip of R_1 | <i>stigma</i> , Curt. |

M. crassicornis, Winn. I cannot see how to distinguish this from *M. fasciata*, Mg., and consider that there is only one rather variable species. *M. annulicoxa*, Mik, is evidently a synonym of *M. crassicornis*, Winn.

M. vittata of the List (and probably of Meigen) is, I feel sure, only a variety of the female of *M. lutea*.

M. pusilla, Mg. Dingwall (May 1911) and Loch Assynt (June 1911—J.W.Y.). These specimens perhaps represent the true *M. pusilla*. The *M. pusilla* of our list is apparently an undescribed species, but the material is too poor and scanty to describe.

M. maculata, Mg. This very distinct species, though previously recorded as British, was omitted from the List of 1901. The British Museum possesses three specimens from Felden, Herts (A. Piffard). It resembles *M. phalerata*, but has bare wings, and two blackish marks on the posterior portion of the mesonotum. The latter character, together with the different wing-markings, will also serve to distinguish it from *M. angulata*.

**M. grandis*, Lundstr. Bowness, Westmoreland (G.H.V.).

CEROPLATUS, Bosc.

**C. testaceus*, Dalm. This species has been bred in the New Forest by Dr. Sharp in some numbers, and some have been collected in the same locality by Mr. F. C. Adams. It is in the British List as *C. tipuloides*, Bosc.

The species was at first thought to be undescribed, and figures of the wing and male genitalia were accordingly prepared (figs. 3 and 4), but I am now convinced that it is *C. testaceus*. Dalman described the antennae as 15-jointed, but he regarded the first joint as an articuliform process, and evidently overlooked the minute round terminal (17th) joint. There is no other disagreement between our specimens and the description (*Analecta Ent.*, p. 98). The author described the scutellum as pale testaceous; it is usually darker in the middle. It is doubtful, however, whether Zetterstedt had identified the species correctly.

C. lineatus, F. New Forest (D.S.); Monk's Soham, Suffolk (C.M.); Cambridge (F.J.); Mordiford, Hereford (J.H.W.) The genus *Cerotelion*, Rnd., has been used for this species, but it seems inadvisable to separate it from *Ceroplatus*, since *C. sesioides* (as described by Winnertz)

exhibits an intermediate venation, while in all other characters the species are essentially similar.

PLATYURA, Mg.

I have devoted considerable attention to this genus, having examined fully 300 British specimens in all, a large number considering the rarity of most of the species. There were 18 species represented; I give figures of the hypopygia of all these, except *P. nigriceps*, Wlk., the male of which is unknown to me. Dr. H. Dziedzicki very kindly examined some of my drawings, and informs me that those of *P. marginata*, *modesta*, *infusca*, *fasciata*, *unicolor*, *semirufa*, and *nemoralis* correspond with Winnertz's specimens which he has examined.

There should be little difficulty about determining British specimens of *Platyura* by the following table:—

1. R_{2+3} ending in R_1 (*Apemon*, Joh.), *marginata*, Mg.
 R_{2+3} ending in costa 2.
2. Anal vein reaching hind margin 3.
 Anal vein not reaching hind margin 10.
3. Male antennae almost twice as long as head and thorax together;
 front tibiae and metatarsi equal in length *macrocera*, sp. n.
 Male antennae about as long as head and thorax together;
 front tibiae longer than the metatarsi 4.
4. Wings with an obvious dark tip and a dark cloud on Cu_2
biumbrata, sp. n.
 Wings quite unmarked, or with a small inconspicuous dark
 apical spot 5.
5. Tip of Sc well before base of R_s ; small yellow species 6.
 Tip of Sc level with or beyond base of R_s ; larger species 8.
6. Last two segments of male abdomen black *nigricauda*, Strobl.
 Last two segments of male abdomen yellow 7.
7. Tip of male wing with a small faint greyish spot (female wing
 clear) *flava*, Meq.
 Wing of male quite clear *modesta*, Winn.
8. Thorax black with yellow shoulders (normally)
dorsalis, Staeg., Wlk.
 Thorax yellowish, with or without dark stripes 9.
9. Thorax clear yellowish; wings with a small grey spot at tip
nigriceps, Wlk.
 Thorax with three dark stripes; wings quite clear
dorsalis, Staeg., var.; *atriceps*, sp. n.

10. Anal vein strong, almost reaching the hind margin; rather large species usually with an entirely shining black thorax; tip of costa scarcely extending beyond R_{4+5} . . . *semirufa*, Mg.
 Anal vein weaker; usually disappearing much before the hind margin; if with a black thorax, then small species; costa distinctly produced beyond tip of R_{4+5} 11.
11. Front tibiae distinctly longer than the metatarsi; thorax black 12
 Front tibiae at most as long as the metatarsi; thorax yellow or with yellow ground colour 14.
12. Wings with the apex broadly though sometimes faintly darkened
nemoralis, Mg.
 Wings clear 13.
13. Abdominal segments 2-4 pale at the apex; R_{2+3} rather long and slanting *zonata*, Zett.
 Abdominal segments 2-4 pale at the base; R_{2+3} short and almost vertical *perpusilla*, sp. n.
14. Third and fourth costal divisions about equal; wings almost or quite clear *aestivalis*, Winn.
 Third costal division considerably shorter than the fourth. 15.
15. Wings almost unmarked; costa extending half the distance between the tips of R_{4+5} and M_{1+2} *pectinifera*, sp. n.
 Wings with a dark fascia before the apex; costa extending at most one-third of the distance between the tips of R_{4+5} and M_{1+2} 16.
16. Abdomen mainly or entirely black; thorax of male with three large confluent shining black stripes *nigricornis*, F.
 Abdomen largely or mainly reddish yellow; thorax reddish yellow in both sexes 17.
17. Inner edge of wing-fascia protuberant between R_{4+5} and M_{1+2}
fasciata, Mg.
 Inner edge of wing-fascia indented between R_{4+5} and M_{1+2}
unicolor, Staeg.

P. marginata, Mg. Enderlein (Stett. ent. Zeit. 1911, p. 163) introduces the genus *Paraplatyura* for this species, basing it on the neururation, but since Loew's *P. occlusa* exhibits an intermediate structure, the separation of this species from *Platyura* seems undesirable. Enderlein places it in the Sciophilinae, obviously an error. In any case *Paraplatyura* would be antedated by *Apemon*, Johannsen (Gen. Ins. 1909, p. 20). *P. marginata* has the faint fold-like basal extension of the media and the absence of bristles on the whole body characteristic of *Apemon*, but some other

species, e.g. *P. semirufa* and *P. nigricornis*, have practically no bristles except on the coxae. *Apemon* is therefore not adopted in this paper. As Strobl suggests, *P. marginata* is very likely only a variety of *P. atrata*; I am unable to confirm the latter as British, unless this is the case. Hypopygium, fig. 5.

**P. macrocera*, sp. n. ♂.

Fusca; *antennis thorace cum capite duplo longioribus*; *alis subinfuscatis, immaculatis*; *vena anali marginem attingente*.

Head and thorax blackish-brown, somewhat shining; small yellowish shoulder-patches in front of the mesonotum. Abdomen, including hypopygium, dark brown. The abdomen is unusually long and thin, for a *Platyura*, and the hypopygium (figs. 7 and 8) has a quite unusual structure. Antennae, palpi and legs, dark brown, femora somewhat lighter; front tibiae and metatarsi equal in length. Antennae twice the length of the head and thorax together. Wings (fig. 8a) somewhat infuscated, but quite unmarked. Halteres long, whitish, knob small, black. Length (without antennae) 5 mm.

Two males of this interesting species were taken at Aviemore, Inverness, by Lt.-Col. Yerbury, on August 10th, 1911, and presented by him to the British Museum. Another male was taken by the same collector at Nethy Bridge, 19. vii. 1905, and is in Mr. Collin's collection. The species is sufficiently distinguished from all the other members of the genus by the long antennae, suggesting *Macrocera*. In fact, it is difficult to decide in which of the two genera the species should be placed, though on the whole it would seem to go better in *Platyura*, on account of the venation, which bears a close resemblance to that of *P. flava* and *P. nigricauda*.

**P. biumbata*, sp. n.

Fusca; *thorace flavo brunneo-trivittato*; *abdominis incisuris, coxis, pedibus, halleribusque flavis*; *alis apice fuscis, umbraque fusca in vena postica*; *vena anali marginem posteriorem attingente*.

♂, Head black above, front yellowish; palpi dark brown; antennae black, the two basal joints yellowish. Thorax dingy yellowish, with three separate dark brown stripes. Abdomen dark brown, the posterior borders of segments 1-5 yellowish. Hypopygium as in fig. 9. Legs yellow tarsi and tibial spurs dark; front

tibiae about one-fifth longer than the metatarsi. Wings with the apex dark, and with a dark cloud along Cu_2 . Tip of Sc immediately above base of R_3 ; third costal division scarcely one-third as long as fourth; R_{2+3} moderately long, at an angle of 45° with R_{4+5} ; costa extending nearly half the distance between the tips of R_{4+5} and M_{1+2} ; anal vein reaching margin.

2 ♂. Padstow, Cornwall, Sept. 1903 (*C. G. Lamb*—type in British Museum; para-type in Cambridge Museum); 1 ♂ Studland, Dorset, 11. viii. 1909 (*Lt.-Col. Yerbury*), in Mr. Collin's collection.

P. nigricauda, Strobl. Crowborough (F.J.); New Forest (D.S.); Felden (A.P.); Porthcawl (J.W.Y.). Males only. Hypopygium, figs. 10 and 11.

**P. flava*, Mcq. This is the species recorded by Verrall as *P. modesta*, Winn. Crowborough (F.J.); New Forest (D.S.); Stokenchurch (J.W.Y.); King's Lynn (E.A.A.). The male has a small greyish costal spot at the apex of the wing, resembling in this respect *P. dorsalis* and *P. nigriceps*. Hypopygium, figs. 12 and 13.

P. modesta, Winn. (= *simplex*, Grz.). Studland (J.W.Y.); Tangham Wood (G.H.V.). I have only seen two males of this species, both in Mr. Collin's collection. Hypopygium, figs. 14 and 15.

P. dorsalis, Staeg. (= *mycetophiloides*, Wlk., = *humeralis*, Winn.). King's Lynn (E.A.A.); New Forest (D.S.); Nairn and Aviemore (J.W.Y.); Studland (J.E.C.). Hypopygium, figs. 16 and 17.

P. nigriceps, Wlk. I have only seen two recent examples, a female from Carrow, Norwich (F.J.) and one from Aviemore (J.W.Y.). Two of Walker's original specimens are in the British Museum, both females. The Aviemore specimen has indications of three darker stripes on the thorax. I have rather a strong suspicion that *P. nigriceps* may be only the female of *P. dorsalis* as the only differences seem to be coloration, and equally marked differences are known to occur between the sexes of *P. nigricornis*.

**P. atriceps*, sp. n.

♂. *Flava*; capite nigro, thorace brunneo-trivittato, tarsis antennarumque flagello fuscis; alis flavescentibus, vena anali marginem attingente.

Head black; palpi and three basal joints of antennae reddish-yellow, rest of antennae dark brown. Thorax yellowish with three

brown not confluent stripes; metanotum dark brown. *Abdomen* yellowish, the last segment and the genitalia (figs. 18 and 19) dark brown. *Legs* yellow, tarsi and tibial spurs dark brown. Front tibiae longer than the metatarsi. *Wings* quite unmarked, slightly yellowish tinged; halteres yellow. Apex of Sc opposite base of R_8 ; R_{2+3} long, at an angle of 45° with R_{4+5} ; distance between tips of R_1 and R_{2+3} less than half that between tips of R_{2+3} and R_{1+5} ; costa just reaching tip of wing and extending nearly half the distance between tips of R_{4+5} and M_{1+2} . Anal vein strong, reaching hind margin.

One male from Goathorn, Dorset, 7. vi. 1907 (*Lt.-Col. Yerbury*). Type in Mr. Collin's collection. This may be the species described by Winnertz as *P. nigriceps*, but it differs from Walker's type in the venation (Sc is shorter and costa longer), in the absence of the dark spot at the apex of the wing, and in the striped thorax.

P. semirufa, Mg. This is a common and very variable species, and seems to have been described under a variety of names. I have seen several varieties which at first sight appear quite distinct, but as they all have identical genitalia (fig. 6), and differ only in colour, I regard them all as one species:

(a) Thorax and abdomen entirely black. This is the commonest form; the male has apparently been described by Van der Wulp as *P. concolor*, and is certainly Walker's *P. vitripennis*. The female of this form (of the others I only know the male) has the wings rather deeply brownish-tinged, especially on the margins, being darkest on the anterior margin of the apical half. Females of this form have been described by Meigen as *P. baumhaueri*, by Staeger as *P. brunnipennis* and by Walker as *P. unicolor*. (Meigen's *P. baumhaueri*, indeed, was described as $2\frac{1}{2}$ lines long, while the usual size is 4 lines, but this discrepancy signifies little, as the species varies greatly in this respect.)

(b) Head and thorax black, abdomen red except at base and apex. *P. semirufa*, Mg., and probably *P. erythrogaster*, Mg., belong here. This form is also common.

(c) Thorax dark reddish brown with two black stripes, abdomen reddish. 1 ♂, Crowborough (F.J.). Winnertz's *P. taeniata* perhaps belongs here.

(d) Like var. a, but a distinct dark fascia before the tip of the wing. Wells, Somerset (C.G.L.); Tram Inn, Herefordshire (J.W.Y.); Tarrington (J.H.W.). *P. fulvipes*,

Mg., probably, and *P. morio*. Grz., certainly belong here. In all these forms the strong anal vein almost reaches the hind margin.

P. nemoralis, Mg. (probably = *flavipes*, Mg., Curt., Ztt., = *nana*, Winn., = *cincta*, Winn.). The commonest species of the genus in this country. It is so variable in size and in the amount of yellow (if any) on the abdomen, that I feel confident that the same species has been described under these various names. I have mounted the genitalia of a number of different-looking specimens and find them constant (figs. 20 and 21).

**P. zonata*, Zett. (= *concosa*, Wlk., = *forcipula*, Lundstr.) (Crowborough (F.J.); New Forest (D.S.); East Leigh (G.H.V.). Walker's type is in quite good condition, and answers quite closely to Zetterstedt's description of *P. zonata*. This may be the species described by Winnertz as *P. succincta*, Mg., but as it only occasionally has the margin of the wing slightly darker, and as the male claspers are not oval, I have preferred to call it *P. zonata*. Hypopygium, fig. 22.

**P. perpusilla*, sp. n.

Minuta; *thorace nigro*; *coxis, pedibus, halleribusque ochraceis, tarsis abdomineque fuscis*; *alis subhyalinis, vena anali marginem posteriorem non attingente*.

♂. *Head* including whole antennae blackish; palpi dark brown. *Thorax* black, rather shining, clothed with strong black bristles. *Abdomen* mainly blackish-brown, segments 2, 3 and 4 rather broadly yellowish at the base. Genitalia, fig. 23. *Legs*: Coxae, femora and tibiae light yellow, tarsi and tibial spurs dark; front tibiae considerably longer than the metatarsi. *Wings* hyaline, unmarked. Tip of Sc_1 immediately above base of R_3 ; R_{2+3} very short, straight, considerably beyond tip of R_1 , the distance between the tips of R_1 and R_{2+3} being about two-thirds of that between the tips of R_{2+3} and R_{4+5} ; R_{4+5} entering costa at a very low angle; the costa does not reach the tip of the wing, but extends nearly half the distance between the tips of R_{4+5} and M_{1+2} . Anal vein very much abbreviated. Length 2.5 mm.

One male from Boyton, Suffolk, 19. vii. 1908 (*G. II. Verrall*). Type in Mr. Collin's collection.

**P. aestivalis*, Winn. What I take to be this species is represented by a short series from the New Forest (D.S.) and one male from Studland (J.W.Y.). In most specimens

the thorax is uniformly yellowish, but in the one from Studland it has three brown stripes, while in another it is entirely dark brown; this last specimen has the wing darkened at the tip and along the hind margin. Hypopygium, figs. 24 and 25.

***P. pectinifera, sp. n.**

♂. *Ochracea*; *alis subhyalinis, macula parva apicali grisea; vena anali marginem vix attingente.*

Head blackish; palpi yellow; antennae dark brown. *Thorax* reddish-ochreous. *Abdomen* discoloured but apparently in life it must have been entirely ochreous. Genitalia as in figs. 26 and 27. *Legs* yellowish; tarsi and tibial spurs dark. Front tibiae hardly as long as the metatarsi. *Wings* slightly yellowish-tinged; a small dark apical spot on the costa. Tip of Sc immediately above base of R_5 ; third costal division about three-quarters as long as fourth; R_{2+3} long, at an angle of about 45° with R_{4+5} ; costa extending half the distance between the tips of R_{1+5} and M_{1+2} ; anal vein distinct, almost reaching margin. Length about 4 mm.

1 ♂. New Forest, vii. 1905 (*D. Sharp*). The general aspect of this species is extremely like *P. flava*, from which it appears to be distinguished by the shortened anal vein. The name is suggested by the comb like appendage of the hypopygium. *P. ochracea*, Mg., is also similar but is larger, and there are several differences in venation.

**P. nigricornis*, F. (= *nigriventris*, Ztt., = *antica*, Wlk., = *infusata*, Winn.). New Forest (D.S., F.J.); Monkswood (D.S.); Crowborough, Cambridge (F.J.). I have little hesitation in adopting Fabricius' name for this species. He describes the abdomen of the female as having the borders of the segments yellowish; this is often the case, though typically the female abdomen is entirely black. The thorax of the female generally has more or less distinct indications of three darker stripes. Hypopygium, figs. 28 and 29.

P. fasciata, Mg. The hypopygium (figs. 30 and 31) seems to be indistinguishable from that of Lundström's *P. tristis*, and his species is therefore very likely a dark variety of *P. fasciata*. The latter is not uncommon with us.

**P. unicolor*, Staeg. Apparently not at all uncommon. Logie, Cambridge, Crowborough (F.J.); New Forest (D.S.); Clacton-on-Sea (J.W.Y.). This species might be

confused with *P. fasciata*, as the abdomen, though usually more or less unicolorous, is apt (especially in the female) to develop dark bands. The two can most readily be distinguished by the character given in the key; in addition, *P. unicolor* is usually smaller. Hypopygium, figs. 32 and 33.

*HELLADEPICHORIA, Beck.

H. servula, Wlk. (*Platyura servula*, Wlk.). This is the species referred to by Jenkinson as "the dark species of *Asindulum* which is as common as *A. flavum*." It is common in the New Forest (F.J., D.S., C.G.L., F.C.A.) and specimens have also been taken at Whittlesford, Cambs. (C.G.L.) and Crowborough (F.J.).

The thorax is blackish-brown rather than ferruginous, as Walker described it; the type is in fairly good condition, so that the identification is certain. The proboscis is about the same length as in *Asindulum rostratum*, but much more slender; the anal vein is very short; the subcostal cross-vein is present though very difficult to make out. Loew's short description of *Asindulum geranias* applies in most respects to this species, but he states that the anal vein is not very much shortened. Becker's *H. tenuipes*, the type of the genus, must be extremely similar, the only discrepancy I can find between our insect and his being the statement that the proboscis is as long as the middle tibiae, while in *H. servula* it is considerably shorter; but for this I should have regarded *H. tenuipes* as a synonym. Head, fig. 34; hypopygium, fig. 35.

The genera *Asindulum* and *Helladepichoria*, though very similar, must, I consider, be kept distinct, as they apparently represent separate developments from two different groups of *Platyura*. This is strongly indicated by a study of the hypopygia; that of *H. servula* is of a type similar to *P. biumbrata*, while those of the other species appear to show more affinity with the *P. dorsalis* group.

ASINDULUM, Latr.

**A. rostratum*, Zett. This is the species which is in the List as *A. flavum*; Dr. Lundström has confirmed my identification by examining a specimen. The true *A. flavum* (which I have not seen) has a much longer proboscis. Head, fig. 36; hypopygium, figs. 37 and 38.

**A. nigrum*, Latr. Mildenhall, Suffolk (D.S.). These specimens are somewhat larger and have the dark apex of the wing more extended than in *A. femorale*, but otherwise agree rather closely. Latreille's description is of course inadequate, but the determination seems probably correct. Head, fig. 39; hypopygium, figs. 40 and 41.

MYCOMYIA, Rond.

(*Sciophila*, Winn.).

This genus seems to me to be in a very unsatisfactory state; the following species have been identified by means of the male genitalia, but their synonymy in some cases is in much doubt.

**M. affinis*, Staeg. (= *flava*, Winn.). Carrow, Cambridge, Crowborough (F.J.); New Forest (D.S.); Henley-on-Thames (H. Scott); Aberfoyle (A.E.J.C.).

M. incisurata, Zett. This seems to be by far the commonest species of the genus here.

**M. winnertzii*, Dz. Common. Probably the *S. fasciata* of the list.

**M. lucorum*, Winn. Felden, Herts. (A.P.); New Forest (D.S.).

**M. wankowickzii*, Dz. Common. (New Forest, etc.).

M. tennis, Wlk. (*apicalis*, Winn.; *radoskowskii*, Dz.). Largs, Logie, Cambridge, Crowborough (F.J.); Nethy Bridge (J.W.Y.); New Forest (D.S.); Padstow (C.G.L.). Walker's type has lost its abdomen, but as this is one of the most distinct species in the genus. I do not think there can be any doubt about the determination.

M. maura, Wlk. (*lugubris*, Winn.). The genitalia of this species resemble those of *S. penicillata*, Dz., rather closely; *S. penicillata* may perhaps be a synonym or variety. The colour, as usual, is very variable; the thorax is usually entirely shining black, but some specimens from Aberfoyle (A.E.J.C.) have it light brown with three dark reddish brown stripes.

NEOEMPHERIA, O.-S.

N. pictipennis, Hal. This is not the same as *Empheria pictipennis*, Winn. All the British specimens I have seen have a wing venation resembling that figured by Winnertz for *N. formosa*, but *N. pictipennis* has similar wing-markings in both sexes, while in *N. formosa* the male has

the whole apex of the wing dark. The abdominal markings of some specimens of *N. pictipennis* resemble those of *N. formosa*, but they are variable, especially in the female: one female from the New Forest (D.S.) has a dark apex to the wing. It is quite possible that *N. formosa* may be only a variety of *N. pictipennis*. The new name **winnertzi** is proposed for *pictipennis*, Winn. (*nec* Hal.).

POLYLEPTA, Winn.

P. undulata, Winn. This is the species which is in the list as *P. splendida*. A male specimen taken at Logie, 9. ix. 1909, by Mr. Jenkinson, lacks the small cell on both wings. This disconcerting variation, in the character on which the subfamily Sciophilinae was founded, occurs in a number of species. It has been recorded by de Man (Tijd. v. Ent. 1884, p. 137) in *Polylepta leptogaster*, and I have also met with it in *Empalia vitripennis*, *Sciophila lutea*, and *S. hirta* (see below).

PARATINIA, Mik.

P. sciarina, Mik (?). This species exhibits remarkable variation in size. I have compared mounts of the genitalia of a large specimen sent me by Mr. Carter, and a very small one in Mr. Jenkinson's collection and find them identical. If Mik's figure of the palpus is anything like accurate, the British species cannot be *P. sciarina*, and it is certainly not *P. difficilis*. Dz., but I do not like to describe it as new.

MONOCLONA, Mik.

This genus, it seems to me, has its nearest ally in *Acnemia*, the only difference being the absence of the small cell in the latter. Both have the apical half of the club of the halteres black, which is most unusual in this family. In fact, if an abnormal *Monoclona* without a "small cell" were to occur it could only be distinguished from *Acnemia* by the genitalia.

M. rufilatera, Wlk. Males from Studland (Dorset). Sheviock and Lelant, Cornwall (J.W.Y.); Cambridge (F.J.), and New Forest (D.S.), agree in having genitalia of the exact structure figured by Dziedzicki for *M. unicornuta*. In Dziedzicki's specimen, however, the genitalia were yellow, not black (as they are in ours), and the thorax

had three distinct blackish stripes, while in the seven specimens I have seen the thoracic stripes are completely fused. Lundström records a similar example to Dzierdzicki's from Finland. It is probable that *M. unicornuta* is only a colour variety of *M. rufilatera*. The type of the latter is a female, but there is no doubt that the males are correctly associated with it.

M. halterata, Staeg., seems to be rare. I have only seen females—from Crowborough, Quy, and Cambridge (F.J.); Colwich and Rotherfield (G.H.V.).

SCIOPHILA, Mg. (Rond.).

(*Lasiosoma*, Winn.).

S. hirta, Mg. (= *L. pilosa*, Winn. var. *a*, according to Dzierdzicki). A specimen taken 4. vi. 1902 at Cambridge, by Mr. F. Jenkinson, lacks the small cell on both wings, while another example taken 6. viii. 1908 at the same place by the same collector is even more remarkable in having the fifth vein simple (both wings). The latter specimen can be seen not to be a *Monoclona* by its unicolorous yellow halteres. Both are males, and their genitalia do not depart in any way from the normal structure found in *S. hirta*. Hypopygium, figs. 42 and 43.

S. lutea, Macq. (= *L. analis*, Winn., as Dr. Dzierdzicki informs me). The structure of the male genitalia is the only sure distinction of this species, as it is very variable in colour. Some specimens are almost entirely yellow, others almost entirely blackish-brown, but even in the darkest specimens the hypopygium remains yellow, and does not vary in structure. A female from Cambridge, 11. vii. 1906 (F.J.) has lost the small cell on the right wing only. Hypopygium, fig. 53.

S. rufa, Mg. The species which I recognise under this name agrees fairly well with Winnertz's description, but the male has black hair on the last few segments of the abdomen. It is the largest species of the genus in this country, and has been bred by Dr. Sharp and Mr. H. St. J. K. Donisthorpe from a *Polyporus* growing on birch trees at Rannoch. Walker's *S. ochracea* may be a synonym, but the type appears to have been lost. Hypopygium, fig. 56.

S. fenestella, Curt. This was erroneously referred by Mr. Jenkinson to *Apoliphthisa*; it is evidently a true

Sciphila. The subcostal cross-vein † is situated at about the middle of the small cell, which is not normally the case in any other species I have seen. Hypopygium, figs. 48-50. I have seen two males, one from West Woodhay (F.J.), the other from New Forest (D.S.); a third in the Clifton collection in the British Museum seems to be a variety of this species (see fig. 50).

**S. nigra*, Landrock. Lochinver, and Aldburgh (J.W.Y.) Blairgowrie (A.E.J.C.); New Forest (D.S.); Dyffryn (G.H.V.); Stoke Wood (J.H.W.). This may be a variety of Winnertz's *L. nitens* with the hind femora partly yellowish.

**S. varia*, Winn. Logie, 1 ♂ 1 ♀ (F.J.). Hypopygium, figs. 51 and 52.

***S. sharpi**, sp. n. ♂

Nigra, subnitida, robusta; S. hirtae similis, differt magnitudine et hypopygio.

Head, thorax and abdomen black, rather shining, with yellow pubescence. Palpi, two basal joints of antennae, prothoracic lobes, coxae, femora, tibiae and halteres yellowish, tarsi and extreme tip of hind tibiae dark. *Wings* subhyaline, veins dark; subcostal cross-vein placed more basally than the small cell which is practically square; costa reaching only a small distance beyond the tip of the first longitudinal vein; upper fork nearly sessile; axillary vein strong, reaching a little beyond the base of the lower fork. *Genitalia*, figs. 54 and 55. Length 6 mm. A large species, about the size of *L. rufum*.

A single male from Nethy Bridge, Inverness, July 1910 (*D. Sharp*).

**S. interrupta*, Winn. Lyndhurst (G.H.V.); Mildenhall (J.W.Y.). Dr. H. Dziedzicki very kindly sent me copies of his drawings of the hypopygium of Winnertz's type; these showed some slight differences from those here given, figs. 44 and 45; not greater, however, than between the two specimens of *S. fenestella* figured. The two hairs on the dorsal plate of Winnertz's specimen are much shorter and thicker.

**S. geniculata*, Zett. One male from Whiting Bay, Arran (Rev. J. Waterston), presented to the British

† Walker's statement (Ins. Brit. III. p. 42) that the "subcostal vein is not connected with the radial" is in direct disagreement with Curtis' figure.

Museum by Mr. A. E. J. Carter. This very closely resembles *S. nigra*, Landrock, except in the hypopygium. Dr. Bengtsson of Lund informs me that the one remaining specimen of Zetterstedt's series has lost its abdomen, so that there is no possibility of verifying the determination. Hypopygium, figs. 46 and 47.

***S. jenkinsoni**, sp. n.

Nigra, nitida; palpis, antennis basi, halterum basi, coxis pedibusque flavis, tarsis fuscis; venula transversali subcostali pone cellulam cubitalem anteriorem inserta.

♂♀. *Head* blackish; palpi yellow; antennae a little longer than the thorax, first two joints and basal half of third yellow, remainder blackish. *Thorax* shining black or black-brown, a little yellowish below the shoulders, clothed with rather sparse yellow pubescence. *Abdomen* black, rather shining, long and thin in the male, thicker in the female; pubescence yellowish. Hypopygium, fig. 57. *Legs* with the coxae, femora and tibiae yellow-ochreous; trochanters black; tarsi dark brown. *Wings* hyaline; the subcostal cross-vein is placed distinctly beyond the small cell, which is less rectangular than in most species of the genus; fork of fourth vein sessile; upper branch of fifth vein less curved at the base than usual. Halteres with a light ochreous stem and a black knob. Length 5 mm.

Aldenham, Salop, 1 ♂ (type in British Museum—F.J.); Logie, 1 ♂ 1 ♀ (F.J.). The position of the subcostal cross-vein and the dark knob of the halteres will distinguish this species from all those previously described.

EMPALIA, Winn.

E. vitripennis, Mg. In Walker's type of *Mycetophila finalis* (which is really this species) and in a specimen from Crowborough, 11. viii. 1906 (F.J.), the small cell is absent on one wing, while in one from Studland, Dorset (J.W.Y.), one from Crowborough, Sussex (F.J.), and a third from the New Forest (D.S.), it is wanting on both wings. In such cases the species can be recognised by the very characteristic elongate hypopygium.

***E. paradoxa**, sp. n.

E. vitripenni similis, differt hypopygio et abdominis segmentis 2-4 maculis basalibus (nec apicalibus) flavidis; vena brachiali nulla.

♂ ♀. *Head* blackish; ocelli almost in a straight line; palpi and scape of antennae yellow; flagellum of antennae dark brown; antennae about as long as thorax in female, a little longer in the male. *Thorax* black, mesonotum rather shining, black-haired. *Abdomen* dark brown, first segment with apical, second to fourth segments with basal lateral yellowish spots; genitalia brownish-black. Coxae and femora yellow, hind femora with a short black stripe at the base beneath, and rather broadly black at the apex. Tibiae brown, spurs yellow-brown; tarsi dark fuscous. *Wings* hyaline, venation as in *E. vitripennis*, but the small cell is absent. Halteres yellow. Length 3.5 mm. (without antennae). Wing, fig. 61; ♂ hypopygium, figs, 58-60.

Type ♂, and two females from Lyndhurst, New Forest (F.J.); two males from Lochinver, Sutherland (J.W.Y.); a male from Lyndhurst and another from Stokenchurch (G.H.V.). Type in the British Museum.

The absence of the small cell on both wings of all the five specimens would seem to place this species in *Boletina*, but the general appearance, the structure of the male hypopygium and the slightly different venation (the forks of the fourth and fifth veins have longer stalks than in *Boletina*, and the anal vein is not nearly so well marked), all tend to show that the real relationships of the species are with *Empalia*.

APOLIPHTHISA, Grzeg.

A. subincana, Curt. Logie (F.J.); Nethy Bridge (C.G.L.); Spey Bridge, Inverness, and Sheviock, Cornwall (J.W.Y.); New Forest (D.S., F.J.). Haliday's description of *Tetragoneura melanoceros* applies in every detail to the insect which Mr. Jenkinson has named (no doubt correctly) *A. subincana*, Curt., and it is reasonably certain that the names are synonymous. *A. rara*, Grz., the type of the genus, is also, I consider, the same species, although Grzegorzek does not mention the slightly expanded front tarsi of the female. This feature is by no means conspicuous and may well have been overlooked.

*ECTREPESTHONEURA, Enderl.

Enderlein (Stettin. Ent. Zeit. 1911, p. 155) introduces this genus for *Tetragoneura hirta*, owing to the marked difference in neuration between that species and *T. sylvatica*.

DZIEDZICKIA, Joh.

D. (Hertwigia) marginata, Dz., has occurred to Mr. Jenkinson at Logie, Auchinbowie, and Crowborough. It varies considerably in size and colour, some specimens having quite distinct yellow bands on the apices of the abdominal segments, others not.

*LOEWIELLA, Meun.

**L. hungarica*, Lundstr. Grantown-on-Spey, 17. viii. 1912. 1 ♂ (J.W.Y.); Kirkmichael. Perth, 1 ♂ (A.E.J.C.).

*PARANEUROTelia, Landr.

**P. dispar* (Winn.). Nethy Bridge, 2 ♂ (D.S.). Although the subcostal cross-vein is absent, this species undoubtedly belongs to Landrock's new genus, as the neurulation is otherwise the same as in *P. dziedzickii*, Landr. The wings are shortly pubescent; if this is also the case in *P. dziedzickii* it will distinguish the genus from *Boletina*, though not from *Anaclinia*.

SYNTEMNA, Winn.

**S. flava*, sp. n.

Flava; *thorace nigro-bimaculato, abdominis incisuris segmentisque ultimis nigris*; *antennis apice tibiis tarsisque fuscis*.

♂. *Head* blackish on the vertex, yellow on the front. *Antennae* with the first three joints yellow, the next three yellowish beneath, the remainder dark; joints of flagellum scarcely longer than broad. *Thorax* yellow; a pair of large elongate black spots above and in front of the roots of the wings; three rows of black setae, the lateral ones placed along a darkened line in the integument. *Abdomen* yellow, the posterior margins of the first five and practically the whole of the sixth and seventh segments black; pubescence black. *Genitalia* yellowish, a pair of black combs transversely placed near the base are very conspicuous from above. *Legs* with the coxae and femora yellow; tibiae and tarsi brownish; tibial spurs orange. *Wings* yellowish tinged; tip of Sc immediately above base of R₈; base of fork of Cu far before cross-vein R-M; anal vein extending about level with cross-vein R-M. Length 6.5 mm.

The Doward, Herefordshire, 14. vi. 1910, 1 ♂ (*Dr. J. H. Wood*). Type in Dr. Wood's collection.

The only near ally of this species is the North American

S. polyzona, which is much smaller and differs in several details of coloration.

BOLETINA, Mg.

In order to determine the species of this genus with certainty it is usually necessary to remove and mount the male genitalia, but some species are recognisable by other characters, and for these the following table is put forward.

- | | |
|---|--|
| 1. Subcostal cross-vein absent | 2. |
| Subcostal cross-vein present | 4. |
| 2. Shoulders yellow, first four abdominal segments with large triangular lateral yellow patches | <i>reuteri</i> , Ldst. |
| Thorax and abdomen black | 3. |
| 3. Third vein (R_3) rather wavy | <i>inermis</i> , Ldst. |
| Third vein almost straight | <i>villosa</i> , Lndr. |
| 4. Fork of fifth vein (Cu) rather short [<i>Empalia paradoxa</i> , sp. n.] | |
| Fork-cells normal | 5. |
| 5. Thorax cinereous with three black stripes, the middle one divided | <i>trivittata</i> , Mg. |
| Thorax not distinctly striped | 6. |
| 6. Shoulders and posterior borders of abdominal segments obviously yellow | <i>basalis</i> , Mg., ♀. |
| Thorax and abdomen black or blackish | 7. |
| 7. Costa produced at most one third of the distance from the apex of R_8 to that of M_{1+2} | 8. |
| Costa produced about half the distance | 9. |
| 8. Third and fourth antennal joints dark | <i>plana</i> , Wlk. |
| Third and fourth antennal joints yellow | <i>basalis</i> , Mg., ♂. |
| 9. Medium-sized species; anal vein well-marked | <i>lundbecki</i> , Ldst. |
| Small species; anal vein rather faint | <i>sciarina</i> , Staeg.,
<i>dispecta</i> , Dz., <i>brevicornis</i> , Ztt., <i>gripha</i> , Dz., <i>nigricans</i> , Dz.,
<i>moravica</i> , Lndr., <i>trispinosa</i> , sp. n., <i>lundstroemi</i> , Lndr. |

B. borealis, *B. winnertzi*, *B. dubia*, and *B. analis* are omitted from the above table, as I am unable to confirm them as British, having seen no males.

**B. reuteri*, Lundstr. New Forest (D.S., C.G.L., F.J.—a long series); Beattock (C.G.L.); Loch Assynt and Spey Bridge (J.W.Y.); Chippenham (G.H.V.—bred from rotten stump). I have examined 55 specimens and find that in only one of them is the subcostal cross-vein present.

**B. inermis*, Lundstr. Logie and Crowborough (F.J.); New Forest, Wells (Somerset), and Padstow (C.G.L.);

Lochinver, Porthcawl, and Mundesley (J.W.Y.); Stoke Wood (G.H.V., J.W.Y.); Polton (A.E.J.C.). Two of the twenty-two specimens I have seen have the subcostal cross-vein present. The outer claw on the front leg of the male is greatly enlarged and bears about eight fine teeth on its underside; the front claws of the female are alike, and each bears only a single tooth. The hypopygium is orange with the apical half of the dorsal surface black, and not all brown as stated by Lundström.

**B. villosa*, Landrock. Aberfoyle, 1 ♂, and Kirk-michael, 1 ♂ (A.E.J.C.); Logie, 1 ♂ (F.J.). In all these three specimens there is a strong bristle before the apex of the genital claspers (fig. 62); the abdomen is entirely black, and the tibial spurs are blackish. In all these points our specimens differ from the true *B. villosa*, but I hardly think they can be specifically distinct, as the agreement in other respects is so close. Two out of the three specimens have the hypopygium dark brown, yellowish at the base.

B. plana, Wlk. (= *gzregorzekii*, Dz.). Stokenchurch (J.W.Y.); Logie (F.J.); New Forest (D.S.). This is the species recorded by Verrall as *B. basabis*, Mg. The latter also occurs, *e. g.* at Logie (F.J.); Nairn, Rannoch, Chippenham (G.H.V.); Nethy Bridge (D.S.).

**B. lundbecki*, Lundstr. Logie and Crowborough (F.J.); Polton (Midlothian) and St. Kilda (A.E.J.C.). I have seen several specimens (from New Forest, D.S., and Westhide, J.H.W.) of a female *Boletina* with *thickened front tarsi*, which may possibly be the female of this species; no species of *Boletina* with this character has been described.

**B. nigricans*, Dz. Nethy Bridge (D.S.). The hypopygium (fig. 63) differs slightly from Dziedziicki's figure.

**B. dispecta*, Dz. Stoke Wood, Hereford, 1 ♂ (J.H.W.).

**B. griffa*, Dz. This species seems to be much commoner than *B. sciarina*. The females appear to be indistinguishable.

**B. moravica*, Landr. Logie and Crowborough (F.J.); Aviemore (J.W.Y.). These specimens have dark spurs, thus resembling *B. conformis*. Dolgelley (G.H.V.). This specimen has light spurs.

**B. brevicornis*, Zett. 1 ♂ New Forest (D.S.). The hypopygium (fig. 64) does not quite agree with Lundström's figure.

* *B. lundstroemi*, Landr. 1 ♂ Aviemore (J.W.Y.).

**B. trispinosa*, sp. n. ♂.

B. sciarinae similis, differt hypopygio et coxis posterioribus tiliarumque calcaribus fuscis.

Closely resembles *B. sciarina* in general appearance, yet the genitalia (fig. 65) are totally unlike those of any species of *Boletina* which has so far been figured. If it were not for the darkened posterior coxae I should have said that the species was *B. conformis*, Siebke (pseudosciarina, Strobl), but it seems best on the whole to describe it as a new species. The antennae are about twice the length of the head and thorax together.

A male from Lelant, Cornwall, 31. viii. 1907 (J.W.Y.), (type, in the British Museum); another from Bettws-y-Coed (G.H.V.). This latter specimen has only the basal half of the hind coxae darkened, and the genitalia have an additional long spine, which, however, is weaker than the other three.

PHTHINIA, Winn.

**P. winnertzi*, Mik. Logie, Crowborough (F.J.); Beattock (C.G.L.); Sheviock, Cornwall (J.W.Y.); King's Lynn (E.A.A.); New Forest (F.C.A., D.S.). The hypopygium (fig. 66) is small, weakly chitinated and light yellow in colour. The anal vein is practically straight. Ovipositor, fig. 67.

P. humilis, Winn. The specimens I have seen of this species do not agree very well with the original description. They are larger (6 mm.), have a lighter coloured thorax and shorter antennae. Still I think the identification is probably correct. New Forest (D.S., F.C.A.); Crowborough (F.J.); Lelant (J.W.Y.). One of the specimens originally recorded under this name is *P. winnertzi*. Hypopygium, figs. 68 and 69; ovipositor, fig. 70. A specimen from Studland (J.E.C.) has the thorax with three sub-confluent dark brown stripes, and in this, as in three males from the New Forest, the genitalia are slightly different, the large black appendages (fig. 69a) not being nearly so broad. This form I at first took to be a distinct species.

The anal vein in *P. humilis* is curved downwards towards the tip.

COELOSIA, Winn.

As I interpret this genus it should include also *Phthinia thoracica*, Winn., and probably *P. curta*, Joh., a North American species.

**C. tenella*, Zett. (= *flavicauda*, Winn.). Logie and Crowborough (F.J.); Nethy Bridge (D.S.).

C. flava, Staeg. I have seen only one recent specimen of this species (Bonchurch, G.H.V.), but there is a male in the Clifton collection in the British Museum, and Walker's type of *Mycetophila flava* is evidently *Coelosia flava*, though now much discoloured.

LEIA, Mg.

I very much doubt whether the three species (*terminalis*, Mg., *variegata*, Winn. and *elegans*, Winn.) are really distinct; in any case I have only seen one distinct British species, which had better be known as *terminalis*, Mg.

DOCOSIA, Winn.

D. valida, Winn. A female taken at Logie, 23. ix. 1904, by Mr. F. Jenkinson, appears to be a variety of this species. The legs and halteres are entirely blackish brown, as in *D. morionella*, Mik, but the yellowish pubescence extends on to the abdomen, and is not confined to the thorax and coxae. Other specimens from Stoke Wood (J.H.W.) have the legs almost all black, but in these the halteres are yellow.

D. sciarina, Mg. The mediastinal vein (Sc.) in this species seems to be much more bristly than in *D. valida*.

BRACHYPEZA, Winn.

B. radiata, Jenk. One female from Dartford, Kent (J.W.Y.).

**B. spuria*, sp. n. (Verrall MS.).

Flava; *thorace* grisescente, *vittis* 3 *obscuris subconfluentibus*; *antennarum flagello vertice tarsisque fuscis, maris articulis 3 ultimis tarsorum anticorum flexis, subpilosus*; *abdominis segmentis dorso fusciscentibus*; *alis subhyalinis, immaculatis*.

♂. *Head* dark brown, frons yellowish; palpi and base of antennae yellow, flagellum brown. *Thorax* greyish-ochreous, with short yellowish pubescence and black bristles on the margin; mesonotum with three rather indistinct and almost united brown stripes. *Pleurae* ochreous-brown. *Abdomen* yellow-ochreous, segments 1-5 with large triangular dark brown patches on the dorsum, the base of the triangle towards the base of each segment; sixth segment dark

brown except on the hind margin; hypopygium yellowish (figs. 71 and 72). *Legs* rather long and slender; fore tibiae shorter than the metatarsi; mid tibiae and metatarsi about equal in length. *Coxae* and femora yellowish; tibiae rather darker, the hind pair with three rows of bristles, spurs dark; tarsi dark brown. The last three joints of the front tarsi are (at least after death) bent round into an almost equilateral triangle; they and the second joint (especially the second) are clothed with a rather longer and denser pubescence than on the tarsi of the other legs, but are without spines. *Wings* slightly tinged with ochreous, but unspotted. Halteres yellow.

♀. Resembles the male, but front tarsi simple, and sixth abdominal segment more yellow, like the preceding ones. First, fourth and fifth abdominal segments each with two or three long hairs at the apex beneath. Length 5.6 mm.

Lodore, Cumberland, 2 ♂ (including type, in British Museum), 1 ♀ (G.H.V.); Ivybridge, S. Devon, 1 ♀ (G.H.V.); Three Bridges, Sussex, 1 ♂ (G.H.V.); Brodie, N.B., 2 ♂ (J.W.Y.); Wells, Somerset, 1 ♀ (C.G.L.); New Forest, 1 ♀ (D.S.); Westhide, (1 ♂) Haugh Wood (1 ♂) and Stoke Wood (1 ♀), Hereford (J.H.W.).

B. bisignata, Winn. New Forest, 1 ♂ (D.S.).

RHYMOSIA, Winn.

The species of this genus are as a rule not very easy to distinguish except by genital characters, or in the case of *gracilipes*, *signatipes*, and *spinipes*, by the tarsal characters of the males. The four species *fenestralis*, *cristata*, *domestica*, and *macrura* differ from the other eight hitherto recognised as British in having the pale markings of the abdomen situated mainly towards the apices of the segments instead of at the bases. These four species may be easily separated by an examination of the thorax: *cristata* has two rows of stout spines; *fenestralis* has three dull reddish brown stripes; *domestica* and *macrura* have a dark thorax with shining greyish pubescence on the shoulders and sides.

I have seen no British specimen of *R. truncata*, Winn. Walker's *Mycetophila selecta*, which Mr. Verrall placed in *Rhymosia*, is quite unrecognisable, and as the type appears to be lost it had better be placed in the "expurgated" list.

**R. gracilipes*, Dz. Felden, Herts. (A. P.); Newmarket (G.H.V.); Ledbury (J.H.W.).

**R. signatipes*, Wulp. New Forest, Sept. 1904, 1 ♂ (C.G.L.).

**R. spinipes*, Winn. Logie (F.J.); Lelant (J.W.Y.); Salcombe (G.H.V.); New Forest (F.C.A.).

**R. virens*, Dz. Logie, Crowborough, Aldenham (F.J.); Felden (A.P.); Aviemore and Sheviock (J.W.Y.); New Forest (D.S.); Llangollen (G.H.V.); Nethy Bridge (D.S.).

**R. domestica*, Mg. Seems to be common. Logie, Cambridge, Crowborough (F.J.); Beattock, New Forest, Wells (C.G.L.); Aviemore, Spey Bridge, Sheviock, Lelant (J.W.Y.); Newmarket (G.H.V.); Westhide, Tarrington (J.H.W.).

**R. macrura*, Winn. I regard as *R. macrura* a species very similar to *R. domestica*, but with quite different genitalia, and with a short median pale line in front of the scutellum which *R. domestica* does not possess. I have seen the species from Logie (F.J.); New Forest (D.S. and C.G.L.); Felden (A.P.); Sheviock (J.W.Y.); Chippenham, Cambs. (G.H.V.); Nethy Bridge (D.S.); Stoke Wood (J.H.W.).

**R. connexa*, Winn. Crowborough, 1 ♂ (F.J.); Bridgend, Glamorgan (J.W.Y.).

**R. fovea*, Dz. Logie, 1 ♂ (F.J.). In this specimen the mediastinal vein ends in the subcostal, not freely between it and the costal. The general character and structure of the hypopygium, however, agree with Dziedzicki's description and figure. The same remarks apply to the Crowborough specimen of *R. connexa*.

**R. placida*, Winn. Salcombe (G.H.V.).

ALLODIA, Winn.

(including *Brachycampta*, Winn.).

A. crassicornis, Stann. Some very dark specimens from Felden and elsewhere evidently represent Winnertz's *A. obscura*, having the flagellum of the antennae all black and the thorax blackish instead of reddish. The male hypopygium, however, is quite typical, and *A. obscura* may safely be regarded as a dark variety of *A. crassicornis*.

A. lugens, Wied. (= *ornaticollis*, Mg.). This species perhaps shares with *Erechia fungorum* the position of being the commonest fungus-gnat in this country. It is extremely variable, especially in the abdomen, which ranges from entirely black to mainly yellow. No other fungus-gnat

has a thorax quite like it and it should be easy to recognise in all its varieties.

**A. caudata*, Winn. This and *A. amoena* are also very common with us, all the remaining species being more or less rare. *A. caudata* is the species which is in the list as *B. griseicollis*, but I follow Lundström's interpretation of the latter, which also occurs with us (Logie, Crowborough, New Forest, etc.).

**A. brachycera*, Zett. Logie, Forres, Cambridge (F.J.). Mildenhall (J.W.Y.); Newmarket (G.H.V.).

**A. cinerea*, Lundstr. Logie (F.J.); New Forest (D.S.); Wyre (G.H.V.).

**A. pistillata*, Lundstr. Cambridge (F.J.); Chippenham, Cambs. (G.H.V.).

**A. fissicauda*, Lundstr. Crowborough, 4. x. 1903, 1 ♂ (F.J.).

**A. silvatica*, Landr. Cambridge (F.J.); Newmarket, Cambs.; Stokenchurch, Oxon. (G.H.V.); Porthcawl, Glamorgan (J.W.Y.).

**A. triangularis*, Strobl. Logie, 1 ♂ (F.J.).

**A. barbata*, Lundstr. Stoke Wood, 1 ♂ (J.H.W.); Aviemore, 1 ♂ (J.W.Y.).

TRICHONTA, Winn.

**T. atricauda*, Zett. Logie, Aldenham, Crowborough, Lyndhurst (F.J.); Nethy Bridge (C.G.L.); Studland (J.W.Y.); Colwich Park, Staffs. (G.H.V.); Stoke Wood (J.H.W.).

**T. fissicauda*, Zett. Logie (F.J.); Bettws-y-Coed (G.H.V.).

**T. melanopyga*, Zett. Logie (F.J.); Spey Bridge (J.W.Y.).

**T. hamata*, Mik. Lochinver and Glenmore, (J.W.Y.); Bettws-y-Coed (G.H.V.); Nethy Bridge (D.S.).

**T. spinosa*, Lundstr. Crowborough (F.J.); Dolgelley (G.H.V.).

**T. submaculata*, Staeg. Colwich Park, Three Bridges, Newmarket (G.H.V.); Westhide (J.H.W.); Lelant, Sheviok, Dowlerry (J.W.Y.); Crowborough (F.J.); Studland (J.E.C.); King's Lynn (E.A.A.).

**T. umbratica*, Winn. Harrow, 16. xi. 1912, 1 ♀ (F.W.E.). This specimen agrees very well with Winnertz's description, except that there is no yellow on the shoulders. I know

of no other described species which it could be. New Forest. 2 ♂ 1 ♀ (D.S.).

**T. terminalis*, Wlk. (*funebri*, Lundstr., ? Winn.). Logie and Crowborough (F.J.); Dunkeld (J.W.Y.); Felden (A.P.).

**T. falcata*, Lundstr. Colwich Park, Staffs. (G.H.V.).

PHRONIA, Winn.

**P. rustica*, Winn. Newmarket (G.H.V.); Lelant and Aviemore (J.W.Y.); Felden (A.P.); New Forest (D.S.); Nethy Bridge (C.G.L.); Crowborough, Auchenbowie, Morville (F.J.); Blairgowrie (A.E.J.C.).

**P. forcipata*, Winn. Felden (A.P.); Crowborough, Logie, Auchenbowie (F.J.); Woolhope (J.W.Y.); Nethy Bridge (D.S.).

**P. braueri*, Dz. Sawley (F.J.); Haslemere (E. W. Swanton); Lyndhurst (J.E.C.).

**P. tenuis*, Winn. Newmarket, Chippenham (G.H.V.); Felden (A.P.); Sheviok, Lelant (J.W.Y.); Logie, Cambridge, Crowborough (F.J.); Polton, Midlothian (A.E.J.C.).

**P. strenua*, Winn. Logie and Crowborough (F.J.).

**P. triangularis*, Winn. New Forest, 1 ♂ (D.S.); Aviemore, 1 ♂ (J.W.Y.).

**P. bicolor*, Dz. Aldenham, 5. ii. 1903, 1 ♂ (F.J.).

**P. vitiosa*, Winn. New Forest (C.G.L. and D.S.); Loch Assynt, Studland, Sheviok, St. Ives, Lelant (J.W.Y.) Lodore (G.H.V.). Lt.-Col. Yerbury took a good series of this species in Cornwall last autumn. The female, which is undescribed, resembles those of *P. forcipata* and *P. crassipes* in having the front tarsi thickened.

**P. taczanowskyi*, Dz. Newmarket, Butley Thicks (G.H.V.); New Forest (D.S.).

**P. elegans*, Dz. Lodore, Colwich Park (G.H.V.).

**P. disgrega*, Dz. 1 ♂ Nethy Bridge (D.S.).

**P. interstincta*, Dz. 1 ♂ Glenmore (J.W.Y.).

EKECHIA, Winn.

**E. spinuligera*, Lundstr. (= *spinigera*, Lundstr. *nov.* Winn.). This species is on the list as *E. spinigera*.

**E. trivittata*, Staeg. Orford, Chippenham (G.H.V.); Sheviok, Lelant (J.W.Y.); Harrow and Pinner (F.W.E.); Logie, Cambridge (F.J.); Blythburgh (C.M.); New Forest (D.S., F.C.A.).

**E. trisignata*, sp. n. ♂.

E. trivittatae similis, differt hypopygio et longitudine antennarum.

Apart from the differences in the hypopygium and the slightly longer antennae I can see no differences between this and *E. trivittata*. Lundström seems to have confused the two; in his paper (Acta Soc. pro Fauna et Fl. Fennica, 1909) figs. 67 and 68a appear to represent *E. trisignata*, while fig. 68b is *E. trivittata*. Hypopygium, figs. 73-75; the appendages of the hypopygium of *E. trivittata* are shown for comparison (fig. 76).

Type in the British Museum from Beattock (C.G.L.); other specimens from Logie and Crowborough (F.J.); Polton, Midlothian (A.E.J.C.).

**E. parva*, Lundstr. Sheviock (J.W.Y.); Logie, Cambridge, Crowborough (F.J.); New Forest (D.S.).

**E. separata*, Lundstr. (= *concinna*, Lundstr. nec. Winn.) Felden (A.P.); Logie, Crowborough (F.J.); New Forest (D.S.); Newmarket (G.H.V.); Brockenhurst (J.E.C.); Tarrington and Ashperton (J.H.W.).

**E. lucidula*, Zett. Felden (A.P.); Newmarket (G.H.V.).

**E. bicincta*, Staeg. A male in the Clifton Collection (in British Museum), without locality, but probably from the London district; Studland, Dorset (J.W.Y.).

**E. nigroscutellata*, Landr. Felden (A.P.); Logie (F.J.); New Forest (D.S., F.C.A.); Blairgowrie (A.E.J.C.).

**E. subulata*, Winn. Sheviock, Lelant (J.W.Y.); New Forest (D.S., F.C.A.); Logie, Crowborough (F.J.).

**E. gracilicornis*, Landr. (= *tenuicornis*, Lundstr. nec. Wulp). Logie, Aldenham (F.J.); Felden (A.P.).

**E. unguiculata*, Lundstr. Nethy Bridge, 1 ♂ (D.S.).

**E. magnicauda*, Lundstr. Stokenchurch (G.H.V.).

**E. fimbriata*, Lundstr. Logie (F.J.); Brodie (J.W.Y.); Nethy Bridge (D.S.); Blairgowrie (A.E.J.C.).

**E. festiva*, Winn. Logie and Crowborough (F.J.); New Forest (C.G.L., D.S., F.C.A.); Crickehowell, Sheviock and Lelant (J.W.Y.); Tuddenham (G.H.V.); Stoke Wood (J.H.W.).

**E. contaminata*, Winn. (*dorsalis*, Lundstr. nec. Staeg.). Logie (F.J.); New Forest (D.S.); Studland (J.E.C.); Blairgowrie (A.E.J.C.); Nethy Bridge (D.S.); Coldborough (J.H.W.).

**E. pseudocincta*, Strobl. (*contaminata*, Lundstr. nec. Winn.). Nethy Bridge (C.G.L.); New Forest (D.S., F.C.A.);

Logie (F.J.); Kirtling, Suffolk (G.H.V.); Brockenhurst (J.E.C.).

**E. pulchella*, Winn. (= *intersecta*, Lundstr.). Blairgowrie (A.E.J.C.); Brockenhurst (J.E.C.).

**E. crucigera*, Lundstr. Cambridge (F.J.); Newmarket (G.H.V.).

**E. clypeata*, Lundstr. Logie (F.J.); Musselburgh, Midlothian (A.E.J.C.).

E. leptura, Mg. New Forest (D.S., F.C.A.).

I have seen several other species which I have been unable to name, the hypopygia not having been figured; while *E. lateralis*, *tenuicornis*, *dorsalis*, and *interrupta* may be confirmed as British.

SCEPTONIA, Winn.

**S. concolor*, Winn. Logie (F.J.); New Forest (C.G.L.); Mildenhall, Tottington (G.H.V.); Lelant, Downton (J.W.Y.). This species seems to occur with *S. nigra*, but is rarer.

EPICYPTA, Winn.

E. punctum, Stan. Of the 24 specimens of this species which I have examined, no fewer than 19 have the four posterior coxae blackish. The median ocellus, though very small and difficult to see, is always present.

E. trinotata, Staeg. Mr. Jenkinson (*Ent. Mo. Mag.*, 1908, p. 131) is evidently right in his identification of this species. I have examined 24 specimens, and find very little variation. The median ocellus is much more evident than in *E. punctum*. This species has been bred from limpet-like larvae found feeding on wood of a decaying oak, at Haslemere, Surrey, by Mr. E. W. Swanton.

E. scatophora, Perris. Two distinct species have apparently been confused under this name, one or both of which should in my opinion be transferred to *Mycetophila*. The species identified by Mr. Jenkinson is evidently the *E. scatophora* of Winnertz, but this cannot be the true *E. scatophora*. Winnertz refers to "das kleine Afterglied und die kleine Zange der ♂," while Perris says the male armature "consiste en deux appendices linéaires, aplatis, velus, longs de près de un millimètre," and gives a figure which bears out this description. Strobl describes the male armature of *E. aterrima* thus: "zwei sehr langen, lanzettlichen, gelben, dicht mit langen, gekräuselten Flaumhaaren

besetzten Lamellen;” he does not refer to *E. scatophora*, but it is fairly evident that he had Perris's insect before him. The fact that the larvae of *E. scatophora* and *E. trinotata* agree in their remarkable habits may show that they really belong to the same genus, but as Strobl definitely states that “die Randader geht *nicht* über die Mündung der dritten Längsader,” it is difficult to see how the species can be kept in *Epicyptha*. Increased knowledge may of course show that the larvae of other species of *Mycetophila* form the same peculiar limpet-like cases.

In the other species, with the very small hypopygium, the costa does not extend beyond the third vein, and the median ocellus is absent, so that there is really nothing to exclude it from *Mycetophila*. In fact, I have been unable to detect any difference between the hypopygium of this species and that of *M. unicolor*, although Lundström has just described the form under consideration as a distinct species (*M. posticalis*); very probably *E. scatophora*, Winn., is only a variety of *M. unicolor*, Stan., without the central wing-spot. If the female of *M. unicolor* should prove to have the two long hairs on the ventral side of the second abdominal segment, the specific identity of the two would be fairly well established. These hairs are not present in the male sex; the specimen referred to by Mr. Jenkinson as taken at Cambridge, 24. vii. 1904, is really a male of this species, and I have seen another from Crowborough, 5. viii. 1912 (F.J.).

The synonymy of the two may stand as follows:—

1. *Mycetophila scatophora*, Perris (1849).
 ? *Mycetophila aterrima*, ♀, Zett. (1852).
 Epicyptha aterrima, ♂, Strobl. (1894).
Mycetophila unicolor, Stan., var. *posticalis*.
 Epicyptha scatophora, Winnertz, Jenkinson.
 Mycetophila posticalis, Lundstr. (1912).

MYCETOPHILA, Mg.

(including *Mycothera*, Winn.)

Since Lundström has found that the occurrence of a median ocellus is not constant even within the limits of a species, and as it is found in several species which have been included in *Mycetophila*, the genus *Mycothera* cannot be maintained; the type species (*M. dimidiata*, Staeg.)

exhibits no other structural differences from *Mycetophila*, though *M. semifusca*, Mg., is remarkable for the shortness of its cubital fork, and approximates more or less to the closely allied genus *Zygomysia*. *M. semifusca* may eventually require a new genus (the name *Mycothera* unfortunately being inapplicable to it if *M. dimidiata* is excluded), but for the present at least it is placed in *Mycetophila*.

The following table of the British species of this genus may be of use in roughly determining a specimen, but too great reliance should not be placed upon it. Several of the species can only be properly separated by a microscopical examination of the male genitalia. A few more British species of *Mycetophila* are certainly still to be found.

1. Wings quite unspotted 2.
Wings with at least a central dark spot 3.
2. Reddish-brown species *punctata*, Mg.
Shining black species *unicolor*, var. *posticalis*, Ldst.
3. Wings with a central spot only (*M. stolidus* sometimes has a small rather faint subapical spot) 4.
Wings with a central spot and other dark markings more towards the apex 7.
4. Reddish or brown species, thorax dull, usually striped
lineola, Mg.
Black species, thorax shining, unstriped. 5.
5. Thorax and (usually) abdomen entirely black *unicolor*, Stan.
Thorax with yellow shoulder patches 6.
6. Yellow patches between wing base and scutellum *stolidus*, Wlk.
No such patches present; shoulder patches much smaller
pumila, Winn.
7. Wings with a complete but ill-defined dark fascia just beyond the middle; cubital fork very short *semifusca*, Mg.
Wings without such fascia; cubital fork not very short, though its base is sometimes rather beyond that of the median 8.
8. Subapical wing markings reaching and usually including the apex of the first longitudinal vein (R_1) 9.
Subapical wing-fascia entirely distal to the apex of the first longitudinal vein 16.
9. Thorax shining black, reddish in front *adambrata*, Mik.
Thorax dull (more or less) 10.
10. Thorax striped 11.
Thorax unstriped, blackish, usually with yellowish shoulder patches 13.

11. Centra spot of wings much enlarged, reaching costa
formosa, Ldst.
 Central spot not reaching costa 12.
12. Apical area of wing dark, including an oval pale spot
dimidiata, Staeg.
 No pale spot included in the apical darkening of the wing
czizekii, Lndr.
13. Whole apex of wing dark *stylata*, Dz.
 Light areas included in the dark apical markings, even if the
 apex itself is darkened 14.
14. Hind femora with a dark line above *vittipes*, Zett.
 Hind femora dark at apex only 15.
15. A dark patch in the anal cell (except in light specimens); wing
 apex more or less darkened ? *nebulosa*, Stan.
 No dark patch in anal cell; wing apex not darkened
bimaculata, F., *luteicauda*, sp. n.
16. Thorax all yellowish-brown, hind tibiae with bristles in three
 rows (though the middle row may only comprise two
 bristles) 17.
 Thorax dark, or with obvious dark stripes; hind tibiae with
 bristles in two rows 18.
17. Subapical wing-fascia large and conspicuous *cingulum*, Mg.
 Subapical wing-fascia small and rather inconspicuous
confluens, Dz.
18. Large reddish species, subapical wing-fascia forming four
 distinct though not always completely separated spots
rufescens, Zett.
 Medium sized or small species, subapical wing-fascia not forming
 four distinct spots 19.
19. Thorax dull, or with two or three distinct stripes. 20.
 Thorax shining, black, not striped or with the stripes com-
 pletely confluent 24.
20. Thorax shining, the stripes usually well separated (middle one
 sometimes obsolete, especially in *M. signatoides*) *lunata*, Mg.†;
signata, Mg., *sigillata*, Dz., *signatoides*, Dz., *guttata*, Dz.
 Thorax dull 21.
21. A dark blotch in the anal cell (sometimes indistinct). 22.
 No dark blotch in the anal cell 23.
22. Abdomen entirely blackish; thoracic stripes quite confluent
curviseta, Ldst.
 Posterior margins of abdominal segments pale, thoracic stripes
 not confluent 22a.
- 22a. Central spot of wing larger and mainly distal to the basal
 portion of the third vein *spectabilis*, Winn.

vein is distinctly shorter, though not narrower. Both these characters are known to be variable in some species. *M. adumbrata* has a superficial resemblance to *E. punctum*, but the costa does not extend beyond the third vein, and the hind femora are dark only at the apex.

M. unicolor, Stan. Of the typical form of this species, with a central wing-spot, I have only seen a single male (Cambridge, 2. xi. '03, F.J.). See notes under *Epicrypta scatophora*.

**M. formosa*, Lundstr. (= *pulchra*, Lundstr.). This very distinct species has occurred at Inveran and Colwich Park (G.H.V.); Crowborough (F.J.); New Forest (F.J., D.S., and C.G.L.) Lundström's *M. pulchra* seems to have been described from a dark female of this species.

**M. nebulosa*, Stan. ? What I cannot but regard as this species is represented by a good number of specimens from Logie and Crowborough (F.J.), two from the New Forest (D.S. and C.G.L.), and one from Aviemore (J.W.Y.). In dark specimens the apical wing-fascia which includes a pale spot (somewhat as in *M. dimidiata*), reaches the hind margin, and there is a distinct brown blotch in the anal cell, these points not being observed by Winnertz. But the wing-markings vary a good deal in intensity and some specimens answer fairly closely to Winnertz's description. The hind femora are broadly brown at the apex, which also is not mentioned by Winnertz. So far as I have observed, there are only two ocelli. The wing-markings of the palest specimens resemble those of *M. vittipes*. Hypopygium, figs. 79 and 80.

M. vittipes, Zett. This seems to be rather common. In every one of 35 examples which I have examined microscopically, three ocelli are present. There are two forms, which may perhaps prove to be distinct species: (1) wings and coxae yellower, thorax with two large yellowish shoulder-patches, wing not darkened round apex; (2) wings and coxae greyer, thorax only very narrowly yellow on the front margin, wing darkened round apex. The latter form is the true *M. vittipes*; the former has been described (evidently by mistake) by Dziedzicki as *M. gibba*, Winn.

M. stolidus, Wlk. The type (a male) is fortunately still in existence and is in fairly good condition. A large series has been taken in the New Forest by Dr. Sharp and Mr. C. G. Lamb. There is frequently a fairly distinct pre-apical wing-spot, as well as the central spot on the cross-vein.

There are a pair of yellow patches one on each side in front of the scutellum, but the scutellum itself is entirely black.

M. luctuosa, Mg. One male from Crowborough (F.J.) shows a remarkable abnormality in the venation: the fork of the fourth vein of one wing is divided into two by a cross-vein about the middle, the two branches being drawn in so as to form an oval cell somewhat like that of *Synapha*.

M. obscura, Dz. Tuddenham, Boyton (G.H.V.); Crowborough (F.J.). This seems to me to be probably only a dark variety of *M. lunata*, Mg. (Winn.), as the hypopygia are practically identical.

**M. fuliginosa*, Dz. Mildenhall and Tottington (J.W.Y.); Felden (A.P.); Dunphail (F.J.).

**M. blanda*, Winn. Logie, Boat o' Garten, Cambridge, Crowborough (F.J.); New Forest (D.S., C.G.L.). The brown cloud in the anal cell is absent in most of the British specimens I have seen, but some Dr. Lundström sent me from Finland have it very distinctly.

**M. tarsata*, Winn. Westhide, 1 ♂ (J.H.W.).

**M. curviseta*, Lundstr. Plymbridge (G. C. Bignell); Southern Down and Bridgend, Glamorgan (J.W.Y.); Felden (A.P.); Westhide (J.H.W.—in this specimen the blotch in the anal cell is wanting).

**M. spectabilis*, Winn. Dolgelley, Bettws-y-Coed, Ugbrooke, Lyndhurst (G.H.V.); Felden (A.P.); Sheviock (J.W.Y.); Crowborough (F.J.); New Forest (D.S., C.G.L.); Haugh Wood and Stoke Wood, Hereford (J.H.W.).

**M. marginata*, Winn. This seems to be one of the commonest species.

**M. fraterna*, Winn. Logie (F.J.); Lelant (J.W.Y.); Bettws-y-Coed (G.H.V.).

**M. finlandica* nom. n. (Dziedziicki, MS.—*lunata*, Lundstr. nec Mg.). Nethy Bridge (C.G.L.); Logie and Crowborough (F.J.); Bettws-y-Coed (G.H.V.); New Forest (D.S.); Stoke Wood (J.H.W.).

**M. confluens*, Dz. New Forest and Nethy Bridge (D.S.); Aviemore (J.W.Y.).

**M. sigillata*, Dz. Bettws-y-Coed (G.H.V.).

**M. signatoides*, Dz. New Forest (D.S.); Crowborough (F.J.); Iken, Lelant (J.W.Y.); Felden (A.P.); Llangollen, Bettws-y-Coed, Rydal, Newmarket, Stoke Wood, Hay (G.H.V.).

**M. guttata*, Dz. Lodore (G.H.V.); Tottington (J.W.Y.). Felden (A.P.); Crowborough (F.J.); New Forest (D.S.).

M. signata, Mg. (Dz.). I have only seen two males of this species, from Crowborough (F.J.) and Westhide (J.H.W.). The females of the *signata* group seem to be indistinguishable.

M. rufescens, Zett. (= *ornata*, Stph.). This is the largest species of the genus here, and one of the most distinct, the only species which at all resembles it being *M. cingulum*. It is not uncommon. Stephens gave an excellent figure, the plate on which it appears bearing the inscription "London, published by J. F. Stephens, 30th April, 1832." The name of the species, however, does not appear on the plate, and his description did not appear till 1846; meanwhile, Zetterstedt had published his *M. rufescens* (1838). The *M. lutescens* of the British List is most likely this species.

**M. rudis*, Winn. New Forest, 1 ♂ 2 ♀ (D.S.); Sheviock, 1 ♂ (J.W.Y.). These specimens agree very nearly with Winnertz's description, but in none of them does the pre-apical wing-fascia reach the costa, a remarkable character by which, if it were constant, the species might easily be recognised. The dark markings of the thorax occupy the greater part of the surface of the mesonotum, leaving only two rather large shoulder patches and three smaller patches in front of the scutellum yellow. The black colour extends to the front margin in the middle. The hypopygium (figs. 81 and 82) appears small in the dried specimens, being almost retracted, but in reality it is quite large; Winnertz's description does not fit well, but descriptions of this organ are apt to be misleading. Apart from these points there is no disagreement between our specimens and the description of *M. rudis*. Dr. H. Dziedzicki very kindly sent me a specimen which he had compared with Winnertz's type; it is identical in all respects with ours.

**M. russata*, Dz. New Forest (D.S.); Henley-on-Thames, bred from *Polystictus versicolor* (H.S.); Felden (A.P.); Wormsley, Suffolk (G.H.V.). All the specimens (about a dozen) have a distinct blotch in the anal cell, not mentioned by the describer, while the front tarsi of the male are not thickened, as they were in Dziedzicki's single specimen. The hypopygium agrees very closely with the figure.

***M. luteicauda**, sp. n.

M. xanthopygae similis, differt hypopygio.

This species answers almost exactly to Winnertz's description of *M. xanthopyga*, and at first I had no hesitation in so naming it. Dr. H. Dziedzicki, however, has very kindly sent me drawings of the hypopygium of Winnertz's type of *M. xanthopyga*, which prove that the two insects are not the same.

In our species the median ocellus is distinct; the scutellum is entirely black; the abdomen is all black except the hypopygium, which is yellow; the branches of the fourth vein are indented downwards before the middle; the base of the fork of the fifth vein is considerably posterior to that of the fourth; the hind tibiae, though thickened apically, are not curved. For the rest the insect resembles *M. xanthopyga*. Hypopygium, figs. 77 and 78.

Described from one male from Crowborough Warren, 7. viii. 1906 (F.J.) (type—in Cambridge Museum); two other males from Colwich Park, Staffs. (G.H.V.), and a fourth from the New Forest (D.S.).

***OPISTHOLOBA**, Mik.

**O. caudata*, Staeg. Grantown-on-Spey, 17. viii. 1912, 1 ♀ (J.W.Y.); Logie, 27. viii. 1909, 1 ♀ and 29. ix. 1910, 1 ♀ (F.J.). These specimens diverge from Mik's figure in that the branches of the fourth vein are scarcely curved. In one from Logie the dorsum of the abdomen is entirely dark, but the others are more normal in having the fifth and sixth segments dorsally mainly yellow. The abdomen is flattened dorsally, not laterally as in most species of *Mycetophila*. The distinction between the two genera, however, is a very slender one.

CORDYLA, Mg.

**C. nitens*, Winn. The species which I have determined as *C. nitens* seems to be fairly common in the New Forest (D.S., C.G.L., F.J., J.W.Y.) and has also been taken at Logie and Crowborough (F.J.), and Stoke Wood (J.H.W.). It agrees well with Winnertz's description, *except* that the antennae of the male are 14-, not 16-jointed. I have examined a number of specimens, which agree so well in general with Winnertz's description that it seems possible he may have been mistaken as to the number of antennal

joints. *C. nitens* may be at once separated from the three following by its shiny black thorax.

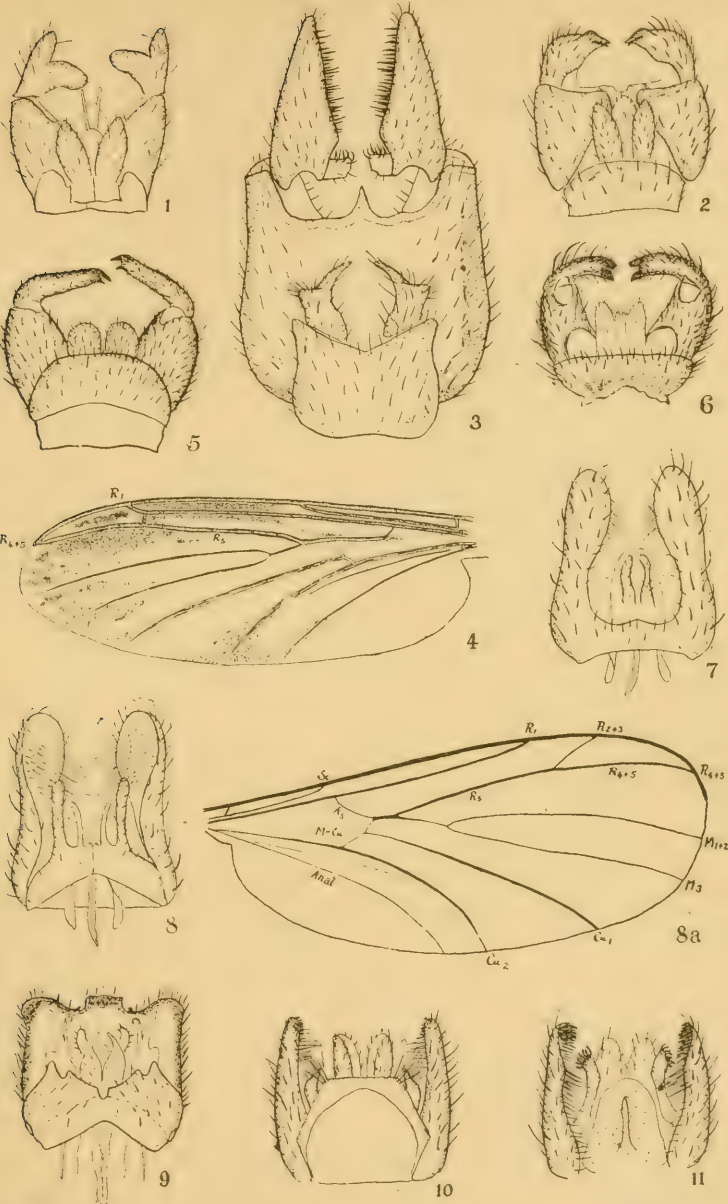
C. fasciata, Mg. (? *flaviceps*, Staeg.). This species, like *C. nitens* has only 14-jointed antennae in the male. It seems to me that *C. flaviceps*, Staeg., is a synonym, but Winnertz definitely states that the antennae of male *C. flaviceps* are 16-jointed. The species (or the two species, if they are distinct) differ from all the other members of the genus found in Britain in having the palpi entirely yellow. The length of the fork of the fifth vein is very variable.

C. semiflava, Staeg. This species is most easily known by the deep black basal palpal joint, the two apical joints being yellow. As stated by Winnertz, the male antennae are 16-jointed. This is much the rarest of the four British species known to me.

C. crassicornis, Mg. This common species may be known by the entirely dark blackish-grey thorax and palpi. I do not know *C. brevicornis*, Mg., but it is probable that the record of its occurrence in Britain really referred to *C. crassicornis*. The species is under both names in the Verrall collection.

LIST OF FIGURES.

1.	<i>Bolitophila oclusa</i> , sp. n.	Hypopygium from above.	× 50.
2.	„ „ <i>saunderi</i> , Curt.	„ „ „	„
3.	<i>Ceroplatus testaceus</i> , Dalm.	„ „ „	„
4.	„ „ „	Wing.	× 7·5
5.	<i>Platyura marginata</i> , Mg.	Hypopygium from above.	× 29.
6.	„ „ <i>semirufa</i> , Mg.	„ „ „	× 35.
7.	„ „ <i>macrocera</i> , sp. n.	„ „ „	× 50.
8.	„ „ „	„ „ below.	„
8a.	„ „ „	Wing.	× 13.
9.	„ „ <i>biumbrata</i> , sp. n.	Hypopygium from below.	× 50.
10.	„ „ <i>nigricauda</i> , Strobl.	„ „ above.	„
11.	„ „ „ „	„ „ below.	„
12.	„ „ <i>flava</i> , Mcq.	„ „ above.	„
13.	„ „ „ „	„ „ below.	„
14.	„ „ <i>modesta</i> , Winn.	„ „ above.	„
15.	„ „ „ „	„ „ below.	„
16.	„ „ <i>dorsalis</i> , Staeg.	„ „ above.	„
17.	„ „ „ „	„ „ below.	„
18.	„ „ <i>artriceps</i> , sp. n.	„ „ above.	„

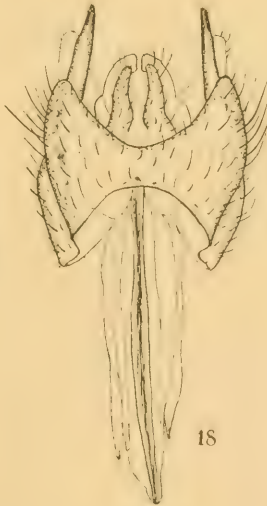
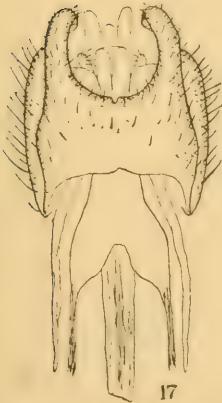
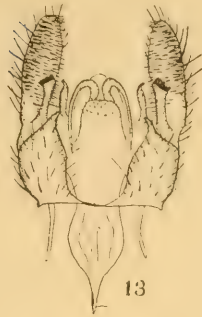


F. W. Edwards, del.

C. Hentschel.

BRITISH MYCETOPHILIDAE.

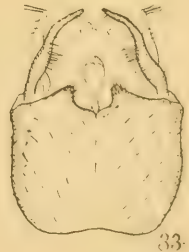
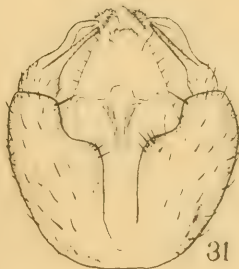
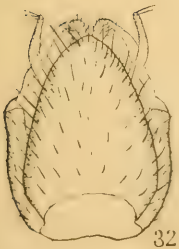
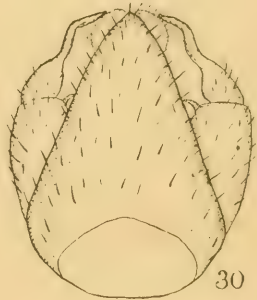
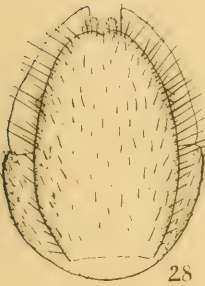




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C. Hentschel.

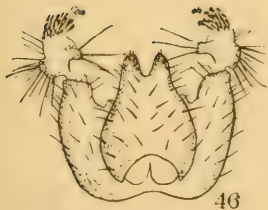
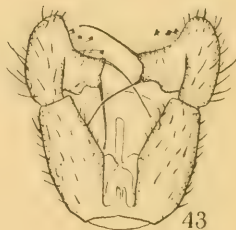
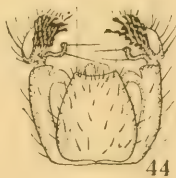
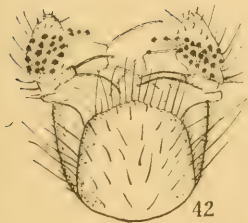
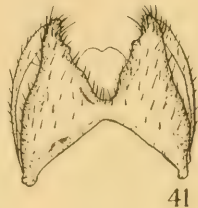
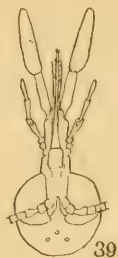
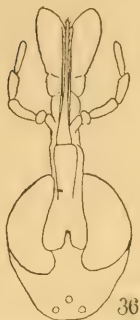
BRITISH MYCETOPHILIDAE.



F. W. Edwards, del.

C. Hentschel.

BRITISH MYCETOPHILIDAE.



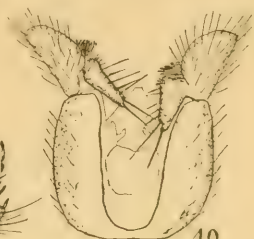
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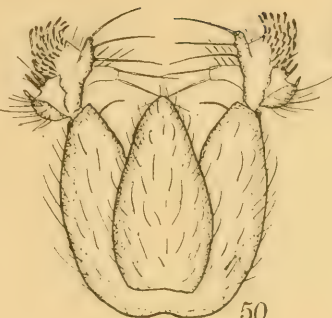
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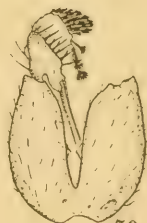
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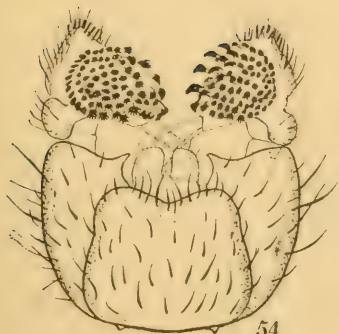
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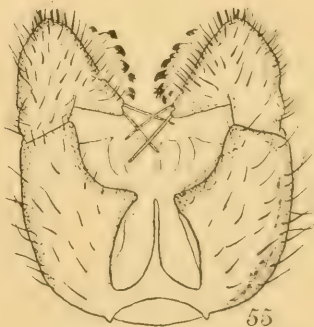
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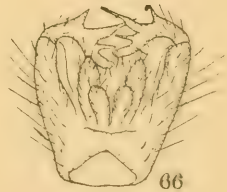
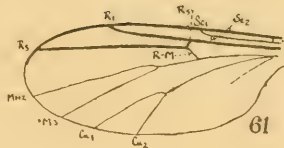
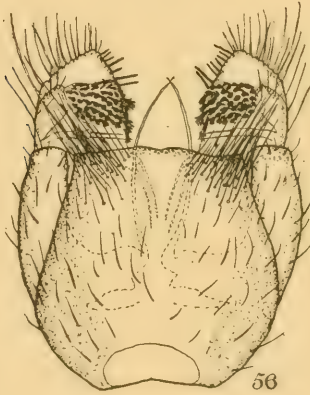
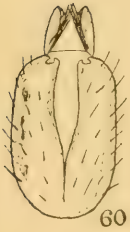
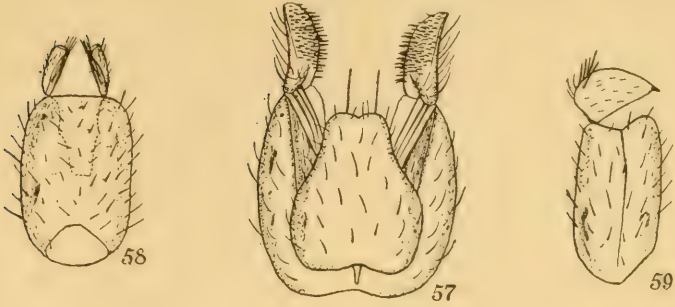


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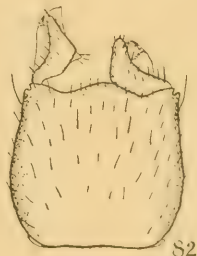
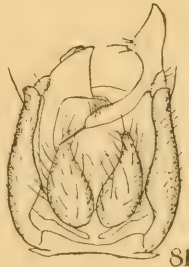
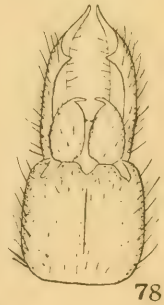
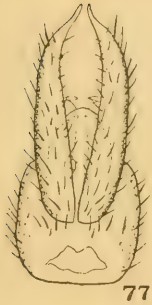
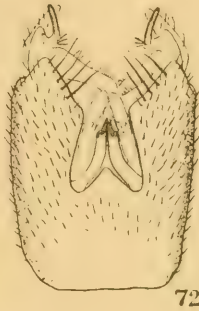
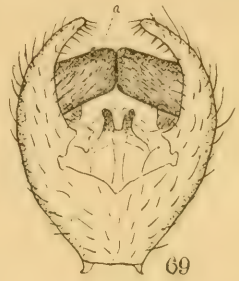
BRITISH MYCETOPHILIDAE.



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BRITISH MYCETOPHILIDAE.



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BRITISH MYCETOPHILIDAE.

19.	<i>Platyura artriceps</i> sp. n.	Hypopygium from below.	× 50.
20.	„ <i>nemoralis</i> , Mg.	„ „ above.	„
21.	„ „	„ „ below.	„
22.	„ <i>zonata</i> , Zett.	„ „ above.	„
23.	„ <i>perpusilla</i> , sp. n.	„ „ „	„
24.	„ <i>acstivalis</i> , Winn.	„ „ „	× 35.
25.	„ „ „	„ „ below.	„
26.	„ <i>pectinifera</i> , sp. n.	„ „ above.	× 50.
27.	„ „ „	„ „ below.	„
28.	„ <i>nigricornis</i> , F.	„ „ above.	„
29.	„ „ „	„ „ below.	„
30.	„ <i>fasciata</i> , Mg.	„ „ above.	„
31.	„ „ „	„ „ below.	„
32.	„ <i>unicolor</i> , Staeg.	„ „ above.	„
33.	„ „ „	„ „ below.	„
34.	<i>Helladepichoria servula</i> , Wlk.	Head.	× 29.
35.	„ „ „	Hypopygium from below.	× 50.
36.	<i>Asindulum rostratum</i> , Zett.	Head.	× 29.
37.	„ „ „	Hypopygium from above.	× 50.
38.	„ „ „	„ „ below.	„
39.	„ ? <i>nigrum</i> , Ltr.	Head.	× 13.
40.	„ „ „	Hypopygium from above.	× 29.
41.	„ „ „	„ „ below.	„
42.	<i>Sciophila hirta</i> , Mg.	„ „ above.	× 50.
43.	„ „ „	„ „ below.	„
44.	„ <i>interrupta</i> , Winn.	„ „ above.	„
45.	„ „ „	„ „ below.	„
46.	„ ? <i>geniculata</i> , Zett.	„ „ above.	„
47.	„ „ „	„ „ below.	„
48.	„ <i>fenestella</i> , Curt.	„ „ above.	„
49.	„ „ „	„ „ below.	„
50.	„ „ var.	„ „ above.	„
51.	„ <i>varia</i> , Winn.	„ „ „	„
52.	„ „ „	„ „ below.	„
53.	„ <i>lutea</i> , Mcq.	„ „ above.	„
54.	„ <i>sharpi</i> , sp. n.	„ „ „	„
55.	„ „ „	„ „ below.	„
56.	„ ? <i>rufa</i> , Mg.	„ „ above.	„
57.	„ <i>jenkinsoni</i> , sp. n.	„ „ „	„
58.	<i>Empalia paradoxa</i> , sp. n.	„ „ „	„
59.	„ „ „	„ „ side	„
60.	„ „ „	„ „ below.	„
61.	„ „ „	Wing.	× 13.
62.	<i>Bolctina villosa</i> , Landr.	Variety of clasper.	× 50.

63.	<i>Bolctina nigricans</i> , Dz.	} {	Variety of hypopygium,	× 50
64.	„ <i>brevicornis</i> , Zett.		from below.	„
65.	„ <i>trispinosa</i> , sp. n.		Hypopygium from below.	„
66.	<i>Phthinia winnertzi</i> , Mik		„ „ above.	„
67.	„ „		Ovipositor from side.	„
68.	„ <i>humilis</i> , Winn.		Hypopygium from above.	„
69.	„ „ „		„ „ below.	„
70.	„ „ „		Ovipositor from side.	× 29.
71.	<i>Brachypezza spuria</i> , sp. n.		Hypopygium from above.	× 50.
72.	„ „ „		„ „ below.	„
73.	<i>Exechia trisignata</i> , sp. n.		„ „ above.	„
74.	„ „ „		„ „ below.	„
75.	„ „ „	} {	Right clasper from the	„
76.	„ <i>trivittata</i> , Staeg.			inside.
77.	<i>Mycetophila luteicauda</i> , sp. n.		Hypopygium from above.	„
78.	„ „ „		„ „ below.	„
79.	„ ? <i>nebulosa</i> , Stan.		„ „ above.	„
80.	„ „ „		„ „ below.	„
81.	„ <i>rudis</i> , Winn.		„ „ above.	„
82.	„ „ „		„ „ below.	„

ADDENDUM.

Since the proofs of this paper passed through my hands I have received from Dr. Lundström a copy of his "Neue oder wenig bekannte europäische Mycetophiliden, III." (Ann. Mus. Nat. Hung., XI., 1913, pp. 305-322). In this paper the species which I had identified with some doubt as *Mycetophila nebulosa*, Stan. is described as *M. edwardsi*, sp. n., while the *M. luteicauda*, sp. n., of my paper is described and figured as *M. forcipata*, sp. n.

XIII. *On the classification of British Crabronidae*
(Hymenoptera). By R. C. L. PERKINS, M.A.,
D.Sc., F.Z.S.

[Read April 2nd, 1913.]

PLATE XIX.

THE *Crabronidae*, owing to the number of their species, form a most important part of the British Hymenoptera Aculeata, and in the tabular classification that follows, I have attempted to show the relationship of the various groups, genera and species to one another. Some characters that have been very little used by British hymenopterists are largely utilised, since I have found them of great importance in dealing with exotic species. Edward Saunders in his admirable works recognised only two genera: *Entomognathus* with a single species and *Crabro* including all the others, employing, however, a number of subgenera of *Crabro* in his latest writings. I think that Ashmead, following the example of earlier classifiers, was correct in considering the *Crabronidae* to consist of many good genera, and also in grouping these genera together in divisions of a higher order, which he calls subfamilies, and these I have recognised here, without discussing the point as to whether the divisions are of subfamily value or not, since they are, at any rate, natural. To place our British species of *Crabro* in a single genus appears to me precisely the same as if all our butterflies (excluding *Hesperiidae*) were assigned to *Papilio* and a few subgenera of this.

Ashmead's deep insight into the affinities of the groups of Hymenoptera was rarely at fault, but his carelessness in the definition of characters of genera, etc., is well known, even when the genera themselves are perfectly valid. The type of his genus *Metacrabro* is our well-known species *Crabro lituratus*, the ♂ of which he says has no spur on the middle tibiae, but an unusual structure of the 2nd antennal joint. In neither of these points is he correct. The ♂ of his genus *Xestocrabo*, according to specimens sent to me from America, is also incorrectly said to be without

this spur. The common insect called by Saunders *Solenius vagus* appears to be congeneric with *Xestocrabo*, Ashm., but Ashmead's restriction of *Solenius*, if correct, excludes any British species from the latter, the American *Solenius* being very different in structure. I do not think that the genus *Stenocrabo*, Ash., is valid. It would probably contain our *Crossocerus varius*, etc., but it was based only on male characters. The American hymenopterist also largely employed sculpture in his generic divisions, and, I think, went too far in this respect, though not without some fair reason, when one examines the North American species of *Crabronidae*, where, as elsewhere, a similar style of sculpture runs through whole series of species. According to the same author the genus *Coelocrabo*, Thoms., is a synonym of *Blepharipus*, Lep., Morawitz having subdivided the latter previously. Our British species that stood under *Blepharipus* (*Coelocrabo*) are a very heterogeneous assemblage and are sure to be further subdivided, while one of them, *B. podagricus*, cannot possibly be considered as congeneric with the others. *Crabo vagabundus*, Panz., also appears to me to have very distinct generic characters. I have not been able to critically examine specimens of *B. styrius*, and it is possibly misplaced in my table and not really closely allied to *B. capitosus*. Two species (*C. elongatulus* and *wesmaeli*) are a discordant element in the genus *Crossocerus*.

The minute tubercles at the sides of the mesosternum in the small species of the *Thyreopinae* require careful examination, because the margin of the coxal cavities behind these is sometimes a little prominent, and might be mistaken for these tubercles. The latter are always placed well in front of the coxal cavities, at the point where the mesosternum slopes down to the latter, and in fact are the homologues of the carinae of the *Crabroninae*. I have referred to these structures indifferently as being "spinose" or "tuberculate," as the tubercles are often pointed. Owing to the interference of the dense clothing, it needs a little practice before it becomes easy to see the important structures of the clypeus, and to do so is greatly facilitated by opening the mandibles. The mandibular structure is so important and interesting in the *Crabronidae*, that these organs should always be spread open in some individuals of a species, and since only a few species are so small as 5 or 6 mm., and many are large insects, it requires very little skill or trouble to do this, when the

specimens are freshly caught, or after relaxing in the case of old examples.

In the *Thyreopinae* the erect hairs* of the antennae of the ♂ are in some of the smaller species not conspicuous on casual inspection, but they are worthy of attention since their arrangement and character show considerable variety in different species. Under no circumstances should specimens of *Crabronidae* be gummed on card, most of the important characters being hidden or obscured under this treatment.

TABLE OF SUBFAMILIES OR TRIBES.

- 1 (2). Antennae of ♂ 12-jointed, the flagellar joints beneath with appressed microscopic hairs or tomentum; both sexes with a carina bounding the posterior declivous portion of the mesosternum at the sides and with the recurrent nervure entering the cubital cell far beyond the middle of its lower side, the transverse cubitus longer than the distance between its lower extremity and the point of reception of the recurrent nervure, sometimes twice as long; basal abdominal segment not long and petiolar.

Crabroninae.
- 2 (1). Antennae of ♂ 13-jointed; both sexes without a carina and at most with a small spinous tubercle in place of the carina; recurrent nervure varying in position but usually received further from the extremity of the transverse cubitus than the length of the latter, and most often much further than this, sometimes near the middle of the lower side of the cubital cell.
- 3 (6). Basal abdominal segment not long and petiolar with the apex swollen.
- 4 (5). Mandibles of the ♂ always bidentate at apex, of the ♀ (except in *Hoplocrabro*) with two or more teeth. Antennae of ♂ with some or many of the flagellar joints with erect fine hairs beneath. If the mandibles of the ♀ are simple (*Hoplocrabro*) the occipital margin is produced into a prominent spine or angle at its extremity beneath the head *Thyreopinae*

* In the single ♂ of *C. styrius*, that I have examined, these hairs are not, or hardly, visible under a very strong lens, and even under a compound microscope are extremely short and sparse, but they are certainly present.

- 5 (4). Mandibles of ♂ and ♀ simple at the apex, not toothed; ocelli in a triangle with very wide base; antennae of ♂ not fringed with erect hairs beneath on the flagellar joints *Lindeniinae*.
- 6 (3). Abdomen with the basal segment entirely petiolate, but swollen at the apex *Rhopalinae*.

It must be understood that the above table is somewhat simpler than would have been the case had I included all the many exotic species that I have examined. Thus some of the petiolate species of other countries appear to me to belong to the *Crabroninae* and not to the *Rhopalinae*, and have no connection with the latter.

CRABRONINAE.

♂ ♂.

- 1 (2). Superorbital foveae deep and distinct; the front tarsi greatly dilated; head very strongly narrowed behind the eyes, so as to form a neck. *Thyreus*, Lep., *T. clypeatus*, Sch.
- 2 (1). Superorbital foveae wanting or represented only by very faint impressions or smooth areas near the eye-margins; head normal; front tarsi not laminately dilated.
- 3 (10). Mandibles without a tooth on the inner (upper) margin near the middle of its length; antennae with the third joint produced beneath near the middle and at the apex, the following joints also with projections at the apex beneath *Clytochrysus*, Mor.
- 4 (9). Ocelli in a nearly equilateral triangle; 3rd antennal tooth (or projection beneath) about as long as either of the two basal ones.
- 5 (6). First tooth with a thin tuft of fine hairs at the apex.
C. 6-cinctus, H. Schf. (= *saundersi*, Perk.).
- 6 (5). First tooth without such hairs.
- 7 (8). Emargination between the first and second antennal tooth very shallow compared with the following.
C. planifrons, Thoms.
- 8 (7). These emarginations or arches about equally deep.
C. cavifrons, Thoms.
- 9 (4). Ocelli in a more obtuse-angled triangle (but less wide at the base than in the following genera), 3rd antennal tooth much shorter than the first two and of minute size.
C. chrysostomus, Lep.
- 10 (3). Mandibles with a tooth on the inner margin towards the middle; antennae with the third joint simple.

- 11 (14). Sixth joint distinctly emarginate beneath
Xestocrabro, Ashm. (= *Solenius*, Auct.).
- 12 (13). Front femora becoming suddenly widened from the base, so as to be subangulate beneath near the base; clypeus produced in the middle at the apex; 3rd antennal joint short . . . *X. microstictus*, H. Schf. (= *larvatus*).
- 13 (12). Front femora gently rounded beneath from the base; clypeus broadly rounded apically in the middle; 3rd antennal joint longer, twice as long as wide or more.
X. vagus, L.
- 14 (11). Sixth antennal joint not emarginate beneath, all the joints simple.
- 15 (16). Tooth on inner edge of mandibles rather small; clypeus apically in the middle bluntly pointed; basal joint of middle tarsi simple. *Metacrabro*, Ashm., *M. lituratus*, Panz.
- 16 (15). Tooth on inner edge of mandibles very large; clypeus apically in the middle broadly rounded or almost truncate; basal joint of middle tarsi subangulately dilated.
M. (?) quadricinctus, F. (*interruptus*, Saund.) *an. gen. nov. ?*

CRABRONINAE.

♀ ♀.

- 1 (2). Superorbital foveae sharply defined; basal abdominal segment strongly punctured (mandibles 3-dentate at apex and with a tooth on the inner edge).
Thyreus, Lep., *T. clypeatus*, Schr.
- 2 (1). Superorbital foveae absent or ill-defined or very feeble; basal abdominal segment at most very finely and feebly punctured.
- 3 (12). Mandibles 3-dentate at apex and without a distinct tooth on the inner margin towards the middle, at most with the margin faintly sinuate or with a trace of an angulation.
- 4 (11). Antennae with the third joint very elongate, becoming in some aspects conspicuously slender behind the apical portion, fully twice as long as the fourth; clypeus apically in the middle strongly produced and on each side of the produced part there is a strong emargination, forming on each side a prominent tooth; ocelli generally in a sub-equilateral triangle (more obtuse-angled in *chrysostrabus*).
Clytochrysus, Mor.
- 5 (10). Ocelli in a nearly equilateral triangle; size larger.

- 6 (7). Distance between the lateral angles of the median produced part of the clypeus, not less than the distance between one of these and the nearest lateral tooth.
C. cavifrons, Thoms.
- 7 (6). Distance between the lateral angles of the median produced part of the clypeus much less than the distance between one of them and the nearest lateral tooth.
- 8 (9). Face longer *C. planifrons*, Thoms.
- 9 (8). Face much wider across the eyes. *C. sexcinctus*, H. Sch.
- 10 (5). Ocelli in a triangle much widest at base, smaller, length about 11 mm. *C. chrysostomus*, Lep.
- 11 (4). Antennae with the third joint elongate but much less than twice as long as the fourth and not conspicuously attenuated behind the apical portion in some aspects; clypeus not strongly produced in the middle and with only a slight emargination on each side of this; so that all the angles are obtuse or feeble; ocelli in a triangle with very wide base. *Metacrabro*, Ashm., *M. lituratus*, Panz.
- 12 (3). Mandibles 3-dentate at apex, but with a very distinct additional tooth towards the middle of the inner margin.
- 13 (14). Mesonotum without or almost without punctures, transversely rugose in front and longitudinally behind; superorbital foveae represented by feeble depressions along the eye-margins, the depressions dull and finely punctured.
M. quadricinctus, F. (*interruptus*, Saund.) *an. gen. nov.?*
- 14 (13). Mesonotum densely punctured; superorbital foveae represented by feeble impressions, which are smooth and shining *Xestocrabro*, Ashm.
- 15 (16). Clypeus somewhat pointed or very narrowly rounded in the middle of its apical margin; 3rd antennal joint short; pygidial area much less elongated, the raised margins divergent from near the apex, not continuing subparallel for nearly half their length *X. microstictus*, H. Schf.
- 16 (15). Clypeus with the median part of its apical margin wide, truncate or slightly emarginate; third antennal joint long; pygidial area very greatly elongated, the raised margins subparallel for a long distance from the apex; a larger species *X. vagus*, L.

THYREOPINAE.



- 1 (6). Ocelli arranged in an isosceles triangle much widest at the base; recurrent nervure received far beyond the middle

of the lower side of the cubital cell, the distance between its point of reception and the extremity of the transverse cubitus being usually only about equal to the length of the transverse cubitus itself. Antennae with the flagellum subfusiform or at least with many of the joints wide and flattened. Front legs very abnormal, the tibiae with enormous lamellate expansions, which are broader than long, tarsi distorted *Thyreopus*, Latr.

- 2 (5). Mandibles at the base with a prominent spine or process.
- 3 (4). Mesonotum strigose *T. cribrarius*, Fab.
- 4 (3). Mesonotum punctate *T. scutellatus*, Schr.
- 5 (2). Mandibles at the base simple *T. peltarius*, Schr.
- 6 (1). Ocelli arranged in an equilateral triangle or nearly; recurrent nervure generally received near the middle of the cubital cell or at least much further distant from the end of the transverse cubital nervure than the length of the latter, very rarely with these distances not greatly unequal; antennae not conspicuously dilated or flattened; front legs with the tibiae rarely greatly dilated.
- 7 (10). Superorbital foveae deep, distinct, narrow and elongate sublinear or elongate-triangular; legs simple.
Blepharipus, Lep.
- 8 (8). Clypeus in front with two great subprominent angles, which are very widely separated from one another.
B. leucostomus, L.
- 9 (7). Clypeus quite differently formed, produced in the middle apically *B. nigrinus*, Lep. (*pubescens*, Shuck.).
- 10 (7). Superorbital foveae rarely distinct, deep and narrow, usually feeble or subobsolete, or represented by smooth spaces. If well-defined or deep they are short or broad or the front legs have some special modifications.
- 11 (14). Anterior area of propodeum ill-defined, not bounded completely, or almost completely, or by a distinct consute or crenate furrow.
- 12 (13). Front legs with the tibiae and tarsi dilated.
B. (?) cetratus, Shuck.
- 13 (12). Front legs simple, hind tibiae unusually incrassate.
- 13 (a) (13b). Clypeus produced into a strong median blunt tooth in the middle *B. (?) capitosus*, Shuck.
- 13 (b) (13a). Clypeus with the apical margin feebly 3-dentate, the middle tooth not strongly prominent. *B. (?) styrius*, Kohl.
- 14 (11). Anterior area of propodeum well defined by a usually consute or crenate furrow, rarely not altogether complete.

- 15 (40). Occipital margin not produced on each side beneath the head into a prominent spine.
- 16 (35). Small species with entirely black abdomen; the front tibiae either simple or laminately dilated, the front femora never armed with a spine beneath at about the basal third of their length. Recurrent nervure rarely received far beyond the middle of the lower side of the cubital cell.
- 17 (24). Seventh dorsal abdominal segment with only a fine and feeble or indefinite puncturation not greatly different from that of the preceding.
- 18 (21). Mesopectus simple, not tuberculate or spinose on each side.
- 19 (20). Front legs with the tibiae and first two tarsal joints conspicuously dilated, the front femora suddenly widened from the base, so as to form a distinct angle beneath; clypeus black *B. (?) gonager*, Lep.
- 20 (19). Front legs simple, clypeus yellow (?) *aphidum*, Lep.
- 21 (18). Mesopectus minutely spinose or tuberculate on each side.
- 22 (23). Middle tibiae normal with a calcar; hind tibiae normal; superorbital foveae feebly defined; mesonotal puncturation normal *B. (?) carbonarius*, Dahlb.
- 23 (22). Middle tibiae much thickened, elongate-triangular, only with a few short apical or subapical spines,* the true calcar usually wanting; hind tibiae much swollen; mesonotum not shining, but with extraordinarily minute puncturation; superorbital foveae short, generally punctiform. *Ablepharipus* gen. nov., *A. podagricus*, V. d. Lind.
- 24 (17). Seventh dorsal segment with a peculiar sculpture, at least on its apical portion (the punctures being large and close, though generally shallow) or quite different from that of the preceding.
- 25 (32). Mesopectus on each side with a distinct minute spine or tubercle.
- 26 (27). Front tibiae very greatly laminately dilated.
Crossocerus, Lep., *C. palmarius*, Schr.
- 27 (26). Front tibiae not dilated, the basal joint of front tarsi sometimes dilated (*Stenocrabro*, Ashm.).
- 28 (29). Front tarsi with the basal joint conspicuously dilated.
C. palmipes, L.
- 29 (28). Front tarsi not evidently dilated.

* I have mentioned this character, in spite of its inconstancy, on account of the interest of its variability.

- 30 (31). Anterior area of propodeum on each side of the median channel rugose or striate *C. varius*, Lep.
- 31 (30). Anterior area with a smooth polished space on each side of the channel *C. ovalis*, Lep. (*anxius*, Wesm.).
- 32 (25). Mesopectus without a spine or tubercle on each side.
- 33 (34). Anterior area of propodeum with a smooth space on either side of the median channel, this space being at the most very faintly rugulose even under a very strong lens.
C. (?) wesmaeli, V. d. Lind.
- 34 (33). Anterior area closely rugose or striate.
C. (?) elongatulus, V. d. Lind.
- 35 (16). Large species with yellow-marked abdomen; either the front tibiae are angulately dilated (but not laminate) or the front femora have a spine beneath. Recurrent nervure always received far beyond the middle of the lower side of the cubital cell.
- 36 (37). Superorbital impressions, deepish, large and very distinct, not situated in wide lateral depressions of the head; front femora with an angular spine beneath before the middle; basal abdominal segment ordinary not lengthened, the spiracles not further apart than the distance from them to the base of the abdomen; 7th ventral segment without erect spines, but with a basal elevation (mandibles with a well-developed tooth near the middle of their inner margin; clypeus with a distinct median truncate or slightly emarginate production of its apical margin and with a well-marked angle on each side exteriorly to this.
Acanthocrabro gen. nov., *A. vagabundus*, Pz.
- 37 (36). Head widely depressed on each side to the ocellar region, the superorbital foveae sometimes ill defined, sometimes with the inner margin raised so as to form a longitudinal division of the large lateral depressions of the head; basal abdominal segment elongated, the spiracles not so far apart as the distance from them to the base of the segment; 7th ventral segment with two erect spines.
Cuphopterus, Mor.
- 38 (39). Hind tibiae spinous above, the hind femora unarmed, the hind coxae with a spine or angular projection beneath (mandibles on their flat surface impressed between the longitudinal carinae) *C. dimidiatus*, Fab.
- 39 (38). Hind tibiae unarmed, the hind femora with a spine or tooth beneath towards the base inwardly.
C. signatus, Panz.
- 40 (15). Occipital margin of the head produced into a prominent

spine on the underside of the head (clypeus with five emarginations, which produce six nearly equidistant teeth); all the legs simple; superorbital foveae represented by smooth, slight callosities; mandibles bidentate, the inner edge edentate.

Hoplocrabro, Thoms., *H. 4-maculatus*, Fab.

THYREOPINAE.

♀ ♀.

- 1 (6). Ocelli in a triangle much widest at the base, recurrent nervure received by the cubital cell far beyond the middle of its lower side and at a distance from the apex subequal to (or at most rather longer or shorter than) the length of the transverse cubitus. Mandibles bidentate at apex and without a tooth on the inner margin. Pygidial area flat, triangular, roughly punctured and setose *Thyreopus*, Latr.
- 2 (3). Mesonotum longitudinally rugose . . . *T. cribrarius*, Fab.
- 3 (2) Mesonotum punctured.
- 4 (5). Lateral prothoracic angles not prominent.
T. scutellatus, Schr.
- 5 (4). Lateral angles of pronotum prominent. *T. peltarius*, Schr.
- 6 (1). Ocelli in a triangle that is equilateral or nearly; recurrent nervure generally received near the middle of the lower side of the cubital cell, very rarely at a distance from the apex subequal to the length of the transverse cubitus. Mandibles generally tridentate at apex (if bidentate, the species are very small and the abdomen is black); pygidial area often excavated, or shining though in some small species closely punctured and setose.
- 7 (16). Anterior area of the propodeum not clearly defined by distinct and generally complete furrows, that are usually consute or crenate *Blepharipus*, Lep.
- 8 (13). Mandibles at the apex tridentate; mesopectus spinose or tuberculate on each side, faintly so in *ceptratus*. Superorbital foveae deep or deepish, distinct and narrow.
- 9 (12). Head above and mesonotum clothed with long or longish erect hair; mesosternum not polished and with a copious fine puncturation.
- 10 (11). Head in front of the anterior ocellus more or less transversely depressed or sloping from the eye-margin to the median impressed line, the surface polished and more or less sparsely or irregularly punctured . . . *B. leucostomus*, L.

- 11 (10). Head in front of the anterior ocellus with the surface on each side of the median impression not at all depressed but slightly convex, and not polished, finely punctured.
B. pubescens, Shuck.
- 12 (9). Head above and mesonotum with short and much less conspicuous hairs; mesosternum polished, finely and remotely punctured, very deeply excavated posteriorly; tubercles of the mesopectus very feebly developed.
B. (?) cetratus, Shuck.
- 13 (8). Mandibles at the apex with four teeth, the innermost the smallest; mesopectus not spinose; superorbital foveae more or less feeble and shallow.
- 14 (15). Hind tibiae unarmed, not spinose above; clypeus produced in the middle into a strong, blunt, narrow, apical tooth or process, and with a smaller and shorter tooth on each side of this *B. (?) capitosus*, Shuck.
- 5 (14). Hind tibiae armed with spines; clypeus not produced into a strong narrow median tooth, but faintly 3-dentate or 3-tuberculate **B. (?) styrius*, Kohl.
- 16 (7). Anterior area of propodeum defined by a distinct cunite, or crenate furrow, usually complete, very rarely a little incomplete.
- 17 (42). Mandibles either bidentate or tridentate at the apex (the teeth sometimes worn down or blunt); occipital margin beneath the head not produced into a prominent spine or angle at its apical extremity.
- 18 (37). Small species, with black (not yellow-marked) abdomen; superorbital foveae small or feeble or marked only by smooth spaces or faint impressions.
- 19 (26). Pygidial area with the sides strongly raised so that it appears excavated.
- 20 (25). Mandibles tridentate.
- 21 (24). Mesopectus not spinose or tuberculate on each side.
- 22 (23). Clypeus with a distinct prominent tooth on each side of the middle of the apical margin; clypeus black.
B. (?) gonäger, Lep.
- 23 (22). Clypeus somewhat broadly rounded or nearly truncate in the middle of the apical margin; clypeus wholly or largely yellow *B. (?) aphidum*, Lep.
- 24 (21). Mesopectus tuberculate or spinose on each side.
B. (?) carbonarius, Dahlb.

* I have not been able to examine the mandibles of this species, and its position here is doubtful.

- 25 (20). Mandibles bidentate at apex (pygidial area dull, the surface with microscopic sculpture and without appressed setae, the raised sides thickened about the middle), mandibles with a distinct tooth on the inner margin near the middle, the mesopectus spinose or tuberculate; mesonotal puncturation excessively minute.
Ablepharipus gen. nov., *A. podagricus*, V. d. Lind.
- 26 (19). Pygidial area triangular, not narrowly produced apically, finely margined, not impressed or excavated, often clothed with appressed setae, sometimes shining and punctate, but not setose; mesonotal puncturation fine, but ordinary.
- 27 (34). Pygidial area dull, punctate, with conspicuous decumbent setae on the apical portion; mesopectus with a small spine or tubercle on each side (mandibles bidentate at apex). *Crossocerus*, Lep.
- 28 (29). Clypeus more or less yellow or all yellow; superorbital foveae obsolete *C. palmarius*, Schr.
- 29 (28). Clypeus black beneath the silvery hairs; superorbital foveae shallow but wide subovate or subpyriform.
(? subgen. *Stenocrabro*, Ashm).
- 30 (33). Anterior area of propodeum finely rugose or striate.
- 31 (32). Front legs with the calcar often dark; the median channel of the anterior area of the propodeum wider and with larger spines on the mesopectus . . . *C. palmipes*, L.
- 32 (31). Front legs with the calcar usually pale; the median channel of propodeum narrower and smaller mesopectoral spines or tubercles *C. varius*, Lep.
- 33 (30). Anterior area of the propodeum with smooth, polished area on each side of the median channel. *C. anxius*, Wesm.
- 34 (27). Pygidial area polished and with large punctures; mesopectus not tuberculate laterally.
- 35 (36). Middle tibiae black, yellow only at the base; pygidial area black *C. (?) elongatulus*, V. d. Lind.
- 36 (35). Middle tibiae yellow above; pygidial area red apically.
C. (?) wesmaeli, V. d. Lind.
- 37 (18). Large species, abdomen with yellow marks; superorbital foveae large and distinct, well-impressed and dull, or else placed in wide lateral depressions of the head, which extend from the eye-margins to the ocellar region.
- 38 (39). Recurrent nervure received by the cubital cell far beyond the middle, or not much more distant from the apex than the length of the transverse cubital nervure; pygidial area elongate and narrow, and behind the apical part with a median longitudinal carina; superorbital foveae

large, deepish, very distinct, subtriangular, dull; mandibles with a very distinct tooth on the inner edge, 3-dentate at apex; basal abdominal segment not unusually long, the spiracles wider apart than the distance to the base of the segment.

Acanthocrabro, gen. nov., *A. vagabundus*, Panz.

39 (38). Length of transverse cubitus very much less than the distance between its extremity and the recurrent nervure; pygidial area much less narrowly prolonged apically; sides of the head above much and widely impressed; the super-orbital foveae smooth, placed in these impressions, large, but sometimes ill-defined; mandibles 3-dentate, and with a feeble angulation on the inner margin; basal abdominal segment narrow and elongate, the distance between the spiracles less than that from them to the base of the segment *Cuphopterus*, Mor.

40 (41). Superorbital foveae distinctly margined on the inner side, so as to form a distinct longitudinal division of the lateral depressions of the head in which they are placed.

C. signatus, Panz.

41 (40). Superorbital foveae ill-defined inwardly, not forming a raised line *C. dimidiatus*, Fab.

42 (17). Occipital margin produced at its apex beneath the head into a prominent spine or angle; mandibles simple at the apex; pygidial area flat, triangular, the margins fine, the surface dull, microscopically granulate, and with sparse large punctures.

Hoplocrabro, Thoms., *Hoplocrabro 4-maculatus*, F.

In the *Thyreopinae* the relationship of *Blepharipus* (*Coelocrabro*) *gonager*, *B. aphidum* and *B. carbonarius* to the typical *B. nigrinus*, etc., seems to me remote, while the first named (*gonager*) is also remote from the two following. *C. wesmaeli* and *elongatulus* will probably be found generically distinct from the rest of *Crossocerus*. A more extensive collection of the small black species of America is necessary before these points can be decided.

RHOPALINAE.

♂ ♂.

I (2). Antennae highly modified, third joint very small, not strongly divided from the large and long fourth joint, which is strongly widened from the base, the fifth elongate and

arched beneath. Clypeus very strongly produced in the middle, with an angle on each side of the median production. Front and middle metatarsi abnormal, though not greatly dilated; apex of occipital margin beneath the head produced into a spine as in *Hoplocrabro*; a median frontal prominence between the antennae.

Rhopalum, Kirby, *R. tibiale*, Lep.

- 2 (1). Antennae nearly simple, the 6th joint with a slight emargination or arch beneath; clypeus and face ordinary; metatarsi simple . . . *Physoscelis*, Lep., *P. clavipes*, Linn.

♀ ♀

- 1 (2). Clypeus strongly produced in the middle and with distinct lateral angles; face with a mediofrontal prominence; pygidial area apically produced and excavated; hind tibiae conspicuously spinous above.

Rhopalum, K., *R. tibiale*, Lep.

- 2 (1). Clypeus ordinary; pygidial area dull, with dense microscopic granulation, its margins very feeble, hardly produced apically, not excavated; face simple; hind tibiae inconspicuously spinose . . . *Physoscelis*, Lep., *P. clavipes*, L.*

LINDENIINAE.

- 1 (4). Eyes bare; mandibles simple *Lindenius*, Lep.
 2 (3). ♂ hind tibiae yellow above; ♀ hind tibiae yellow only at the base, usually for about one-fourth of their length.

L. albitabris, Fab.

- 3 (2). ♂ hind tibiae yellow on the basal half only or less; ♀ hind tibiae yellow except at the apex. *L. panzeri*, V. d. Lind.

- 4 (1). Eyes hairy; mandibles with a prominent angle near the base beneath.

Entomognathus, Dahlb., *E. brevis*, V. d. Lind.

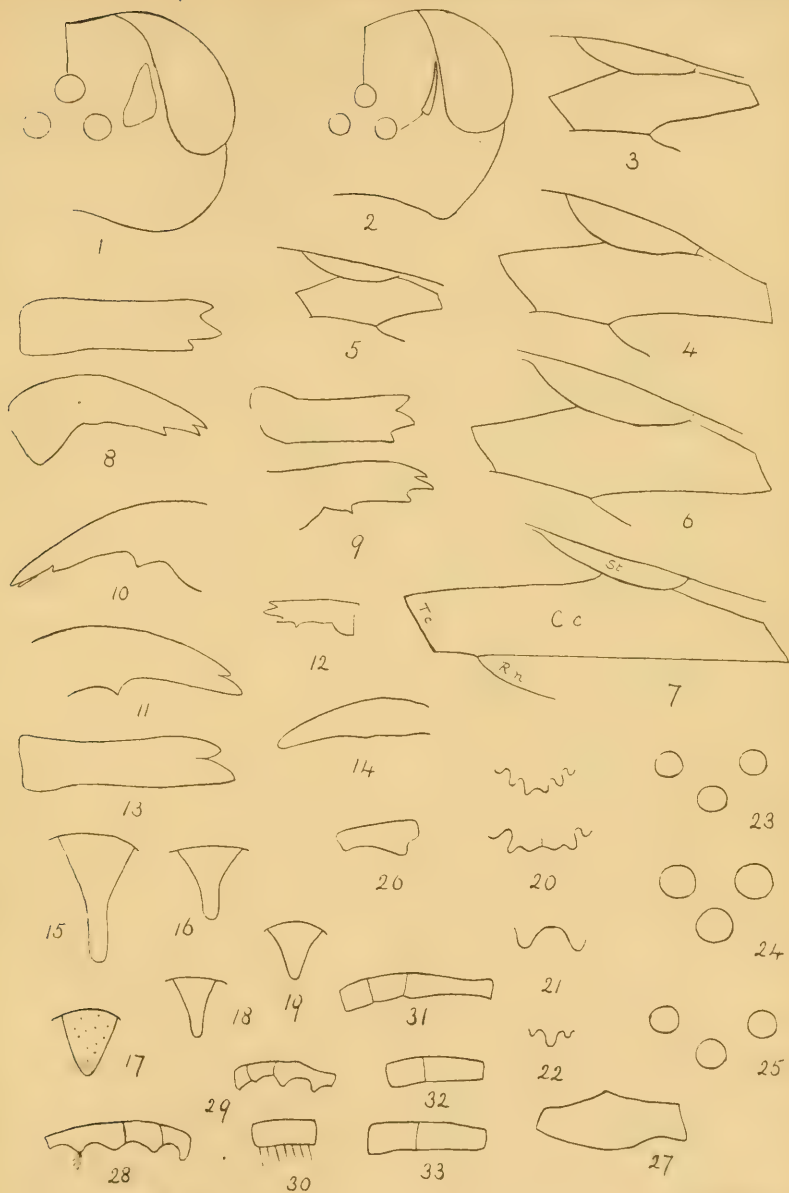
* Since the above was written a second species of *Rhopalum* has been added to our list by Col. C. G. Nurse (Ent. Mo. Mag. 1913, p. 83). It may be distinguished as follows:

- a. Clypeus in the middle triangular (rounded in ♂ at apex, acute in ♀), tegulae pale *R. tibiale*, Lep.
 b. Clypeus in the middle truncate, tegulae black; abdomen wholly black *R. kiesenwetteri*, Mor.

EXPLANATION OF PLATE XIX.

- FIG. 1. Right side of head (in dorsal aspect) of *Acanthocrabro vagabundus* ♀, showing the large and definite (strongly depressed) superorbital foveae, between the inner margin of the eye and the ocelli.
2. The same of *Blepharipus leucostomus* ♀, the fovea deep and narrow.
 3. Stigma and cubital cell of *B. leucostomus* ♀, showing the point of reception of the recurrent nervure in the lower side of the cell.
 4. The same in *A. vagabundus* ♀.
 5. The same in *Crossocerus varius*.
 6. The same in *Cuphopterus dimidiatus*.
 7. The same in *Metacrabro* (?) *quadricinctus*, (= *interruptus*, Saund.). Cc. = cubital cell; T. c. transverse cubitus; St. stigma; Rn. recurrent nervure.
 8. Mandible of *Clytochrysus cavifrons* ♀ in two aspects; the apex tridentate and no distinct tooth on the inner margin.
 9. The same of *A. vagabundus* ♀, the lower figure showing the distinct tooth on the inner margin.
 10. Mandible of *Metacrabro* (?) *quadricinctus* ♀, tridentate at apex and with an inner marginal tooth; one of the apical teeth lies mostly beneath the other owing to the position.
 11. Mandible of *A. podagricus* ♀; bidentate at apex and with an inner tooth. More highly magnified than the other species.
 12. Mandible of *B.* (?) *capitosus* ♀; 4-dentate apically.
 13. Mandible of *T. cribrarius* ♀, simply bidentate at apex.
 14. The same of *Hoplocrabro* 4-*maculatus* ♀, the apex simple.
 15. Pygidial area of *Xestocrabro vagus* ♀.
 16. The same of *B. leucostomus*; narrowly produced and excavated.
 17. The same of *H. 4-maculatus*; flat, sparsely punctured and with appressed setae apically.
 18. The same of *X. microstictus* (*larvatus*); the area much less produced apically than that of *vagus*.
 19. The same of *C. varius*; the area is densely punctured and clothed with appressed setae.
 20. Apical margin of clypeus of *H. 4-maculatus*; the upper figure of the ♂, the lower of the ♀.
 21. Apex of clypeus of *B.* (?) *gonager* ♀ (more highly magnified than the preceding figure).

22. Apex of clypeus of *B. (?) capitosus* ♀.
23. Arrangement of ocelli of *C. chrysostomus*.
24. The same in *C. cavifrons*.
25. The same in *M. (?) quadricinctus* ♂ (= *interruptus*, Saund.).
26. Metatarsus of middle leg of *M. (?) quadricinctus*.
27. Tibia of front leg of *C. dimidiatus* ♂.
28. Third, 4th and 5th antennal joints of *C. sexcinctus* ♂.
29. The same of *C. chrysostomus* ♂.
30. Third antennal joint of *C. palmarius* ♂, showing erect hairs, characteristic of *Thyreopinae*.
31. Third, fourth and fifth antennal joints of *C. cavifrons* ♀ showing characteristic 3rd joint of *Clytochrysus*.
32. Third and fourth in *Metacabro lituratus* ♀.
33. The same of *M. (?) quadricinctus* ♀ (= *interruptus*, Saund.).



R. C. L. Perkins, del.

C. Hentschel.

DETAILS OF BRITISH CRABRONIDAE.

XIV. *On the Scent Apparatus in the male of Amauris niavius, Linn.* By H. ELTRINGHAM, M.A., F.Z.S.

[Read March 19th, 1913.]

PLATE XX.

IN 1877 the late Dr. Fritz Müller published a paper "On the Sexual Spots of the males of *Danais crippus* and *D. gilippus*." * He there describes the pockets in the hind-wings of these insects as lined with special scales, and at the same time gives figures of these structures and of the extrusible brushes situated in the anal region. At the end of this account he makes the remarkably ingenious suggestion that the insects may insert the brushes into the pockets and so impregnate the former with the scent material therein secreted. It remained for that acute observer, Mr. W. A. Lamborn, actually to see a similar process taking place in a species of an allied genus, *Amauris*. †

Mr. Lamborn first observed the action in *Amauris niavius* in 1911, and early in the following year noticed the same habit in *Amauris egialea*.

In this genus the scent patches are not in the form of pockets but are merely specialised portions of the hind-wing, and Mr. Lamborn was fortunate enough to see the butterfly stroking the patches with its brushes. ‡

Actual confirmation of Müller's suggestion having been obtained, it occurred to me to examine minutely the structure of the brushes and scent patches in a species of this genus, and *Amauris niavius* was chosen as being the most easily obtainable.

One of the first difficulties in an undertaking of this kind is to obtain material in a proper state of preservation,

* Archivos do Museu-Nacional do Rio de Janeiro, II, pp. 25-29, 1877. English translation by Elliott in Longstaff's "Butterfly Hunting in Many Lands," Appendix, p. 616, 1912.

† Proc. Ent. Soc. Lond., pp. xlvi-xlvii, 1911, and p. xxxv, 1912.

‡ It is interesting here to recall Prof. Poulton's exhibit recorded in the Proceedings of this Society, p. x, 1907, when an example of *Amauris egialea* was shown having had the scent patches completely eaten out by ants.

and after preliminary experiments with some of our native species of butterflies, I found that good sections could be obtained from specimens treated while fresh with a strong solution of corrosive sublimate to which a little acetic acid has been added.

I am greatly indebted to Mr. W. A. Lamborn and Mr. C. A. Wiggins for a supply of material taken by them and preserved in this manner.

I would also express my thanks to Prof. Poulton and to Dr. Dixey for much kind assistance and also especially to Mr. E. S. Goodrich, to whose skill I owe the discovery of the minute pores in the peculiar structures presently to be described.

The scent patches on the wings.

The scent patches occur in the form of two small somewhat oval patches, one on each hind-wing, situated on the more distal half of the submedian nervure (see fig. 2). They differ in texture from the remainder of the wing surface in having a smoother and somewhat greasy appearance. The nervure is greatly swollen where it traverses this patch, and the patch itself is many times thicker than the normal wing membrane.

The scales covering the latter are exceedingly difficult to remove, ordinary mechanical means merely breaking without actually dislodging them.

Microscopical examination of the wing shows that over the greater part of its area the scales are arranged as in Pl. XX, fig. 3. Long and short scales alternate, the former generally overlapping the latter, though there is occasionally some little irregularity in this respect. The scales which cover the scent patch are much smaller and are represented in fig. 4. They are more rounded and are all of the same shape and size. If a portion of the scent patch be denuded of scales and examined under a high power, we find an appearance which is semidiagrammatically shown in fig. 5. The upper surface of the wing is seen to be covered with comparatively large rounded bodies, the length of which is slightly in excess of the breadth. Each appears to have a somewhat thickened edge and has in its centre a minute opening. Between these structures lie the scale sockets from which arise the special scales already mentioned. In the figure the position of the

scales is indicated by dotted lines, from which it will be seen that each scale serves as a cover for one of the rounded projections. Fig. 12 shows the appearance of a transverse section of this portion of the wing. On the upper surface the rounded bodies protrude some distance from the wing membrane and their outer surfaces are closed by a thin chitinous covering, each pierced by a minute pore.* Although provided with a covering, we may for convenience call these structures the scent cups. Between each pair there lies a scale socket. The space between the wing membranes is principally occupied by large cells, which are greatly distended with globules of material having a fatty appearance. If the specimen has been treated for a short time with eau-de-javelle, this substance is dissolved and the space they occupied is represented by large irregular vacuoles. If a section be taken to include the nervure, it is seen that close to the nervure the secretion is so plentiful as to cause a forcing apart of the wing membranes. I have shown such a section in fig. 13, though I am inclined to think that the membranes would not be so widely separated in nature, and that the tissues have been partially torn or expanded by the processes of preservation and embedding. Beneath the secreting cells is a basement layer from which arises a network of connective tissue forming septa. As the scale sockets lie between the scent cups, strands of this connective tissue appear in section to proceed direct to each scale socket. It is not clear whether these have a direct connection with the sockets, though there does appear to be a small nuclear body beneath each socket.

Reverting to fig. 13, the section of the nervure shows a lining of large cells surrounding a granular area which encloses a large lumen. The latter may well be an air vessel, the granular portion being vascular, and we may suppose that the large cells are in some way intermediaries between the circulating fluid and the secreting cells of the wing patch.

Fig. 10 shows a section parallel to the plane of the wing. The secreting cells are seen to form small glands enclosed in a network of connective tissue. Each gland presents a

* I was for some time under the impression that these structures were in the form of open cups. I am indebted to my friend Mr. E. S. Goodrich, F.R.S., who happened to see some of my sections, for pointing out their true structure.

slightly granular appearance and shows a varying number of nuclei. Scattered globules of the secretion are also seen. It should here be noted that Dr. F. Müller and later, independently, Dr. F. A. Dixey, discovered in Satyrines and Pierines, respectively, special distributions of tracheae in connection with the scent patches in butterflies belonging to those genera. I have not found such structures in *Amauris niavius*.

The abdominal brushes.

The position of these in the body of the insect may be understood from fig. 1, which represents a dissection of the genital armature viewed from above, with the brushes *in situ*. In the lower part of the centre of the figure is seen the penis, with its two great extensor muscles, passing through the proximal dorsal membrane of the uncus. The latter is a large arched chitinous plate with a prominent ridge in the centre of its dorsal surface, and on either side of this ridge lie the brushes. Each brush is contained in a membranous bag, the proximal end of which is provided with a muscle attached to one of the sternites. The hairs of which the brush is composed arise mainly from the proximal end of the bag. The membrane at the opening of the latter is continuous with the lining membrane of the tergite. The bag is everted, doubtless by means of fluid pressure, and the process may be compared with the turning inside out of a glove finger. The brush hairs then project from the posterior end of the insect, forming, when completely everted, a more or less spherical tuft. The whole apparatus can be withdrawn by the contraction of the retractor muscles shown in the figure. A microscopic examination of the brushes and their containing membranes reveals the following structure. The hairs of each brush are in two tufts. One, the larger, is composed of yellowish hairs, the sockets of which are placed at the base of the bag. The second tuft consists of black hairs arising from similar sockets placed somewhat more distally and on one side of the bag.

Fig. 8 shows a section of the brush bag at its base. The hairs arise from a thick layer of elongated cells having nuclei at their bases and chitinous sockets at their extremities. Fig. 6 shows three of the hairs with cells attached. The only difference I can find between the

dark and pale hairs, beyond that of colour, is that the former appear to be somewhat stiffer. Both have the distal ends rounded and often somewhat clavate. Their surface is longitudinally ribbed, and in section they have the appearance shown in fig. 7. Seen by transmitted light the hairs have reticular markings as shown in fig. 6.

We now come to the most peculiar structures in this complicated organ. If a brush be examined in section the spaces between the hairs are seen to be packed with very minute particles which have a stellate appearance when occurring singly, but which may also appear as elongate bodies covered with projections. If a brush be removed from a dried specimen, teased out on a slide and examined dry, with a very high power, the whole field is strewn with these objects, which then present the appearance shown in fig. 9. In sections mounted in balsam they appear to be smoother and are much more difficult to see.

These particles arise from a special layer of cells forming the middle portion of the lining of the brush bag. Part of this layer is shown in fig. 11. The cells are very similar to those which produce the hairs of the brush except that they are much smaller. They terminate in chitinous sockets from each of which protrudes a delicate thread-like growth, the free end of which appears to be obtusely forked. In balsam-mounted specimens it is very difficult to observe any segmentation in these filaments, though from the appearance of dry preparations I am convinced that they are segmented. It seems probable that the cells are in fact modified hair-producing cells and that the delicate hairs to which they give rise have a stellate section, and further that they divide transversely into a multitude of minute particles. The stellate appearance may also be due in part to the splitting of the hair at the broken edge.

We may now compare the whole scent apparatus with the corresponding structures in *D. erippus* and *D. gilippus*, as described by Müller in the paper already referred to. Highly magnified sections of the brushes and wing patches are not given, but the author figures and describes views of the inner membrane of the wing pockets of both these insects. The figures would seem to show that there are cup-like projections much as in *A. niavius*, and scales arising from sockets placed between them.

We may here quote Dr. Müller's description. "In *D. erippus* it [the patch] exhibits small circles of about

0.01 mm. diameter, a little more transparent than the rest of the membrane. From the centre of each rises a straight hair, about 0.06 mm. long. The circles are placed in regular lines, about 0.03 to 0.05 mm. apart. Alternating with these circles are opaque grey scales, distinguished from the ordinary ones by their smaller size and by their shape.

In *D. gilippus* the circles are much closer together—so much so that in places they almost touch; although more transparent than the rest of the membrane, they are less so than those of *D. erippus*. The hairs are wanting, but one sees in the centre of each circle a small spot, the last vestige which proves their former existence.

Müller regarded these "small circles" as scale sockets. The evidence for this view is very strong, since in *D. erippus* hairs still arise therefrom. In the Pierine butterflies, as we know from the researches of Dr. F. A. Dixey, the special plume scales themselves act as distributors of the scent which passes into the substance of the scale through the footstalk. We may therefore with some degree of confidence regard the scent cups in the wings of *A. niavius* as highly specialised scale sockets, the pore in the centre of the cover being the vestige of the insertion of the scale stalk and now functioning as an exit for the secretion of the gland cells.

We may suppose that the insect brushes out the secretion, the stiffer hairs probably assisting in lifting the covering scales, which are specially adapted to withstand this treatment. It should be noted that these hairs are on the outer side of the brush, and would thus naturally come first into contact with the scent patch. The completely expanded brush then diffuses the scent. The ribbed structure of the hairs probably serves not only to increase their surface, but also to aid in the retention of the secretion.

It still remains to explain the purpose of the stellate fragments which occur in such profusion in the brush bags, and for the production of which so many special cells exist. The most probable explanation appears to be that they float off the brushes during flight and carry the scent, thus diffusing it to a greater area around the insect than could be accomplished by the brushes alone.

The occurrence of hairs which split transversely into fragments is not unknown in connection with analogous organs in other Lepidoptera.

In another paper * Dr. Müller has described such hairs as being present in the costal fold of the wing of certain male *Hesperidae*, such costal folds being undoubtedly scent organs. Just recently I have found in the brushes of *M. mercedonia*, particles of a similar nature to those found in *Amauris*.

The investigation of which the foregoing is an account was completed before I had had an opportunity of examining Freiling's account of the morphology of the brush hairs in *Euploea asela* and *Danaïda septentrionis*.†

Freiling is of opinion that in these species it is the brushes themselves which produce the scent. Excellent figures are given showing glandular cells from which the brush hairs are developed, and also drawings of the hairs showing pores in their walls through which he supposes the scent material, produced by the glandular cells, to be discharged. I have not yet succeeded in obtaining suitable material to enable me to confirm this author's results. The hairs of the brush in *D. septentrionis* are of a quite different structure to those in *A. niavius*. So much can be seen from hairs taken from a dried specimen, but the existence of pores is not very obvious.‡ The species has a scent pocket in the hind-wing, but Freiling seems to have been unaware of the connection between the scent pockets and the brushes in these Danaines. I have no desire to throw doubt on his results, which have evidently been obtained with great care and a mastery of technical skill. The abdominal brushes may in some species produce the scent, but I am not satisfied that in *A. niavius*, at any rate, they have more than a mechanical function. Freiling makes no mention of the filamentous hairs which I find in *Amauris*.

* "On the costal fold of *Hesperidae*." Archivos do Museu Nacional do Rio de Janeiro, III, 1878, pp. 41-50. English translation by E. A. Elliott in Longstaff's "Butterfly Hunting in Many Lands," Appendix, p. 640, 1912.

† "Duftorgane der weiblichen Schmetterlinge nebst Beiträgen zur Kenntniss der Sinnesorgane auf dem Schmetterlingsflügel und der Duftpinsel der Männchen von *Danais* und *Euploea*."—*Zeit. f. wiss. Zool.*, pp. 210-290, pl. 12-17, 1909: H. H. Freiling.

‡ From an examination of the dry brush hairs in some other species of *Amauris* I am inclined to think that pores do exist in the brush hairs of some species. I hope soon to have suitable material to enable me to make a more exhaustive study of this and other interesting features.

Perhaps these structures are peculiar to that genus. The whole subject is one of great interest, and the present paper is merely preliminary to the further investigation of other brush-bearing species, the material for which I hope shortly to receive.

EXPLANATION OF PLATE XX.

(See *Explanation facing the PLATE*).

EXPLANATION OF PLATE XX.

- FIG. 1. Genital armature viewed from above with brushes *in situ*.
× 10.
2. Diagram of hind-wing showing position of glandular patch.
× 1.
3. Ordinary scales of wing. × 160.
4. Scales on patch. × 160.
5. Diagram of relative position of chitinous projections and
their covering scales. × 300.
6. Large hairs of brush with elongated cells attached. × 300.
7. Transverse section of large hairs. × 750.
8. Longitudinal section of brush showing hairs arising from
sockets. At left is shown a small portion of retractor
muscle. × 135.
9. Filamentous hairs breaking into fragments. × 750.
10. Section of glandular wing patch parallel to plane of wing.
× 450.
11. Cells of central portion of brush bag producing filaments.
× 300.
12. Transverse section of wing patch at right angles to direction
of nervure. × 300.
13. Ditto in way of nervure showing accumulation of secretion.
× 50.



H. Eltringham del.

12.

West, Newman lith.

SCENT ORGANS OF AMAURIS NIAVIUS.

XV. *On new or little-known forms of Acraea.* By H. ELTRINGHAM, M.A., F.Z.S.; with description of a new form of *Acraea encedon*, by PROF. E. B. POULTON, F.R.S.

[Read June 4th, 1913.]

Acraea orestia f. *carpenteri*.

= *orestia* f. *humilis*, Eltr., Trans. Ent. Soc., p. 305, 1912 (nec *humilis*, Sharpe).

The description of this form is the same as that given by me (*l. c. sup.*).

I am indebted to my friend Mr. N. D. Riley of the Natural History Museum for calling my attention to the fact that true *A. humilis* differs in certain important respects from the form of *orestia* which so closely resembles it. The acquisition of long series of examples of both these forms from the Mabira Forest, Uganda, has re-established the specific identity of *A. humilis*, and has once more emphasised the difficulty of correctly diagnosing specific distinctions in the absence of ample series of specimens.

The long series referred to above were found by Mr. Riley to consist of individuals which varied from nearly scaleless forms, through a series of intermediates representing the form I have described as *transita* (*l. c.*) up to the usual red hind-winged *orestia*. Further, the nearly scaleless examples are divisible into two groups, one having the sixth and seventh nervures of the hind-wing arising from a common stalk, whilst in the other these nervures arise independently from the cell in the usual manner. I have now examined the genitalia of the form in which the nervures arise from a stalk, and find that their structure differs from that in the unstalked form. It only remained to re-examine the type of *humilis*, when it was found that it exhibited the stalked condition of the nervures. Though described as a female it is actually a male. Both sexes occur in the above series, but there is no marked difference in external characteristics. *Acraea humilis* must therefore be restored to its position as a separate species, and a new name given to the form of *orestia* which so closely resembles it. For this I propose the name *A. orestia* f. *carpenteri*.

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since Dr. G. D. H. Carpenter actually showed, by breeding, the specific identity of this form with *A. orestia*. Whether I noticed the stalked condition of the hind-wing nervules when examining the type of *A. humilis* I do not now recall, though if so, I probably attached little importance to it in the absence of a series showing it to be constant, since the feature is quite inconstant in some species of *Acraea*, notably in *A. burni* Butl. On the other hand, it is constant in the very few examples of *A. iturina* which I have been able to examine, and this fact naturally suggests some connection between *humilis* and that species. The genitalia are, however, quite different, so that there is no reason to suppose that they are even allied. It seems scarcely possible at present to decide on the position of this species (*A. humilis*). Most examples have a spot in hind-wing near the base of the cell and sometimes there is a second immediately below this in 1c. Beyond these there are no markings, the wings being for the most part transparent with a slight dusting of brownish-black scales about the costa of fore-wing and hind-margin, inner margin and base of hind-wing. The genital armature has a very short uncus somewhat like that in *A. penelope*, whilst the claspers are rather like those of *A. buschbecki*.

The synonymy of the species will now be as follows:—

Acraea humilis, E. M. B. Sharpe, Ann. Nat. Hist., (6) 19, p. 582 (1897); Auriv., Rhop. Aeth., p. 86 (1898); Smith & Kirby, Rhop. Exot., 7, p. 23, pl. 7, f. 3 (non f. 1 and 2) (1901).

= *orestia* f. *humilis*, Eltr., Trans. Ent. Soc., p. 305 (1912) (part).

Acraea orestia, Hew., Ent. Mo. Mag., 11, p. 131 (1874); Exot. Butt., *Acraea*, pl. 7, f. 47 (1875); Snellen, Tijdschr. v. Ent., 25, p. 217 (1882); Auriv., Ent. Tidskr., 14, p. 273 (1893); Rhop. Aeth., p. 112 (1898); Lathy, Trans. Ent. Soc., p. 186 (1903); Eltr., Trans. Ent. Soc., p. 305, pl. 15, f. 10 (as *humilis*) (1912).

= *orestina*, Plötz, Stett. Ent. Zeit., 41, p. 190 (1880).

= *iturina*, Neave, Novit. Zool., xi, p. 346 (1904).

f. *transita*, Eltr., Trans. Ent. Soc., p. 306 (1912).

= *humilis* ♂, Smith & Kirby, Rhop. Exot., *Acraea*, 7, p. 23, pl. 7, f. 1, 2 (1901).

f. *carpenteri* nom. nov.

= *orestia* f. *humilis*, Eltr., Trans. Ent. Soc., p. 305 (1912) (part).

Mr. Riley has recently called my attention to several examples of a form of *Acraea doubledayi* which shows marked differences from the typical form of that species.

Acraea doubledayi f. *rileyi*.

♂. Expanse about 52 mm. F.-w. less pointed at apex and less concave along hind-margin than in typical *doubledayi*. Ground-colour pale dusky pink dusted with brown at base, spots smaller and markings generally paler.

H.-w. dull pink with markings as in *doubledayi* but fainter, and hind-marginal border narrower.

Underside resembles that of *doubledayi* but the spots are smaller.

♀ resembles ♂.

Toma, Abyssinia. Mus. Brit.

The genitalia of this form are similar to those of typical *A. doubledayi*.

I append herewith Prof. Poulton's description of a new form of *A. encedon*.

A. encedon f. *commixta*, Poulton, f. n.

The pattern of this form is made up of the hind-wing of *alcippina* combined with the fore-wing of *infuscata* in which the subapical bar is not white, but tawny or smoky-brown. The fore-wing thus approaches that of *daira*, but differs in the retention of the black apex.

Commixta occurred several times (although to a variable extent) among Mr. Lamborn's captures and bred families, and its pattern is strongly hereditary. *Commixta* resembles *albinus*, Lanz, itself a rather rare combination of two forms of *Danaida chrysippus*, *alcippus* and *dorippus*. In spite of the resemblance the two forms are not related as mimic and model. It is, in fact, probable that they do not meet. *Albinus* is most often met with in N.E. Africa, while *commixta* has up to the present time been observed only in collections from the West Coast, although there can be little doubt that it exists in Uganda and probably occasionally on the East Coast.

Type in Hope Department, Oxford.

In the Brit. Mus. Coll. there are 2 ♂♂, 2 ♀♀ from S. Leone, 3 ♂♂ from Nigeria, and 1 ♀ from Old Calabar.

I append notes on certain forms of *Acraea* omitted from my monograph, or described since its publication.

Acraea polychroma, Rebel, Ann. d. K. K. Naturhist., Hofmus., Wien, p. 410, pl. 14, f. 3 (1910).

There seems nothing in the figure or description of this form to distinguish it from *A. amicitiae*, Heron. The locality is, however, different, viz. N.W. shore of L. Tanganyika, 2,000 m.

We must, I think, regard *polychroma* as a synonym of *amicitiae*.

A. pullula, Grünberg, Deut. Zent. Af. Exp., p. 516, pl. 11, f. 7 (1911).

As the publication referred to is difficult to obtain, I give herewith a translation of Grünberg's description.

Allied to *A. vinidia*, Hew. Colouring as in var. *tenella*, Rogenh. The yellow markings of less extent, the wings shorter and more broadly rounded.

♂. Upperside, ground-colour blackish-brown, distal half of fore-wing uniformly dark, without pale subapical band. Inner marginal spot of fore-wing on middle of margin 5.5 mm. in width, of the same width in area 1b, extending over the basal part of area 2, obscured in the cell and barely indicated in the angle of area 3.

H.-w. very like that of *vinidia* var. *tenella*, the yellow basal part somewhat less developed, the blackish-brown border broader, with small, barely indicated reddish-yellow marginal spots. The black basal spots not perceptible on the upperside. Underside more heavily and extensively darkened than in *vinidia*. Both wings with acute angled yellow marginal spots, subapical band in fore-wing merely vestigial, hind-marginal patch much as on upperside. The pale basal area of h.-w. very much reduced by the black markings, the black basal spots of the costa and cell fused together, beyond the cell large and very black, the distal ones extended into long streaks. The yellowish-red markings distinct only in area 1c. On the costa before the precostal nervure a well-defined yellowish-red spot.

Expanse 33 mm.

Ruanda, Mohasi Lake, vii. '07. 1 ♂.

The figure accompanying the description is a very poor one, but I should be much surprised if this form is not ultimately found to be a mere aberration of *A. acerata*.

The fusion of black spots into streaks is an almost certain characteristic of aberration, added to which we have the well-known extreme variability of *A. acerata*.

Acraea (acerata) vinidia, f. *ruandae*, Grünberg, *l. c.*, p. 516, pl. 11, f. 6 (1911).

This form is described as bearing the same relation to f. *diavina* as does f. *tenella* to the type. The description is as follows:—

Upperside very like that of *tenella*. Pale markings straw-yellow with faint reddish-yellow suffusion. H.-w. with small indistinct yellow marginal spots. Subapical band of f.-w. as large as in *tenella*, the pale mark before the end of cell separated from inner marginal spot. Discal spot in area 1b and 2 large and well defined, but somewhat smaller than in *diavina*. Underside also very like that of *tenella*. Discal spot of 1b and 2 smaller than above. Black basal and discal spots of h.-w. small, the red streaks scarcely indicated. Length of f.-w. 19 mm.

Ruanda, Mohasi Lake, vii. '07 1 ♀.

A. tropicalis, Blachier, Bull. Soc. Lep. Genève, p. 174, pl. 15, f. 2 (1912).

Ngomo, Fr. Congo.

This is a form of *A. pelopeia* having somewhat less than the normal suffusion on the nervules on the underside of hind-wing.

A. conradti ab. *flavescens*, Blachier, *l. c.*, p. 175, pl. 15, f. 3 (1912).

German E. Africa.

The usual red ground-colour is replaced by pale ochreous.

A. horta ab. *conjuncta*, Blachier, *l. c.*, p. 176, pl. 15, f. 4 (1912).

Ground-colour dull brownish-yellow. Hind-wing markings elongated and confluent. No locality.

A. eugenia f. *ochreata*, Grünberg, S. Ges. Nat. Fr. Berlin, p. 470 (1910).

Described as differing from typical *eugenia* in being more densely scaled. The fore-wing with a distinct black

discocellular spot. Hind-wing from base to middle scaled with yellowish-brown.

Spanish Guinea, Makomo, Ntume Region. 1 ♂.

Acraea egina ♀ f. *alba*, f. nov.

Grünberg has already * remarked on the ♀♀ of *A. egina* from Sesse I. Examples received at Oxford from Dr. Carpenter exhibit the same peculiarities, and it seems desirable that the form should have a name. On the upperside there is no trace of red or ochreous. The ground-colour is dark sepia grey to black. There is a white subapical bar in fore-wing and the outer half of cell, the space just beyond end of cell, base of area 2, and central part of area 1b are dusky white. In the hind-wing the internervular spaces and often the central part of cell are also powdered with dusky white. On the underside there is no red except in area 9, base of 7, base of cell, and of areas 1c, 1b and 1a.

There are in the Oxford collection one or two very similar examples from near Mombasa, but these are associated with ♂♂ of the *areca* form, whereas the ♂ *egina* in Sesse I. is of the typical or western pattern.

The close resemblance of this form to the rare western form *medea* is very remarkable.

Sesse I. Type, Oxford.

Acraea terpsichore f. *ventura*, Hew. (note).

Grünberg has also noted (*l. c.*) that examples of *A. terpsichore* from Sesse I. have the red patches on the hind-wing underside exceptionally well marked. Dr. Carpenter's specimens also show this feature, and all belong to the *ventura* form though differing in the fact that the subapical patch of ground-colour in fore-wing is rarely completely cut off by the discal black bar. The brilliance of the red on the hind-wing underside is in most examples very noticeable, and the inner edge of the marginal border is also frequently dusted with red. The form is scarcely sufficiently well defined to require a name.

One ♂ example differs from all the others in having the marginal and subapical black of the fore-wing and the marginal black of the hind-wing considerably extended, so that the spots of ground-colour are much reduced and

* Sitzb. d. Ges. Naturf. Fr., (4) p. 148, 1910.

the fore-wing subapical patch is very small. In this example the underside of hind-wing has the basal portion dull red, the discal area dusted with red and the inner edge of the hind-marginal border of the same colour. The hind-marginal border is without the characteristic black internervular triangular markings.

A. egina, ab. *contraria*, Grünberg, Soc. Ent. Steglitz, p. 145 (1910).

Described by Grünberg from three male examples from Lake Kiwu.

The form resembles *A. egina* f. *harrisoni*, Sharpe, but the black spots of the hind-wing are much smaller, and on the hind-wing underside the hind-marginal black is much reduced.

A similar example occurs in the Oxford collection and was taken by Neave on Chirui Island, L. Bangweolo.

XVI. *Pupal coloration in Papilio polytes, Linn.* By
J. C. F. FRYER, M.A., F.E.S.

[Read May 7th, 1913.]

THE following paper gives an account of certain rough and incomplete experiments which were made in Ceylon on the coloration of the pupa of the butterfly *Papilio polytes*, Linn.; the material dealt with was very large, but it was devoted primarily to breeding experiments in relation to the polymorphism of the imago, and in consequence the question of pupal coloration could only be treated as a side issue.

In *Papilio polytes*, as in many other species of this genus, the pupa shows a marked dimorphism in colour; certain specimens are green with faint yellow markings on the dorsal surface, while the remainder are ochreous brown more or less mottled with dark brown and grey: between these two forms the essential difference seems to be that in the brown pupae there is a definite development of pigment in the subcutaneous tissues, and to a lesser extent in the pupal skin itself, while in the green pupae pigment is only feebly developed. As a general rule, both in nature and in captivity, green pupae were found on green twigs and on the underside of the leaves of the food-plant, while the brown form occurred in almost every other situation the larvae could choose, whether it was the brown trunk of a tree, a white-washed wall, or a black fence. In several cases a certain degree of adaptation was noted in the depth of colour of a brown pupa, but the reverse was so often the case that no generalisations could be made on the subject. Intermediates between these two forms were exceedingly rare, but in captivity complete errors in coloration were not infrequent, brown pupae often occupying situations where green pupae might have been expected, while the converse, though rare, occurred in many broods. It was at first supposed that the stimulus determining the formation of one or other form of pupa was derived from the colour of the support chosen and its immediate surroundings; subsequently, however, several features in the case, especially the frequency with which "errors" occurred,

led to the rejection of this view and the initiation of a series of experiments to obtain more light on the subject.

EXPERIMENT I.

The first experiment, or rather experiments were performed more or less inadvertently. At times when there were insufficient breeding-cages to accommodate all the larvae, those of little importance were relegated to various boxes and were allowed to pupate in the dark. Practically all these larvae formed green pupae.

EXPERIMENT II.

A square wooden breeding-cage, open in front, was completely lined with paper of an emerald green colour; sticks, also covered with the same paper, were placed in the cage to provide a variety of situations for the larvae to choose for pupation. Six full-fed larvae were then placed inside and the front was covered with white mosquito netting, which allowed light to penetrate freely into the cage.

The larvae then pupated, and every pupa was of the brown form.

EXPERIMENT III.

Nine full-fed larvae were placed in the green-lined cage, but the front was covered with green lino instead of white netting, which might have disturbed the result in Experiment I. A young branch of Citrus with a green stem was also put inside, in case any of the larvae required more food. Eight brown pupae were formed and one green pupa, the latter being one which had suspended itself behind a leaf of the food-plant. One specimen had pupated behind a stout paper-covered stick so that its ventral side was shaded from the light, while the dorsal surface received only light which had been reflected from the back of the cage. In this case the pupa as a whole was of the brown form, but the ventral surface was green.

EXPERIMENT IV.

Three large glass cylinders were covered with translucent coloured paper so as to obtain vessels lighted only by red, green and blue light respectively. Six larvae, nearly full-fed, were placed in each cylinder with a supply of food-

plant with both green and brown stems, and were left until they had pupated. The results were as follows :—

- In red light. Five green pupae, one brown pupa (two green on green stems, three green on brown stems, one brown on brown stem).
- In green light. Five green pupae (four on green stems, one on brown stem). One larva died before pupation.
- In blue light. Five green pupae, one brown pupa (four green on walls of vessel, one green on brown stem, one brown on brown stem).

EXPERIMENT V.

A single wild pupa was discovered on a black tarred post in a very exposed situation, and it was noted as being exceptionally dark in colour. To test this point further a cage was prepared as in Experiment II, but the paper used was black instead of green; no food-plant was given.

Six larvae pupated inside and all formed brown pupae, but the colour was entirely normal and there was no sign of darkening in response to the black surroundings.

EXPERIMENT VI.

An attempt was made to discover the exact period during which the colour of the pupa is determined. The larva as a rule remains on the food-plant until quite full-fed; then during the night it wanders until it finds a suitable spot, fixes itself there, and by morning has assumed the usual curved semilunar attitude, supported only by the silk thread behind the thorax and by the silken pad to which the terminal segment of the abdomen is affixed. In the morning it is still a clear translucent green, but towards the evening it becomes somewhat opaque and lighter in colour; during the night the larval skin is shed and by the next morning the pupa is fairly dry and hard. Any stimulus therefore due to daylight must be received during the day spent in the "semilunar" position. To test this more exactly full-fed larvae (number uncertain—between six and twelve) were allowed to fix themselves in green light and were left until mid-day, when they were transferred to ample white light amidst dark surroundings, conditions previously found favourable to the formation

of brown pupae, though the dark surroundings were not regarded as necessary.

As a result one green pupa was formed, and the remainder were intermediate between the two forms.

EXPERIMENT VII.

Another set of larvae, ten in number, were allowed to suspend themselves on the bamboo supports of the cage on which brown pupae were almost always formed; they were left in this position until 5 p.m. on the day after the night on which they had suspended themselves, and were then placed in green light for the short period of daylight which remained.

All formed brown pupae, but in each there were traces of green, not usual in normal brown pupae.

At this point it was found that the interference with the pupating larvae had caused an increase in the percentage of cripples, and also had resulted in a certain amount of confusion between two of the pedigree broods. As the breeding experiments were of greater importance than those on pupal coloration, the later were suspended until such time as a number of wild larvae could be obtained—a time which unfortunately never came. The experiments, therefore, were left incomplete, and were not carried out on a scale large enough to give results which can be accepted in detail without further confirmation. In spite of this, however, certain conclusions can be drawn with some degree of confidence. In the first place, it appears that the pupal colour is not controlled by the quality of the light derived from the immediate surroundings; secondly, it is highly probable that the brown pupa is the result of an excess of light, while the green pupa is caused by its relative absence; thirdly, the critical period during which pigment is developed is the day after the suspension of the larvae, and, as an artificial curtailment of this day produces intermediates graduated in accordance with the amount of light lost, it appears that the formation of pigment is directly caused by light and is not a process which once started can be continued in its absence.

Finally, if these deductions are true, it is interesting from a protection point of view to note that brown pupae must be formed in exposed situations, which in a state

of nature are usually the brown stems and trunks of the food-plant or neighbouring trees, while green pupae can only occur in shady positions, which are most often found in the midst of the foliage of the food-plant, where the twigs as well as the leaves are green. There will naturally be more errors among pupae which for protection should be green, as the slightest lack of shading, such as might be caused by the falling of a leaf, will cause the development of pigment.

Since the above observations were made it has been possible to consult the literature* on the genus *Papilio*, though no case analogous to that of *P. polytes* has yet been found. Prof. Poulton in his extensive memoir† on the subject of pupal coloration recorded a few experiments on *Papilio machaon*, Linn., from which it seemed probable that the pupae of this species, though dimorphic, did not respond to the colour of their surroundings: in a later paper, ‡ however, written in conjunction with Mr. Merrifield, he brings forward a number of fresh experiments and observations which tend to show that pupae of *machaon* can adapt their colour to that of their surroundings to a very considerable degree. This adaptation does not seem at all comparable with that of *polytes*, except in that darkness produced green pupae; in other respects *machaon* behaved more like such a species as *Pieris brassicae*. As a further point of interest it may be pointed out that winter pupae of *machaon* on reeds were in almost every case of the green form, a somewhat curious fact when it is remembered that reeds in winter, and in fact the predominant colour of a fen, are brown.

Passing to observations on other species of *Papilio*, Fritz Müller § records the pupae of *Papilio polydamus*, Linn., as being quite unresponsive to the colour of their surroundings. On the other hand, two *Papilios* in South Africa appear to behave more like *Papilio machaon*; the pupa of *P. nireus*, Linn., was shown by Mrs. Barber || to accommodate itself most accurately to the colour of its surroundings, and this observation was subsequently

* My best thanks are due to Prof. Poulton, who most kindly read this paper and advised me on the subject of literature.

† Phil. Trans. 1887, vol. 178, p. 406.

‡ Proc. Ent. Soc. 1898, Oct. 5, and Trans. Ent. Soc. 1899, p. 369.

§ Phil. Trans. *op. cit.*, quotation from Kosmos, vol. 12, p. 448.

|| Trans. Ent. Soc. 1874, p. 153.

confirmed by Mr. Trimen, who has also recorded * a similar accommodation in the pupa of the widely spread *P. demoleus*, Linn.; the latter species also occurs in Ceylon, and, from the close resemblance of its larva to that of *P. polytes*, was often collected by mistake and reared to the imago stage. Unfortunately no definite experiments were made, but general observations seemed to suggest that in Ceylon it would behave in the same manner as *polytes*.

As a whole it is obviously impossible to make any generalisations on the subject of pupal coloration in the *Papilios*. The genus is evidently of considerable interest from this point of view, and it is to be hoped that those who have abundant material at hand will not neglect their opportunities of making experiments—especially as the apparatus required is neither large nor expensive, and the amount of time required comparatively small.

* Phil. Trans., *op. cit.*, p. 316.

XVII. *The larval habits of the Tineid moth Melasina energa, Meyr.* By J. C. F. FRYER, M.A., F.E.S.

[Read May 7th, 1913.]

PLATE XXI.

THE following notes were suggested by the discovery in a compound, at Peradeniya in Ceylon, of a number of earthy tubes, projecting above the surface of the ground in a manner which at once recalled the tubes of Polychaet worms found on the sea shore at low tide. Further investigations showed that these tubes passed deeply down into the ground and were in most cases without any living inhabitant. Ultimately, however, out of a large number examined, several were found containing the remains of lepidopterous pupae, killed apparently by some fungus, while five were inhabited by what appeared to be Tineid larvae. Two of these died, but the remaining three produced moths, which Mr. Meyrick has kindly identified as females of *Melasina energa*, Meyr. From the same source it is learnt that the larvae of several of the European and African members of the genus are known, and that they construct cases closely resembling those of the Psychidae. The peculiar habits of the larva of *M. energa* therefore seem of sufficient interest to merit a detailed description.

When the larva is full-grown, the tubes measure from 10 to 15 centimetres in length; two-thirds of the tube descends vertically into the ground, while the remaining one-third either lies horizontally on the surface, or winds its way into a mass of dead leaves. The tube is cylindrical in shape and measures from 6 to 8 mm. in diameter throughout its median portion; towards the free end it is funnel-shaped, widening out until at its termination it may measure 12 mm. in diameter. The subterranean end of the tube, when the larva is young, appears to open freely into the earth; in the case of full-grown larvae it widens considerably, thus forming, as will be shown subsequently, a pupal cell.

In composition the tube is built of a strong, closely woven silk, to the outside of which grains of earth, pieces of dead

leaf and broken twigs are attached, the earth covering the subterranean portion, while the dead leaves and twigs encrust that above ground.

The pupal cell is formed by the terminal 2 cm. at the bottom of the tube and differs from the remainder in its greater width and in the increased thickness of its silken walls. Inside the pupal cell lies a thin cocoon which is cylindrical in shape and flat at each end; it is peculiar in that it is composed of fine silk matted together by some dark-coloured secretion, thus resembling the cocoons of certain Hymenoptera. This cocoon fits fairly closely into the pupal cell, but for the greater portion of its length is only loosely attached to it by a few strands of silk; at the extreme lower end, however, it is firmly woven to the lower lips of the cell so that the flat end of the cocoon entirely blocks the subterranean entrance. This arrangement seems peculiar for, while the walls of the pupal cell are very thick, the end is guarded solely by the thin flat silken disc which forms the bottom of the cocoon. The similar disc, which forms the upper end of the cocoon, is easily detached and on the emergence of the moth is pushed up like the lid of a box. In the few cases examined the empty pupa skin was found in the cocoon.

The food of the larvae consists of dead leaves and other decaying vegetable matter, though in captivity they never seemed entirely satisfied with the food of this nature which was given them; they did not desert their original tubes, but showed dissatisfaction by constructing branch tubes on the surface of the earth, a proceeding never observed under natural conditions. Feeding was accomplished only by night, and it was practically impossible to watch the larvae at work, as they retreated immediately on the approach of a light; they were never found away from their tubes and probably never leave them, since the five captured larvae, when removed from their dwellings, were unable to crawl on a flat surface and could not regain their tubes without assistance.

No suggestion can be made as to the precise reasons which have brought about this strange modification of the tube-building habit; there are certain obvious advantages, such as freedom from the attacks of birds and parasites, but there are also serious disadvantages in the very small area which is available as a feeding-ground and the extreme liability to fungoid diseases, a serious consideration in a

damp hot climate such as that of Peradeniya. From the evolutionary point of view it appears probable that to make some simple form of tube is ancestral in the genus, and that this habit has developed on the one hand into that of making a case, or portable tube, and on the other of building an elaborate fixed structure such as that just described.

This account may be concluded by a short description of the larva itself, taken from one supposed to be full grown.

The head is ovate in shape and is so attached to the first thoracic segment that the anterior surface is directed upwards, bringing the mouth forward; in colour it is dark brown with the surface finely shagreened.

The first thoracic segment is elongated and in front is slightly broader than the head but behind is markedly constricted; its surface is chitinous, brown in colour and finely shagreened, this latter feature being less evident than in the case of the head.

The remainder of the body is cylindrical, tapering slightly posteriorly; in colour it is greenish-grey, lighter ventrally; hairs are present but they are sparsely scattered and are very minute.

The legs are brown in colour, rather long, and directed forward. The prolegs are very short and are armed with a series of broad hooks, the suckers being hardly functional. The spiracles are brown, those on the penultimate segment being large and conspicuous. Length 23 mm.

EXPLANATION OF PLATE XXI.

FIG. 1. *Melasina energa*, Meyr. Bred.

2. Diagrammatic representation of a tube of *M. energa*, to show its position in the ground.
3. Section of a tube of *M. energa*, showing (a) general shape of tube, (b) cylindrical cocoon lying in the widened lower end of tube, described as "pupal chamber," (c) method of blocking subterranean entrance by means of the disc forming the lower end of the cocoon.
4. Photograph of a tube, somewhat shrivelled and torn, of *M. energa*.

[Figures 1, 3, 4 are approximately natural size.]



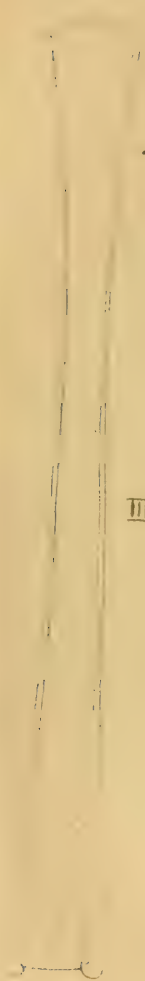
I



II



IV



III

J. C. F. Fryer, photo.

C. Hentschel

MELASINA ENERGA, Meyr.



XVIII. *On the Urticating Properties of Porthesia similis*,
Fuess. By HARRY ELTRINGHAM, M.A., D.Sc., F.Z.S.

[Read October 1st, 1913.]

PLATE XXII.

IN a former note * I pointed out that the urticating properties of the female of *P. similis* were due to the presence in the anal tuft, of barbed spicules, apparently identical in structure with those of the larva, and although it seemed probable that the moth derived its spicules from the cocoon, the manner in which it did so was not very obvious, since although there are many spicules in the cocoon the body of the moth would seem to be protected from contact, even during emergence, by the pupal skin.

During the past summer I have had an opportunity of studying the subject more fully, with extremely interesting results. I am indebted to Prof. Poulton for many useful suggestions, and to Commander Walker and Mr. A. H. Hamm for a portion of the material for my experiments.

The larva, though well known, seems not to have been examined very minutely, and it may be of interest to describe the structure in relation to the spicules, as revealed by a series of sections.

The spicules occur on every segment except the first and second. The third and fourth segments have two extra large masses which meet dorsally. On each remaining segment they occur on two dorsal and two dorso-lateral projections. Plate XXII, fig. 2, shows a diagrammatic section of half a segment, the spicule tufts being marked *S*.

The large hairs (*h*) arise from chitinous sockets which seem to occur all over the larva, though especially numerous on the lateral projections. These hairs are branched as shown in the figure. Amongst the dorso-lateral spicules are found white plume-like structures, one of which is shown at Plate XXII, fig. 2 (*p*). Occasionally these arise on the dorsal tufts also. To the unaided eye their matted branches

* Proc. Ent. Soc. Lond., p. lxxx, 1912.

have the appearance of white spots on the larva. Fig. 1 is a diagrammatic view of a section of the larval skin including one of these plumules. From this it is seen that the spicules *S*, are borne in tufts on small chitinous papillae, each of the latter being in direct communication with a double layer of special cells *E*. The spicules themselves are finely pointed barbed structures, the thicker outer end being triradiate. They are very easily detached; in fact, it is almost impossible to touch the larva without displacing them in considerable numbers. The plume-like structure* arises from a chitinous socket, differing little, if at all, from the sockets of the larger branched hairs, and having at its base several cells *G* apparently of a glandular nature. The plume is quite as easily detached as the spicules.

As in so many similar cases, it is much easier to determine the morphology than the physiology of these structures. The two layers of hypodermal cells *E* doubtless secrete the spicules themselves, but whether the gland *G* does more than merely secrete the plume, I am at present unable to decide. Neither the plumes nor the spicules have any appreciable action on litmus paper. During life the plume may serve to hold spicules, or even by itself becoming detached, to carry them to a distance. At least it seems improbable that so complicated a structure should have been evolved, merely as a factor in the rather conspicuous pattern of the larva.

The large branched hairs which occur all over the larva certainly serve to hold loose spicules, although this may be only a part of their function, and they are probably also mechanically protective.

The question whether the urticating properties of these and similar larvae are due to chemical or mechanical action or to both combined, still remains unsolved. Whilst I favour the purely mechanical theory I admit the difficulty of accounting for the marked difference of individual susceptibility to the urticating spicules of different species of larvae. In my own case the spicules of *Cnethocampa pityocampa* applied in small doses produce less irritation than those of *P. similis*, and yet the former species is generally regarded as the most "venomous" of all the

* This structure is proportionately a good deal longer than shown in the diagram.

European forms. Nor is there a great difference in the structure of the spicules, those of *C. pityocampa* being merely devoid of the triradiate barb at the thicker end.

The spicules of *C. pityocampa* have been variously said to contain formic acid, cantharidin, and no poison at all. Deegener, in the "Handbuch der Entomologie," seems to favour the theory of a combined chemical and mechanical action. I have found that the irritating effect of the spicules of this species is in no degree impaired by prolonged immersion in various solvents such as ether, alcohol, and xylol. On the sixth and seventh abdominal segments of the larva of *P. similis* there are two eversible glands which have been supposed to secrete a fluid which poisons the spicules. Of this there is no satisfactory evidence. The glands have probably a repugnatorial function. They have been described by Poulton (Trans. Ent. Soc. 1887, p. 300). The drop of moisture which often appears on these structures has no action on either red or blue litmus paper, nor indeed have I been able to detect any peculiar odour associated with them, though others seem to have noticed something of the kind.

To turn now to the imago. When full fed the larva spins a thin but tough cocoon, compounded of silk with which its own large hairs are interwoven. The inner lining of the cocoon is of much looser silk, and though spicules are scattered all through it there is a particularly dense mass of these arranged roughly in a belt round the inside of the lining, and placed towards the anterior end, a little beyond the middle, Fig. 3, S. The spicules adhere together in small masses probably owing to their barbed structure. By taking pupae out of their cocoons I was easily able to show that the moth obtains its spicules from the cocoon, since an imago hatched from a naked pupa never has any of these bodies in its anal tuft. I then carefully watched the emergence of imagines from naked pupae in order to see if there could be observed any appropriate movements which would result in the collection of the spicules. A male on emerging immediately crawled to the side of the box and assumed a position suitable for the expansion of its wings. The behaviour of a female was, however, quite different. Once out of the pupal skin it began a series of curious contortions of the abdomen. The latter was moved so that the anal tuft described a succession of circles, whilst by longitudinal expansion and contraction

of the segments the tuft was made to open and close, the action somewhat resembling the manner in which an elephant picks up small objects with its trunk. Not every female emerging from a naked pupa made these movements, or at least not for any appreciable length of time, a fact which suggested a further experiment which I shall describe later. I now wished to see the process actually carried on in the cocoon. Since it was not possible to decide when a moth was about to emerge from a pupa when the latter was enclosed, pupae were removed by cutting off the posterior end of the cocoon. With a little practice it is possible to determine with some accuracy by the appearance of the pupa when a moth is ready to emerge. As soon as it had cracked the pupal skin it was slipped back into the cocoon the open end of which was pinned down. From a male pupa so treated the moth emerged very rapidly. The anterior end of the cocoon seems to be comparatively thin, and a thrusting movement of the head and thorax soon tore a hole through which the moth emerged and ran to the side of the box. A female treated in the same manner at first emerged only so far as the anterior part of the thorax. In this position the extremity of her abdomen was just on a level with the band of spicules in the cocoon and she proceeded to carry out the peculiar movements I have already described. The anal tuft could be distinctly seen moving round and round the cocoon and opening and shutting amongst the spicules.

It is of great interest to note that the hairs of which the female tuft is composed are specially adapted to hold these spicules when collected, since towards their proximal ends they are irregularly spinose. Fig. 4 shows the ends of a few of these hairs with one or two spicules adhering thereto.

I have already said that not every female emerging from a naked pupa made the appropriate sweeping movements, a fact which suggested that normally the stimulus of contact with the cocoon was necessary. I therefore placed such a female after complete emergence but before the wings had begun to expand, in a cocoon. Almost immediately she began to make her way out and having partially emerged proceeded to sweep up the spicules in the manner already described.

One further point remains to be elucidated. Prof.

EXPLANATION OF PLATE XXII.

Porthesia similis.

FIG. 1. Portion of larval skin shown in transverse section.

C. Chitinous cuticle.

S. Tufts of urticating spicules arising from cuticular papillae.

E. Hypodermal cells associated with urticating spicules.

P. White plume-like body.

Sc. Socket of same.

G. Gland at base of plume.

2. Diagram of transverse section of larva (one half only).

h. Large branched hairs or setae.

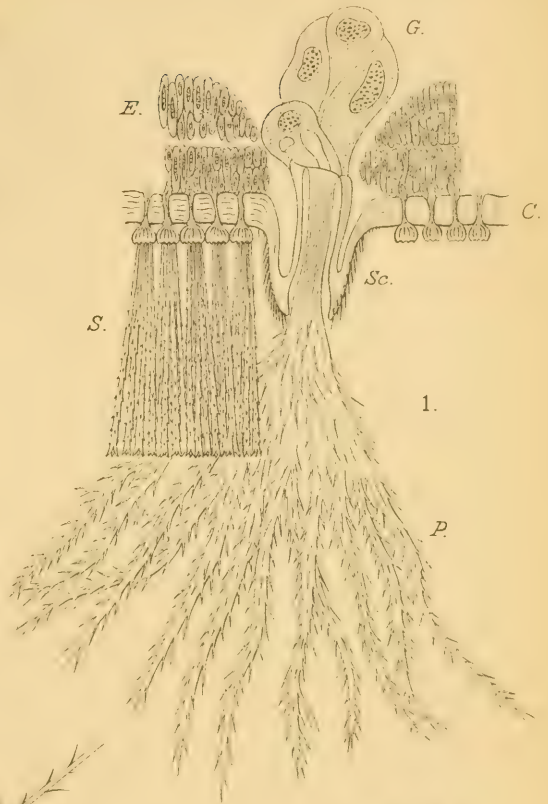
S. Urticating spicules.

P. Plume-like body.

3. Section of cocoon showing the band of urticating spicules (*S*) therein.

4. Some of the hairs (modified scales) which form the "gold tail" in the ♀ moth. Their basal or proximal ends (*b*) are irregularly spinose and so hold the urticating spicules swept by the moth from the cocoon.

(The corresponding structures in the ♂ are smooth throughout their length.)



H. Eltringham del.

West, Newman lith.

Poulton made the ingenious suggestion that possibly the arrangement of spicules in a ring or band might be peculiar to the cocoons spun by a female larva. Unfortunately by this time I had but few cocoons left and further supplies were unobtainable. The few remaining examples were cut open and the pupae carefully sexed. Of six cocoons two contained female pupae and four male. In the former the spicules were certainly arranged in a more definite band than in the latter. In two of the male cocoons they were much less numerous, and in the remaining two were more scattered. It will be interesting to complete this observation when further material becomes available. Meanwhile we have evidence of a very remarkable instinct in the female moth, which by collecting its own larval spicules, materially adds to the protective qualities of the tuft of hair with which it ultimately covers its eggs. The spinose structure of its own hairs causes the majority of the spicules to be retained in that part of the tuft, which when eventually transferred to the eggs, lies uppermost.

The moth itself is probably distasteful, and nearly every collector must have observed the manner in which the conspicuous gold "tail" is suddenly protruded between the wings when the insect in its resting position has been disturbed. This warning action may also be associated with the presence of the urticating spicules in the tuft, the males in such case being, as males are said to be, mere deceivers.

EXPLANATION OF PLATE XXII.

(See explanation facing the PLATE.)

XIX. *Illustrations of specific differences in the Saws of*
 ♀ *Dolerids*. By the Rev. F. D. MORICE, M.A.,
 F.E.S.

[Read October 1st, 1913.]

PLATES XXIII-XXV.

HAVING found much pleasure and interest in the work of dissecting out, examining, and photographing at various magnifications, the terebrae of such European *Dolerids* as I have been able to procure (viz. in all thirty-six reputed species), I venture to offer to the Society a series of these photographs—the latest and so far as I can judge the least unsuccessful of many attempts which I have made in that direction, hoping that it may be of some service to any colleague who cares to occupy himself with the determination and classification of that admittedly difficult group of Sawflies.

The original photomicrograms here reproduced on a somewhat smaller scale were all taken at the same magnification (about $\times 240$), and as far as possible under the same conditions as to lighting, aperture of lens, time of exposure, etc. Possibly by “stopping down” more I could have brought out better certain details of these rather inconveniently “solid” (not flat) objects, but this, for other reasons, I was anxious to avoid. With the magnification employed I could only get a small portion of each saw into my quarter-plates; but this suffices to show pretty well the characters to which I propose to call attention, and with a lower magnification this would sometimes have hardly been the case.

The late Mr. Cameron has remarked that for separating *Dolerus* spp. “the form of the ovipositor can be safely relied upon, but it is not always easy of application.” With this, as the result of prolonged study of the subject, I quite agree. But it seems to me that mere *outlines* of the saws, such as are given in the Plates of his well-known Monograph, are not really of much use to students attempting to identify species by the characters of that organ. Such

a method of representation gives a very inadequate idea of the really very characteristic appearance under a good microscope of the objects in question. It is not merely in the *margins* of the saws that striking and useful characters are to be found. Others, to my mind quite as important, and often more immediately recognisable, occur in connection with the *surface* (not the *edge*) of certain saws, and especially with the remarkable alternating elevations and depressions ("ridges and furrows,") which invariably cross these surfaces diagonally, but must generally be ignored in an outline drawing.

For instance, if the reader will compare for a moment the first and last of my figures (Plate XXIII, fig. 1, and XXV, fig. 12), he will see, no doubt, that the saws shown in them *can* be distinguished by their *outlines* only, but that they can be much more rapidly and confidently separated by the great unlikeness of their *surfaces*. The former shows a surface crossed by corrugations, which are armed with most conspicuous teeth or spines; while in the latter there are also corrugations, but they are edentate and comparatively characterless.

Compare, again, figs. 1 and 5 of Plate XXIV, and it will be seen that though the *outlines* of their margins are not identical, a much more noticeable difference between the two saws is the presence in fig. 5 of great triangular tooth-like projections on the surface, which are altogether wanting in the other figure.

It appears to me that, taking them as a whole and considering all their characters, we can divide the saws here figured into certain more or less definite groups; which groups to some extent, but not altogether, correspond to subdivisions already pointed out by various authors as existing among these insects—subdivisions founded on external characters only and without any consideration of the structure of the saws.

For instance, figs. 1, 2, 3, and 4 of Plate XXIII are all extremely different from any of those which follow them; and three of them at least (2, 3 and 4) have a most peculiar and very similar common "facies" of their own—resembling perhaps a little the saws of a very different Sawfly genus, viz. *Tenthredopsis*, but quite unlike those of any other *Dolerids*. Now these figures represent four out of the five species (the fifth *genucinctus*, Zadd., is unknown to me) which were singled out by Thomson, mainly on

characters of the head (elongate eyes, etc.), to form his "Sectio I" of *Dolerus*, and they are now recognised by systematists as a separate genus, viz. *Loderus*, Konow.

Again, figs. 5, Plate XXIII, to 3, Plate XXIV refer to species which, because of the largely or entirely testaceous colour of the abdomen in all the ♀♀ and nearly all the ♂♂, were formerly considered distinct generically from the black-bodied *Doleri*, and called by Leach, Stephens, etc., *Dosytheus*. Now nearly every one of these insects has a saw exhibiting characters either of the surface, or the margin, or both, which—with two exceptions (Plate XXIII, figs. 4 and 5)—not one of the *Dolerus* spp. with black abdomen possesses! I do not suggest that these differences are so *essential* as to support the idea that *Dosytheus* should again be considered as a "good genus." Still it is interesting to find that in this group of insects a difference in the colour of the abdomen is so frequently correlated with a difference in the characters of the saw. And it is curious to note that on the other hand a difference in the colour of other parts of the body (*e. g.* in the thorax of the ♀♀ and in the legs of both sexes) seems to have no connection whatever with the characters of the saw. *Sanguinicollis* and *ravus* (Plate XXIV, 11 and 12), the former with, and the latter without, red on the ♀ thorax, have saws so identical in construction, as to make it highly probable that Konow was right in considering *ravus* as a var. of *sanguinicollis*. *Thoracicus*, another species with red on the thorax (Plate XXV, 12), is evidently most nearly allied to a group of entirely black spp. (Plate XXV, 6–11). Yet another such species, *haematodes*, has a saw much like those of the blue-black forms *anthracinus* and *nitens* (Plate XXIV, 6–8).

Finally, of the more or less red-legged species, the best known—*gonager*—has a saw hardly distinguishable from that of the black-legged *niger* (Plate XXV, 6, 7); whereas *puncticollis*—which Konow considered, but wrongly, I feel sure, as a var. of *gonager*—and another red-kneed insect *liogaster* (Plate XXV, 1, 2) have saws which seem to place them in the group of *aeneus*; and *gessneri* (Plate XXIV, 5) also with red on the legs has a saw unlike any of the species with similar external characters and allying it, I should say, quite unmistakably with the "*Dosytheus*" *dubius* (Plate XXIII, 10).

Even in cases, and of such there are many, where it

would be difficult, if not impossible, to say from the characters of its saw only to what species a given insect belongs, these characters will often suffice to show that at any rate it does *not* belong to some particular species. For instance specimens of *fumosus*, *oblongus*, etc. (Plate XXV), are often hardly distinguishable by external characters from one another, or from other members of the same group, or finally from *nigratus* (Plate XXIV, 10). But on examining the saw of such a specimen we shall sometimes be able to say at once that at any rate it is *NOT nigratus*! Thus these saw-characters, even where they do not absolutely bring us to a conclusion as to the species of a particular insect, may at least supply us with a preliminary "orientation" of our ideas on the subject. And, as in the cases quoted above of *gonager* and *puncticollis*, *sanguinicollis* and *ravus*, they may be helpful towards forming an opinion as to the desirability or otherwise of uniting two doubtfully conspecific forms.

I will now review shortly the saws here figured *seriatim*, pointing out such characters as I think noticeable in particular cases, and indicating the groups into which they appear to me most naturally to arrange themselves.

Of the *Loderus* spp. (Plate XXIII, 1-4) I have already spoken. *Palmatus* and *vestigialis* are well-known and fairly common species. *Pratorum* I have figured from a specimen taken by myself at Woking. *Gilvipes* (= *ornatulus*, Knw.) is from a specimen given to me by Konow as *ornatulus*. A fifth palaeartic form (*genicinctus*, Zadd.) is very rare, and I have been unable to procure a specimen.

Passing to the species formerly distinguished as *Dosytheus* (Plates XXIII, 5 to XXIV, 3), I think it is possible to recognise among them four or five fairly distinct groups.

Etruscus and *bimaculatus* (Plate XXIII, 6 and 8) are evidently very closely allied by the quadrate form of the so-called saw-teeth,* and of the intervals or emarginations (almost as wide as themselves) which separate them.

Pratensis, *palustris* and *aericeps* (Plate XXIII, 5, 7, 9) form a group which has much in common with *etruscus* and *bimaculatus*, but the saw-teeth (if I may call them so under

* I should prefer to consider each of these so-called "teeth" as a *separate saw*, and confine the term saw-teeth to those minute denticulations of their edges which can be clearly seen in my Figure of *bimaculatus*, but are hardly to be recognised except as a very slight sinuation in *etruscus*.

protest) are (except a few at the apex) more elongate, not separated by such wide intervals, and much more conspicuously and intricately denticulated. Also the saw as a whole widens less rapidly from the apex towards the base. This is particularly noticeable in *aericeps*, in which the inferior and superior margins of the saw might almost be said to run parallel to each other. The corrugations crossing the blade diagonally are armed with sharp teeth in all these species, but the character is not so conspicuous in these as in certain other cases.

Anticus (Plate XXIII, 11) and *dubius* (Plate XXIII, 10) agree closely in the great development of tooth-like projections on the diagonal corrugations (a pair on each!), and also in the triangular not quadrate form of the so-called saw-teeth, and the large bold denticulation of their cutting edges. These characters belong also to *gessneri* (Plate XXIV, 5), a species whose saws are almost exactly like those of *dubius*, though it would not have been reckoned as a *Dosytheus* by the old authors since its abdomen is not testaceous but black! From both *dubius* and *gessneri* the saw of *anticus* is distinguishable at a glance, by the more projecting "teeth" and the wider intervals which separate their cutting edges, also by the humpy undulating apex of its superior margin—in which respects it resembles a good deal the group of *etruscus* and *bimaculatus*. (There is an indication of the same character in the saws of *pratensis*, etc., but it is much less developed there!)

The saw of *ferrugatus*, Lep. = *thomsoni*, Knw. (Plate XXIII, 12), is utterly unlike that of *anticus*, though in most external characters the two species resemble each other so closely that they are often confounded in collections. (Nearly all British specimens which have come to my notice under the name *anticus* really belong to *ferrugatus*; in fact, I have only once seen a real British *anticus*, which was captured by Mr. E. Atmore at King's Lynn.) I cannot place the saw of *ferrugatus* anywhere but in a group by itself. Compared with *anticus*, etc., it is curiously narrow, the denticulations of its cutting edges are numerous and distinct but very small, and the armature of its lateral corrugations is almost obsolete.

Triplicatus, *madidus* and *schulthessi* (Plate XXIV, 1, 2, 3) have extremely similar saws. In all three the corrugations appear to be edentate. The cutting edges

show numerous denticulations, large and conspicuous in *triplicatus* and *madidus*, less so in the other species. *Tinctipennis* (Plate XXIV, 4), though an entirely black insect, has a saw presenting so distinctly the characteristics of a *Dosytheus*, that, until I myself dissected a British specimen and found the saw here figured, I had always a suspicion that Cameron had made some mistake, and that the saw mounted by him in balsam (now in the S. Kensington Coll.) and figured in his Monograph, did not really belong to the insect to which he assigned it! No other black-bodied *Dolerus* has a saw in the least resembling it, and I can only group it (in spite of the insect's external characters) with those of *pratensis*, *aericeps*, etc.

We come now to a large group of species (Plates XXIV, 6 to XXV, 4 inclusive) whose saws are easily distinguished from any of those hitherto considered, but as a rule not at all easily distinguished from one another. The diagonal corrugations of the blade seem to be always quite simple—merely a series of alternate straight and equal ridges and furrows. The so-called teeth are always distinctly projecting, triangular (not quadrate) in outline and separated from each other by rather wide but not very deep sinuations or emarginations; those nearest the apex of the saw are hardly denticulated at all, but towards its centre a few distinct denticulations begin to appear, and still nearer the base they are often pretty numerous, but always very small and visible only with high magnifications. (Unfortunately, as already explained, I have been unable to include this part of the saws in my figures.) The superior margin of the saw is always simple, not lumpy at the apex; and it generally coincides with the long linear groove, etc. which connects together the saw and its "support." In some of my figures (*e. g.* Plate XXIV, 6 and 7) the presence of denticulations on the cutting edges of the organ can be detected without much difficulty, but in others I can only see them with the help of a magnifying glass, and in some I have not succeeded in making them visible at all. The general appearance of all these saws is pretty much the same; none of them are particularly wide or narrow or in any other way paradoxical. A few, however, by dint of considerable experience I can recognise at a glance—*e. g.* Plate XXIV, 11, 12 by their curved "falcate" shape, the superior margin distinctly sinuated

inwards! In Plate XXIV, 10, on the contrary, this margin is sinuated distinctly though not very conspicuously *outwards*. And in other cases, as a rule, it is practically a simple straight line. Plate XXV, 4 again (the common species *aeneus*, Htg. = *elongatus*, Thoms. Cam., etc.) I can always recognise by the evidently *concave* curvature of each of the cutting edges and their consequently small and acute-looking actual apices. In other cases, on the contrary (*e.g.* Plate XXIV, 9, XXV, 3, etc.), these cutting edges are either practically straight or slightly convex, and this makes their apices appear less prominent. But on the whole, though I can generally recognise a saw at once as either belonging or not belonging to this group, I should have to look to other characters, puncturation, sculpture of head and thorax, etc., before venturing to *name* the insect possessing it.

Picipes = *leucopterus*, Zadd. (Plate XXV, 5), is a saw which I can always identify by its curiously lumpy apex, combined with its convex, much denticulated (though the denticulations are very small), and very slightly projecting "teeth." This and the two next species (*gonager* and *niger*) seem to me more or less transitional between the last group (*aeneus*, etc.), and another which includes all my remaining figures (Plate XXV, 8 to 12 inclusive). This appears to me a very distinct group, characterised by (*a*) the very broad and blunt apex of the saw, (*b*) the very slight and inconspicuous separation of the cutting edges, (*c*) the fact that these cutting edges form an almost continuous line and are not placed as usual more or less *en échelon*, (*d*) the very close and regular denticulation of these cutting edges, even those quite near the apex of the instrument, (*e*) the *straightness* of these edges—neither concave nor convex.

Most of these peculiarities are to be found also in *gonager* and *niger*, but those species have a much less broad and more pointed apex than in *gibbosus*, *megapterus*, etc. (Plate XXV, 8 to 12), and on that account I do not actually include them in the *gibbosus* group, but prefer to treat them rather as forming a transition towards it.

1



2



3



4



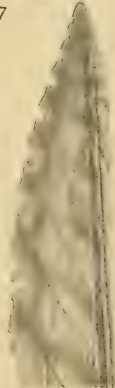
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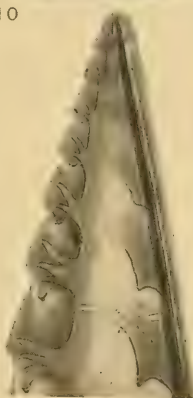
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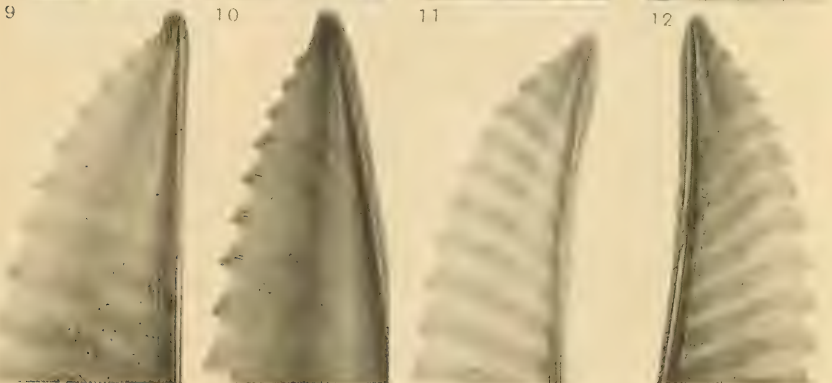
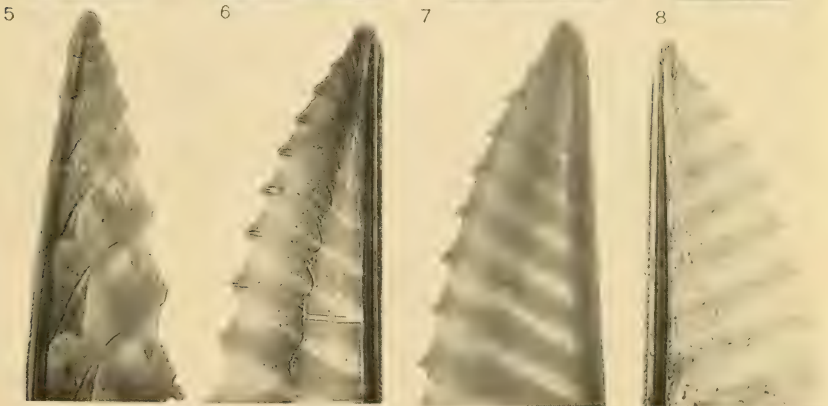
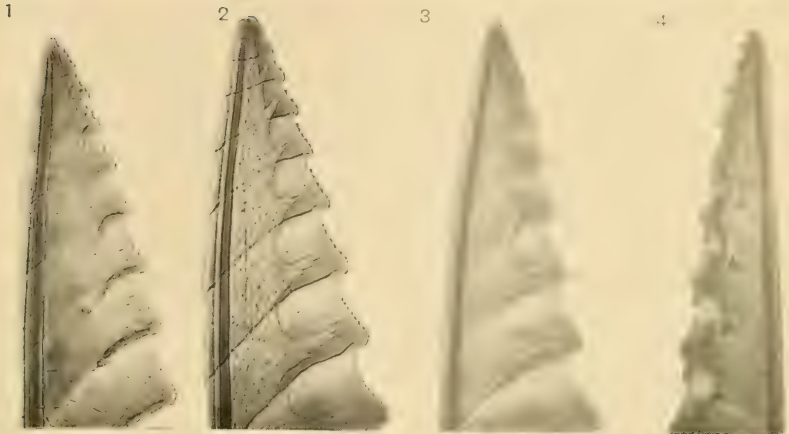


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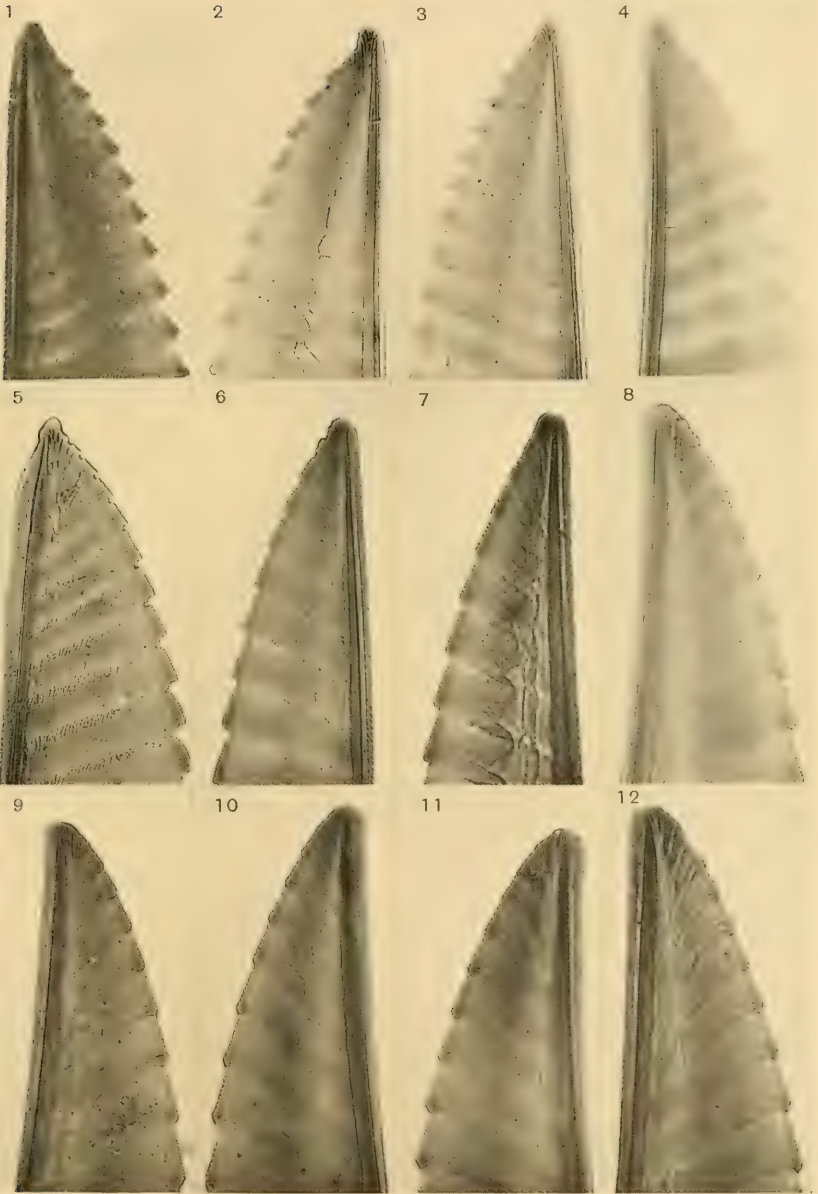
F. D. Morice, photo.

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EXPLANATION OF PLATES XXIII-XXV.

PLATE XXIII.

FIG.

1. *Loderus palmatus*, Kl.
2. *L. vestigialis*, Kl.
3. *L. pratorum*, Fall.
4. *L. gilvipes*, Kl.
5. *Dolerus pratensis*, L.
6. *D. etruscus*, Kl.

FIG.

7. *D. palustris*, Kl.
8. *D. bimaculatus*, Geoffr.
9. *D. aericeps*, Thoms.
10. *D. dubius*, Kl.
11. *D. anticus*, Kl.
12. *D. ferrugatus*, Lep.

PLATE XXIV.

1. *D. triplicatus*, Kl.
2. *D. madidus*, Kl.
3. *D. schulthessi*, Knw.
4. *D. tinctipennis*, Cam.
5. *D. gessneri*, Andr.
6. *D. haematodes*, Schr.

7. *D. anthracinus*, Kl.
8. *D. nitens*, Zadd.
9. *D. rugosulus*, D.T.
10. *D. nigritus*, Müll.
11. *D. sanguinicollis*, Kl.
12. *D. rarus*, Zadd.

PLATE XXV.

1. *D. puncticollis*, Thoms.
2. *D. liogaster*, Thoms.
3. *D. rufotorquatus*, Costa.
4. *D. aeneus*, Htg.
5. *D. picipes*, Kl.
6. *D. gonager*, F.

7. *D. niger*, L.
8. *D. gibbosus*, Htg.
9. *D. megapterus*, Cam.
10. *D. fumosus*, Zadd.
11. *D. oblongus*, Cam.
12. *D. thoracicus*, Fall.

XX. *On the Relationship between certain West African Insects, especially Ants, Lycaenidae and Homoptera.* By W. A. LAMBORN, M.R.C.S., L.R.C.P., F.E.S., Entomologist to the Agricultural Department of Southern Nigeria. With an Appendix containing Descriptions of New Species, etc., by G. T. BETHUNE-BAKER, Pres. Ent. Soc., W. L. DISTANT, HARRY ELTRINGHAM, D.Sc., M.A., Prof. E. B. POULTON, F.R.S., J. HARTLEY DURRANT, and Prof. R. NEWSTEAD, F.R.S.

[Read June 4th, 1913.]

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INTRODUCTORY NOTE by Prof. E. B. Poulton.

THE following memoir was written by the author at various times between September 1912 and April 1913. The work was done in the Hope Department, where the specimens, which had already been mounted and labelled, were compared with the records of original observations made in Southern Nigeria. If Mr. Lamborn had not been so greatly pressed he would have entirely completed the memoir, but there was so much to be done during his last visit home that he was not able to put the finishing touches to the paper or to verify his account by a second comparison between specimens and manuscript. I have now, however, been through the whole of it and verified all the data. All additions or comments of my own, except mere verbal alterations, will be found under separate headings with my initials, or within square brackets. Many of the latter passages are also signed by my initials.

From the dates which are freely quoted in the body of the memoir it will be seen that Mr. Lamborn made his observations between September 1911 and the end of July 1912, when he sailed for England. A few earlier observations on the same subject, already published, are referred to under the respective species.

The author's collecting ground—Oni Camp, 70 miles East of Lagos—is at a low elevation, never more than 50 ft. above sea-level. The bush has been cleared in the immediate neighbourhood, but around the camp, at the time when Mr. Lamborn collected, were large tracts of primitive forest, in which, unless otherwise stated, it may be assumed that the captures were made. All precise distances such as "1 mile E.," etc., refer to localities in the forest at various distances to the East of Oni Camp.

In the laborious and minute work of preparing Mr. Lamborn's material so that this paper could be written, I have to thank my assistants in the Hope Department, Mr. A. H. Hamm and Mr. Joseph Collins. The setting, printing and labelling has involved a very large amount of labour, and the almost complete accordance between Mr. Lamborn's notes and the specimens is evidence that a successful result has been obtained.

It may be assumed that the notes in Mr. Lamborn's manuscript are confirmed by the data he had written to accompany the specimens, except in the few cases in which a discrepancy is mentioned. A careful examination of the whole of the material in the Hope Department will well repay the naturalist who is interested in ants and the insects associated with them. The related forms are kept together and arranged in the order of the present memoir to which they supply the fullest illustration. (E. B. P.)

INTRODUCTION.

The observations herein recorded were made during the latter part of a three years' sojourn in Southern Nigeria in a bush camp at Oni, situated 70 miles E. of the town of Lagos and about 10 miles from the sea.

In the course of a study directed in the first place towards an elucidation of the life-history of West African Lycaenid butterflies it was found that, as has frequently been noted in other parts of the world, a very close relationship exists between their larvae and ants.

The relationship has in the majority of cases in West Africa been found to be one tending to the common good of both, the ants lavishing their blandishments on the smooth soft-skinned larvae, and in some instances very definitely extending hospitality and protection to them in return for much-prized secretions from certain special glands, evidently very similar to those described for the first time in 1867 by Guenée as existing in certain European Lycaenid larvae, and since found in many New World and Oriental species. The character of the gland in various Ethiopian larvae will be touched on when recording observations made on particular specimens. For the present it will suffice to mention that in most cases an orifice from which a fluid secretion will exude under appropriate stimuli has been found to exist on the dorsal aspect of the 11th segment, and that behind it and to the

outer side is a pair of protrusible tubercles which seem to exert a definite attractive influence on the ants.

In other cases a triple association has been found to exist between Lycaenid larvae, ants and Homoptera, in which the larvae, though treated as honoured guests by their ant hosts, repay them with the basest ingratitude by devouring their fellow-guests the Homoptera. In such instances as far as has been discovered the attraction exerted on the ants by the larvae is a much weaker one than in the preceding case, for though the accessory tubercles have been noted, no gland has as yet been seen nor have the ants been observed to concentrate their interest at the site at which the secreting structure is usually found, as in other larvae. Still further, some Lycaenid larvae are undoubtedly present as predaceous intruders on colonies of Homoptera fostered by ants and are of no benefit to them whatever though they are tolerated from necessity, because the ants are unable to put up a successful fight with an enemy protected by hairy fringes, by hard rough tubercles or a tough cuticle, though, as will be seen, they do not hesitate to avail themselves of a chance to commence an attack when a favourable opportunity presents itself.

Prof. Poulton suggested to me that in writing an account of the various species I should perhaps give the most vivid impression in my power if I transcribed the original notes written when the living insects were actually before me, with only such alterations as more recent knowledge has shown to be necessary. These notes were originally contained in letters written by me to Prof. Poulton and I have to thank him for the care with which he has preserved them so that they are now available for my present purpose, for the trouble involved in identifying some of my specimens and in getting others named by various authorities, so that on my return I found them labelled and ready for reference; but above all I wish to thank him for the constant stimulus and encouragement afforded by his interest in my work and for his ever ready help and guidance by which alone my results could have been obtained.

It is also my pleasant duty to thank Mr. G. T. Bethune-Baker, Pres. Ent. Soc., Prof. Poulton, Mr. H. Eltringham, Mr. W. L. Distant, Mr. J. Hartley Durrant, and Prof. R. Newstead, F.R.S., who have contributed valuable sections to the Appendix; and Prof. A. Forel, who has named the

ants. Mr. W. C. Crawley very kindly carried this latter material safely to Switzerland and back, by hand.

The whole of the material is in the Hope Department at Oxford, and as the numbers originally attached to the specimens have been printed on the labels all can be readily identified.

A.—LIST OF ANTS AND INSECTS ASSOCIATED WITH THEM (E. B. P.)

I have drawn up the following analysis of the associations recorded in this memoir: The list of ants, with the exception of those marked by an asterisk, is quoted from Prof. Forel's paper, *Fourmis de Nigérie*, in *Revue Zoologique Africaine*. Brussels, 1913, pp. 352, 353. The species marked by an asterisk were with one exception determined by Prof. Forel, although they do not appear in his paper. The exception is *Oecophylla smaragdina*, r. *longinoda*, kindly determined by Mr. G. Meade-Waldo in the British Museum. The sign † indicates that the insects associated with the ants were also associated with each other, although the nature of the association is far from uniform. It is to be understood that the great majority of the ant-associations are with the larvae or pupae of the species named.

The ants were determined by Prof. Forel quite independently of their associations, and when his names had been affixed, and the ants re-grouped according to the Lycaenid larvae, etc., they were tending, it was seen that the species and races were remarkably constant in their respective groups. The exceptions were the two species of *Pheidole*, once mixed in the same group (pp. 467-8) almost certainly the result of an accident in labelling after the specimens had been received from Switzerland—and the two races, *alligatrix* and *winkleri*, of *Cremastogaster buchneri*, once mixed according to Prof. Forel's determination (p. 481), once mixed, not in this but in another group, according to Mr. W. C. Crawley and Mr. A. H. Hamm (p. 484). It must be remembered, however, that *winkleri* and *alligatrix* are often very difficult to separate, and Forel himself speaks of intermediate forms. If there has been no mistake, the two forms are sometimes to be found attending the same larva, and it is difficult to believe that the races are really distinct.

Mr. W. C. Crawley has very kindly come to Oxford on purpose to verify the ants in the various groups, and has carefully examined the whole of the material. The data are so numerous and complex, and mistakes, in spite of the utmost care, so probable, that Mr. Crawley's examination of the collection has been a great satisfaction to me.

*1. ODONTOMACHUS HAEMATODES, Linn. ♀

Associated with the Lycaenid *Lycaenesthes flavomaculata* (p. 483).

2. SIMA AETHIOPS, Sm. ♀.

Associated with *Coccidae* and probably with the larva, and pupa of the Aegeriid moth *Tinthia lambornella* (p. 493).

3. CREMASTOGASTER BUCHNERI, For., r. ALLIGATRIX,
For. ♀.

Associated with the following Lycaenids: *Epitola oniensis* (p. 457), *Deudorix (Hypokopelates) obscura* (p. 471), *Lycaenesthes flavomaculata* (p. 483), *Triclema lucretilis* (p. 485). With *Stictococcus sjöstedti* (p. 462), and other Coccids (p. 486). Attacking the Jassid *Nehela ornata* (p. 462).

4. CREMASTOGASTER BUCHNERI, For., r. CLARIVENTRIS,
Mayr. ♀.

Associated with the Lycaenid *Lycaenesthes alberta?* (p. 476).

5. CREMASTOGASTER BUCHNERI, For. r., WINKLERI,
For. ♀.

At first Prof. Forel was inclined to consider this form as a variety of *africana*, Mayr, another race of *buchneri*, but more extended study has led him to give it the position of a separate race.

Associated with the Lycaenids *Aslauga lamborni* † and the Coccid *Stictococcus sjöstedti* (p. 447); with *Lycaenesthes flavomaculata* (p. 483), *Triclema lucretilis* (p. 485).

6. CREMASTOGASTER BUCHNERI, For., r. LAURENTI,
For. ♀.

Associated with the Lycaenid *Aslauga vininga* † and the Coccids *Dactylopius longispinus* and *Lecanium punctuliferum*, var. *lamborni* (p. 446).

In addition to the above races, *Cremastogaster buchneri*, For., ? race, is described as associated with the following *Lycaenidae*:—probably *Epitola ceraunia* (p. 456), *E. carcina* (p. 456), *Argiolas alcibiades* (p. 474), *A. julus* (p. 474).

7. PHEIDOLE ROTUNDATA, For., var. ♀.

This form appears in Prof. Forel's paper under the name *Pheidole punctulata*, Mayr., r. *impressifrons*, Wasm. Prof. Forel, however, informs me that the ant is, in his opinion, even closer to *P. rotundata*, For. r., *ilgii*, For., than it is to *P. punctulata*. He considers it to be intermediate between *punctulata* and *rotundata* but nearer to the latter. This is the principal "house-ant" of Oni, although it is also found in the open. Throughout the following paper it will be described as *P. rotundata*, var., the name attached to the specimens by Prof. Forel.

Associated with the following *Lycaenids* after they had been brought home, nearly always replacing ants of other species removed at time of capture: *Aslauga lamborni* † and *Stictococcus sjöstedti* (p. 447); with *Myrina subornata* (p. 472), *Hypolycaena philippus* (p. 474), *Lycaenesthes lachares* (p. 478), *L. flavomaculata* (p. 483), *Triclema lucretilis* (p. 485), *Catochrysops malathana* (p. 488), *Oboronia punctata* (p. 489).

Associated with the following *Lycaenids* in the forest and clearing: *Hypolycaena philippus* (p. 474), *Lycaenesthes lachares* (p. 478), *N. lyzanius* (p. 484), *Oboronia punctata* (p. 489); probably with the Pyralid moth *Obtusipalpalis saltusalis* (p. 492). With the Membracid *Leptocentrus altifrons* (p. 495).

Attacking and uncertain treatment of the *Lycaenid* *Megalopalpus zymna* (pp. 463-4). Carrying off eggs of *Charaxes ussheri* (p. 467). Devouring sugar and dead insects in the house (p. 491). Attacking and carrying off larvae and imagines of the smaller "red house-ant" *Monomorium pharaonis*, L. (p. 491).

8. PHEIDOLE AURIVILLII, Mayr., r. KASAIENSIS,
For., ♀.

Associated with the *Lycaenid* *Megalopalpus zymna* † the Jassid *Nehela ornata* and the Membracids *Gargara variegata*, *Anchon relatum*, *Beninia* sp., *Leptocentrus altifrons*, etc. (pp. 458-468); with *Hypolycaena nigra* (p. 473).

H. lebona (p. 473), probably *H. philippus* (p. 474), probably *Lycaenesthes silvanus* (p. 476), *L. larydas* (p. 477), *L. lachares* (p. 478), *Oboronia punctata* (p. 489). Probably with the Pyralid moth *Obtusipalpalis saltusalis* (p. 492). With the Coccid *Stictococcus sjöstedti* (p. 460). With the Membracid *Anchon decoratum* (p. 498).

*9. OECOPHYLLA SMARAGDINA, F., r. LONGINODA,
Latr., ♀.

Associated with the Coccid *Stictococcus sjöstedti* (p. 447, 453), the Lycaenid *Euliphyra mirifica* (p. 450), a Heterocerous larva (p. 451), *Aphidae* (p. 453), with the Noctuid *Eublemma ochrochroa* † and *Stictococcus* (p. 491).

Carrying off just hatched larvae of the Saturniid moth *Bunaea alcinöe* (p. 467).

*10. CAMPONOTUS MACULATUS, F., subsp.? ♀

Associated with the Lycaenids *Myrina silenus* (p. 472), and *Hypolycaena philippus* (p. 474), the latter as an exception. With the Psyllid *Rhinopsylla lamborni* (p. 498).

CAMPONOTUS AKWAPIMENSIS, Mayr., var. POULTONI,
For., ♀.

The sign ♀ has been inadvertently printed instead of ♀ in Prof. Forel's paper (*l. c.* p. 353).

Associated with the following Lycaenids: *Lachnocnema bibulus* † and the Jassid *Ossana bicolor* (p. 470); with *Myrina silenus* (p. 472), *Hypolycaena philippus* (p. 474), *Lycaenesthes silvanus* (p. 476), *L. larydas* (p. 477), *Catochrysops malathana* (p. 488). In shelters with Membracids and Jassids (p. 465). With *Nehela ornata* (p. 465). With the Membracids *Leptocentrus altifrons* (p. 495, 497), and *Neoxiphistes lagosensis* (p. 497).

B.—LYCAENIDAE ASSOCIATED WITH ANTS:
INTRODUCTORY NOTE (E. B. P.)

The following 27 species of *Lycaenidae*, with the exception of the *Lycaenesthes* group, are arranged in the order of Aurivillius' "Rhopalocera Aethiopica" (1898). In *Lycaenesthes* and its allies I have followed Mr. Bethune-Baker's monograph (Trans. Ent. Soc., 1910, p. 1).

Mr. Bethune-Baker's description of new forms of

Lycaenidae, in the Appendix to the present memoir (p. 499), includes a species of *Aslauga* upon which no bionomic observations have been made by Mr. Lamborn. It was thought, however, that it would be convenient for an account of this novel and interesting form to appear beside that of allied species whose bionomic associations are here recorded.

Emergence of the sexes.—Mr. Lamborn's careful records throw much light upon the question of the relative order of the emergence of the sexes of butterflies, and, in the present paper, some of his facts are now made public. It will be observed that in most *Lycaenidae*, of which a sufficient number were bred from the same family, the females emerged on the average before the males—a result opposed to the usual experience in butterflies. In *Euliphyra mirifica*, however, 3 males emerged before any of the 5 females (p. 455-6). The other species, in which marked results were obtained, are *Epitola ceraunia*, 9 females, 6 males, and 1 male and 1 female together, emerging in that order, Feb. 22-23, 1912 (p. 456); *Hypolycaena nigra*, 5 females, 1 male and 1 female together, 2 females, all within 24 hours, Feb. 13-14, 1912 (p. 473); *Lycaenesthes lachares*, the groups tabulated on p. 481, where the early emergence of females is very clear; *L. flavomaculata*, 1 female, 2 males, Jan. 19-20, 1912 (p. 483).

The notes also show that emergence of certain species takes place at a particular time of the day, and indicate furthermore the interval between emergence from the pupa and the first flight. This period is seen to be very short in Lycaenid butterflies, contrasting in the most remarkable manner with the facts observed by Mr. Lamborn in the specially protected *Acraeinae*.

Relationship with ants.—The relationship with the ants will be found to be extremely varied, some species, such as *Lycaenesthes flavomaculata* (p. 483), being associated with various kinds of ants, others again being confined to a single species. The number of observations upon the replacement of the ants found attending the larvae in the wild state by the "house-ant" *Pheidole rotundata*, var., are of the highest interest.

It will be noted that the behaviour of certain ants towards certain Lycaenid larvae is marked by much uncertainty, e. g. in *Euliphyra* and *Megalopalpus* (pp. 453, 463-4).

A puzzling and difficult problem is presented by *Euliphyra*, shown by Mr. Eltringham's paper in the Appendix (p. 510) and by Mr. Lamborn's observations (pp. 452-3) to be effectively protected against ants and to be attacked by them under certain circumstances (p. 453), and yet thrusting its head and neck into the mouth of an ant in order to be fed (p. 452). In such cases the most helpful consideration is probably that suggested in conversation to the present writer by Prof. W. M. Wheeler, viz. that the ant community is so successful and affords so safe a retreat from the attacks of enemies, that ants are liable to be overwhelmed by the numbers of forms living under their protection. The uncertainty of their temper is probably one means by which this danger is prevented from becoming too great; for a species that seeks the shelter of the ants' nest is itself taking terrible risks.

The species of *Lycaenidae* observed by Mr. Lamborn belong to both subfamilies *Lipteninae* and *Lycaeninae*. The *Lipteninae*, which will be described first, are included in the genera *Aslauga*, *Euliphyra* and *Epitola*.

In this and all the following sections of the present paper, when there is no further specification, it is to be understood that the ants referred to belong to the worker minor caste.

I. LIPTENINAE.

1. *Aslauga vininga*, Hew.

A. marginata, Plötz, 1888, is evidently the female of this species (see p. 499).

The associated ant was *Cremastogaster buchneri* r. *laurenti*.

No. 695. The following note referring to this ♀ specimen was written March 24, 1912:—

“The larva of this *Lycaenid* was carnivorous, its prey being Coccids such as are now sent. These insects occur in great numbers at the base of some leaves on the underside, filling up the depressions between the main ribs and clustering also on the stem just below the insertion of the petioles. They are attended by ants which frequently construct shelters over them.”

The larva was found in the forest 1½ miles E. of Oni, Feb. 25; pupation, March 3; emergence, March 14.

The Coccids have been determined as *Dactylopius*

longispinus, Targ.-Tozz. (p. 523), and 12 ants were in attendance.

No. 699. A ♂ specimen is referred to in the following note dated March 24, 1912 :—

“The larva of this Lycaenid was carnivorous and ate tiny smooth hemispherical insects attached in colonies to the stems of various plants, especially kola. These insects are also attended by ants which cover them with shelters.” Parts of two shelters are in the collection and the material of which they are built is described on p. 524 by Prof. R. Newstead. The larva was found in the forest 1½ miles E., Feb. 25; pupation, March 2; emergence, March 17.

The food-insects referred to are Coccids—a new form—which has been named *Lecanium punctuliferum*, var. *lamborni*, Newstead (p. 523), and the 19 ants found ministering to them are the same as in No. 695, viz. *C. buchneri laurenti*.

2. *Aslauga lamborni*, Bethune-Baker, sp. n. (p. 499).

The associated ant was *Cremastogaster buchneri* r. *winkleri*. In the house, *Pheidole rotundata*, var., was attracted to the larva or to the Coccids.

No. 543. The larva from which this male specimen was bred, Nov. 22, 1911, was obtained in the forest 1½ miles E. on Nov. 1, and it pupated Nov. 3. [The specimen is the male type of the species.]

A note dated Nov. 27, 1911, referring to it, is as follows :—

“The stem of the plant, *Bridelia micrantha*, Baill. (*Euphorbiaceae*), on which the larva was found, bore a number of Coccidae [*Stictococcus sjöstetti*, Cockerell] which are almost invariably attended by ants. They often roof over a number of the Coccids with a thin covering composed of particles of bark and other vegetable débris so as to form a convex chamber which fits down on all sides round the enclosed insects. The chambers are about the size and shape of a half hazel-nut, and they are tenanted by ants as well as Coccids.”

“Dec. 4, 1911. I am disposed to think that in some cases *Lycaenidae* find food where these bodies have been; for some stems frequented by the butterflies look as if they had borne the Coccids. The *Stictococci* are usually surrounded by a multitude of ants, and I was interested to see that the ferocious ‘tree-drivers’ (*Oecophylla*) do not

eat them but seem, like other ants, to visit them for some food-material."

The note dated Nov. 27, 1911, continues, speaking of the larva of *A. lamborni* :—

"The larva, brown in colour and resting motionless on the stem, looked so very like one of these ant-constructed chambers that it had a narrow escape from injury, for I actually attacked it with scissors under a mistaken impression as to what it really was, my custom being invariably to explore these chambers. I did not actually discover what its food was, for it pupated almost immediately."

The Homoptera have been determined by Prof. Newstead as a species of Coccid—*Stictococcus sjöstedti*, Cockerell (p. 521), of which 4 were borne by a stem of *Bridelia* sent with the specimens. The stem also showed distinct marks where other Coccids had been fixed to it. Two *C. buchneri winkleri* accompanying the specimens, were probably collected with the Lycaenid larva on Nov. 1.

No. 591. One male labelled B and a female labelled A. The text of a note dated Jan. 13, 1912, relating to these specimens, is as follows :—

"I discovered yesterday, in the forest $1\frac{1}{2}$ miles E., two carnivorous larvae, the food of which is the little beady insects found in considerable numbers, immobile and firmly fixed to the young shoots of certain plants."

The Lycaenid larvae, when found Jan. 12, were resting on plant stems, 2 of which are in the collection, and they bear many Coccids identified by Prof. R. Newstead, F.R.S., as *Stictococcus sjöstedti*, Cockerell (p. 521). Twenty-four ants, *C. buchneri winkleri*, attending the Coccid food-insects near to the larvae, were sent, together with 77 others visiting the Coccids or elsewhere on the plant.

The larva of B ceased feeding and became motionless Jan. 17, and both larvae pupated Jan. 19; A emerged Feb. 3, B Feb. 4.

My note goes on : "The two larvae were attended by ants [since determined as *C. buchneri winkleri*], and on the same stem were five Coccids which yield a watery secretion much in demand by ants. The leaves on the stem were snipped off and it was then carefully transferred to a glass tube so that none of the insects were disturbed. On arrival home it was found that 3 only out of the 5 Coccids remained. The ants were taken away and the larvae transferred, at 5 p.m. Jan. 13, to a tube containing

a stem bearing 22 Coccids. In a short time tiny black ants (identified as *Pheidole rotundata*, var.), which abounded in the house, found their way into the tube, which was then closed with very fine gauze and put away on a shelf, out of reach, it was thought, of more ants. However, more of the same species found it during the night and being unable to get in collected in a little knot on the gauze.

“When the tube was inspected at 8 a.m. on the following day, 14 of the Coccids had disappeared—most of them entirely. The rings which had formed the basal portion of the scale of a few Coccids were, however, left by the caterpillars.

“Later in the day I actually watched with a lens one of the larvae eating a Coccid, and at 1 p.m. only 3 Coccids out of the 22 remained. The larvae passed frass abundantly. The ants took no part in eating the Coccids.”

A note dated Jan. 15, 1912, is as follows:—

“At 5 p.m., Jan. 14, 1912, the 2 larvae were placed in separate boxes and all ants excluded for 24 hours. By 5 p.m. on the following day A had consumed 12 out of the 15 Coccids that I had placed at its disposal, and larva B had taken 16 out of 28, a few basal portions still remaining attached to the stems supplied to both larvae. I found that the larvae would eat these Coccids whatever the plant they happened to be attached to. The secretion of the Coccids was not sweet to the taste, but had an aromatic flavour rather suggestive of turpentine.

“These larvae presented the same general characteristics as those of *A. vininga*, being oblong on dorsal view with lateral surfaces sloping downwards and outwards. They had a hard tough toad-coloured skin covered with coarse rough tubercles, evidently protective in function, and it extended down as a fold on all sides in carapace fashion so as to protect the softer lateral and ventral surfaces. The lower margin of this fold bore a fringe of very fine hairs such as would efficiently prevent small insects from crawling in underneath. The segmentation characteristic of Lepidopterous larvae was shown only by the presence of spiracles, but rather more than halfway to the anal extremity was a deep transverse groove, the only region at which, owing to the leathery consistence of the cuticle, it was possible for flexion to take place. The cuticle was indeed so hard that a larva placed on its back was unable

to bend itself sufficiently to turn over unaided. Towards the hinder end of the body and just inside the spiracular line were two horny rounded eminences, one on each side of the mid-dorsal line. From these eminences pointed tubercles were from time to time thrust out, but no dorsal gland was detected. The tubercles appear to represent those of the *Lycaeninae*, in which group, however, they are more externally placed, being just to the outer side of and behind the spiracles of the 12th segment (see p. 488-9).

"The head was small in proportion to the size of the larva and there was a definite neck, of sufficient length to enable the head to be thrust forward or retracted in tortoise-like manner under the shelter of the carapace. The anus was protected in a similar manner. I have witnessed the protective value of the carapace in a larva of this type as described on p. 452."

No. 526. Male. The pupa of this was found in the forest $1\frac{1}{2}$ miles E., on a leaf of the plant *Culcasia scandens* on Oct. 22, 1911, near black ants of the genus *Cremastogaster*. Emergence, Nov. 5.

No. 658. Female. The larva found in the forest $1\frac{1}{2}$ miles E., on Jan. 26, 1912, fed up, in five days' time, on *Stictococci* which were attended by the same ants as No. 591, etc., viz. *C. buchneri winkleri*. It is especially noted of 24 of these ants that they were not only attending the *Coccidae*, but also running over the Lycaenid larva.

Pupation, Jan. 31; emergence, Feb. 14.

No. 688. Female. The larva, found in the forest $1\frac{1}{2}$ miles E., on Feb. 16, 1912, fed up on the same Coccids, and pupated on Feb. 21, emerging March 6.

No. 819. Female. The larva was found in the forest $1\frac{1}{2}$ miles E., on June 5, 1912, and having fed up on the Coccids, pupated on June 8, emerging June 24.

3. *Euliphyra mirifica*, Holland.

[A brief revision of the genus based on Mr. W. A. Lamborn's material will be found on pp. 504-8. Mr. Eltringham's account of the larva will be found on p. 509.]

The associated ant was *Oecophylla smaragdina* r. *longinoda*.

A preliminary note as to the presence of Lycaenid larvae and pupae in the nests of *Oecophylla* was communicated to the Entomological Society on March 20, 1912, by Prof. Poulton (Proceedings, pp. xxxii, xxxiii), and, on Nov. 6, I

was able to exhibit to the Society (*ibid.*, p. cvi) two larvae in spirit and two bred imagines with the corresponding pupa-cases. Seven butterflies in all were bred out. The larvae, which approximate to the type described in *Aslauga*, seem to be very near to that of *Liphyra brassolis*, Westw., described by Bingham in his "Fauna of British India," to which account my attention was drawn by Mr. A. H. Hamm, of the Hope Department. This larva is found in the East and in Australia in the nests of *Oecophylla smaragdina*. It is apparently present as an intruder, and the suggestion has been made that it feeds on the immature forms of ants. Though I have paid especial attention to this point I have not found such habits in *Euliphyra*. Furthermore, the pupa is not protected by the hard chitinous larval skin described in *Liphyra*, although the skin of *Euliphyra* is tough and heavy-looking and still partially encloses the posterior segments of 3 out of 8 pupae, viz. E, F and G (see p. 455-6).

The following notes, contained in a letter dated Feb. 10, 1912, refer to the larvae of *Euliphyra* :—

"In accordance with your request I commenced an investigation as to whether our form of *Oecophylla* does make use of its larva to weave together the leaves composing the nest. I opened up some nests a few weeks ago, but the ants were so deliberate in their movements that I had to defer the necessary watching till I could spare more time.

"On Feb. 6 I made a window into a nest, snipping out a square piece of leaf with scissors, and on looking in I saw a larva which I recognised at once, as it was similar to the one which I saw assailed by these ants, but successfully protected itself against attack by drawing down its hard carapace-like shield in limpet fashion, to the supporting surface. I tore the nest open and discovered more larvae and thereupon took ants and all in a tin box. I broke other nests open and found larvae in four more, bringing up the total of larvae secured to 19. They were not all of the same age in each nest.

"In one nest, not containing these larvae, I found a totally different caterpillar—rather hairy and evidently Heterocerous. The hairs were very stout and curved back over each segment, obviously as a protection. I did not discover what it ate, and it soon formed a cocoon of stout silk inside a web of finer material. Last night, however,

some creature, probably a rat, broke into the box and ate it, together with a fine *Charaxes* pupa.

"I think that the 19 larvae must be Lycaenid! I will not attempt to describe them in detail as I am sending some in spirit. They are protected by a hard, leathery skin. The head is remarkable. When the larva is at rest, and usually when it crawls, the head is completely hidden by a fold of skin which extends all round so as to form, with the leathery skin of the dorsum and sides, a kind of carapace. The head is sometimes thrust forward under the fore margin of this fold and one then sees quite a long neck gradually tapering up to a point terminated by fine jaws. [For this and other details of the larval structure see Plate XXVIII and Mr. Eltringham's account, pp. 509-12.] The larva, as it crawls, frequently swings this proboscis first to one side and then to the other as if in search of food. It took me 48 hours to find out the source of their food-supply; for they did not touch the leaves, and I did not see them attack ants or ant larvae, neither did they go near the dead insects which the ants had stored as food.

"By this time the ants had to some extent settled down in glass-fronted boxes and I saw large workers feeding smaller ones, the two standing opposite to each other, the smaller with head a little bent back. I fancy that the larger ants must have been disgorging food into the mouths of the smaller ones. Anyhow I actually saw a Lepidopterous larva thrust its little proboscis into the jaws of a large ant and keep it there while the ant made movements as if feeding it. Sometimes too, when a large ant was feeding a smaller one, the latter retired in favour of a caterpillar.

"The caterpillars were frequently near with extended proboscis when the ants were ministering to their own male and female larvae.

"The feeding does not seem to take place very often: I presume that the high nutritive value of the material provided makes it unnecessary."

"Feb. 10, 1912. The larvae in the nests of *Oecophylla* have neither dorsal gland nor tubercles. I have not discovered how they can benefit the ants."

"Feb. 18, 1912. I replaced yesterday in the nests of *Oecophylla smaragdina* the rest of the larvae originally found; for the ants were not doing well. All the winged forms and some ant larvae had been dead for some days

and the workers seemed sickly. I think it is noteworthy that the larvae had all been on one leaf since my last note and that this had not been eaten at all; also that, though the ant larvae were dead and had dropped down—the last one four days ago—yet the Lepidopterous larvae were all alive and had even grown a little. The ants certainly seem to feed them.

“ I find that if a worker comes across water it drinks, and then proceeds to disgorge it for the benefit of any one of its thirsty fellows that it may meet, and I think the same thing happens in the case of food. *Oecophylla* attends *Aphidae* and is also very fond of the secretion of *Stictococcus sjöstedti*.”

“ March 29, 1912. I have hitherto failed to breed the Lycaenid larvae which live in the nests of *Oecophylla*. They appear to be extremely slow-growing. I am still watching the larvae, but observation is attended with difficulty, because the ants desert if one interferes too much, and it is necessary to break open the nest each time one wishes to inspect the larvae. The head and neck of the larvae appear to be protected against attack, but the ants lose no opportunity of seizing other parts. I once saw a larva crawling with an ant fastened on to one of its claspers, the abdomen only of the ant being visible, as the rest of its body was under the lateral fold of skin. I have also seen a larva which protected itself by just settling down closely on the supporting surface, and when the ants retired it raised itself a little and crawled, but when they reappeared settled down again.”

[F. P. Dodd—in his paper in “Entomologist,” 1902, p. 184—describes a similar attack by *Oecophylla* and defence by the larva of *Liphyra brassolis*.]

“ May 13, 1912. I continue to watch the larvae in the nests of *Oecophylla*. They have grown considerably, but I have not been able to find pupae as yet. One has to be careful not to disturb the ants very frequently or they desert the nest.”

“ June 10, 1912. You will have been expecting news as to the larvae which live in the nests of *Oecophylla*. I have a pupa at last. I have examined the nests about every fortnight, but my interference has caused the ants to remove to a new home nearly every time, and, as the larvae have been obliged to wander till they found the nest, I presume that some have been lost. To this I attribute

the gradual dwindling in their numbers. I have found the larvae a little larger each time I have inspected them, and to-night I found a fresh pupa with the cuticle of the larva still adherent to its base.

“ Presuming that these larvae are the same that I restored to ants’ nests weeks ago—and I think they are—they have taken far longer to attain full growth than in my experience is usual with *Lycaenid* larvae.

“ I have examined a great number of nests of *Oecophylla* without finding more of these or any other larvae, and I frequently looked into nests last year and during my first year on the West Coast, for the purpose of watching the ants, and I did not find larvae, so that I am not disposed to accept the statement that Lepidopterous larvae are very commonly found in the nests of these ants in this country. I am inclined to think that one would find a greater variety in the nests of the black tree-ants (*Cremastogaster buchneri*), for I have now frequently seen *Lycaenids* ovipositing on the bark of trees frequented by these ants, and more than once in the actual stream of ants going up and down the trunk. I have also frequently found *Lycaenid* pupae and pupacases in the immediate vicinity of their black carton nests (pp. 456-7).

“ I really must try and look through some of these nests. The difficulty is that they are so hard that one would require a hammer and chisel to make any impression on them, and the ants are excessively numerous and bite savagely.

“ By the way, the *Lycaenid* larvae were mostly in one large nest of *Oecophylla*, and I subsequently collected a few in little outlying dependencies of the same nest. Should the butterfly turn out to be one of the rarer species, surely it would be an argument against their common occurrence in nests, for, in such a position, the mortality should not be high.”

“ June 24, 1912. I am sending the first of the *Oecophylla* *Lycaenids*. Some of the other pupae do not look very healthy, but I am sure to get a few more imagoes. I forget if I mentioned that I had found one small pale green *Lycaenid* larva of the same type as these others in a nest of *Oecophylla*. I have since found 3 other larvae of some kind, so small that I am not even able to pronounce whether they are Lepidopterous or not. They are pale green in colour, so that I am not confusing them with the larvae of

ants, but the ants look after them with an assiduity as great as if they were their own offspring. When I looked into the nest the ants picked them up and carried them away, and one ant carried one of these in addition to a larva of its own species. I have made no further discoveries as to how the Lycaenid larvae feed."

"June 29, 1912. More *Oecophylla* Lycaenids are sent and cuticles accompany some of the pupa-cases. One cuticle in particular shows remarkably well the length of the neck of the larva."

"Feb. 10, 1912. The Lepidopterous larvae are not always well treated by the ants. It so happened that I accidentally put some into a box in a crevice of which there was some scale naphthalene. Some died and the others which revived were put into an ants' nest in a half-stupefied condition. Such as happened to fall on their backs were immediately seized by the ants. I also found that a healthy larva placed on its back has difficulty in turning over, and is in this position liable to attack. In one instance I saw a larva with an ant gripping it by the neck on the ventral side.

"When the larva feeds, the fore part of the body is raised and the margins of the lateral folds of cuticle are bent round till they meet, thus protecting the soft ventral surface. The head comes out at the apex of the cone thus formed."

The dates of emergence, etc., in 1912 of the 3 males and 5 females (818 A—H) of *Euliphyra mirifica* are as follows. All except one are figured on Plate XXVII.

818 A (Plate XXVII, fig. 5). Male: emerged June 20, 1912, from a pupa found earlier in the same month. The precise pupa-case accompanies this specimen as in each of the others.

B. Male (fig. 6) emerged June 28, from a pupa found in an *Oecophylla* nest in the forest, near Oni Clearing, June 11. Accompanying it is a dead pupa found attached to a leaf in the same nest.

C. Male (fig. 7): emerged June 29, from a freshly formed pupa found under the same conditions as B, on June 10.

D. Female (fig. 8): emerged July 1. Resting larva found in ants' nest June 11, pupation June 12. (Pupa-case, fig. 8A.)

E. Female (fig. 11): emerged July 2. Larva found in ants' nest June 11, pupation June 14.

F. Female (fig. 10): data as in E, save that the larva, found June 11, was in the resting state. (Pupa-case, fig. 10 A.)

G. Female: data as in F, save that pupation occurred June 13.

H. Female (fig. 9): emerged July 7, from a pupa found in ants' nest June 20. A dead pupa was also found in the same nest.

4. *Epitola ceraunia*, Hew.

The associated ant was probably a race of *Cremastogaster buchneri*.

No. 671. No less than 17 pupae were found at one spot $1\frac{1}{2}$ miles E., on Feb. 17, 1912. There were no ants in attendance, but *C. buchneri* abounded in the vicinity and were to be found on the shrubs bearing the pupae.

The pupae are very like those of *E. hewitsoni*, Mab., and are fixed like the latter so that they stand on their tails. "All except one rested at an angle of 45° on their tails, and usually on the upper side of a leaf. One [N] was suspended head down under a leaf."

[All the pupae are labelled so as to bring them into relationship with the respective imagines, and all are attached to the upper surface of a leaf, except N and Q, fixed to the under surface, and C, to a stem.]

The dates of emergence are as follows: 2.15 p.m., Feb. 22, 7 females A—G; 3 p.m., Feb. 22, 1 female H; about 3 p.m., Feb. 22, 1 female I; 11 a.m., Feb. 23, 2 males J, K; about 11 a.m., Feb. 23, 4 males L—O; about 12 p.m., Feb. 23, 1 male P and 1 female Q. It is obvious that the individuals belonged to the same company of gregarious or semigregarious larvae. The relative order of emergence of the two sexes is interesting and unusual.

5. *Epitola carcina*, Hew.

The associated ant was a race of *Cremastogaster buchneri*.

No. 652. This male butterfly was bred out, 8 a.m., Feb. 8, 1912, from a pupa, and was flying about 9.30 a.m. My note of Feb. 10 records that the pupa was found Feb. 7 on a leaf within a foot of a huge nest of black ants in the forest $1\frac{1}{2}$ miles E. These ants were undoubtedly a race of *Cremastogaster buchneri*, but I omitted to collect specimens. An empty pupa-case of the same species was also found on a leaf near by.

6. *Epitola oniensis*, Bethune-Baker, sp. n. (p. 501).

The associated ant was *Cremastogaster buchneri* r. *alligatrix*.

No. 635, A, B. These 2 male butterflies were bred from pupae. Emergence of A, 9 a.m., Feb 4, as it was being carried home; B, flying by 10 a.m., Feb. 6. My note concerning them is as follows:—

“Feb. 5, 1912. The two pupae were found Feb. 4, in a dead curled-up leaf of the ivy-like *Culcasia scandens*, climbing up a Kola tree in the forest 1 mile E. In a fork of the tree, and two feet above the pupae was a large carton nest of black ants [*Crem. buchneri alligatrix*, of which 35 were sent] which were running about in all directions, some being actually on the leaf bearing the pupae, a fact which strongly suggests the existence of a special association between them and the Lycaenid.

“I noted these Lycaenid butterflies in the vicinity of the same tree last year as well as this, and have often looked for larvae without success. There seems to me to be a very strong probability that the larvae have some relationship with the ants, but I did not find it feasible to break open the nest because it was very large and hard, and the ants, which were extremely numerous, bite very fiercely.”

At a later date, Feb. 12, an empty pupa-case of the same species was found at the same place, also very close to the nest of ants.

Although the male of this species closely resembles that of *E. carcina*, their pupae are easily distinguished by the size and form of the dark markings on the dorsal surface.

II. LYCAENINAE: INTRODUCTORY NOTE.

Before describing the observations upon the separate species it is convenient to record a few general notes made upon the ant-attracting gland and paired accessory structures of the Lycaenine larva. The notes, dated Jan. 13, 1912, were drawn up after an experience of about five or six species:—

“The median dorsal opening of the gland on the 11th segment of the Lycaenine larva, has in some species well-defined anterior and posterior lips, and I have been able to induce a larva to extrude a droplet of fluid by tickling it

with a wisp of wool. In some species the 11th segment is widened anteriorly opposite the mouth of the gland, and in some the opening is placed on a specially pigmented area. It is, however, possible, by careful examination, to detect the opening when there is no special pigmentation to indicate the site. In one case a pellet of excrement which accidentally fell upon the back of a larva deprived of ants, became firmly glued to the gland-opening. The secretion of another larva, also deprived of ants, had in 24 hours dried so as to form a little white crust over the orifice. Again, in a larva that had died, mould was growing at the orifice in about 12 hours, although not elsewhere.

“The ants certainly get nothing from the two accessory tubercles, and are never even permitted to touch them [see pp. 488-9], so that the only explanation I can think of is that they produce scent which attracts to the neighbourhood of the gland. There can be no doubt about the conclusion that the tubercles of some Lycaenid larvae do actually attract ants and keep them in attendance.”

We now proceed to the observations upon various species of *Lycaeninae*.

7. *Megalopalpus zymna*, D. & H.

The associated ant was *Pheidole aurivillii* r. *kasaiensis*. The larvae were sometimes attacked by *Ph. rotundata*, var. These latter, in the house, were apparently sometimes hostile, sometimes peaceful.

The larvae, as will be seen by the following notes, are carnivorous, and feed on a variety of Homoptera belonging to the families *Jassidae* and *Membracidae*, which are invariably ant-attended.

I have not found that the ants derive any benefit from the presence of this larva, or that they are of service to it. There is, on the contrary, some evidence to show that their attitude to it is distinctly one of hostility, in connexion with which it is noteworthy that the larva is not of the smooth, soft onisciform type, characteristic of the *Lycaeninae*, but it is protected by a hard skin studded with tubercles which are surmounted by coarse sparse hairs.

The larva is dark-brown, a tint approximating very closely to the colour of the débris out of which the ant-shelters are constructed, a strong contrast again to the colour of the Lycaenine vegetable feeders, of which the great

majority discovered were leaf-green. As with the vegetable-eating larvae, the food of *Megalopalpus* seems to range within certain limits, but though larvae have been found eating both Jassids and Membracids, a larva accustomed to take Jassids will refuse Membracids and *vice versa*, and there is some evidence that a larva which habitually eats one form of Membracid will refuse a closely-allied species.

The mother butterfly, in depositing her egg, which is a very characteristic one, exercises the same care in ensuring an immediate food-supply for the newly-hatched larva as do other butterflies for their plant-eating offspring. She places it very commonly in the immediate neighbourhood of an ant-shelter containing Homoptera, and an egg-shell is sometimes found attached to a stem actually within a shelter, having obviously been deposited before the Homoptera attracted the attention of ants, and, indeed, probably on the egg-mass itself, before hatching, since the Membracid and Jassid colonies seem to remain and feed close to the spot where the parent laid her eggs. The eggs of *Megalopalpus* have been found attached to the egg-mass of the Homoptera, and in two cases actually on living and half-grown Membracid nymphs (p. 466).

Not only does *Megalopalpus* feed in the larval state on the Homoptera, but the butterfly seems frequently to flourish also at their expense, probing them with its proboscis and obtaining food-material direct from their surface, as well as from the plant on which they happen to be resting. [It will be seen on pp. 467, 468, that this habit is as characteristic of males as females, and cannot therefore be interpreted as bearing relation to oviposition.]

The following material forms the subject of the succeeding notes, dated Jan. 18-22, 1912.

No. 603 A. ♂. Larva in forest 1½ miles E., Jan. 14, 1912; pupation, 3-5 p.m., Jan. 20; emergence, 6.30 a.m., Feb. 1.

No. 603 B. ♀. Larva in forest 1½ miles E., Jan. 16, 1912; pupation, Jan. 22; emergence, 9 a.m., Feb. 4. The 3 *P. aurivillii kasaiensis* sent were running over the larva of 603 B.

Seven mature Jassids, *Nehela ornata*, and 10 immature forms of the same species are labelled as the food-insects of 603. One mature *Nehela*, together with the nymph-case from which it emerged about Jan. 17, is also present. All from the forest near Oni Clearing, about Jan. 17.

“ Jan. 18, 1912. In the course of a further search for Lycaenid larvae I have obtained two of the same species which are carnivorous and prey on active jumping Homoptera, which they lull to a false sense of security by simulating the attentions of ants. The history of my discovery is as follows. On Jan. 14 I found, on a young leaf of the plant *Musanga smithii*, R.Br. (*Urticaceae*), a small Lycaenid larva brown in colour and studded all over with tubercles. A number of the small black ants, since determined as *Pheidole aurivillii* r. *kasaiensis*, were running about over the leaf, on the underside and margins of which they had built up shelters of waste vegetable matter, such as they construct so frequently over *Stictococcus sjöstedti* and other Coccids.

“ On cutting off the leaf with a view to making a closer examination, I shook it, with the result that several tiny insects, since described as the Jassid *Nehela ornata*, Dist. (see p. 519), left the shelters and jumped to a distance in all directions. I did not at the time attach any definite significance to the presence of these insects; but the larva would not feed in captivity. I offered it a fresh branch of the plant on which it had been, and when it refused this I tried it with maimed ants, *Aphidae*, *Stictococci*, and the larvae of *Membracidae*, for I could not find any more of the Jassids near which it had been discovered. On Jan. 16, however, I came across another cluster of ant-tended Jassids of the same species on the stem of a different plant, and at rest close to them was a similar larva over which the ants were running. I then felt that the association must be more than accidental, so I cut the stem through and transferred it to a glass tube. Most of the Homoptera managed to evade capture by jumping off, but I secured three which soon gathered together again on the stem. By the evening the ants were ministering to them and caressing them with their antennae, and, as I watched, the larva crawled slowly in the direction of the insects, stopping frequently and vibrating all three pairs of true legs. It stopped when it had nearly reached the Jassids, and then again moved on with, I believe, only the first pair of legs in vibration. It then reached the insects and caused its vibrating legs to play on the closed wings of a Jassid, in such a way as to simulate, as I thought, the caresses of ants.

“ Still advancing, it gradually raised the fore-part of its body so as to overhang the insect and, when well above,

suddenly dropped and seized its prey with all its true legs.

“The larva immediately bit in behind the head, holding the insect pressed down on the stem, and when it had taken several mouthfuls, it raised the fore-part of its body and continued feeding, now holding the Jassid well away from the stem. The victim was by this time incapable of movement, and as the larva had no difficulty in retaining it by means of its second and third pair of legs, the first pair was used to take up loose fragments, and guide them to the mouth. I saw a loose leg thus taken up and eaten, and in this way every particle of the unfortunate little ‘hopper’ was secured.

“After the meal the legs of the first pair were drawn one after the other between the mandibles, and then polished on the outer side of the face, after the manner of a cat.

“I continued to watch the larva closely. It remained without movement for about twenty minutes and then approached another Jassid. This one was evidently not satisfied as to the honesty of its purpose, for immediately the larva commenced to tickle it, the Jassid ran away up the stem to a distance of about half an inch. However, the larva followed on and overtook it, and in due course it shared the fate of its predecessor, the series of actions by the larva being precisely the same as described in the former case.

“I was up early next morning on the hunt for more of the food-insects, and the larva first found made up for its long fast by catching nine out of eleven between 8 a.m. and 3 p.m.

“The procedure was so interesting to me that I actually witnessed the caressing, capture, and eating of most of these, and I have seen it many times since. The caterpillars eat both nymphs and imagos of the Jassids, but seem to secure more of the former, for though these are able to jump and run with surprising activity, quite as fast as an ordinary ant, the imagos sometimes escape by flying. When imagos are eaten, the hard anterior wings are usually rejected. The perfect and imperfect forms are certainly of the same species; for I have seen, and now send, a partially emerged imago. The Jassids of all stages congregate on young shoots of a variety of plants, and are frequently covered by ‘shelters’ built by ants.

“I have considerable difficulty in obtaining a sufficient

quantity of food-insects for the larvae and find it necessary to enclose them, stem and all, in a wide-mouthed jar containing chloroform vapour, and then, when they are overcome, I can transfer them to the tube containing the caterpillars.

“In nature the slow-moving Lycaenid larva must depend for its very existence on the fact that these insects are gregarious and if disturbed frequently re-assemble at the same spot.

“The egg-masses of these Jassids are attached to plants in clusters, much like those of the Membracids, *Leptocentrus altifrons*, Walk. (p. 496), viz. in parallel rows often superimposed so as to form oval masses; the Lycaenid larva does not interfere with these.

“The ants in attendance on the Jassids frequently run over these caterpillars and stroke them with their antennae, but are not so attentive as they are to other Lycaenid larvae. I do not think that the ants obtain any secretions from the caterpillars, and I have not made out the existence of either dorsal gland or tubercles.”

A further note from a letter dated Jan. 20, 1912, is as follows:—

“If the caterpillar is on a broad surface it raises itself anteriorly when grasping a victim, but when on a narrow surface it drags the insect off its support by simply bending to one or other side.”

A note dated Jan. 22, 1912, runs thus:—

“I went out collecting again to-day and filled my tubes with so much material that, when I found the Jassids required as food for my larvae, I was obliged to drop the 6 obtained into a tube containing a stem bearing *Stictococci* with their attendant ants, *C. buchneri alligatrix*. When I reached home I found that these ants had attacked 2 of the Jassids and were running about with them in their jaws. I rescued them, but they were so badly injured that they soon died. One of the carnivorous larvae pupated late in the afternoon of Jan. 20, and the other is now in the resting condition, which is a relief, for I have had difficulty in obtaining enough of the food-insects, and, though I found other Jassids very closely allied, the larva refused them.” The collection contains 6 of the above-mentioned *alligatrix* with confirmatory data.

More of the same species are referred to in the following notes written on Jan. 29, 1912.

“No. 621 A—D. I have now 3 more pupae and 1 larva which are, I feel almost sure, *Megalopalpus*, and the interesting point about them is that they would not take the Jassid *Nehela ornata* which was eaten by my 2 previous larvae.

“Larva 621 A. was found in the forest near Oni, on Jan. 22, 1912, in an ant-shelter on *Triumfetta cordifolia*, (Guill. and Perr. There were no Jassids at all in this shelter, but it covered a large number of little green hopping creatures which look to me like immature Membracids. [Seven Membracid larvae of various sizes with 45 ♀ min. and 2 ♀ maj. *Pheidole aurivillii kasaiensis*.]

[From this point as far as p. 468 many observations on the relationship between ants and *Membracidae* are recorded. These pages should be read in connexion with Section D, pp. 494–8.]

“I placed the larva in a tube with some of the Jassids [4 *Nehela ornata*], but it had eaten none by the following morning, Jan. 23. I thereupon introduced the top of a *Triumfetta*, bearing shelters containing ants [*Pheidole rotundata*, var., 11 ♀ min., 1 ♀ maj.], and little Membracid larvae. The ants swarmed out and seized the Jassids and they ran all over the larva, one seizing it by an anal clasper exposed as it stretched across between two leaves. The larva did not feed but suspended itself for pupation and on Jan. 24 house-ants of the same species, *P. rotundata*, var. [26 ♀ min., 1 ♀ maj.] came in but did not seem to want to molest it though they ran all over it.” The larva subsequently died.

“The second larva, 621 B, was found in the forest near Oni, on Jan. 23 in a shelter on *Triumfetta* containing the ants, *Pheidole aurivillii kasaiensis* [21 ♀] and Membracid larvae [13 of various stages]. I saw this Lycaenid larva feeding on a large larva of the Membracid type though I did not actually witness the attack. The caterpillar ate the body and then part of the head, but was unable to finish its meal, for a tiny ant, which had been dragging persistently at the remaining morsel, managed to get it away.

“On Jan. 24 I admitted the small black house-ants, *P. rotundata*, and I am under the impression that their attitude to the caterpillar was distinctly hostile.

“The larva duly pupated and on pulling away the leaves of the *Triumfetta* so as to break down the ant-shelter I

found on the stem a tiny white Lepidopterous egg-shell, which I have since learnt to be that of *Megalopalpus*." The pupa died.

Membracid larvae similar to those mentioned under 621 B have been bred out and the species has been determined by Mr. W. L. Distant as *Gargara variegata*, Sign. Four examples bred from the earlier stages are in the collection sent, one of them accompanied by the nymph-case from which it emerged.

The account continues :—

"621 C. ♀. The larva of the butterfly C was also found in a similar ant-shelter. I have mislaid my precise notes about it, but I know that one of these larvae—this particular one I believe—was attacked by house-ants, *P. rotundata* [5 ♀ min., 1 ♀ maj.], one of which fastened on to one of its legs, so that I had to remove it." The 6 *Pheidole* are accompanied by the note "621 C. House-ants found in box with larva, 24. i. 1912."

The labels on 621 C give the following information :—

Larva, forest 1 mile E., Jan. 23; pupation, Jan. 27; emergence about 9 a.m., Feb. 2.

"Another larva, 621 D, was also found on Jan. 25, on breaking into a shelter constructed like the others, on *Triumfetta*, by *P. aurivillii kasaiensis*. [Twenty-nine ants of this species from the shelter are in the collection, together with 23 immature Membracids of various stages and 2 imagines of very different species. One resembles *Anchon relatum*, but is in very poor condition, while the other is a very small species perhaps of the genus *Gargara*.] These shelters so efficiently conceal their contents that on breaking this one open four days later I found a second half-grown *Megalopalpus* larva inside, the presence of which I had not suspected.

"I put a new shelter containing *Pheidole rotundata*, var. [17 ♀ dated Jan. 29] and Membracid larvae into the tube. An ant immediately seized the *Megalopalpus* larva ventrally just behind the mandibles. This larva was not successfully reared.

"I should have mentioned that a fully developed Membracid, attended by ants, was feeding near the shelter in which 621 D was found, and another similarly near the shelter of 621 A and 621 B." [These specimens were not sent, and probably escaped.]

This note concludes the observations recorded Jan. 29.

An ant-shelter on *Triumfetta* often contains, in addition to immature forms of *Gargara*, young *Membracidae* of several other species. The precise determination of these has not been possible, for they have not yet been bred out, but, judging by their general characteristics, they probably belong to the genera *Anchon* and *Beninia*. One frequently finds Membracid imagines of the genera *Anchon*, *Beninia* or *Gargara* feeding in the open on a stem close to an ant-shelter and tended by ants from it, and though these shelters are usually constructed by a species of *Pheidole*, yet it is not uncommon to find them also built by the ants, *Camponotus akwapimensis*, var. *poultoni*, and containing the same Membracids. This latter ant was the only one taken in the following shelters, etc., found, unless otherwise described, on *Triumfetta* in the forest near Oni Clearing, Jan. 27, 1912 :—

Shelter E. Eighteen larval Membracids of various stages and at least 2 species, fragments of the shelter, 4 ants.

Shelter F. Twenty-five larval Membracids of various stages and at least 2 species, 7 ants.

Shelter G. Twenty-eight larval Membracids as above, 4 ants.

Shelter H. Twenty-two larval stages almost certainly of the Jassid *Nehela ornata*, 3 ants.

From another shelter near Oni Clearing, also examined Jan. 27, but not noted as on *Triumfetta*, 1 mature Membracid, probably *Beninia lamborni* (p. 517).

On Jan. 26, in the forest $\frac{1}{2}$ mile E., on *Triumfetta*, but not noted as from a shelter, 1 mature Membracid, evidently *Beninia*, sp., and probably *B. lamborni*, but in poor condition, with 1 ant.

On Feb. 26, on a stem in the forest $\frac{1}{2}$ mile E., 21 mature *Nehela ornata*, 2 larvae probably of the same species, 8 ants ♀ min., varying much in size.

A note dated Feb. 10, 1912, is as follows :—

“ I have another pupa of *Megalopalpus* from a larva which ate a species of Membracid closely allied to *Gargara variegata*, although it refused this species.”

The chrysalis referred to cannot be that of No. 673, which did not pupate till Feb. 13.

“ No. 673, Feb. 26, 1912. This *Megalopalpus* took a rather different Membracid from other Lycaenids I have reared. I have bred one of its food-insects from larva to imago, and am now sending it labelled ‘ of especial

importance,' for I do not know where to get any more for identification."

The specimens sent under 673 are *Megalopalpus zymna* ♀; larva in the forest, $\frac{1}{2}$ mile E., Feb. 7; pupation, Feb. 13; emergence, Feb. 25: *Leptocentrus altifrons* and the nymph-case from which it emerged; larva in the forest, Feb. 17; emergence, Feb. 23. The *Leptocentrus* is labelled "food-insect of 673."

A note of Mar. 7, 1912, runs:—

"*Megalopalpus* usually deposits its egg in the immediate neighbourhood of a colony of the food-insects, but I have sometimes found an egg on the egg-mass of the insect. In one case it was on the eggs of the Membracid, *Leptocentrus altifrons*, Walk., but I could not find this again so as to watch the progress of the larva, and, though I am familiar with the immature forms of *Leptocentrus*, I have never seen the larva eat them. [The history of No. 673 shows that this last statement is mistaken: see above. E. B. P.]

"The egg of *Megalopalpus* is very characteristic, being a circular disc with a broad flattened white margin and a raised bluish semitransparent centre.

"On March 5 I found two nymphs in the same colony of the Membracids *Gargara variegata* unsheltered by ants and each bearing an egg of *Megalopalpus*: in one case on the right side of the dorsal surface of the abdomen just behind the wing, and in the other on the base of the left wing. ["Forest $1\frac{1}{2}$ miles E." on labels of the two specimens.]

"The larvae were on opposite sides of the stem and I did not examine them very closely at the time of capture for fear of losing them, but when I got home I found one eggshell empty though I did not see any larva."

Further notes on ants and the ova of *Lycaenidae*, etc., are as follows:—

"April 29, 1912. The eggs of some *Lycaenids* seem to be specially protected. I have seen a *Liptena lybissa*, Hew., deposit an egg on a dead stick, and a few days later I saw a *Lycaenid* unknown to me deposit two eggs right in the path of a procession of black ants running between the ground and their nest which was placed 20 feet up on a tree-trunk. The ants were all round her as she oviposited.

"I have several times watched *Megalopalpus zymna* deposit a single egg among ants which have subsequently investigated it with their antennae but have not interfered with it. The eggs of various species of other families,

however, are sometimes greedily taken by ants. A *Charaxes ussheri*, Butler, in my possession laid, on Mar. 17, 1912, 8 eggs, 6 of which were eaten in the night by the small black ants, *P. rotundata*, var."

"June 3, 1912. I am sending a white *Larinopoda* which I saw deposit an egg on a dead stick. There were no ants on it, but they were abundant on leaves of other plants in the neighbourhood.

"May 13, 1912. I saw to-day a number of the *Oecophylla* ants carrying off the larvae of the Saturnian moth *Bunaea alcinöe*, Stoll, as they hatched from the egg."

The following notes refer to the relationship between *Megalopalpus* butterflies, Homoptera and ants:—

"Dec. 29, 1911. I took an *M. zymna* ♀ on the same stem with a Membracid, *L. altifrons*, and 4 attendant ants, *P. aurivillii kasaiensis* [3 are in the collection], all being so sluggish that I readily secured them between the bottle and cork of a killing bottle. The butterfly was probing with its proboscis under and around the Membracid, and I am quite sure that the proboscis occasionally touched the insect's body." ["Forest $\frac{1}{2}$ mile E." on specimens.]

"Jan. 10, 1912. I took two *Megalopalpus* ♂ ♀, which were probing with their tongues under and around a Membracid, *Anchon relatum*, Dist. [the type of the species, p. 516], near to which were 2 immature and 1 mature *Nehela ornata*. Seven ants, *P. aurivillii kasaiensis*, were in attendance." ["Forest 1 mile E." is on specimen, together with a note which apparently implies that the butterflies were probing the Jassids as well as the Membracid. E. B. P.]

"Jan. 15, 1912: Forest $\frac{1}{2}$ mile E. I obtained 2 *Megalopalpus* [1 ♂ only in collection] sucking food from the forewing of one or other of 2 Membracids, *Leptocentrus altifrons*, which were on a green stem, side by side and attended by 19 *P. aurivillii kasaiensis*."

"Jan. 21, 1912: Forest $\frac{1}{2}$ mile E. I took a ♂ *Megalopalpus* sucking food off the fore-wings of 3 Jassids, *Nehela ornata* [labelled as the food-insects of No. 603 A, B, p. 459]. Nine *P. aurivillii kasaiensis* were in attendance."

"Feb. 7, 1912: Forest $\frac{1}{2}$ mile E. I took, on a green stem, a ♀ *Megalopalpus* probing with its tongue and evidently sucking up food material from 3 Jassids, *Nehela ornata* [the type and paratypes of the species, p. 519], which were attended by 5 ants." [Of the 5 ants which now

accompany the specimens, 3 are *P. aurivillii kasaiensis* while 2 appear to be *P. rotundata*, var., although they bear the name of the former species as the determination. It is probable that there has been an error in the labelling since the specimens were received from Switzerland, and that the 5 ants sent by Mr. Lamborn and named by Prof. Forel were all *kasaiensis*.]

“Mar. 9, 1912: Forest $\frac{1}{2}$ mile E. I captured a ♂ *Megalopalpus* probing with its proboscis a larva of a Membracid, probably *Gargara variegata*, eaten by its own larva. Seventeen ants, *P. aurivillii kasaiensis*, were in attendance.”

The sluggishness of *Megalopalpus zymna* when feeding is well shown by the behaviour recorded in Proc. Ent. Soc. 1913, p. xxii. The following note gives additional details:—

“June 3, 1912. On May 28, I saw a worn *Megalopalpus* feeding, $\frac{1}{2}$ mile E., on a fresh leafless shoot covered with sticky secretion which ants were also enjoying. On May 29 I saw the same specimen in the same position, so, with a view to identifying it subsequently, I trimmed its right hind-wing off square with a pair of scissors. When released, it flew into a shrub near by, but it had returned on the following morning and was again feeding. I saw it again on the twig on May 30 [and on May 31 as recorded on the label], and I took it in my fingers and put it in the killing-bottle in the early evening of June 1.”

[The following observations upon Oriental *Lycaenidae* allied to the Ethiopian *Megalopalpus* have a very direct bearing upon the facts recorded in the present paper by Mr. Lamborn. E. B. P.]

Mr. J. C. W. Kershaw, F.L.S., in an account of the life-history of *Gerydus chinensis*, Felder (Trans. Ent. Soc. 1905, pp. 1-4, Pl. I.), states that the butterfly lays its eggs towards evening, alighting “in the midst of the Aphides and ants, which she thrusts aside with a brushing movement of her tail, immediately laying a single egg. She then generally moves slightly and remains for some time sucking up the exuding juice of the plant; . . . The ants do not appear to meddle either with the butterflies or the eggs, though ants are very destructive to eggs of most butterflies, . . . Nor do they seem to interfere with the larvae.” Mr. Kershaw describes the larvae feeding “on the Aphides, sometimes pressing them against the plant with head and fore-legs, sometimes holding them in the

fore-legs quite away from the plant. A few bites disposes of an Aphis and the larva then licks and cleans its legs, just as a Mantis does." Mr. Kershaw found that the larvae, after having eaten one kind of Aphis, were quite ready to take others of a different kind, in this respect differing from Mr. Lamborn's *Megalopalpus*. Furthermore, Mr. Kershaw has not observed *Gerydus* in the perfect state feeding upon the secretions of the Aphis or exploring them with its proboscis. With these slight exceptions the procedure of *Gerydus*, as described by Mr. Kershaw, and *Megalopalpus* seems to be nearly the same and points to a close affinity between these Oriental and Ethiopian forms.

The late Col. C. T. Bingham in the "Fauna of British India—Butterflies," vol. ii, 1907, pp. 287–288, describes and figures an observation by Col. H. J. W. Barrow, who states that *Allotinus horsfieldi*, Moore, "settles over a mass of Aphides and then tickles them with its proboscis, just as ants do with their antennae, and seems to feed on their exudations." The figure represents the butterfly clasping an Aphid between its two anterior legs. Barrow states that the butterfly was not attacked by ants. *Allotinus* belongs to the *Gerydinae* and is the genus next to *Gerydus*, the Oriental representative of the Ethiopian *Megalopalpus*. The observation was made at Maymyo, near Mandalay. Col. Barrow's account has been confirmed, except as regards the position of the anterior legs, by Mr. J. C. Moulton, Curator of the Sarawak Museum, Kuching, who showed the figure in Col. Bingham's book to his Dyak collectors and has thus been able to record similar observations (Proc. Ent. Soc. 1910, pp. xxxviii–xli) upon *Allotinus nivalis*, H. H. Druce, and an allied species. Moulton's Dyak collector also observed *A. horsfieldi* attending "Heteropterous larvae?" but the group to which the latter have been assigned requires confirmation.

A letter recently received from Mr. J. C. Moulton states that the same relationship between Lycaenids and Aphides was observed by the late Mr. R. Shelford in Borneo and also twice by the writer himself. Finally, in the same letter, Mr. Moulton records a recent observation still nearer to those of Mr. Lamborn in that the Homoptera were *Membracidae* :—

"I watched some few months ago a group of ants, a Lycaenid belonging to the sub-fam. *Gerydinae*, and

Homoptera (identified by Distant as the Membracid, *Ebhul varius*, Walker, previously only known from the unique Burmese type). The Membracids were quite passive while ants vigorously massaged them and imbibed the exuding liquid. The *Gerydus* rested within a foot of an ant, slowly stroking an Homopteron with his proboscis and I suppose at the same time drawing up liquid."

Mr. Moulton's letter was hurriedly written and is undated, but it is evident that the observation was made in the neighbourhood of Kuching in the course of the present year, 1913. E. B. P.

8. *Lachnocnema bibulus*, F.

The associated ant was *Camponotus akwapimensis* v. *poultoni*.

In this case, as in *Megalopalpus*, I have not discovered that the larva is of any direct benefit to the ants; for no glandular apparatus was found on it; but although it is protected by coarse hairs the ants certainly treat it with more consideration than they show to *Megalopalpus*, and in one case I gained the impression that they were endeavouring to feed it in spite of its habit of preying on their Homopterous protégés. The notes are as follows:—

"No. 692 A: Feb. 26, 1912. Forest near Oni. I found yesterday a new Lepidopterous larva, much like that of *Megalopalpus*, on a tree, on which were a number of tiny Homopterous larvae attended by ants. [The Homoptera have since been described as Jassids, *Ossana bicolor*, Dist. (p. 519), and the ants as *C. akwapimensis*, var. *poultoni*.]

"I have not yet seen this larva eat any of the insects, but I have observed it passing its mouth to and fro over them as if it might be obtaining food, and I have frequently seen the ants feed it with material obtained from the insect larvae. An ant and a larva stand in front of each other mouth to mouth. Some jerky movements take place, the ant stroking the larva with its antennae after the manner of an *Oecophylla* ant which, having stored itself with water, proceeds to dispense it to its fellows."

"No. 692 A, ♂: Mar. 7, 1912. This butterfly was bred from the larva which I thought was fed by ants. I have since speculated as to whether I might not have been mistaken in thinking that the ants feed the larvae.

Perhaps the position is reversed, and it is the larva that provides the ants with food, possibly buccal secretion or regurgitated material, since it has no dorsal gland. When I first had the larva it did not feed, as far as I could see, for 24 hours unless the ants gave it food, but it then ate a number of the Jassids. I imagine that these carnivorous larvae when they find a colony of food-insects have to make as big a meal as they can so as to be prepared against a possibly long wait before they find others.

No. 692 B, ♀. The larva was found in the forest $\frac{1}{2}$ mile E., on Mar. 3, and pupated on Mar. 7, 1912. "It ate the same food-insect as larva A, and they were attended by the same ants."

No. 692 C, ♀. The larva was found in the forest $\frac{1}{2}$ mile E., on Mar. 7, and pupated on Mar. 11. "It ate the same Jassids as larva A, and the same ants were in attendance on them."

Pupation of A, Mar. 1; B, Mar. 7; C, Mar. 11; emergence of A, 7 a.m., Mar. 10; B, Mar. 16; C, Mar. 20.

The Jassids, *O. bicolor*, were in each case found on similar food-plants, as yet undetermined. Nine mature and 17 immature Jassids in various stages were sent, together with 11 ♀ minor and 2 ♀ major *C. akwapimensis* v. *poultoni*—both Jassids and ants collected in the forest near Oni Clearing, Mar. 7, 1912. One ♀ major is the type of the variety. Five of the larval Jassids are different from the others and may perhaps be *Nehela ornata*.

9. *Deudorix (Hypokopelates) obscura*, Bethune-Baker,
sp. n. (p. 501).

The associated ant was *Cremastogaster buchneri* r. *alligatrix*.

No. 796. The larvae of the 2 male butterflies under this number were soft-bodied vegetable feeders. The note, May 26, 1912, runs: "The larvae of these 2 Lycaenids were found in the forest $1\frac{1}{2}$ miles E., on May 4, 1912. They were attended by a large number of ants, but I did not discover the source of attraction to them, for, as far as I could see, neither gland nor tubercles were present.

"The butterflies were new to me but may have been confused with others." Fourteen ants were in attendance.

Pupation, May 9; emergence, May 16.

10. *Myrina silenus*, F.

The associated ants are probably *Camponotus maculatus* and *C. akwapimensis* v. *poultoni*.

A note bearing on the relationship between the larvae and ants was communicated on my behalf by Prof. Poulton in 1911 (Proc. Ent. Soc., pp. xcix-c). The ants in attendance seem to have been mostly the larger species, e. g. *Camponotus maculatus*, F., ? subsp., and *C. akwapimensis* v. *poultoni*, but little work has been done on these larvae since that time.

No. 696, ♀, the only specimen bred since 1911, was attended in the larval state by ants, but these have been lost. They were, however, I feel sure, *C. akwapimensis* v. *poultoni*.

The larva was found in Oni Clearing Mar. 1, 1912, pupated Mar. 4, and the butterfly emerged Mar. 14.

11. *Myrina subornata*, Lathy.

The associated ant, only in the house, was *Pheidole rotundata*, var.

No. 694. The note referring to this ♀ specimen is extracted from a letter dated Mar. 24, 1912 :—

“The larva of this Lycaenid resembled very closely that of *Myrina silenus*. It was found Mar. 1, 1½ miles E. of Oni camp, on a small tree in the centre of a native village—a position unfavourable to the presence of ants, and there were none in attendance. The larva, however, had both dorsal gland and tubercles, and the small black house-ants (*Pheidole rotundata*, var.) found their way to it very soon after I brought it home. The tubercles were exerted on tactile stimulation. The pupa also was like that of *Myrina silenus*, and the small black ants covered it completely with débris, though it was suspended in a vertical position. The larva did not feed while in my possession.” It was found on the food-plant of the Bombycid moth *Norasuma kolga*, Druce, and on the under-surface of the leaves were numerous colonies of the Coccids, *Dactylopius longispinus*, Targ.-Tozz., which, as already reported in the Proc. Ent. Soc., 1912, p. xviii, are eaten by the larva of the Lycaenid, *Spalgis lemolea*, H. H. Druce.

The larva of this *Myrina* bore a close resemblance to that of *M. silenus* and was, moreover, found on a species of fig-tree to which family the food-plant of *M. silenus* is

to be referred, so that I have no doubt that it also is a plant-eater. Pupation occurred Mar. 5 and emergence Mar. 14.

12. *Hypolycaena nigra*, Bethune-Baker, sp. n. (p. 502).

The associated ant was *Pheidole aurivillii* r. *kasaiensis*.

No. 653, A—I. The ♂ type of the species is G, the ♀ type D. The note referring to these 9 butterflies (8 ♀, 1 ♂) is as follows:—

“Feb. 26, 1912. The larvae were all found in the forest, 1½ miles E., on two adjacent leaves, on Feb. 4. I am sure they are all of one company.” The larvae were soft, green, and onisciform in shape. Of the numerous attendant ants, *P. aurivillii kasaiensis*, 16 were sent.

All the larvae pupated Feb. 5; A—E emerged 8 a.m. and flew about 9.30 a.m., Feb. 13; F and G (the only male), about 8.30 a.m. and flew 10 a.m., Feb. 13; H, 7 a.m., and I, before 7 a.m., Feb. 14.

13. *Hypolycaena (Zeltus) lebona*, Hew.

The associated ant was *Pheidole aurivillii* r. *kasaiensis*.

No. 595. A note of Jan. 18, 1912, refers to a female specimen:—

“I am sending a Lycaenid butterfly, with the 8 precise ants which were in attendance on its larva. I was able to see the dorsal gland in this, but was not sure as to the presence of the tubercles. The larva eats the cortex of the young shoots, and rarely the upper or lower surface of the leaves of the wild ‘bush-yam’ called ‘Ewo’ in the Yoruba tongue.”

The 8 ants in attendance were *P. aurivillii kasaiensis*.

The larva was found in the forest 1 mile E., Jan. 4; pupation, Jan. 7; emergence, 7 a.m., Jan. 16.

No. 627. My note referring to a male specimen is as follows:—

“Jan. 29, 1912. The larva of this Lycaenid was deep green in colour. The orifice of the dorsal gland was conspicuous, having reddish lips: at the usual site of the tubercles were white spots, but I did not see the structures protruded.”

Four *P. aurivillii* r. *kasaiensis*, in attendance, were sent with the imago. The larva was found Jan. 12, in the forest, 1½ miles E.; pupation, Jan. 16; emergence, about 10 a.m.; flight, 11.45 a.m., Jan. 27.

14. *Hypolycaena philippus*, F.

The associated ants were *Pheidole aurivillii kasaiensis* (probably), *Ph. rotundata*, var. (in the house as well as in the open), *Camponotus akwapimensis* v. *poultoni*, and *C. maculatus*, the latter as an exception.

A note bearing on the relationship between these larvae and ants was communicated on my behalf to this Society by Prof. Poulton on Dec. 6, 1911 (Proceedings, pp. c-ci). The ants therein mentioned as being in attendance on the larvae when found are now recognised, after a study of Prof. Forel's recent determinations, as a species of *Pheidole*, very probably *aurivillii* r. *kasaiensis*, whereas the "house ants" which came and attended the larvae in captivity were certainly *Pheidole rotundata*, var. The following butterflies were bred during 1912:—

No. 643, a female specimen, was reared from a larva found on Jan. 31, 1912, in forest $\frac{1}{2}$ mile E., and 3 *C. akwapimensis* v. *poultoni* were in attendance on it. The larva was then transferred to another plant in Oni Clearing near my house, and, on Feb. 4, six *P. rotundata*, var., were removed from it.

Pupation, Feb. 5; emergence, about 9 a.m., Feb. 12.

No. 675, a male specimen, was bred from a larva found in Oni Clearing on Feb. 14, 1912: 3 *P. rotundata*, var., were in attendance.

Pupation, Feb. 16; emergence, Feb. 25.

A third larva, which died Jan. 16, was found Jan. 12 in Oni Clearing with a single *Camponotus maculatus*, F., subsp.?, in attendance. This ant is in my experience an unusual attendant of *H. philippus*.

15. *Argiolaus alcibiades*, Kirby.

The associated ant was a race of *Cremastogaster buchneri*.

No. 805. A letter dated June 10, 1912, states that the pupa of this ♀ Lycaenid was found June 2, in the forest $1\frac{1}{2}$ miles E., on a leaf of *Culcasia scandens*, Beauv. (*Aroideae*), a plant of ivy-like habit, climbing up a Kola tree on which was a huge nest of black ants which were scattered everywhere on the plants. The ants were undoubtedly a race of *Cremastogaster buchneri*.

Emergence, June 6.

16. *Argiolaus julus*, Hew.

The associated ant was a race of *Cremastogaster buchneri*.

No. 765 A—C. Two males and 1 female. The note in my letter, dated May 13, 1912, is as follows:—

“The larvae of these *Lycuenuidae* were ant-attended and had each a dorsal gland, though I could not see any tubercles. The three were found together in the forest $1\frac{1}{2}$ miles E., on a climbing parasitic plant. They were wonderfully coloured, ruby and green being predominant.”

Unfortunately the precise ants in attendance were not collected, but they were undoubtedly a race of *C. buchneri*. The larvae were plant-eaters.

All pupated Apr. 23 and emerged May 3.

17. *Spalgis lemolea*, H. H. Druce (*S.-signata*, Holl.).

The Coccid food of the larva has been recorded in the Proceedings of this Society (1911, pp. civ–cv; 1912, p. xviii). Additional notes on these larvae and their food-insects are reproduced below:—

“Jan. 7, 1912. I had repeatedly examined the Coccids without detecting the larvae, and it was only my attempt to find a particularly large Coccid for examination that led me to turn one over and discover it to be Lepidopterous.”

“Feb. 18, 1912. The larvae of *Spalgis lemolea* do not strike me as being much larger than the Coccids on which they feed, for they are rather flattened and usually nestle up closely to the masses of Coccids under what appears to be a common covering of shed cuticles, etc. It is sometimes really quite difficult to distinguish them. The Coccids are so closely packed and so well covered that one can rarely see the form of a single individual.”

“June 15, 1912. I have watched several *Spalgis* ovipositing on the Coccid masses, and am now sending some larvae in spirit. It is quite common to see tiny Coccids wandering in the material on the back of the larvae.”

Some of the Coccids, as eaten by the larvae of *Spalgis*, from the plant “Pride of Barbados” in Oni Clearing, May 25, 1912, were sent in spirit, and these, when examined by Prof. Newstead, F.R.S., were found to be *Dactylopius virgatus*, var. *madagascariensis*, Newst. (p. 523). The food-insects previously sent were determined by the same authority as *D. longispinus*, Targ.-Tozz. (Proceedings, 1912, p. xviii); hence the larvae of *Spalgis lemolea* are not confined to a single species of Coccid. Although the condition of the specimens was such that Prof. Newstead

cannot be certain about either determination, he is nevertheless quite sure that the species are different.

18. *Lycaenesthes* sp.? *alberta*, Bethune-Baker.

The associated ant was *Cremastogaster buchneri* r. *clariventris*.

The specimens are stunted so that their determination was difficult. Mr. Bethune-Baker, however, after comparing them with the type of *alberta*, considers that they probably belong to the same species.

The following note refers to three bred specimens, 1 ♂
2 ♀:—

No. 705. Mar. 24, 1912. "The larvae of these *Lycaenidae* were all obtained at Idakun on one plant on March 13. A dorsal gland and tubercles were present in the usual situation and a great number of ants, rather different from any others I have sent, were in attendance."

The ants, which numbered 31, have been determined as *C. buchneri*, Forel, r. *clariventris*, Mayr.

All three pupated Mar. 15 and emerged Mar. 23.

19. *Lycaenesthes liodes*, Hew.

This species has a green, onisciform, leaf-eating larva. Notes as to a bred specimen are as follows:—

No. 719, male, April 1, 1912. "This larva had both dorsal gland and tubercles in the usual region. Three ants were in attendance on it when found." These were despatched home but were lost, probably in the post. The imago and its pupa-case arrived safely.

Larva in forest, 1½ miles E., Mar. 20; pupation, Mar. 23; emergence, Mar. 30.

20. *Lycaenesthes silvanus*, Drury.

The associated ants were *Pheidole aurivillii* r. *kasaiensis* (probably) and *Camponotus akwapimensis* v. *poultoni*.

A preliminary note as to the relationship between the larvae of this species and ants was communicated to this Society by Prof. Poulton in 1911 (Proceedings, p. civ).

The larvae are green and onisciform, and are leaf-eaters.

No. 553, A, B. Two males. Dec. 4, 1911. "The larva was found on a leaf with ants in attendance."

Ten *P. aurivillii kasaiensis* are probably the specimens referred to, but decisive data are wanting.

The above note refers to a single specimen, but the lettering probably indicates that the 2 larvae were found together.

A, Larva in forest, 1 mile E., Nov. 23, 1911; pupation, Nov. 26; emergence, about 3 p.m. Dec. 3. B, Larva in forest, 1 mile E.; emergence, about 3 p.m. Dec. 6. No other data.

No. 616, male. Jan. 18, 1912. "The larva was found in the forest, $1\frac{1}{2}$ miles E., on Jan. 11, with two ants in attendance. It had both dorsal gland and tubercles, the former hard to see owing to the absence of any special pigmentation."

The two ants were *C. akwapimensis* v. *poultoni*.

Pupation, Jan. 15; emergence, Jan. 22.

21. *Lycaenesthes larydas*, Cram.

The associated ants were *Camponotus akwapimensis* v. *poultoni* and *Pheidole aurivillii* r. *kasaiensis*.

A note on the relationship between these larvae and ants was communicated on my behalf by Prof. Poulton to this Society in 1911 (Proceedings, p. civ).

The larvae of this species were green and onisciform in shape and ate leaves. The notes referring to a long series are as follows:—

No. 611. *L. larydas* ♂. "Jan. 18, 1912. The larva of this Lycaenid, found in the forest near Oni Clearing on Jan. 10, possessed both gland and tubercles, which were sometimes protruded when I tickled it." It ate the food-plant of the Pierine *Terias senegalensis*, Boisd., and 3 ants in attendance on it were *C. akwapimensis* v. *poultoni*.

Pupation, Jan. 13; emergence, about 2 p.m., Jan. 21.

No. 613. *L. larydas*, ♀, tending to *kersteni*, Gerst. "The larva was found $\frac{1}{2}$ mile east of our camp on Jan. 8, 1912, and two ants were in attendance." These also were *C. akwapimensis* v. *poultoni*.

Pupation, Jan. 13; emergence, Jan. 21.

No. 614. *L. larydas*, ♀, tending to *kersteni*. "Jan. 18, 1912. The larva possessed a dorsal gland, but the orifice was hard to see, not being marked out by pigment. Two white tubercles were present and were protruded on tickling with a wisp of cotton wool." Larva in the forest near Oni Camp; imago emerged Jan. 22. No other data.

No. 617. *L. larydas*, ♂. "The larva was found on Jan. 8, 1912, in forest $\frac{1}{2}$ mile E. of Camp. There was only

one ant in attendance on it, a large ♀ min. of *C. akwapimensis* v. *poultoni*."

Pupation, Jan. 13; emergence, Jan. 22.

No. 623. *L. larydas*, ♂. Jan. 29, 1912. "I found the orifice of the dorsal gland in the larva of this specimen and detected the sites of the tubercles, but I could not cause them to be protruded."

One *C. akwapimensis* v. *poultoni* was in attendance on the larva, Jan. 14.

Larva in forest near Oni Clearing, Jan. 14; pupation, Jan. 19; emergence, Jan. 26.

No. 628. *L. larydas*, ♀, deformed.

"The larva was found $\frac{1}{2}$ mile east of camp on Jan. 15, 1912." One *C. akwapimensis* v. *poultoni* was in attendance.

Pupation, Jan. 17; emergence, Jan. 28.

No. 639. *L. larydas*, ♂, tending to *kersteni*.

The larva was found in the forest $\frac{1}{2}$ mile E., on Jan. 26, 1912, and 9 ants, *P. aurivillii kasaiensis* were in attendance on it. A note dated Feb. 5, 1912, records that both dorsal gland and tubercles existed in the larva.

Pupation, Jan. 29; emergence, before 9 a.m., Feb. 5.

No. 641. *L. larydas*, ♂, tending slightly to *kersteni*.

The larva was found in the forest, $1\frac{1}{2}$ miles E., on Jan. 26, 1912, and 4 ants, *P. aurivillii kasaiensis*, were in attendance on it. A note dated Feb. 5 is as follows: "I saw the dorsal gland in the case of this larva, and tubercles were put out when I tickled it."

Pupation, Jan. 29; emergence, before 10 a.m., Feb. 5.

No. 669. *L. larydas*, ♀, tending to *kersteni*.

The larva of the specimen was found in the forest, $\frac{1}{2}$ mile E., on Feb. 13, 1912. One ant only, a *C. akwapimensis* v. *poultoni*, was in attendance.

Emergence, Feb. 22.

22. *Lycaenesthes lachares*, Hew.

The associated ants were *Pheidole aurivillii* r. *kasaiensis* and *Ph. rotundata*, var., the latter in the house as well as in the open.

[The females of *lachares* from the neighbourhood of Oni differ from the ordinary form of this sex in the absence or slight development of the yellow patch in the centre of the upper surface of each wing. Hewitson's type in the British Museum, from the Cameroons, has the patch strongly developed in each fore-wing, weakly in each hind.

Mr. W. A. Lamborn has sent 10 females captured on the following dates: 1910, March 26—two, April 5—one, May 24—one; 1911, Jan. 1—six. These last 6 were taken in one spot, and had evidently only just emerged from the pupa. The only specimen with the yellow patches conspicuous is that taken April 5, 1910. In all the others they are wanting, or very slightly developed. All these specimens are shown on Plate XXVI, figs. 1–10.

The relative development of the yellow marks in the females of the following series of bred specimens has been described as carefully as possible in order that comparison may be made with the above-mentioned captured females, and it will be found that this feature is, upon the whole, far more prominent in the former. The comparison suggests that artificial conditions, acting as a shock, have tended to cause reversion to the normal pattern of the species. The extent to which these yellow marks appeared, differed greatly in the females of the different groups, each of which was bred from larvae found together and therefore developed from the eggs of a single female. This difference is probably to be accounted for by differing hereditary tendencies towards reversion, so that, although the shock has probably been of the same general kind, the effects produced are far from uniform.

The whole of the bred females except No. 612, arranged in their little families, are represented on Plate XXVI, figs. 11–30.

Modification of the under surface, probably in consequence of artificial conditions, is also represented on figs. 31–39 of the same Plate. Figs. 31–36 represent the males and 37–38 the females of a single family (No. 615, p. 481), while fig. 39 represents the underside of a captured female for comparison with the two latter. It will be noted that the pattern of fig. 36 is extraordinarily different from that of the other males, although fig. 35 is slightly transitional towards it. Furthermore, the two females, especially that shown in fig. 38, have undergone somewhat similar modifications. It will be noticed that by far the greatest change, as shown in figs. 36 and 38, has been undergone by the smallest individuals, namely, by those which have presumably been most strongly affected by the artificial conditions.

The upper surface of the male shown in fig. 36 is also remarkable in the possession of a distinct pale submarginal

line, increasing in brightness and breadth towards the anal angle of both wings, but stronger in the hind-wing. The very peculiar pattern of the under surface is also visible through the slightly transparent wings and gives to the insect a peculiar and characteristic appearance. The upper surface of the male represented in fig. 35 is transitional towards that above described. E. B. P.]

The larvae were of the usual green onisciform type. The following note, referring to specimens numbered 605, 607, 609, 615, was written on Jan. 18, 1912 :—

“ I am sending a long series of these *Lycaenids* grouped for the sake of precision under several numbers. The larvae of all, except those labelled 604, came off one shrub near Oni Clearing, on and about Jan. 10, 1912. The two, labelled 604, were taken, Jan. 11, $\frac{1}{2}$ mile E. of camp. These larvae were always found under leaves and in groups which I have kept distinct, and all were ant-attended. They showed a tendency to conceal themselves by drawing leaves together, especially when about to pupate. The eight larvae the imagos of which are numbered 615 were found together and six of them pupated under a leaf lightly attached to the wall of the box. House-ants replaced in most cases the usual attendant ants. I have mislaid a note on the position of the dorsal gland but it is present in the usual situation, and the paired tubercles were extruded on weak tactile stimulation.

“ The larvae were all leaf-green, but became reddish, and exhibited oblique stripes of a lighter shade about 36 hours before pupation. All the imagos emerged about 8 to 9 a.m.—*never* earlier—and all flew about 10–10.30 a.m.” [605 C, D and 607 J appear to have been exceptions.]

The history of these 4 separate groups is as follows :—

No. 605. Six larvae found together under one leaf were attended by 18 ants, *P. aurivillii kasaiensis*, and 1 male and 5 female butterflies were bred from them.

No. 607. Five larvae, under one leaf, attended by 18 *P. aurivillii kasaiensis*, gave 2 male and 3 female butterflies.

No. 609. Two larvae under one leaf, which were attended by 7 *P. aurivillii kasaiensis*, gave 1 male and 1 female butterfly.

No. 615. Eight larvae under one leaf were attended by no less than 41 *P. aurivillii kasaiensis*. Six male and 2 female butterflies were bred from these.

The dates of pupation and emergence, etc., of the above-mentioned groups 605 to 615, found on a single shrub on or about Jan. 10, 1912, are shown below in tabular form :—

Group No. and date of capture.	Date of Pupation.	Date and hour of Emergence.	Sex, Reference Letter, and Fig. on Plate XXVI.	Development of yellow marks on wings of female.
605. Larvae found Jan. 10.	Jan. 12	Jan. 20 : about 10.0 a.m.	C ♀ Fig. 26	Yellow marks distinct in all four wings, and strong in all except D.
	" 12	" 21 : " 10.0 a.m.	D ♀ " 27	
	" 13	" 21 : " 8.0 a.m.	E ♀ " 28	
	" 13	" 21 : " 8.0 a.m.	F ♀ " 29	
	" 13	" 21 : " 8.0 a.m.	G ♀ " 30	
	" 13	" 22 : " 8.0 a.m.	H ♂	
607. Jan. 10.	Jan. 13	Jan. 21 : 8.30 a.m.	I ♀ Fig. 16	Distinct but not strong in I and K, very feeble in J.
	" 13	" 21 : flew 9.0 a.m.	J ♀ " 17	
	" 13	" 21 : 8.30 a.m.	K ♀ " 18	
	" 13	" 21 : flew 10.0 a.m.	L ♂	
	" 13	" 22 : 8.0 a.m.	M ♂	
609. Jan. 10.	Jan. 12	Jan. 21 : about 8.0 a.m.	N ♀ Fig. 24	Strongly developed.
	" 13	" 22 " 8.0-9.0 a.m.	O ♂	
615. About Jan. 10.	Jan. 12	Jan. 21 : 8.0 a.m.	P ♀ Figs. 11 and 37	Only faintest trace of marks on all wings of P and U. The ♂ W an extraordinary var., especially on under surface (p. 479).
	" 13	" 22 : about 8.0-9.0 a.m.	Q ♂ Fig. 31	
	" 13	" 22 : " 8.0-9.0 a.m.	R ♂ " 32	
	" 13	" 22 : " 8.0-9.0 a.m.	S ♂ " 33	
	" 13	" 22 : " 8.0-9.0 a.m.	T ♂ " 34	
	" 13	" 22 : " 8.0-9.0 a.m.	U ♀ Figs. 12 and 38	
	Unrecorded	" 23 : " 8.0 a.m.	V ♂ Fig. 35	
	"	" 23 : " 8.0 a.m.	W ♂ " 36	

Other bred specimens are :—

No. 604. Two *L. lachares*, both females (Plate XXVI, figs. 19, 20). Although number 604 is earlier than those of the groups already described, the larvae were captured later and are therefore treated in this position. The two larvae were found under one leaf. in the forest $\frac{1}{2}$ mile E., Jan. 11, 1912 : pupation, Jan. 13; emergence of ♀ A, 9 a.m., Jan. 20, of ♀ B, 8 a.m., Jan. 21.

Three *P. aurivillii kasaiensis* were in attendance on the larvae.

The yellow marks are well developed on the wings of both females, but not quite so strongly as on those of 605.

No. 612. *L. lachares*, ♀. "Jan. 18, 1912. This larva had a dorsal gland rather more conspicuous than in most, because the anterior and posterior lips were pink in the mid-line and white on each side. Tubercles of the usual kind were present." Larva, near Clearing, Jan. 10; pupation, Jan. 12; emergence 8 a.m., Jan. 21.

Yellow marks well developed—as in 605 C.

No. 631. One *L. lachares*, ♀ (Plate XXVI, fig. 14). The larva was found on Jan. 20th, in forest 1 mile E. Six *P. rotundata* are accompanied by the note "631. Ants in attendance on larva when found." Pupation, Jan. 22; emergence, about 10 a.m., Jan. 31. Distinct trace of yellow marks on fore-wings, extremely faint on hind.

No. 632. Two *L. lachares*, 1 male and 1 female (Plate XXVI, fig. 13). The larvae of these were found together on Jan. 20, in the forest, $\frac{1}{2}$ mile E. No ants were sent home with the specimens, so that it is doubtful as to whether the larvae were ant-attended when discovered, but as soon as they were placed in a box the house-ants, *P. rotundata*, to the number of nine, 8 ♀ min. and 1 ♀ maj., came and attended them.

Both pupated Jan. 24 and emerged Feb. 2.

Faintest trace of yellow on all wings of female—even less than on 615 P and U.

No. 637. One *L. lachares*, male. The larva was found in forest, $\frac{1}{2}$ mile E., Jan. 24, 1912, with three *P. aurivillii kasaiensis* in attendance on it. A note dated Feb. 5 runs as follows: "The larva of this Lycaenid was green. The orifice of the dorsal gland was indicated by two bright pink spots, one in the middle of each lip. I did not succeed in getting the larva to put out its tubercles, but there were dark patches in the region where these are usually found."

Pupation, Jan. 30; emergence, before 9 a.m., Feb. 5.

Nos. 665, 666 and 667, all *L. lachares*, were bred from larvae found on one plant 1 mile E. on Feb. 9, 1912.

No. 665. A female (Plate XXVI, fig. 25) was bred from a larva found on a leaf by itself with 2 *P. aurivillii kasaiensis* in attendance.

Pupation, Feb. 12; emergence, about 8 a.m., Feb. 20. The yellow patches are strongly marked.

No. 666. Two males and 3 females (Plate XXVI, figs. 21-23) were bred from larvae on one leaf attended by *P. rotundata*, var., which were removed. House-ants of the same species subsequently covered the pupae with débris, traces of which may be seen on 2 out of the 3 pupae in the collection. Eleven *P. rotundata*, var., are accompanied by the note "ants in attendance on 5 larvae, Feb. 9, 1912." It is worthy of note that the other ants taken from the same bush were *P. aurivillii kasaiensis*.

All pupated Feb. 12 and emerged Feb. 20,—1 male at 8 a.m., the remaining butterflies at about this hour. The females were strongly yellow-marked on fore-wing, rather less so on hind-wing.

No. 667. A female (Plate XXVI, fig. 15) was bred from a larva with 6 *P. aurivillii kasaiensis* in attendance.

Pupation, Feb. 12; emergence, about 8 a.m., Feb. 20. The wings, especially the fore-wings, are slightly but distinctly yellow-marked.

23. *Lycanesthes flavomaculata*, Smith and Kirby.

The associated ants were *Odontomachus haematodes* and *Cremastogaster buchneri*, races *winkleri* and *alligatrix*. Also, in the house, *Pheidole rotundata*, var.

No. 602, A—C, 2 males and 1 female were bred from 3 larvae found side by side under a leaf in the forest, $\frac{1}{2}$ mile E., on Jan. 9, 1912. A note dated Jan. 18, thus refers to them: "The precise ants, 18 *C. buchneri winkleri*, in attendance on the larvae are sent. I was able to see with the unaided eye the orifice of the dorsal gland in the usual situation. In the case of one larva a droplet of watery fluid exuded from it. I could not detect any special taste to it, but I subsequently watched the house-ants, *P. rotundata*, var., which adopted the larvae, drinking it. I could see no tubercles, though a light spot on each side in the usual situation suggested that they might be present. The larvae dropped to the ground when I started ant-catching."

All pupated Jan. 11. ♀ A emerged 10 a.m., ♂ B about 10.30 a.m., Jan. 19; ♂ C 9 a.m., and flew 10 a.m., Jan. 20.

No. 638. A male butterfly was bred from a larva found in the forest near Oni Clearing, Jan. 24, 1912.

"Feb. 5, 1912. The larva had a dorsal gland, but the

orifice was not indicated by special pigmentation. No tubercles were extruded when I tickled the larva, but on one occasion only a drop of fluid—tasteless to me—exuded from the orifice of the gland.” One ant, *Odontomachus haematodes*, L., was in attendance on the larva. I have not before noted the association of any ant of this genus with Lycaenids.

Emergence before 10 a.m., Feb. 5.

No. 640. A male butterfly was bred from a larva found in the forest near Oni Clearing, on Jan. 28, 1912. Ten ants were in attendance [identified by Prof. Forel as *C. buchneri alligatrix*. Mr. W. C. Crawley and Mr. A. H. Hamm, after a careful examination, are convinced that one out of the ten is a typical example of the race *winkleri*]. On the evening of Jan. 28, three *P. rotundata*, var., were taken off the larva in the house. The following note, dated Feb. 5, refers to this larva:—

“The dorsal gland was seen, but no tubercles. I watched house-ants on the larva with a hand-lens, and actually saw one drink up fluid from the gland.”

Emergence, Feb. 5.

No. 651. A female specimen was bred from a larva found in the forest $\frac{1}{2}$ mile E., on Jan. 27, 1912. Seven ants were in attendance. [Of these 3 bear Prof. Forel's determination *C. buchneri alligatrix* and 4 his determination *C. buchneri winkleri*. All bear the number “651.” Mr. W. C. Crawley and Mr. A. H. Hamm, after examining these specimens and comparing them with Prof. Forel's descriptions, conclude that the 4 labelled *winkleri* are, although intermediate, nearer to *alligatrix*.]

Pupation, Jan. 31; emergence, Feb. 8.

24. *Neurypexina lyzanius*, Hew.

The associated ant was *Pheidole rotundata*, var.

No. 579, A—F. Two male and 4 female butterflies. The note dated Jan. 8, 1912, refers to these as follows:—

“The larvae of these 6 Lycaenids were found in the forest $\frac{1}{2}$ mile E., Dec. 28, 1911. They were all close together on the new shoots of a broken stem, but they were non-gregarious. They were attended by *P. rotundata*, var., but I was obliged to collect all the attendant ants in one box, so that it will not be possible to arrange particular groups with their original Lycaenids.” Twenty-one *P. rotundata* were labelled “in attendance,” 18 “on other

parts of the same plant," while 12 others cannot be placed with certainty in either category.

Pupation, ♂ B, Dec. 31; 1 ♂ 4 ♀, Jan. 1. Emergence, ♀ A, Jan. 8; 2 ♂ 3 ♀, Jan. 9. ♂ B and ♀ C emerged about 9 a.m.

No. 600. A male butterfly was bred from a larva found in the forest $\frac{1}{2}$ mile E., on Jan. 5, 1912. No less than 37 *P. rotundata*, var., were on the same leaf, many concentrating their attention on the larva.

Pupation, Jan. 10; emergence about 2 p.m., Jan. 18. A note records that the larva was the same as 579 A—F.

25. *Triclema lucretilis*, Hew.

The female of this species is described by Mr. Bethune-Baker on p. 503. The associated ants were *Cremastogaster buchneri*, races *alligatrix* and *winkleri*. Also, in the house, *P. rotundata*, var.

No. 555. A single male specimen. A note dated Nov. 27, 1911, runs:—

"I recently found 4 remarkable Lycaenid larvae, though 3 have since died and the remaining 1 is sickly. I first saw a little dark green larva in a pit which it had gnawed in the dark green cortex of a soft plant. It was small, and I removed it carefully for the purpose of an examination with a lens. There were numerous ants on it (*C. buchneri alligatrix* *). Having examined it, I replaced it on the stem and it soon crawled down and vanished into a hole out of which ants had been coming. I found 2 other small larvae on the stem, and a fourth could be seen just inside another hole.

"I opened up a stem, and in so doing, cut into a larva inside it. The ants, which bite and so produce a little temporary skin irritation, came rushing out in numbers."

Larva in forest $1\frac{1}{2}$ miles E., Nov. 22; pupation, Nov. 27; emergence, 8 a.m., Dec. 7. This male butterfly is somewhat dwarfed, and the blue markings on the upper surface are much reduced. The pale markings on the under surface are yellow.

A further note referring to the same ants on Jan. 10, 1912, runs thus: "These particular ants bite savagely, and when

* The 7 ants sent as examples of those attending 555 were collected at a later date, viz. Jan. 10, 1912.

alarmed run about with abdomen uplifted and turned forwards over the thorax."

The note of Nov. 27 continues: "I found that the pith in the centre of the stem had largely been eaten away and that on the inner side were a number of little pits. In some of the older tunnels thus produced were white scale insects. Normal stems have no central cavity."

I feel confident that the larvae of *Triclema* eat only the young cortex of this particular plant, and that the presence of Coccids is accidental as far as they are concerned, although there probably is relationship between the Coccids and the ants.

No. 657. Five male and 3 female butterflies. One of these latter is the specimen described by Mr. Bethune-Baker (p. 503). A note in my letter of Feb. 26, 1912, records that no less than 12 pupae were found in the forest $\frac{1}{2}$ mile E., on about Feb. 13, in the central cavity of a stem similar to that already mentioned. Three of the pupae were injured in opening it up and one other pupa died. Ants, undoubtedly one of the races of *C. buchneri*, were running in and out of holes in the stem as in the preceding case. The stem was suspended in a box in my bungalow, and, on Feb. 14, twenty-three "house-ants," *P. rotundata*, var., were collected off the pupae.

One male emerged about 7.30 a.m., Feb. 14, the remaining butterflies about 8 a.m., and probably on the same date. Four ants bear the note "ants in cavity of stem with the 12 pupae. Feb. 13, 1912." [Owing to some error these examples were not sent to Prof. Forel, but Mr. W. C. Crawley and Mr. A. H. Hamm are confident that they are *C. buchneri winkleri*.]

No. 660. Two female butterflies. Three pupae were found in the forest near Oni, in a similar hollowed stem about Feb. 13, but one died. The precise ants in attendance on them have been mislaid, but they were undoubtedly a race of *C. buchneri*.

One butterfly emerged about 9 a.m. Feb. 15, the other about 8 a.m. Feb. 16.

[Both specimens, as well as No. 663 (p. 487), are somewhat dwarfed, and their upper surface is of a uniform fuscous tint with barely a trace of the markings of the normal females as described by Mr. Bethune-Baker (p. 503). The under-surface markings are much yellower than in any of Mr. Lamborn's 5 normal females, in this respect resembling

males 555 and 662. In order to confirm the sex, Mr. Eltringham kindly mounted and examined a fore-foot of the specimen which emerged Feb. 16. E. B. P.]

No. 662. This male specimen was bred from a larva found in the forest $1\frac{1}{2}$ miles E. on Feb. 4, 1912, which pupated Feb. 6, and emerged Feb. 16. The ants running in and out of the cavity were *C. buchneri* r. *winkleri*, of which 11 were sent.* The following note, dated Feb. 26, refers to the specimen:—

“This Lycaenid was walled up in the stem when in the pupal state by débris brought by house-ants, *P. rotundata*, var. These butterflies when freshly emerged seem to me to possess an excessive amount of downy material about the coxae and ventral surface of the body which frequently gets rubbed off and deposited on the edges of the opening by which they leave the stem.”

[F. P. Dodd, in “Entomologist,” 1902, p. 184, speaks of the thick covering of loose scales by which the freshly emerged *Liphyra brassolis*, Westw., is protected from the attacks of *Oecophylla* ants.]

The hollow stem which contained the pupa still retains plenty of the débris brought by the house-ants.

No. 663. A female specimen was bred from a larva found in the forest $1\frac{1}{2}$ miles E., Feb. 2, 1912, on a similar stem. It was attended by a race of *C. buchneri*.

Pupation, Feb. 7; emergence, Feb. 16. This specimen is dwarfed, dark, and yellow-marked beneath like females 660 (p. 486).

No. 670. Two female butterflies were bred from larvae found on a similar stem in the same locality, Feb. 14, 1912. They entered the central cavity on Feb. 15, and consequently I lost sight of them. Ants were as usual in attendance, but though none were sent home they were without doubt a race of *C. buchneri*.

One butterfly emerged Feb. 22, the other was flying 8 a.m.; the date unrecorded, but probably Feb. 22.

The association of the particular ants *C. buchneri* with the larvae in nature is perhaps to be explained by the fact that these ants favour the particular tree, which provides food for the larvae, as a site for their carton nests.

* Four ants only were determined by Prof. Forel, but Mr. Crawley and Mr. Hamm have no doubt that the whole series belongs to the race *winkleri*.

26. *Cupido (Catochrysops) malathana*, Boisd.

The associated ant was *Camponotus akwapimensis* v. *poultoni*. Also, in the house, *Pheidole rotundata*, var.

No. 581. ♂. The following note refers to the larva of the specimen :—

“Jan. 7–8, 1912. On Jan. 5 I discovered a small Lycaenid larva which had eaten an oval hole in the side of a seed-pod and was half inside and half out of it. The seed-pod belonged to a Leguminous climbing plant with a flower very like that of our French bean.

“Five ♀ min. and 1 ♀ maj. *C. akwapimensis poultoni* were running to and fro on the pod, the centre of interest being the larva. On the dorsal aspect of the visible half of its body was a small dull-red area over which an ant was standing head down and holding his ground all the time against the attempts of others to come there. I secured all these ants and they are now sent. On arriving home I discovered a drop of fluid rather larger than a pin's head on this patch. I shut the larva up closely and left it for the night. On the same day I had found two *Oboronia* pupae in a head of the plant *Costus afer*, and had left them on my verandah table. I found next morning that the small black ‘house-ants,’ *P. rotundata*, var., had made an attempt to cover them with bits of wool, excreta of caterpillars and tiny fragments of wood, so I took away the pupae, and the ants scattered over the table. I then opened the box containing the *Catochrysops* larva which had left the seed-pod, and the ants very soon swarmed over it. I removed all the ants save three so that I was then able to watch the proceedings without difficulty.

“The ants undoubtedly obtained food-material from the red patch, but behind and to its outer side I observed, on either side, a little white tubercle which was protruded and drawn in again repeatedly, and with such great rapidity that one could hardly count its movements. I then took away two more ants. The remaining one fed at the red patch, and now that the other ants were no longer running over the larva the two tubercles remained protruded. Presently the ant made a rush at one of the tubercles which was promptly withdrawn. It then ran over to the second tubercle. This was withdrawn in turn, but the first tubercle was thrust out again and incited the ant to rush back a fraction of a second too late to secure anything, for

the tubercle had been already retracted. This happened repeatedly, and I then took away the ant and examined the structures more closely.

"The larva, green in colour and onisciform in shape, is about 7 mm. in length. The red patch, which is about 2 mm. long and 1 mm. broad, is situated in the mid-dorsal line of segments 10 and 11. It is diamond-shaped and the anterior angle is produced forwards and constitutes the area on segment 10. I feel sure that with a lens I can see a crescentic opening, with the concavity directed backwards, in the portion of the patch on segment 11.

"Both tubercles are on segment 12, 3 mm. behind and to the outer side of the patch, and 4 mm. from the mid-dorsal line, and their length when fully extended is, according to my estimate, 1 mm. The tubercle is white, and, with a lens, one can see a ring of tiny bristles forming a fringe encircling its blunt and rounded apex. When the ants are removed, the tubercles are only to be seen for about half a minute, and when they are retracted one cannot detect the exact spot at which they were extruded, but a weak tactile stimulus will cause one or other to reappear.

"The larva subsequently entered the little seed-pod again and ate out the whole of the interior, voiding a large quantity of pale green excreta. It spent the whole of yesterday crawling about without taking food, and to-day (Jan. 8) it has become motionless and is almost concealed under débris piled up by the ants (*P. rotundata*). If this happens under natural conditions the covering must effectually conceal the pupae."

The following data accompany No. 581. Larva in forest 1½ miles E. Jan. 5, 1912; pupation, Jan. 9; emergence, 10.45 a.m., Jan. 16; flew about 11.45 a.m. Of the 6 *C. akwapimensis poultoni* attending larva Jan. 5, one is a ♀ major, and 3 of the minors are much larger than the other 2. Eight of the *P. rotundata*, var., attending the larva from Jan. 6 were also sent, together with the material heaped by them over the resting larva on Jan. 8; also the seed-pod and the pupa-case.

27. *Cupido (Oboronia) punctata*, Dew.

The associated ants were *Pheidole aurivillii kasaiensis* and *P. rotundata*, var., the latter in the open as well as in the house.

Various notes on the habits of the larva were communicated for me by Prof. Poulton to this Society in 1911 (Proceedings, pp. ci-civ). The ants which construct a nest over the head of the plant *Costus afer*, Ker.-Gawl. (*Scitamineae*), in the calyces of which the larva lives, have since been determined as belonging to the genus *Pheidole*, and two species are probably concerned, viz. *P. aurivillii kasaiensis* and *P. rotundata*, the former being more usually found.

No. 442. The 15 butterflies of this series were all bred from larvae and pupae found in the calyces of *Costus afer* between Sept. 11 and Oct. 7, 1911. All were covered in by nests built up by *Pheidole*. The larvae and pupae were found in Oni Clearing and in the forest at various points up to $1\frac{1}{2}$ miles E., the majority coming from this latter distance. Specimens D, E, F, G, J, O and P (all males) bear notes stating that they emerged at 9 a.m., and an eighth unlettered ♂ specimen "about 9 a.m." Only 2 specimens, B, ♀, and G were captured as larvae, on Sept. 10 and 13 respectively: they pupated Sept. 11 and 15 and emerged Sept. 21 and 26. Of the remainder A, C, and K are ♂, I, L, and N ♀. Nearly all the pupa-cases are contained in the calyces of the food-plant—never more than one in each. The remainder are attached to the scale-like leaves of the flower-head.

No. 474. The female parent, referred to in Proceedings, 1911, p. cii, was captured in a swamp in Oni Clearing, Sept. 18, 1911. She died and was partially eaten by ants Sept. 21. The 3 probable offspring, all ♂, emerged Oct. 2, 6, and 7 respectively. The larvae and pupae were tended by house-ants, *P. rotundata*. The conditions of the breeding experiment, as described in the Proceedings, leave little doubt that these 3 butterflies are the offspring of 474 and therefore that the cycle from egg to imago is run through very rapidly.

No. 580, A ♀ and B ♂. Two pupae were found in Oni Clearing on Jan. 4, 1912, in the usual situation on *Costus afer*, and 50 *P. aurivillii kasaiensis* were collected from the ants' nest. On Jan. 6 the pupae were covered in the house with material brought by *Pheidole rotundata*, 20 of which, 19 ♀ min. and 1 ♀ maj., were collected.

Emergence of A, Jan. 6; of B, 9 a.m. Jan. 9.

No. 582, ♀. One pupa was found Jan. 3, 1912, in Oni Clearing in a calyx of *Costus afer* covered by a nest of

P. aurivillii kasaiensis; the imago emerged Jan. 7: 31 ♂ min. and 1 ♀ maj. were collected from the nest.

"Jan. 15, 1912. The small black house-ants, *P. rotundata*, var., covered up the pupa as it lay on my table with particles of wood, wool and other rubbish, including the egg-shells of a Saturnian moth and the shed caudal horn of a Sphinx larva."

"Jan. 15, 1912. With a view to attracting more ants I left a lump of sugar on the table and an attempt to cover this also was made. These ants liked the sugar very much, but they are also carnivorous and had devoured a small green Mantis which I had left on the table dead.

"I found a small box containing tiny red house-ants and their larvae which I placed on a table where the small black house-ants (*P. rotundata*, var.) come. The latter soon vanquished the former and carried them off with their larvae."

No. 596, ♀. The larva was found on Jan. 2, 1912, in Oni Clearing in a head of *Costus afer*. The butterfly emerged on Jan. 15, about 7 a.m.; 7 ♂ min. and 2 ♀ maj. of *Pheidole rotundata* were collected Jan. 2, from the nest covering the head of the plant.

No. 597, ♂. The pupa was found in Oni Clearing in a head of *Costus afer* on Jan. 14, 1912, and the imago emerged on Jan. 15 about 7 a.m.; 13 *P. aurivillii kasaiensis* were collected Jan. 14 from the nest covering the head of plant.

C.—CARNIVOROUS MOTH-LARVAE AND MOTH-LARVAE ASSOCIATED WITH ANTS.

1. *Eublemma ochrochroa*, Hampson (*Erastrinae*).

These little Noctuid moths were compared in the British Museum with the type of the species, from Sierra Leone.

No. 776. The larva of this moth was found near Oni Clearing on Mar. 29, 1912, and a note dated May 13 thus refers to it:—

"The larva was very remarkable. I discovered a stem of *Triumfetta cordifolia* bearing Coccids, *Stictococcus sjöstedti*, on the secretions of which *Oecophylla* ants were feeding. Among the Coccids was a small brown oval structure, apparently of silk, fixed to the bark. I took it to be a cocoon and so brought it home, but by and by the structure moved with considerable rapidity, and I then

saw that it consisted of a case concealing a purple caterpillar. This covering was not an intrinsic part of the larva, for I believe that the latter was able to turn round almost completely beneath it. I certainly saw its head very near where the anal extremity had been and from time to time at the side. The larva ate one Coccid and then became quiescent, having sealed down its covering to the stem on all sides. The cocoon-like structure sent is really the covering of the active larva. Though I was able to see very little of it I felt certain that this larva was Lycaenid; for I have found other larvae which I am sure were *Lycaenidae* under coverings of débris. Accordingly when a little moth emerged I did not connect it with the cocoon until two days later, when I noticed for the first time the valve-like aperture by which it had made its exit."

Pupation about Mar. 31, emergence Apr. 10. A *Stictococcus* is still attached to the stick bearing the cocoon.

No. 826. The larva of this moth was found near Oni Clearing on May 22, 1912, and is referred to in the following note:—

"July 1. The larva of this moth was carnivorous and was found moving among *Oecophylla* ants and feeding on Coccids, *Stictococcus sjöstedti*, the food of the larva of *Aslauga lamborni*. The ants were feeding on the secretions of the Coccids. The larva was protected by a rounded covering of silk in which were the remains of *Stictococci*, and this covering served to form the cocoon."

Pupation about May 26, emergence June 24. A *Stictococcus* is also attached to the stick bearing the cocoon, and remains of *Stictococci* are clearly visible in the walls of the latter.

2. Probably *Euproctis* sp. (*Lymantridae*).

No. 844. The larva of this little Lymantrid moth was found near ants, June 24, 1912, in the forest 1½ E. It spun June 26, and the perfect insect emerged July 8. The moth itself bears a remarkable superficial resemblance to a Lithosid of the genus *Miltochrista*.

3. *Obtusipalpis saltusalis*, Schaus (*Schoenobiinae*).

The larvae and pupae of this Pyralid moth live in the flower-heads of *Costus afer* among the *Pheidole* ants which tend the larvae and pupae of the Lycaenid, *Oboronia punctata* (see pp. 489-91, also Proceedings, 1911, pp. ciii, civ).

No. 484 A and B. The pupa of A was found Oct. 7, 1911, in an ants' nest in a head of *Costus afer* in Oni Clearing. The moth emerged Oct. 10. The larva of B was found, Sept. 27, 1911, in a similar situation in the forest 1½ E. The moth appeared Oct. 10.

4. *Tinthia lambornella*, Durrant, sp. n. (p. 513) (*Egeriidae*).

No. 674. The following note refers to the single bred specimen.

"Feb. 26, 1912. The larva of this Aegeriid moth was maggot-like, and lived inside a stem which I cut open in my search for *Lycaenidae*. These particular stems are often hollowed out by a large ant (*Sima aethiops*, Smith ♀) which lives inside in company with some scale insects, samples of which are sent in spirit. The ants often form communities of 6 or 7 [probably workers with a ♀] in an internode and have larvae with them."

The moth larva was found by itself in an internode, but ants were found in those on either side of it. The moth is accompanied by its pupa-case in a hollow stem, together with 9 ♀ *Sima*, bearing the date Feb. 29, and 2 stems similar to those which they inhabit. A note states that the ants were found each in a separate internode, at Alo, 4 miles E. of Oni. [The date of the above note (Feb. 26) shows that the moth larva was not taken with these particular ants.]

5. *Tortrix callopista*, Durrant, sp. n. (p. 513).

No. 625. The larva of this moth was found in the forest 1½ miles E., on Jan. 14. My note concerning it is as follows:—

"Jan. 15, 1912. On going yesterday to obtain more Coccids as food for *Lycaenid* larvae, I discovered, on the stem of the same plant, some inanimate objects which looked very like *Lycaenid* larvae. In the walls of each were imbedded a number of *Stictococci*. On attempting to remove one with scissors I found that it was hollow and contained a maggot-like Lepidopterous larva, and that the wall covering the larva was composed of silk with brown material containing the Coccids on its outer side."

"Jan. 29, 1912. This tiny moth was bred, Jan. 27, from a larva, similar to one sent in spirit, which I found in a tunnel constructed under *Stictococci* which are eaten by the

larva of *Aslauga lamborni*. I have since found that the little moth larvae eat out the inside of the Coccids, attacking them from underneath, and when one is eaten they construct a tunnel so as lead to and get beneath another."

It is probable that the minute Lepidopterous larva which Prof. R. Newstead describes as preying upon *S. sjöstedti* is allied to *T. callopista* (see p. 522, also Journ. Econ. Biol., vol. v, 1910, p. 22).

D.—ANTS AND MEMBRACIDAE.

The following section deals with the relationship between ants and *Membracidae* and incidentally includes observations on the life-history of one species,—*L. altifrons*. This section should be read in connexion with that upon *Megalopalpus zymna* (p. 458) and especially pp. 463–468, where many other observations on *Membracidae* and their attendant ants are recorded.

1. *Leptocentrus altifrons*, Walker (see also p. 516).

No. 38. "These insects are fairly plentiful on the growing stem of the food-plant of *Acraea bonasia*, F.—*Triumfetta cordifolia*, Guill. and Perr., var. *hollandii*, Sprague (*Tiliaceae*), and I see them occasionally on that of *A. parrhasia*, F.—*Urera obovata*, Benth. (*Urticaceae*). They are invariably attended by ants. Sometimes they are found singly and sometimes there are several together. They are easily examined in situ, but hard to catch, as they jump off to an astonishing distance and take to flight with great suddenness."

The 14 specimens bearing No. 38 were found Oct. 14, 1911, in the forest 1½ miles E. Accompanying them is an egg-mass on *Urera obovata*, with the same data.

Companies of mature forms are frequently found, but never as far as I remember on green stems, and I am disposed to think that these massed individuals are invariably such as have only just emerged from the nymph condition and that they scatter when hardened up. (See also Proc. Ent. Soc. 1913, pp. xxxvi–xxxvii, and xxxvii footnote.) One frequently finds mature forms feeding on green stems but rarely more than two together, and they are invariably ant-attended. Thus among the specimens sent is a single large *L. altifrons*, found Jan. 14, 1912, on a green stem in

the forest $\frac{1}{2}$ mile E., together with the 2 attendant ants, *C. akwapimensis* v. *poultoni*.

The solicitude of ants for the larvae has a very definite object, for they are extremely partial to the fluid excreted at the anal extremity, and I remember seeing a *C. akwapimensis* v. *poultoni* with the caudal whip of a Membracid larva actually in its mouth. [The same attraction is also described by J. C. Kershaw in Ann. Soc. Ent. Belg., Vol. LVII, 1913, p. 191.]

The attraction exercised on ants by mature forms is not so clear, but in some cases it has seemed to me that the ants have obtained edible material off the wings. The ants usually in attendance on this species are *C. akwapimensis* v. *poultoni*, but two mature specimens found near Oni Clearing about Jan. 6, 1912, were attended by *Pheidole rotundata*, var. These Membracids, No. 54, were found near a shelter containing larvae, probably of the same species, of which 7 were sent, accompanied by the 18 *P. rotundata*, var., which attended both larvae and imagines.

Oviposition. A note referring to a female specimen runs as follows:—

No. 43. "This insect was found ovipositing Oct. 25, 1911, on a stem of the plant, *Triumfetta cordifolia*, Guill. and Perr., var. *hollandii*, Sprague, $1\frac{1}{2}$ miles E. of Oni camp. She sat so closely over the egg-mass that I was able to cut off the twig and place it, without disturbing her, in my killing-bottle. Two ants were in attendance, and one seemed to obtain food-material from her wings." The specimen is much larger than Walker's type of *L. altifrons*, but this may be accounted for by the sex. The twig with the egg-mass (figured on p. 496) is in the collection but the ants were not sent.

Since writing the above, I have found a number of ovipositing females which always exhibited the same astonishing degree of reluctance to quit the egg-mass—so much so indeed that it is always possible to make a close examination with a lens, and, if one wishes to capture such a specimen, it is easily taken between thumb and forefinger, a method of capture which is impossible under ordinary conditions. Oviposition is a lengthy proceeding and lasts from 36 to 48 hours.

I believe, though I have to trust entirely to memory on this point, that the eggs are placed only on the old brown cortex and never on the green stem of any plant. The

length of time the female is engaged in oviposition and her apparent insensibility to any danger which may be threatening her must certainly necessitate the careful selection of a site on which she is least likely to be subject to attack, and though on a green stem *Leptocentrus* is a conspicuous object, on a brown stem her dark colour and her shape are, I am sure, of cryptic value, so that she is likely to be detected only by the practised eye. The egg-mass forms an oval structure about 10 mm. long and 8 mm. broad, and the eggs are arranged in parallel rows often superimposed. See the accompanying figure [which shows a condition very different from that described in two Membracids by J. C. Kershaw, *l. c.* pp. 191, 192].



Egg-mass of *Leptocentrus altifrons*: \times about $4\frac{1}{2}$.

Hatching and the earliest larval stages.—The following note describes the hatching of larvae which I am now confident are those of *L. altifrons* :—

No. 53. "On Jan. 2, 1912, I watched some Membracid larvae hatching. When first seen, the tiny larvae were just starting to come out of the 2 egg-masses side by side on a twig of *Triumfetta*. Two or 3 had left the eggs and were huddled together $\frac{1}{4}$ inch higher up the stem. No ants were present. When seen again on Jan. 4, hatching was still in progress and a mass of larvae had collected about an inch above the eggs. The uppermost larvae, viz. those first hatched, were at least double the size of the lowest, and, on the twig below the mass, tiny scattered larvae were crawling up to join the rest of the community.

Large black ants were in attendance. By taking my time I was able to snip off the leaves and secure both larvae and ants on the stem in a test-tube. The soft green bark bore numerous puncture marks at the spot where the larvae had been feeding. When disturbed, the larvae started to run in various directions quite actively. More have hatched out to-day (Jan. 6) and with a lens I can see that when alarmed, even these exude a tiny drop of fluid at the anal extremity, and then run away, frequently backwards."

The following material illustrates the above notes:—

Sixty-eight minute larvae, hatched Jan. 2-4, together with the double egg-mass on *Triumfetta*, another stem showing punctures and 10 attendant *C. akwapimensis* v. *poultoni*—all collected near Oni Clearing, Jan. 4-6, 1912.

Later stages.—The following note refers to a series of 10 larvae, or more probably nymphs, which I now know to be those of *L. altifrons*. They were taken in the forest, 1½ miles E., on Sept. 1, 1911, and are accompanied by 4 of the attendant ants—*C. akwapimensis* v. *poultoni*.

No. 19. "These insects—attended by a great number of ants—were all congregated at the end of a green stem. Perfect insects were present with them, but took the alarm and flew away directly I touched the stem. The larvae or nymphs now sent retreated slowly down the stem, crawling backwards and protruding a pink caudal whip at the end of which a drop of fluid, the size of a pin's head, appeared. If one attempted to catch them, they ran away with great speed or else jumped off suddenly in various directions. On examination of the stem on which they had been, one always found numerous puncture marks for the purpose of feeding."

2. *Neoxiphistes lagosensis*, Dist., gen. et sp. n. (see p. 515).

No. 50. A company of 9 mature forms of these Membracids were found all huddled together on old cortex on Dec. 8, 1911, attended by 9 *C. akwapimensis* v. *poultoni*. These have the same habit of springing away suddenly when disturbed, but my note records that in the early morning they are more sluggish than later in the day. I have never seen companies of this species on a green stem. These specimens, which belong to a new genus and species described by Mr. W. L. Distant on p. 515, were taken in the forest, about 1 mile E. of Oni Camp.

3. *Anchon decoratum*, Dist., sp. n. (p. 516).

No. 48. Two mature examples, the type at Oxford and the paratype in the British Museum, were found together in the forest, 1 mile E., Dec. 3, 1911. Two larvae of different sizes and probably of 2 different species were captured with them, as well as 34 attendant *P. aurivillii kasaiensis*. [The number of the ants suggests that more Membracid larvae or imagines were present, but escaped. E. B. P.]

E.—PSYLLIDAE, ANTS, AND DIPTERA.

1. *Rhinopsylla lamborni*, Newstead, sp. n. (see p. 520).

No. 61. "These insects, *Rhinopsylla lamborni*, are very numerous now. The larvae are found, on plants in the clearing, in large colonies hidden in a white woolly down which is rather sticky. When hunting through this for Lycaenid larvae, on Feb. 18, 1912, I came across some Dipterous larvae and 2 Dipterous pupae, the imagines from which emerged Feb. 24."

These 2 Diptera with their puparia have been submitted to Mr. E. E. Austen who informs me that the species is *Baccha claripennis*, Lw. (*Syrphidae*).

"On Feb. 25 I found numerous mature forms of the *Rhinopsylla*, and, in the 'wool,' other Dipterous pupae. The ant *Camponotus maculatus*, F., is occasionally found obtaining food in the 'wool.'"

Seven Diptera bred, Mar. 2-5, from the above-mentioned pupae, have been determined by Mr. Austen as *Baccha picta*, Wied., or a species very near to it. A single example of the Trypetid fly *Ceratitis punctata*, Wied., also bred Mar. 2-5, Mr. Austen thinks can only have been accidentally present as larva or pupa in the "wool." The carnivorous larvae of the 2 *Syrphidae*, on the other hand, were just where we might have expected to find them.

The collection also contains a "wool"-covered mass of nymphs and large numbers of imagines of *R. lamborni* collected Feb. 25-26. Two pairs were taken *in coitu*.

EXPLANATION OF PLATE XXVI.

Lycaenesthes lachares, Hew., both captured and bred in the Lagos district.

All the figures are slightly below the natural size.

Figs. 1-10. Females taken (1910-11) in the neighbourhood of Oni; all except the specimen represented in fig. 3, differ from the normal form of this sex in the absence or very slight development of the yellow patch in the centre of each wing (see pp. 478-9).

1 & 2. Mar. 26, 1910. Flitting together in a dry swamp $\frac{1}{2}$ mile N. of Oni.

3. Apr. 5, 1910. In the forest within 3 miles of Oni. The yellow patches strongly developed especially in the fore-wings.

4. May 24, 1910. On a path, Oni Clearing.

5-10. Jan. 1, 1911. All taken at the same spot in the forest $1\frac{1}{2}$ miles E. of Oni: evidently freshly emerged from the pupa.

11-30. Females bred from larvae taken in the neighbourhood of Oni. The figures are arranged to show an increasing development of the yellow patches from left to right. The majority of the bred specimens are shown to contrast strongly with all of the captured ones except fig. 3, and are as a matter of fact the normal form of the species. It is probable that something in the artificial conditions has acted as a shock and caused reversion to the normal type. It will be noted that the development of yellow patches runs with remarkable constancy in each of the little families bred from larvae found together.

"No. 615," and each of the following numbers denotes a separate family.

11, 12. Nos. 615 P & U (p. 481).

13. No. 632 A (p. 482).

14. No. 631 (p. 482).

Explanation of Plate XXVI.

- FIG. 15. No. 667 (p. 483).
16-18. Nos. 607 I, J, K (p. 481).
19-20. Nos. 604 A, B (pp. 481-2).
21-23. Nos. 666 D, E, F (p. 483).
24. No. 609 N (p. 481).
25. No. 665 (pp. 482-3).
26-30. Nos. 605 C, D, E, F, G (p. 481).
31-39. The under sides of the whole of the individuals of No. 615 together with that of a captured female for comparison. The figures show that the dwarfing of one male (fig. 36) has been attended by an extraordinary modification of the pattern which more closely approaches that of the two bred females (figs. 37-38) than it does that of any of the other males of the same family (figs. 31-35), or of the wild female (fig. 39).
31-36. The males of No. 615, namely Q, R, S, T, V, W (pp. 479-81).
37-38. The females of No. 615, namely P and U (pp. 479-81). The upper surfaces of these two specimens are represented respectively in the above figs. 11 and 12.
39. The under side of the captured female represented in the above fig. 7.



Photo., A. Robinson.

(Slightly below natural size.)

C. Hentschel.

Lycaenesthes lachares. Upper surfaces of captured (1-10) and bred females (11-30), the latter showing, perhaps by reversion, a greater prevalence of the yellow patch. Undersides of males (31-36) and females (37-38) of a single bred family compared with a wild female (39). Lagos district: W. A. Lamborn (1910-12).



APPENDIX

1. *Notes on Lycaenidae collected by W. A. Lamborn in the Lagos district of West Africa with descriptions of new species.* By G. T. BETHUNE-BAKER, Pres. Ent. Soc.

Aslauga vininga, Hew.

The Lagos form of the ♀ of this species is darker than that from Sierra Leone, the central radial portion of the primaries and a small central patch in the secondaries being dull ochreous, whereas the greater portion of the primaries and a large part of the secondaries in those from Sierra Leone is ochreous. There is no doubt that *marginata*, Plötz, is a ♀ synonym of this insect: specimens thought to be males are females, and I have been quite unable to trace the existence of a yellow male.

For observations on the life-history see pp. 446-7.

Aslauga lamborni, sp. n.

♂. Both wings deep steel blue, bluer than in *vininga*. Primaries with costa to the cell black, apex and termen broadly black the latter tapering rapidly to a fine edge at the inner margin. Secondaries with costa black-margined by the cell and vein 7, but extending slightly over vein 7 at the apex.

Underside. Both wings lavender grey sparingly irrorated more or less all over with blackish scales, a slightly paler dash marks the disco-cellulars in each wing. Secondaries with the termen broadly pale lavender grey to vein 6 above which there is a small patch of dark scales.

♀. Both wings uniformly dark brown. Primaries somewhat less dark in the radial area, but this may be due to the specimen not being absolutely fresh. Under surface: both wings pinkish brown with subterminal broadish indefinite dark bands, in the secondaries these are more strongly emphasised below vein 7.

Expanse ♂ 40, ♀ 37 mm.

Types in the Oxford Museum from Oni, near Lagos, also in my collection from Sierra Leone. For the ♂ type see p. 447. The ♀ type was taken 11 a.m., Aug. 27, 1911, resting on the top of a green leaf, in the forest 200 yards from the edge of Oni Clearing.

In this species neither wing is angulated in the middle of the termen as in *vinga*, this difference being specially marked in the secondaries.

See also pp. 447-450.

Aslauga bella, sp. n.

[♀] Both wings grey with slight pale blue suffusions. Primaries dark brownish grey with a bright pale basal blue suffusion extending nearly to the end of the cell and about half way along the inner margin, an oval whitish spot at the end of the cell intersected by a black dash on the disco-cellulars: below this and extending to the inner margin is a suffusion of lavender grey scales adjoining the blue colour, this grey extends for a further quarter of the radial area leaving the terminal quarter dark brownish grey. Secondaries pale brownish grey with a slight suffusion of blue scales in the cell and about half way across the wing but getting less plentiful on the outward area, in both wings this suffusion does not invade the costa above the upper margin of the cell. Fringes white of the secondaries, but only tipped with white near the apex of the primaries.

Underside. Both wings creamy white irrorated sparingly all over with chocolate brown. Primaries with a limited apical area of pale chocolate brown, an oblique pale chocolate stripe becoming double from the apex to vein 2 where it terminates abruptly, a similar single stripe in the secondaries from the middle of the costa to the inner margin terminating at a third from the base.

Expanse 44 mm.

Type in the Oxford Museum from Oni, near Lagos. The pupa was found by Mr. W. A. Lamborn in the forest $1\frac{1}{2}$ miles E. of Oni, on June 30, 1912, the imago, No. 843, emerging July 5.

I am unable to decide which sex this specimen is; the palpi and fore-legs incline me to believe that it is a male, but the size of the abdomen and its terminal segment look like a female. The abdomen and thorax in both sexes of all species of this genus are very robust, whilst it appears to me that each sex can use its fore-legs for walking. I hope Mr. Lamborn will be able to verify this when he returns again.

[Mr. Eltringham has now dissected the terminal segments, and there is no doubt that the specimen is a female.]

From its underside pattern this species is allied to *A. purpurascens*, Holland, rather than to the *vinga* group.

Epitola oniensis, sp. n.

♂. Upperside. Both wings bright rather lustrous blue, somewhat of the colour of a deep sky-blue; in a side light, but only in a side light, with a shade of mauve in it. Primaries with an irregular black wedge-shaped spot at the end of the cell. Costa and termen very broadly deep black, the latter gradually tapering towards the tornus, the blue area is very evenly terminated but has slight black incisions at each of the veins: there is a marked sex brand on the lower margin of the cell the vein being much swollen at the base but rapidly tapering to vein 2; vein 1 is likewise prominent for its basal half, though to a very much less extent. Secondaries with the costa deep black to the cell and to vein 6, termen very broadly black, the disco-cellular veins show very finely black.

Underside. Both wings pale madder brown with whitish markings. Primaries with a few whitish scales in the cell at the base of vein 6 and also near the lower angle of the cell, just beyond the cell is a fine curved irregular and interrupted line of similar scales from vein 9 or 10 to vein 2, a more definite curved and *scalloped postmedian* line from vein 10 to vein 1, a submarginal very obscure and indefinite curved broadish line of very fine scales followed by a similarly obscure marginal row. Secondaries, with a few scattered sub-basal whitish scales, a few more such scales across the cell beyond the middle almost assuming the shape of the figure 8, below which are a few more, just beyond the cell a very irregular interrupted and fine curved line as in the primaries followed by a postmedian curved irregular line from the costa to nearly the inner margin, a submarginal broader line somewhat scalloped: there is no marginal line.

Expanse ♂ 36 mm.

Hab. Oni near Lagos.

Type in the Oxford Museum, captured by W. A. Lamborn at rest "on dry stem" in the forest $1\frac{1}{2}$ miles E. of Oni, Feb. 4, 1911. This species seems to be somewhere near *catuna*, G.-Smith. I have a specimen very near it in my own collection from Sierra Leone.

See also p. 457.

Hypokopelates obscura, sp. n.

♂. Both wings black—dead black—with a very slight interneurial suffusion of dark blue scales.

Undersurface. Both wings milky white with a narrowish postmedian stripe of orange. Primaries with orange stripe erect but slightly irregular, a subterminal narrow grey stripe, terminal area broadly grey. Secondaries with the orange stripe with a defined w at the anal angle, a fine crenulate subterminal line to the first anal ocellation. Termen finely black followed by a fine white line which is succeeded by a grey stripe broad at the apex but tapering rapidly to the ocellated spot, this spot is oblong deep velvety black with an orange edging, anal lobe spot velvety black with a few blue metallic scales and an upper and outer edging of deep orange which extends up in a narrow line to join the postmedian orange stripe on the inner margin.

♀. Both wings dull brown. Primaries without any markings. Secondaries with the termen finely black followed by a fine white line and with a sub-terminal whitish suffusion, a darkish spot on the margin between veins 2 and 3 and another at the lobe with a slight pale blue metallic suffusion and an orange line on its inner edge. Underside similar to the male, but the orange coloration is yellow with the exception of the outer edging to the lobe spot which is red.

Expanse ♂ 30, ♀ 32 mm.

Type ♂ in the Oxford Museum from Oni, near Lagos, reared by Mr. Lamborn. Type ♀ in my collection from the Bassa Province, Northern Nigeria.

See also p. 471.

Hypolycaena nigra, sp. n.

♂. Both wings blackish brown. Primaries practically with no blue, though in certain lights it is possible to imagine a slightest trace of steely blue on the fold. Secondaries with a very little more bluish trace, the ground colour lobe spot encircled interiorly with white, a small defined white spot touching the black marginal patch between veins 1 and 2, with a smaller indefinite one above it, outside which nearer the termen is another defined small white spot, two tails a long one by the lobe and a short one from vein 2.

Underside. Both wings white with the usual markings of the genus. Primaries with an even orange oblique postmedian stripe finely edged with black on each side, a submarginal line interrupted at the veins, margin at apex broadly grey tapering rapidly down to a fine line about vein 2. Secondaries with a slightly oblique orange stripe just beyond the cell which is deeply angled near the anal angle and continued upwards to vein 1a, this stripe is edged

finely with black on each side, a broadish duller orange submarginal stripe starting from the apex and tapering gradually into a narrow dark line by the upper black anal spot below which it is curved and the orange colour re-appears and runs up to vein 1a touching the other orange stripe at that point, the least trace of a fine dark marginal line, termen finely black nearly up to the apex, the lobe spot and that between veins 2 and 3 deep black the latter margined internally with orange the former with a trace of a few bluish and orange fine scales.

♀. Both wings brown. Primaries somewhat of an orange tone to beyond the cell whence it becomes sooty brown. Secondaries slightly orange brown for the basal half then becoming of a sooty hue, markings as in the male. Underside of both wings like the male.

Expanse ♂ 34, ♀ 36 mm.

Hab. Lagos, Sierra Leone, Cameroons.

Types in the Oxford Museum from Oni, near Lagos.

Mr. Lamborn has bred the larvae of this species, which appears to be constant. I have it from the Cameroons and from Sierra Leone. It is not unlikely that it has been mixed up with *hatita*, Hew., and with *antifaunus*, Doubl. and Hew. It is not unlike the latter on its upper surface, but is similar to the former below.

See also p. 473.

Triclema lucretilis, Hew.

The female of this species has not yet been recorded, and it is very interesting to know that Mr. Lamborn has bred both sexes at Oni. I now add a description of the female.

♀. Both wings sooty black (not deep black as in the ♂), all the spots showing through in the same positions as in the male but not encircled with blue. Primaries, the subterminal series of blue spots in the ♂ are creamy whitish in the ♀. Secondaries, the blue subterminal line in the ♂ is replaced more strongly by a creamy line in the ♀.

Underside. Similar to the ♂, but with all the white lines and spots more accentuated.

See also pp. 485-7.

II. *The genus Euliphyra, Holland.* By Prof. E. B. POULTON, with notes by G. T. BETHUNE-BAKER and H. ELTRINGHAM.

PLATE XXVII.

MR. W. A. LAMBORN'S material throws so clear a light upon the species of this important and puzzling little genus that it seems worth while to write a short revision. This is all the more necessary because the species, few as they are, have been much confused. Hewitson described together under *leucyania* the male and female of two very different species, and Aurivillius, recognising this mistake, created a new species for the female, which is finally proved by W. A. Lamborn's material to be the hitherto unknown female of Holland's *mirifica*. The want of a proper understanding of the true relationships has been principally due to the great rarity of the specimens.

1. *Euliphyra leucyania*, Hewitson (see the accompanying Plate XXVII, figs. 1-4). First described under the genus *Liphyra* in Trans. Ent. Soc., 1874, p. 355, and afterwards in Ill. D. Lep. Suppl., 1878, p. 34 male, p. 35 female. Hewitson represented in fig. 2 of his Plate V b, the underside of the male and in fig. 1 the upper side of the female. As Aurivillius showed in "Rhopalocera Aethiopica" 1898, the female is an entirely different species from the male. The locality quoted by Hewitson in both publications is Old Calabar, but his two specimens in the British Museum are labelled Sierra Leone. Appended to the description in Ill. D. Lep. Suppl., published after Hewitson's death, is a note (p. 34) by the late W. F. Kirby, expressing the opinion that the reference of the species to the genus *Liphyra* was erroneous. The British Museum has since acquired an example of the true female of *leucyania*. The specimen bears the following data:—

"Ashanti, Obuassi (150 miles inland) 1902-3 (end of wet season and beginning of dry) G. E. Bergmar." At the same time undoubted evidence as to the sexes of *leucyania* is to be welcomed, and is provided by Mr. Lamborn's capture, on Feb. 6, 1911, in the forest 1 mile E. of Oni Clearing, of a pair *in cop*. The note with the specimens is as follows:—

"The damaged condition is attributable to the mode of

capture. They were *in coitû* on a dry twig in the centre of a dead bush, and as I disturbed them they fell and separated, and I was obliged to scramble to catch them."

It will be seen by reference to Plate XXVII, figs. 1-4, that the condition of the butterflies is not so poor as might be inferred from the above note. The specimens have been compared with the male type and the female in the British Museum and they are closely similar—Lamborn's female having a slightly heavier dark marginal band.

2. *Euliphyra mirifica*, Holland (see the accompanying Plate XXVII, figs. 5-11). The male of this species was first described in "Psyche," 5, p. 423 (1890), again described and both upper and under surfaces figured in 1893 in Smith and Kirby's *Rhop. Exot.*, 23, *Lycaen. Afr.*, p. 89, t. 20, f. 11-12. The single specimen was bred by the Rev. A. C. Good on the upper waters of the River Ogové, Gaboon, having been "developed from 'a very singular chrysalis, short and thick, and unlike anything of the kind I have observed before, which was found upon the under side of a large leaf. It was black in color.'" ("Psyche," *l. c.*, p. 423.)

Aurivillius, having discovered Hewitson's mistake, referred to on p. 504 gave the name *hewitsoni* (*Rhop. Aethiop.*, p. 286, 1898) to the female type of "*leucyania*" in the collection of the British Museum. I have compared both under and upper surfaces of Lamborn's 5 females with this type, and they are certainly the same species. The 3 males have been carefully compared by Mr. H. Eltringham and me with the excellent figures and description of Dr. W. J. Holland's male specimen in *Rhop. Exot.*, and we have no doubt that they are the same species. Hewitson's female "*leucyania*" and Aurivillius' female "*hewitsoni*" become the female of Holland's *mirifica*, and Hewitson's original specimen, after serving temporarily as the female type of two species, is finally found to belong to a third.

Of Lamborn's 5 females, D (Plate XXVII, fig. 8) is almost exactly similar to Hewitson's specimen, and, like it, shows an exceedingly faint trace of a white mark below the cell of the hind-wing on the upper surface, corresponding to the position of the strongly marked white bar on the under surface. The trace is very faint and has not been reproduced in Hewitson's figure referred to above. The other 4 specimens—E, F, G, and H (Plate XXVII, fig. 9)—have the same faint mark rather more strongly emphasised, although

it varies in the degree of development. Furthermore, in these 4 the white patch crossing the fore-wing is larger and less clouded over by dark scales in its central part. In the hind-wing patch these 4 females exhibit a slight approach towards *Euliphyra sjöstedti*, Aurivillius, described from the Cameroons in Ent. Tidskr., 16, p. 204, fig. 13, 1895, and almost certainly a Southern geographical race of *E. mirifica*.

A female *sjöstedti* from Ambriz, Angola, exists in the British Museum, and only differs from Lamborn's 4 females in the much greater development of the white patch of the hind-wing above: the patch on the fore-wing is similar, as also the pattern of the under surface.

The material described in the present paper seems to show beyond any reasonable doubt that at present only two species of the genus are known, together with a Southern geographical race of one of them.

Note on the genus Euliphyra and its allies,
by G. T. Bethune-Baker.

This genus has hitherto been placed among the *Lipteninae*; it does not however appear to me to have any relationship with that sub-family. If indeed it has any near connection with another genus, I should with little doubt ally it, as Hewitson did, with *Liphyra brassolis*, Westw. The shape of the wings is very similar,* whilst the male armature, though not like that of *brassolis*, is yet nearer to it than to any other species that I know. Prof. Poulton, having allowed me to dissect one of the Oxford specimens of *Euliphyra*, has enabled me thus to arrive at this conclusion. The clasps are quite small proportionately, they are somewhat oval with a longish angulated process at the apex. The Saccus (*i. e.* the lowest hindermost basal part of the girdle) is large and broad, whilst the girdle is somewhat slight in structure, the tegumen and the falces are very large and copious,

* There is also a remarkable resemblance between certain features of the pattern of the hind-wing under surface, and the fact that the larvae of both live in the nest of the same species of ant *Oecophylla smaragdina*.—E. B. P.

the former being projected hindwards, that is towards the head of the insect, much more than forwards, the front line being straight, the dorsal apex being projected forwards suddenly but slightly, the dorsal apex itself being slightly but evenly excised: the hinder part is deeply hollowed out below the dorsal area, and projected backwards to form a blunt point in the centre of the dorsum: the falces are socketed on to the tegumen on the very front line, they are very large and strong, angled at a third from the socket and then curved forwards, the apical fifth being suddenly reduced so as to form a moderately fine tip. The aedoeagus is of moderate length, short for the size of the insect, of nearly uniform width, with the apical orifice arched, extending from the upper side of the tube, which is slightly lipped, to the under side, which is rounded off. This genus and *Liphyra* do not appear to me to be nearly allied to any other Ruralid group with which I am acquainted, though their male armature quite definitely shows that they belong to it. It may prove to be that they should form a small section of their own, in which case the most appropriate name would be the "*Liphyrinae*," in which I should also include *Aslauga*. The neuration of *Liphyra*, *Euliphyra*, and *Aslauga* is very close, the general shape of the wings is analogous, the life-history of each group is quite specialised. Mr. Lamborn speaks of the resemblance between the larvae of *Aslauga* and *Euliphyra* (p. 451), and both are animal feeders. The legs of *Aslauga* and *Liphyra* have a quite unusual similarity, and I fancy the palpi are also very similar and so are the antennae.

Note on the Structure of the Fore-legs in certain Lycaenidae
by H. Eltringham.

As a rule the fore-feet of *Lycaenidae* furnish an easy method of distinguishing between the sexes, but in the genus *Aslauga*, as noted by Schatz and Röber, the male fore-feet are not distinguishable from those of the female, at least by ordinary methods. The male tarsus is quite definitely five-jointed, and the terminal joint is provided with two claws, a pulvillus, and paronychialia. In the case

of *Aslauga lamborni* a properly prepared microscopic preparation shows a difference between the male and female fore-feet, a difference which consists in the fact that in the male the terminal joint is much swollen, whilst the corresponding joint in the female, though of about the same length, and thicker than those which precede it, is nevertheless not so stout as in the male.

The persistence of the five-jointed, double-clawed tarsus in *Lycaenidae* occurs in other genera than *Aslauga*. The condition is found in *Arrugia*, *Theclopsis*, and *Euliphyra*. In *Arrugia basuta*, Trim., the femur of the male fore-leg is of a peculiar shape, having on the under side a pointed process of the chitin followed by a secondary smaller projection nearer the tibial joint. There is a mere indication of a similar structure in the female. The tarsi are not distinguishable in the two sexes, and in both the joints are equally spine-bearing. The paronychiae are remarkable in appearing to be double on each side, possibly they are merely bifurcated. In *Euliphyra mirifica* there is no difference between the tarsi of the two sexes, except that in the female the claws are rather better developed.

Of *Theclopsis* I have been unable to secure an example for examination, but Godman and Salvin state that there are no paronychiae. Preparations of the fore-feet of *Liphyra brassolis*, from specimens kindly furnished by Mr. Bethune-Baker, show that they are alike in the two sexes. In the male one of the claws seems rather less rounded than the other, but a series would be required to show whether this is a constant feature. The pulvillus is well developed, but there appear to be no paronychiae.

The genera *Aslauga*, *Liphyra*, and *Euliphyra*, more especially the two latter, may be regarded as closely allied, but *Theclopsis* and *Arrugia* are widely separated from them and from each other, and the persistence of the five-jointed male tarsi must apparently be regarded as an independent survival.

EXPLANATION OF PLATE XXVII.

The species of the genus *Euliphyra*, Holland (pp. 450-6, 504-12).
All the figures are slightly below the natural size.

- FIG. 1. *Euliphyra leucyana*, ♂: captured, *in coitū* with the ♀ represented in figs. 3 and 4, in the forest 1 mile E. of Oni, Feb. 6, 1911 (pp. 504-5).
2. Under surface of the above ♂.
 3. *Euliphyra leucyana*, ♀: captured *in coitū* with the ♂ represented in figs. 1 and 2.
 4. Under surface of the above ♀.
 - 5-11. *Euliphyra mirifica* bred in June and July 1912, from larvae or pupae found in or near nests of the ant *Oecophylla smaragdina* r. *longinoda*, in the forest near Oni. Full data will be found on pp. 455-6.
 5. *E. mirifica*, ♂ 818 A.
 6. " " ♂ 818 B: under surface.
 7. " " ♂ 818 C: under surface.
 8. " " ♀ 818 D: the pattern of the specimen here figured is nearly identical with that of Hewitson's type of the ♀ "*leucyana*" and of Aurivillius' ♀ *hewitsoni*.
 - 8A. Pupa-case of above ♀. The expanded sucker-like base is distinctly shown.
 9. *E. mirifica*, ♀ 818 H: the pattern of the under wings exhibits a slight approach towards that of the ♀ *E. sjöstedti* (pp. 505-6): the pattern of the upper wings is similar to *sjöstedti*.
 10. *E. mirifica*, ♀ 818 F: under surface.
 - 10A. Pupa-case of above ♀. The anterior part of the case still lies within the dorsally cleft larval skin.
 11. *E. mirifica*, ♀ 818 E: under surface.



Photo., A. Robinson.

(Slightly below natural size.)

C. Hentschel.

Euliphyra leucyana (figs. 1-4) and *E. mirifica* (figs. 5-11) from the Lagos district :
W. A. Lamborn (1911-12).

III. *The Larva of Euliphyra mirifica*. By HARRY ELTRINGHAM, D.Sc., M.A.

PLATE XXVIII.

Two spirit specimens of this remarkable Lycaenid larva, together with several larval and pupal skins have been kindly handed over to me by Prof. Poulton for examination.

I have endeavoured to illustrate the larva and some of its special features on Plate XXVIII, though I have found the correct delineation of its shape and markings peculiarly difficult, and the figures are scarcely so satisfactory as I could wish.

The specimens are about 20 mm. in length, and the dorsal and lateral views present an appearance recalling that of a mollusc rather than of a lepidopterous larva. The ground-colour is brownish ochreous, and there are several irregular markings of a rich umber brown. The general appearance from a dorsal view may be gathered from fig. 1. The lateral portion of the larval skin is extended and modified into a kind of mantle, the edge of which touches whatever the larva may be resting upon. From the edge of the mantle, the sides, which present an irregular and wavy surface, slope up to the dorsal area, along the whole length of which is a deep groove bounded on each side by a hard chitinous ridge, the latter, except at the extremities, being thrown into a series of deep curving folds. This dorsal groove curves down to the mantle edge rather abruptly at the hinder end but more gradually at the anterior extremity. Round the edge of the mantle are twenty-four dark brown spots, many of which are extended towards the dorsal region as irregular marks, and between these markings there are sometimes smaller spots of the same colour. On each side there are nine spiracles. The first lies just above the second dark spot of the mantle edge, the second is above the fourth spot, and the remainder correspond in position to the mantle spots beneath them. The third is placed very far up the side, the fourth a little lower, and the remainder still lower and in a nearly straight line.

The whole structure of the exposed portion of this remarkable larva is profoundly modified, presumably as

a protection against the attacks of the ants by which in life it is surrounded. The entire skin is covered with thick chitinous plates which are irregularly radiate, and have sloping edges. The projections of these plates interlock with the lateral cavities of those adjacent, and the appearance under a high power is not unlike that of a complicated armour sheet of cog-wheels. Such an arrangement doubtless provides a very efficient protective covering with a maximum of flexibility. One of these plates is shown highly magnified at fig. 7, but they vary considerably in size and in the extent to which the edges are sloped. Further microscopic examination shows that the brown markings on the larva are caused by the presence of small brush-like chitinous tufts, fig. 8, one of which arises from the socket in the centre of each chitinous plate. In the unpigmented parts of the skin, from which these tufts are absent, the plates still have the sockets, so that at one period of its evolution the larva probably had the tufts or at least some scale-like growth on every plate. Here and there in the armour, especially (probably exclusively)* on the pigmented areas, there are small round openings, the edges of the adjacent chitinous plates being neatly hollowed so that each forms its respective part of the circle. Possibly these apertures are the external openings of glands, though I have as yet no proof of this. If, as I think, they are confined to the pigmented areas, this would probably account for the correlated presence of the brush-like tufts, which may either protect the openings, or, as Prof. Poulton has suggested, hold some attractive secretion prized by the ants.

Fig. 5 shows a portion of the margin of the mantle. The extreme outer edge is armed with a regular fringe of flat chitinous projections, their bases furnished with interlocking processes. On the upper side of each projection there is a thin scale, very narrow at its socket but increasing outwardly to about the same width as the projection on which it lies. The purpose of these scales is not very obvious, but possibly they may have a tactile function. Within the peripheral fringe so formed there is a row of thick elongated chitinous plates, the edges of

* The openings described can be seen only in a carefully made microscopic preparation, and proof that they occur on the pigmented areas alone could only be obtained by making preparations of the skin of the entire larva.

which are provided with somewhat irregular interlocking processes. One of these plates is shown highly magnified at fig. 6. Each has a scale-socket, but, apparently, does not bear either a scale or a brush-like tuft.

Fig. 9 shows one of the spiracles. Most, if not all, of these have the openings represented on the plate, although it is sometimes difficult to be sure of the presence of all three. Protection is afforded by stiff pointed hairs, for the most part curving inwards towards or over the spiracular orifices. Finally, the hard chitinous ridges of the dorsal groove are armed with very short hook-like spines and there are a few spines or hairs on the underside of the mantle edge, so arranged as to preclude entry if the mantle were raised at any part.

On turning the larva over its lepidopterous character becomes more evident (see fig. 3). The head, three pairs of true legs, and five pairs of prolegs can now be seen. The true legs seem to be progressively slightly larger as we proceed backwards, whilst the last pair of prolegs are much smaller than the remainder. The prolegs are of what Dr. Chapman has described as the "Macro" type, having hooks only on the inner margins of the feet.

The head calls for special remark, owing to its modification in adaptation to the habits of the species. It is elongated and somewhat conical in form, and when withdrawn there is round the base a deeply invaginated fold of the cuticle. At fig. 10, I have prepared a semidiagrammatic illustration of the anterior portion viewed from beneath, to show the mouth parts, etc., though it must be understood that in the actual specimen the parts are all very small and close together, and cannot be distinguished so easily. There are six ocelli situate at *o*, four of which are anterior and lie in a small semicircle, the remaining two being rather more posteriorly placed. The antennae, *a*, are placed laterally just above the labrum, *l*, and beneath the latter, and in a dorsal view concealed by it, are the mandibles, *md*. These have four ridge-like teeth. The maxillae, *m*, have two large lobes each with two small points, and in the actual specimen lie close together, forming what looks like a pointed organ projecting from beneath the labrum, when viewed from above. There are large maxillary palpi, *mp*, and the labium, *lb*, is long and somewhat pointed, and has on it a small papilla, possibly a tactile organ. There is some evidence of a

second and smaller papilla not shown in the drawing. As already stated the mouth parts are exceedingly small and difficult to make out distinctly.

At fig. 4, I have shown the larval and pupal skins as seen after the emergence of the butterfly. The pupa is attached in a peculiar way to a leaf, its sucker-like extremity being spread out and apparently cemented down. It will be noted that the larval skin is not completely shed, but has been split open on the exposure of the pupa, afterwards remaining in this expanded condition. Viewed from the other side the empty shells of head, feet, etc., are easily seen.

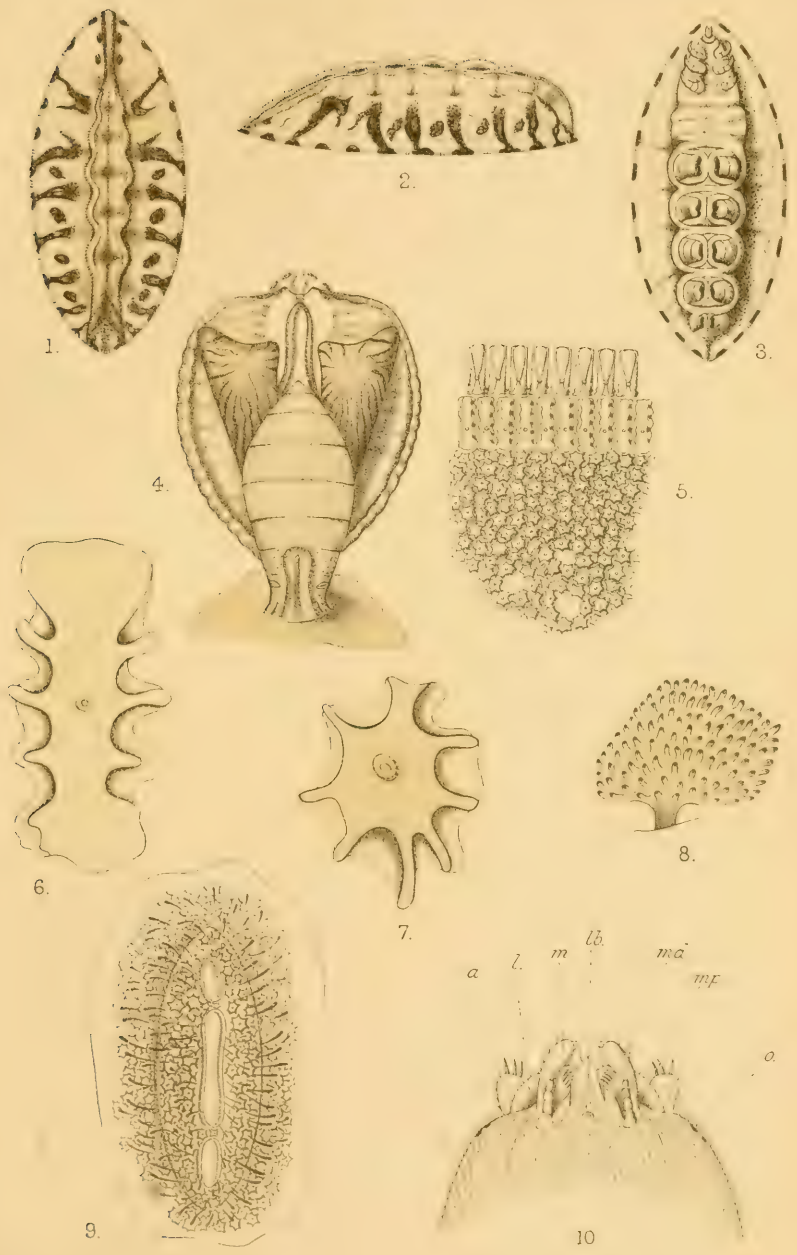
This interesting larva resembles in some respects that of the Australian *Liphyra brassolis* described by Dr. Chapman.* Both the specimens of *E. mirifica* sent by Mr. Lamborn are about the same size, so that I am unable to compare two stages of its growth, but evidently in *L. brassolis* the form in an earlier stage differs from that at a later period. Through the kindness of my friend Mr. G. T. Bethune-Baker, I have had an opportunity of examining larvae of this species. The cuticle is not provided with interlocking plates, but is covered all over with chitinous tubercles, and at the edges of the mantle is provided with numerous short setae. There is no dorsal groove and the cuticle is not thrown into ridges. As Dr. Chapman has stated, the spiracles are "minute holes without marginal structure." I have not been able to examine the mouth-parts, but they are evidently larger than in *Euliphyra*. The antennae are certainly longer and more conspicuous, and the jaws are more adapted for piercing and tearing. Dr. Chapman describes a peculiar modification of the prolegs which is not evident in *Euliphyra*.

A further interesting point of comparison is that whilst in *E. mirifica* the pupa is formed half out of the larval skin, in *L. brassolis* it remains inside the larval cuticle, the latter forming a puparium like that of many Diptera.

* *Entomologist*, p. 225, 1902. I am indebted to Commander J. J. Walker for this reference.

EXPLANATION OF PLATE XXVIII.

- FIG. 1. Larva of *Euliphya mirifica* as seen from above. $\times 2\frac{1}{4}$.
2. Ditto, as seen from side. $\times 2\frac{1}{4}$.
3. Ditto, as seen from below. $\times 2\frac{1}{4}$.
4. View of larval and pupal skins as they appear after emergence of imago. Note peculiar sucker-like attachment of pupa to its support, and the split larval skin remaining *in situ*. $\times 2\frac{1}{4}$.
5. Portion of "mantle" edge of larva showing arrangement of chitinous plates, etc. $\times 33$.
6. One of the chitinous plates of the second row of the mantle edge. $\times 230$.
7. One of the chitinous plates which cover the general dorsal surface. $\times 650$.
8. One of the chitinous tufts which are attached to the pigmented portions of mantle. $\times 650$.
9. A spiracle. $\times 50$.
10. Semidiagrammatic view of extremity of head, arranged to show mouth parts; viewed from below. $\times 50$.
- (a) Antenna.
 - (l) Labrum.
 - (m) Maxilla.
 - (lb) Labium.
 - (md) Mandible.
 - (mp) Maxillary palp.
 - (o) Position of ocelli (these are not visible from a ventral view).



H. Eltringham del.

West, Newman lith.

LARVA OF EULIPHYRA MIRIFICA.

IV. Descriptions of two new *Tineina* (Lep.) from the Lagos District. By J. HARTLEY DURRANT.

TINEINA.

AEGERIIDAE.

Tinthia, Wkr.*Tinthia lambornella*, sp. n.

Antennae and *Palpi* (broken). *Head* and *Thorax* blue-black (the head much denuded). *Fore-wings* and cilia blue-black, without markings or hyaline spaces; somewhat more purplish on the underside than above. *Exp. al.* 28 mm. *Hind-wings* sooty black, with a hyaline space entirely filling the cell and extending somewhat beyond, the extension projecting further between veins 3-4 and 6-7 than between 4-5, thus ending in lunate form beyond the discoidal; between the upper anal and the cubitus the entire space is hyaline to beyond half the length of vein 2, the space between 2 and 3 appearing as a somewhat conspicuous intrusive black triangle; cilia sooty black; underside purplish black, with strong cupreous reflections, especially below vein 2 and toward the dorsum. *Abdomen* and *Legs* blue-black; hind tibiae roughened with scales at the spurs.

Type. ♀ (6790 Drnt. Det. 1912), *Oxf. Univ. Mus.*

Hab. AFRICA, W.—Oni, near Lagos. The unique specimen bred by W. A. Lamborn in 1912.

See also p. 493.

TINEINA.

TORTRICIDAE.

Tortrix, L.*Tortrix callopista*, sp. n.

Antennae dark leaden grey, somewhat tinged with ferruginous. *Palpi* and *Head* ochreous. *Thorax* dark leaden grey, longitudinally striped with ferruginous.

Fore-wings leaden grey, ornamented with two transverse and four longitudinal vermilion stripes; the costa irregularly margined throughout with ochreous, commencing at the base, almost on the dorsum, and continued narrowly along the termen, but expanding above the tornus into an almost circular blotch and ending in a large pretornal triangular patch—these ochreous spots are more or less suffused with blackish, and five or six blackish spots occur along the costa; before the middle of the wing the ochreous costal colouring blends with a transverse vermilion fascia, slightly angulate on the cubitus, and there is a somewhat conspicuous ochreous triangular encroachment on the leaden ground-colour before the apex; parallel with the upper edge of the pretornal patch is a conspicuous vermilion length-streak, with another, somewhat bowed, midway between it and the costa; near the middle of the base is a short longitudinal vermilion streak, and below it a longer one reaches to a fasciaform stripe of the same colour, almost erect from the dorsum, but before reaching the radius gradually curving round, becoming nearly parallel with the costa, and ending abruptly before the base; cilia (injured) ochreous, apparently tipped with greyish. *Exp. al.* 9 mm. *Hind-wings* fuscous; cilia pale at the base, with a dark dividing line. *Abdomen* fuscous. *Legs* greyish ochreous.

Type ♀ (6866 Drrnt. Det. 1913), *Oxf. Univ. Mus.*

Hab. AFRICA, W.—Oni, near Lagos. The unique specimen bred by W. A. Lamborn, Jan. 27, 1912, from a carnivorous larva which fed upon *Stictococcus sjöstedti*.

Closely allied to *Tortrix viridis*, Wlsm. (Tr. Ent. Soc., Lond. 1891, 68–9, Pf. 3·4), but in general pattern even more like *Epagoge albardana*, Slnn. (Wlsm. Tr. Ent. Soc., Lond. 1891, 69–70, 131, Pf. 3·5). The type, which is somewhat injured, has been described at the request of Prof. Poulton to accompany Mr. Lamborn's observations upon the life-history of the species as recorded on pp. 493–4.

V. *Homoptera* (Membracidae and Jassidae) collected in the Lagos district by W. A. Lamborn. By W. L. DISTANT.

Fam. MEMBRACIDAE.

NEOXIPHISTES, gen. nov.

THIS genus possesses all the characters of *Xiphistes* (found in both the Oriental and Ethiopian Regions), but differing in the length of the posterior pronotal process, which is very long, considerably passing the apex of the tegmina. In *Xiphistes* it about reaches the apex of the interior margin of the tegmina.

Type. *Neoxiphistes lagosensis*, Dist.

Neoxiphistes lagosensis, sp. n.

Piceous; the central pronotal ridge, apices of the pronotal angles, and about apical half of the posterior pronotal process, castaneous; tegmina subhyaline with the venation black; pronotum finely rugose, centrally strongly longitudinally carinate, anterior angles robust, tricarinate, obliquely divergent, about as long as breadth of pronotum at their bases, beyond the central longitudinal carination are shorter and less pronounced carinations proceeding from the outer and inner basal margins of the produced angles: the posterior pronotal process is nearly as long as the whole body including the tegmina, and extends considerably beyond the tegminal apices, it is also tricarinate or three-cornered; legs brownish-ochraceous, femora (excluding apices), and the tarsal claws, black.

Long. incl. lat. pronot. angl. and post. pronot. proc. 8 to 10 mm.

Hab. Oni, near Lagos (W. A. Lamborn—Oxford and Brit. Mus.).

See also p. 497.

Genus LEPTOCENTRUS.

Leptocentrus, Stål, Hem. Afr., iv., pp. 87 and 90 (1866);

id. Öfv. Vet.-Ak. Förh. 1869, p. 281; Dist., Faun.

Brit. Ind., Rhynch. Hom., iv., p. 28 (1907).

Rabduchus, Buckt., Monogr. Membrac., p. 251 (1903).

Leptocentrus altifrons.

Centrotus altifrons, Walk., List. Hom., ii, p. 608 (1851).

Centrotus Bos, Sign., in Thoms., Arch. ent., ii, p. 336 (1858).

Leptocentrus Bos, Stål, Hem. Afr., iv, p. 90 (1866).

Rabduchus gnomon, Buckt., Monogr. Membrac., p. 251, Pl. lvii, figs. 4, a, b, (1903).

This species, which was found at Lagos by Mr. Lamborn, has had its nomenclature unduly complicated. Stål, at the time of writing his "Hemiptera Africana," ignored all the work of Walker, even to placing his species as synonyms of other species described subsequently (*supra*). Buckton has redescribed both genus and species. His types are now before me. The one figured by him (not this type) has the pronotal posterior process a little raised.

See also pp. 494-7.

Anchon decoratum, sp. n.

Head and pronotum black; pronotum with a central longitudinal castaneous carinate line and with a cretaceous sericeous line on each side behind and before the base of each lateral process, posterior pronotal process dark castaneous, sometimes black; scutellum more or less greyishly sericeous; tegmina black, sometimes very dark castaneous, a small pale spot near apex of clavus, and a large transverse subapical ochraceous spot extending about half across the apical area from costal margin; body beneath piceous, lateral margins of sternum greyishly sericeous; legs ochraceous or pale castaneous; pronotal lateral processes recurved and divergent, their apical areas moderately flattened and broadened a little but distinctly inwardly ampliate before apex which is acute, the posterior process is obliquely raised at base and there apically furnished with a short outwardly directed spine, then sinuately and obliquely directed to apex and to a little before tegminal apex.

Long. 5 to 5½ mm. Exp. pronot. proc. 4½ to 5 mm.

Hab. Oni, near Lagos; forest (W. A. Lamborn—Oxford and Brit. Mus.).

See also p. 498.

Anchon relatum, sp. n.

Closely allied to and resembling the preceding species *A. decoratum*, Dist., but differing in the following characters. The pronotal apices are considerably more acute and the apical areas are not

ampliated inwardly; the apical area of the posterior process is concavely sinuate and its apex horizontal (in *A. decoratum* the apical area is a little convex and the apex depressed over the apical angle of the tegmen); the tegmina are dark castaneous, with the oblique apical area paler, the apical margin black, and with a somewhat large black spot beyond apex of clavus.

Long. 6 mm. Exp. pronot. proc. $5\frac{1}{2}$ mm.

Hab. Oni, near Lagos (W. A. Lamborn—Oxford Mus.).
See also p. 467.

BENINIA, gen. nov.

Face subtriangular, apically concavely excavate before clypeus; ocelli almost on a level with the upper margins of the eyes and about as far from each other as from eyes; pronotum shorter than the tegmina, without lateral processes, but centrally, anteriorly produced upward in an almost erect process, the apex of which is bilobed, the posterior process is long, somewhat slender, sinuately adpressed to the tegminal suture, its apex deflected, narrowly subacute and slightly passing the inner tegminal angle; tegmina extending beyond the abdominal apex, their apices subacute, their apical areas provided with apical and subapical cells; tibiae slightly dilated.

Allied to *Congellana*, Dist. (Div. *Hypsaucheniarina*), but differing in the completely distinct structure of the pronotal posterior process.

Type. *B. lamborni*, Dist.

Beninia lamborni, sp. n.

Body and legs dark castaneous; tegmina shining ochraceous, base narrowly suffused with castaneous; pronotum finely rugulose, longitudinally tricarinate on disk, central carination straight and continued along the posterior process, the outer carinations short and roundly posteriorly curved inward, the discal erect process apically obliquely transversely bilobed, each lobe upwardly convexly laminate with the margins distinctly paler, posterior process tricarinate.

Long. 7 mm.

Hab. Oni, near Lagos (W. A. Lamborn—Oxford and Brit. Mus.). The type and one paratype were captured on *Triumfetta cordifolia* in the forest $\frac{1}{2}$ mile E. of Oni, Jan. 27, 1912, and two paratypes 1 mile E. under conditions otherwise the same.

See also p. 465.

AWANIA, gen. nov.

Body oblong-ovate; head with two prominent, porrect subacute tubercles at base of head just beneath the anterior margin of the pronotum, and above the ocelli which are about as far apart from each other as from eyes, the tubercles are very plainly seen from above; pronotum convexly gibbous, the lateral angles obsolete subprominent, the central longitudinal carination acute and continued along the posterior process which is somewhat slender beyond the base, tricarinate, concavely sinuate, and extending beyond the claval apex of the tegmen, it is also well separated from the tegminal suture, its apex acute; tegmina more than twice as long as broad, with four long apical cells and two subapical cells; legs moderately long, the tibiae not prominently dilated, the posterior tibiae outwardly shortly, closely robustly serrate. Scutellum complete and visible beneath the raised posterior pronotal process.

I place this genus in my division *Gargararia*, and its principal characteristic is found in the porrect prominent tubercles at the base of head.

Type. *A. typica*, Dist.

Awania typica, sp. n.

Head, pronotum, scutellum, body beneath and legs black, the greater part of the intermediate tibiae and the basal areas of the tarsi, pale castaneous; tegmina shining pale ochraceous, the base and the venation black; head and pronotum subrugulose and coarsely punctate; the posterior pronotal process is also coarsely punctate on each lateral area; other structural characters as in generic diagnosis.

Long. 7 mm.

Hab. Oni, near Lagos, 1912 (*W. A. Lamborn—Oxford Mus.*). The unique type was the prey of an Asilid fly captured by Mr. Lamborn.

Fam. JASSIDAE.

Sub-family BYTHOSCOPIINAE.

OSSANA, gen. nov.

Head with the vertex broad and narrow, including eyes which are broader than long, reaching the anterior angles of the pronotum but not so broad as the posterior pronotal angles, front including face almost or about as long as broad, ocelli on face between the eyes, nearer to eyes than to each other; clypeus slightly broadened posteriorly, its apex truncate; pronotum moderately convex, about

three times as long as vertex and about as long as scutellum, anterior margin slightly rounded, almost truncate, posterior margin almost truncate, the posterior angles slightly roundly prominent; scutellum triangular, its apex acute; tegmina about twice as long as broad, passing the apex of abdomen, apical areas three; legs of moderate length, posterior tibiae long, slightly curved, strongly spinulose.

Type. *O. bicolor*, Dist.

Ossana bicolor, sp. n.

Head, pronotum, and scutellum shining black; body beneath, legs, and tegmina ochraceous; vertex of head in some specimens entirely black, in others more or less suffused with ochraceous; scutellum in some specimens entirely black, in others with the anterior margin more or less suffused with ochraceous; pronotum finely transversely wrinkled; scutellum distinctly transversely incised before apex; other structural characters as in generic diagnosis.

Long. 4 mm.

Hab. Oni, near Lagos (W. A. Lamborn—Oxford and Brit. Mus.).

See also pp. 470-1.

Nehela ornata, sp. n.

Black; posterior margin of pronotum, a curved transverse fascia near apex of scutellum, two short discal transverse lines crossing tegminal suture—one before and the other near middle—a spot on suture a little before apex, and the legs pale ochraceous; anterior and intermediate tarsi, posterior tibiae, and apices of posterior tarsi, black; head with the vertex short, as broad as the anterior margin of the pronotum, rounded, slightly angulate; face dilated, subtriangular, apex produced, laterally before eyes, sinuate; ocelli between eyes, about as far apart from eyes as from each other; pronotum very finely transversely wrinkled.

Long. 4 mm.

Hab. Oni, near Lagos (W. A. Lamborn—Oxford and Brit. Mus.).

This species differs from the type of the genus described by Buchanan White from the Island of St. Helena in having the vertex of the head more rounded and less angulately produced. I have not considered that this is alone, at least for the present, sufficient to justify the proposition

of a new genus, though the hemipterous fauna of St. Helena has not hitherto been shown to have much affinity with that of tropical Africa.

See also pp. 459-67.

VI. Homoptera (*Psyllidae and Coccidae*) collected in the *Lagos District* by W. A. Lamborn. By Prof. R. NEWSTEAD, F.R.S.

PLATE XXIX.

PSYLLIDAE.

Rhinopsylla lamborni, sp. nov.

Length 3·9-4·2 mm.; greatest width of thorax, 1·4-1·50 mm.; width at vertex of head, ·58-·75 mm.; length of fore-wing 4·5-5 mm.

Head slightly birostrate in front; face lobes wanting; eyes hemispherical, prominent; wings with the upper and lower branches of the cubitus very long, stigma wanting; hind tibiae in ♀ (fig. 1*d*) and middle tibiae in ♂ (fig. 1*e*) very strongly pectinated distally; meso-sternites with a lateral and distal horn-like tubercle. General colour ochraceous buff; thorax striped.

FEMALE.—*Head*, inclusive of the eyes, as broad as the thorax; posterior margin of vertex arcuate; front with a sharply defined median suture on either side of which is a deep punctate depression. *Antennae* long and slender, of ten segments, the third incassate and strongly punctate when seen in optical section in cleared specimens. *Thorax* slightly arched and finely punctate; pronotum clearly defined and normally not depressed below the head. *Abdomen* markedly attenuated distally; pygidium (fig. 1*a*) with the circumgenital glands (fig. 1*b*) arranged in curiously contorted double lines. *Legs* with the hind tibiae very strongly pectinated, the teeth black, and each with a faint lateral tooth. *Wings* (fig. 1*c*) hyaline, nearly twice as long as broad, costa strongly arched; there is a small infuscated, submarginal, spinose area between the radius and the upper fork of the upper cubitus, and a similar marginal infuscation between the four succeeding veins; branches of the upper and lower cubitus very long. *Colour* ochraceous-buff or ochraceous; pronotum with a well-defined and relatively broad dark-brown margin;

thorax in front of the transverse suture with four dark-brown or blackish stripes of which the median pair are the broadest; the median pair of stripes behind the suture pale brown; the second pair of stripes dark-brown or blackish, narrowly ovate and attenuated anteriorly; the third pair of stripes are also very broad but of the same colour as the ovate ones.

MALE, closely resembling the female in colour and markings. *Genital armature* (fig. 2) with the superior claspers widely divergent *dorso-ventrally*, with the inner lateral margin strongly concave, and the outer lateral margin angulate near the middle, tips bluntly rounded. *Vesica* (fig. 2*b*) very short and arising from an almost complete chitinous ring through which the penis (fig. 1*c*) passes. The latter curved suddenly downwards and forwards, base bulbous; inferior claspers (fig. 2*d*) wide and broadly rounded distally, lower margin strongly concave; median process (fig. 2*e*) obliquely truncate distally.

Taking all the salient characters into consideration it would seem that this insect agrees best with the genus *Rhinopsylla*, Riley, as defined by Crawford* in his article on the American Psyllidae; though, as this author has pointed out, this genus may eventually prove to be identical with the European *Bactericera*, Puton. The head of *R. lamborni*, Newst., is not, however, so strongly birostrate as in the American species, but this character varies to a somewhat marked extent even in the few known species described from that country.

I have much pleasure in dedicating this insect to its discoverer. Described from 6 ♂♂ and 8 ♀♀. The type male and female bear the following data:—"A in cop. B. B in cop. A. Feb. 26, 1912. Lagos, 70 m. E. nr. Oni clearing. Dry S. c. Dec. 8-11 to Mch. 23, 1912. W. A. Lamborn." The paratypes (now mounted in Canada balsam) bear the record:—"Fr. mass like 61. Feb. 25, 1912. Lagos, 70 E. Oni clearing. Dry Seas. Dec. 8-11 to Mch. 23, 1912. W. A. Lamborn."

See also p. 498.

COCCIDAE.

Stictococcus sjöstedti, Cockerell.

Stictococcus sjöstedti, Cockerell, *Canad. Entom.*, vol. xxx, p. 64 (1903).

* "Pomona Coll. Journ. of Ent.," vol. iii, p. 440 (1911).

Stictococcus sjöstedti, Newstead, Journ. Econ. Biol., vol. ii, p. 149 (1908).

This remarkable Coccid is one of the recognised cocoa pests of Western Africa. I have already noted* that this species and also *S. formicarius*, Newst., are preyed upon by Lepidopterous larvae, though I was unable to determine the group to which the latter belonged.

In examining the material kindly furnished by Prof. E. B. Poulton, I have discovered that the larvae of *S. sjöstedti* are undoubtedly dimorphic. In one of the females there is one embryo larva of each sex still remaining in the body of the parent, so that there can be no possible doubt as to the authenticity of this record. This discovery clears up the marked discrepancies existing between the descriptions of the larvae given by Prof. Cockerell and myself, respectively. Now that I have the larvae of both sexes before me it is perfectly obvious that the larva described by myself was that of the male, while that described by Cockerell was undoubtedly that of the female. The differential characters may be briefly summarised as follows :—

	<i>Male larva.</i>	<i>Female larva.</i>
Mouth . . .	? Obsolete.	Normal.
Anal orifice .	Anal.	In the middle of the back.
Marginal spines	Of great length.	Short, of two types: one broad and dactyliform, the other curved and serrated.

The examples in question are so much distorted in the preparation that it is impossible to add any further particulars at this juncture; neither can I be quite certain as to whether there is a mentum present in the male larva or not, but as there is no trace of the buccal filaments I assume that the mouth is obsolete, as is certainly the case with the male larva of *S. dimorphus*,† Newst. Thus we now have two well-marked instances of sexual dimorphism in the larvae of the *Coccidae*, both belonging to the genus *Stictococcus*: characters which are not only very remarkable but quite unique and unprecedented in this group of insects.

See also pp. 447–50, 460, 462, 491–2.

* "Journ. Econ. Biol.," vol. v, p. 22.

† "Bull. Ent. Res.," vol. i, p. 63, fig. 2 (1910).

Dactylopius longispinus, Targioni-Tozzetti.

A common and widely distributed pest. Fernald* and many other students now refer *Dactylopius*, Targ.-Tozz., to the genus *Pseudococcus*, Westwood. I have thought best to retain the name which has been so long in use, so as to avoid confusion in this communication.

See also pp. 446, 475.

Dactylopius virgatus, var. *madagascariensis*, Newst.

The specimens are all in very bad condition and are denuded of their characteristic covering; but there can, I think, be little doubt as to the correct identity of the species as all the morphological characters agree with typical examples of this Coccid. This insect seems to have established itself in other parts of Western Africa, as I have recently received examples from Illorin, Northern Nigeria, also on "Pride of Barbados," *Caesalpinia pulcherrima*, Sw.

See also p. 475.

Lecanium punctuliferum, var. *lamborni*, n. var.

Female, adult, ovate, moderately convex, margin broadly flattened though in some individuals it is slightly reflexed; integument apparently strongly rugose at the margins; but is so thickly coated with dirt, that the true texture is practically obliterated. *Colour* (dead examples) pale brownish-ochraceous, dusky greenish-yellow, reddish-brown or chocolate-brown. *Antennae* of seven segments of which the third and seventh are the longest. *Legs* well developed; tarsus exclusive of the claw nearly as long as the tibia. Scales of *anal operculum* rounded distally; base much longer than distal margin. *Derm cells* small, oval, widely separated and visible only towards the margin. *Stigmatic cleft* extremely shallow; spines three, the median one of great length. *Marginal spines* long fimbriated distally; short simple spines occur between the larger ones, sometimes alternately.

The young females are much paler than the adults—varying between yellowish-buff and reddish-buff; two examples also exhibit traces of lateral black markings, and in one of them these coalesce posteriorly and form an interrupted U-shaped line. The *anal operculum* in the young females is markedly attenuated and very narrow. The *antennae* are similar to those of the adults, but in one example these organs are asymmetrical, the right antenna

* "Cat. Coccidae of the World," p. 104 (1903).

being short, stumpy and of five segments; the other normal, consisting of seven segments.

This insect differs from *L. punctuliferum*, Green,* in the greater length of the tarsus, in having seven instead of eight segments to the antennae, in the sparseness of the oval derm cells, and in the form of the anal operculum.

With the limited supply of specimens it is impossible to say if there is any variation in the character of the antennae; but so far as one can judge this insect appears to be a well-marked race of *L. punctuliferum*.

All the adult female Coccids had evidently been protected by ants, as portions of the coverings or "sheds" are still attached to the twig and partly cover the little colony of Coccids. On tearing out a small fragment of one of these coverings one finds that it is composed largely of finely comminuted vegetable detritus, among which there are fragments of bud-scales and numerous, unicellular, epidermal plant hairs; interspaced at rare intervals there are traces of the mycelium of a fungus. It is difficult to understand how this material is held together as there are certainly no silken threads employed in its formation; moreover, it has no constituent readily soluble in water, so that, apparently, no gum-like material is used in cementing the fragments of leaves together.

Green (*l. c.*) says that *L. punctuliferum* is "attended by ants (*Oecophylla smaragdina*), which had fastened the leaves (of the food-plant) together, forming a shelter." Wheeler,† in discussing the relation of ants to plant-lice, scale insects and caterpillars, gives an illustration of a "carton aphid tent built by *Cremastogaster lineolata*" which is of similar form to those built over the colonies of the *Lecanium* herein described.

One of the co-type females of *L. punctuliferum*, var. *lamborni*, contains the pupa of a Chalcidid parasite, and another example *in situ* upon the stem of the food-plant has a small perforation in the dorsum indicating the escape of a similar or identical parasite.

See also p. 447.

* "Coccidae of Ceylon," p. 205, pl. lxx, figs. 5-13 (1904).

† "Ants: Their Structure and Development," p. 341, fig. 205 (1910).

EXPLANATION OF PLATES XXVI-XXIX.

(See *Explanation facing the PLATES.*)

EXPLANATION OF PLATE XXIX.

- FIG. 1. *Rhinopsylla lamborni*, Newstead; *a*, pygidium of ♀, ventral; *b*, circumgenital glands; *c*, wing; *d*, pectinated extremity of hind tibia of ♀; *e*, pectinated extremity of middle tibia of ♂.
2. *Rhinopsylla lamborni*, Newstead; male genital armature; *a*, superior claspers; *b*, vesica; *c*, penis; *d*, inferior claspers; *e*, median process.

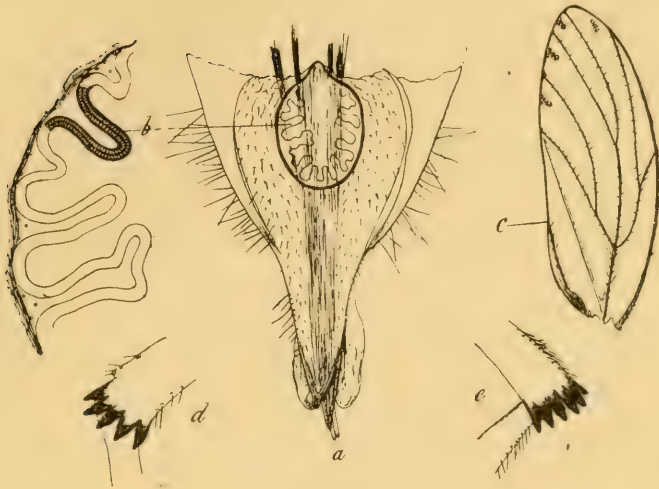
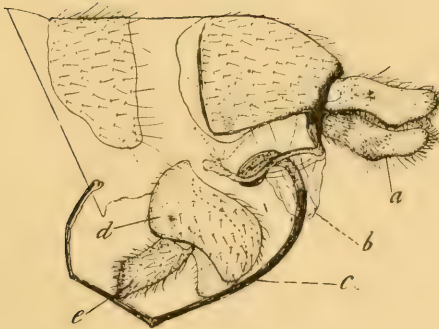


FIG. 1.



R. Newstead, del.

C. Hentschel.

FIG. 2.

RHINOPSYLLA LAMBORNI, Newstead.

XXI. *Descriptions of new species of Staphylinidae from India.* By MALCOLM CAMERON, M.B., R.N., F.E.S.

[Read October 1st, 1913.]

PROTEININI.

1. *Megarthrurus rufomarginatus*, n. sp.

Broad, convex, pitchy brown or pitchy black, sides of thorax reddish testaceous, obtusely angled at the middle. Antennae with first five or six joints reddish testaceous, the following infusate, the last pale testaceous. Legs and palpi reddish testaceous. Length 2·3 mm.

Of the size and short ovate convex build of *M. bimaculatus*, Fvl., but differs entirely in the colour and the shape of the thorax.

Head subtriangular, with a narrow oblique impression on either side posteriorly, finely but roughly sculptured. Antennae with first two joints stout, 2nd shorter than 1st, 3rd to 8th long and slender, 3rd to 5th of equal length, 6th to 8th gradually decreasing in length, 9th and 10th transverse, 11th suborbicular; the last three joints forming a club. *Thorax* twice as broad as long, the sides narrowly explanate, increasing in width from the anterior angles to the middle, obtusely angled, slightly narrowed and slightly emarginate before the posterior angles; disc with median impressed line from base to apex; sculpture rugose and rather coarse. *Elytra* convex, ample, rather more shining than the fore-parts, dilated behind, widest at the posterior third, coarsely and somewhat asperately punctured. *Abdomen* strongly narrowed behind, closely, finely and asperately punctured.

Hab. S. INDIA, Nilgiri Hills (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

OMALIINI.

2. *Phloeonomus* (s. str.) *discalis*, n. sp.

Black, a little shining, elytra dirty testaceous, all the margins infusate. Antennae black, the first two joints pitchy. Legs testaceous. Length 1·8 mm.

Of the size and build of *P. obscurus*, Kr., distinct by the more shining appearance, yellowish and much more finely and sparingly punctured elytra.

Head subtriangular, narrowly impressed on either side of the vertex before the ocelli; finely but distinctly coriaceous, impunctate. Antennae with 1st and 2nd joints stout, 3rd and 4th globose, 5th slightly, 6th to 10th more strongly transverse, gradually increasing in breadth, 11th short, oval. *Thorax* strongly transverse, widest at the middle, regularly rounded from the anterior angles to the base, scarcely perceptibly sinuate before the posterior angles which are obtuse and slightly explanate; disc longitudinally impressed on either side of the middle line posteriorly, finely but distinctly coriaceous, superficially and sparingly punctured. *Elytra* broader than, and twice as long as the thorax, coriaceous, very finely and sparingly punctured. *Abdomen* coriaceous, finely and sparingly punctured.

Hab. S. INDIA, Nilgiri Hills (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

OXYTELINI.

3. *Oxytelus (Anotylus) myrmecophilus*, n. sp.

Black, opaque, the front of the head and the abdomen a little shining; thorax feebly tri-sulcate, impressed laterally, the sides narrowed posteriorly in a straight line. Antennae entirely black, legs testaceous. Anterior tibiae not emarginate. Length 2 mm.

Very similar to *O. tetracarinatus*, Block, but the antennae stouter, the sculpture of the head and thorax longitudinally strigose, the sculpture of the elytra stronger and the abdomen much less distinctly punctured.

Head large, transverse, sub-quadrate, scarcely as wide as the thorax in either sex, temples as long as the diameter of the eyes; impressed with a narrow transverse line towards the front between the antennal tubercles, which, with the part anterior to the line are smooth and shining, the rest densely and finely strigose, impunctate. Vertex sometimes foveolate. Antennae with the 3rd joint shorter than 2nd, 4th small, transverse, 5th square, 6th to 10th transverse, gradually increasing in width, 11th pointed. *Thorax* transverse (less in ♀), broadest just behind the anterior angles, gradually narrowed posteriorly in a straight line to the blunted posterior angles. The sulci feeble, the external curved, the sides impressed, strigose, impunctate. *Elytra* transverse, longer

than the thorax, strigose and obsoletely punctured. *Abdomen* shining, finely and moderately closely punctured.

♂: 6th ventral segment broadly emarginate.

Hab. S. INDIA, Nilgiri Hills (Mr. H. E. Andrewes' Collection). Found in numbers in a decayed *Ficus* in nest of *Phidologiton diversus*, Jerd., by Mr. H. L. Andrewes, November 1906.

4. *Platystethus dilutipennis*, n. sp.

Black, shining; thorax with a row of three or four punctures on either side of the middle line and two or three near the sides, otherwise impunctate. Elytra testaceous, infusate about the scutellum and the postero-external angles. Antennae with first four joints reddish testaceous, the rest black. Mandibles, palpi and legs testaceous. Length 3.5 to 4 mm.

Head (in ♂) very large, transversely suborbicular, densely coriaceous, scarcely perceptibly punctured, broader than the thorax; in ♀ scarcely as broad as the thorax, more shining, much less coriaceous, very finely and sparingly punctured. In both sexes the front is produced into two rather short triangular spines. Antennae with 2nd and 3rd joints of equal length, 4th globose, 5th slightly, the following gradually more strongly transverse, 11th elongate, oval. *Thorax* almost semicircular, posterior angles obliterated, the anterior rectangular; disc with three or four large punctures on either side of the middle line and two or three nearer the sides, no perceptible ground sculpture. *Elytra* transverse, emarginate posteriorly; measured along the suture a little shorter than the thorax, very sparingly and obsoletely punctured. *Abdomen* almost impunctate.

♂: 6th ventral segment with an emargination closed by a white membrane which projects backwards beyond the margin of the segment with a free rounded edge. 7th ventral segment impressed and slightly emarginate posteriorly.

Hab. S. INDIA, Nilgiri Hills, 3500 feet above the sea-level (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

OSORIINI.

5. *Osorius monticola*, n. sp.

Black or pitchy, shining, thorax transverse, closely and rather coarsely punctured; elytra distinctly but less closely punctured. Antennae and legs reddish testaceous. Length 5.5 mm.

Of the size and superficial appearance of *O. nilgiriensis*, Fvl., the head is, however, broader, the thorax shorter and broader with much closer puncturation and the elytra are more closely punctured.

Head nearly as broad as the thorax, emarginate anteriorly, strigose, except the vertex which is smooth and shining and the sides of the front which are sparingly punctured; pubescence scanty, yellowish. Antennae with elongate 1st joint, 2nd much shorter, 3rd shorter than 2nd, 4th to 10th moniliform. *Thorax* transverse, as broad as the elytra, widest at the anterior angles, narrowed in a slightly curved line to the base, without perceptible sinuation before the posterior angles which are pretty distinctly impressed; closely punctured, disc with smooth central line, sparingly pubescent. *Elytra* a little longer than broad, rather closely but superficially punctured. *Abdomen* coriaceous, sparingly punctured at the sides, pubescence yellow, long, scanty.

Hab. S. INDIA, Nilgiri Hills (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

6. *Osorius indicus*, n. sp.

Black, head and thorax not very shining (with greasy lustre only), the former impunctate, striate, the latter with rather large, not very deep, moderately close puncturation. Elytra reddish brown with rather large, superficial, scattered punctures. Antennae and legs red. Length 5.5 mm.

Size and stature of *O. nilgiriensis*, Fvl., from which it is distinguished by the less shining, much more finely strigose head, less shining more coarsely punctured thorax and the more distinctly punctured elytra. From *O. monticola*, Cam., by the more finely strigose, less shining head, the differently shaped, much more coarsely and much less closely punctured thorax and the shorter, coarser and more sparingly punctured elytra.

Head large, nearly as broad as the thorax, finely strigose except in front which is finely wrinkled. Antennae with 3rd joint shorter than 2nd, 4th and 5th shortly oval, 6th to 10th moniliform. *Thorax* transverse, gradually narrowed in a straight line for the anterior two-thirds, then abruptly constricted to the base, anterior angles rectangular, posterior obtuse, distinctly impressed; puncturation rather large, superficial and moderately close, median line of disc impunctate; pubescence sparing, yellow. *Elytra* as long as broad, superficially and not closely punctured as in *O. pilosus*, Fvl. pubescence yellow. *Abdomen* coriaceous, sparingly punctured at the sides, with rather long yellow pubescence.

Hab. S. INDIA, Nilgiri Hills (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

OXYPORINI.

7. *Oxyporus apicalis*, n. sp.

Black, shining, elytra red anteriorly; abdomen with first three visible segments, the extreme sides of the fourth and the apex of the last red. Antennae, palpi femora (except the extreme base) and tarsi, testaceous, the tibiae and extreme base of the femora, black. Length 7 to 10 mm.

Head larger than the thorax, scarcely dilated behind the eyes, black, shining, impressed on the front and with a single puncture near posterior margin of each eye, otherwise impunctate; clypeus testaceous, mandibles black. Antennae with 2nd to 6th joints a little longer than broad, the subsequent gradually strongly transverse. *Thorax* scarcely broader than long, broadest just before the middle, narrowed posteriorly in a straight line; disc with a longitudinal impression on either side of the middle line posteriorly and a transverse impression across the middle from side to side. Prosternum black, rest of pectus red. Scutellum impunctate, reddish. *Elytra* scarcely broader than long, more than the posterior third black and the suture narrowly black almost to the scutellum, the colours are not sharply defined from each other. Puncturation coarse and scattered. *Abdomen* with the first three visible segments red, fourth black with the lateral margins and a small triangular adjacent area at the base, red; fifth entirely black, 6th black with apex testaceous.

Hab. BURMAH, Ruby Mines (British Museum Collection).

MEGALOPINI.

8. *Megalops sexdentatus*, n. sp.

Black, shining, elytra partly yellow. Thorax viewed from above, with three distinct teeth on either side. Antennae ferruginous with black club, palpi testaceous, femora pale testaceous (except the apex and extreme base which are brown), tibiae ferruginous, tarsi testaceous. Length 3.2 mm.

Head large, distinctly broader than the thorax, rather coarsely and closely punctured, with an irregular smooth space in front between the eyes. Clypeal spines yellow, divergent. Antennae short, 1st joint rather short and stout, 2nd stouter, and much shorter than 3rd which is elongate, 4th quadrate, 5th to 7th scarcely

longer than broad, 8th as long as broad, 9th strongly transverse, 10th much larger and broader than 9th, 11th large, oval. *Thorax* as long as broad, broadest in front, viewed from above with three teeth on either side, one at the anterior angles, one before the middle and one near the posterior angles; deeply impressed with four more or less transverse coarsely punctured grooves, the ridges between these smooth and shining; the first groove follows the anterior margin and is not interrupted on the middle line of the disc, the 2nd and 3rd are both interrupted by a narrow longitudinal keel, the 4th follows the posterior margin and is not interrupted. The 3rd ridge has a large puncture on either side. *Elytra* transverse, shorter than the thorax, shoulders prominent, dilated and rounded at the sides; disc irregular, the surface of each with three elevations or calli, one longitudinal near the suture, one passing back from the humeral angle, the third, rounded and situated at the middle of the lateral border; the depressions between the calli present some large irregular punctures, the rest of the surface smooth and shining, black with an irregular yellow band passing from near the base of the suture outwards and slightly backwards to the middle of the lateral border, but not quite reaching it, and an elongated yellow patch reaching from the inner end of the first to the posterior margin along the suture, nowhere, however, does the yellow coloration involve the margins, which are entirely black. *Abdomen* smooth and shining, the first five visible segments with an oblique stria on either side of the base.

♂: Unknown.

Hab. CEYLON, Galle; ASSAM, Patkai Mountains (British Museum Collection).

STENINI.

9. *Stenus diffidens*, n. sp.

Black, shining, abdomen bordered, with a median keel at the base of the first four visible segments. *Elytra* ample, as broad as long. *Antennae*, legs and palpi testaceous, the club of the former scarcely infusate. Fourth joint of the tarsi simple. Length 2.8 mm.

In the build of the fore-parts somewhat similar to *S. bispinus*, Mots, but much less shining and quite distinct by smaller size and the structure of the tarsi and abdomen.

Head broad, about one-third broader than the thorax, narrower than the *elytra*, depressed on either side of the front which is elevated and more finely punctured than at the sides where

the puncturation is much stronger and closer. Antennae moderately long, all the joints longer than broad, the last three forming a club. *Thorax* about a third longer than broad, broadest at the middle, sides slightly rounded and equally narrowed in front and behind, rather coarsely and closely punctured: pubescence whitish, moderate. *Elytra* ample as long as the thorax and as broad as long, similarly punctured to the thorax. *Abdomen* gradually narrowed posteriorly, margined, first four visible segments with a median keel, puncturation fine and close on the basal parts of the segments, much finer and more sparing on the apical parts: pubescence whitish, rather distinct.

♂: Unknown.

Hab. ASSAM, Sudiya (British Museum Collection).

10. *Stenus* (*Hypostenus*) *nitidulus*, n. sp.

Black, shining, elongate; head carinate; thorax almost cylindrical, much narrower than the head; elytra ample, as long as broad; fore-parts moderately, coarsely, and closely punctured. Abdomen cylindrical, not margined, less coarsely and closely punctured than the fore-parts. Antennae, palpi and legs testaceous, the club of the former scarcely infuscate. Fourth joint of the tarsi bilobed. Length 4 mm.

At first sight this species is not unlike *S. bispinus*, Mots, but the head is broader and the thorax narrower, the puncturation of the fore-parts is, however, very similar, but that of the abdomen is very much coarser.

Head much broader than the thorax, as broad as the elytra, with a smooth elevated central space, depressed on either side, rather coarsely and closely punctured. Antennae long and slender, 1st and 2nd joints of equal length, 3rd to 8th very long and slender, gradually decreasing in length, 9th to 11th forming a slender club. *Thorax* narrow, almost cylindrical when viewed from above, very slightly and equally narrowed in front and behind, one-third longer than broad, rather coarsely and closely punctured, sometimes with a smooth space in the middle of the disc. *Elytra* as long as the thorax, as broad as long, sometimes slightly impressed behind the shoulders, punctured similarly to the thorax. *Abdomen* cylindrical, the segments constricted at the bases, puncturation finer and less close than on the fore-parts, especially behind. Pubescence scanty, greyish. Anal spines wanting.

♂: Last ventral segment with deep excision, the apex of which is rounded.

Hab. MANIPUR (British Museum Collection).

11. *Stenus (Hypostenus) nilgiriensis*, n. sp.

Black, shining; elytra much shorter than the thorax, fore-parts very coarsely and closely punctured; abdomen feebly margined at the sides, moderately strongly and closely punctured anteriorly. Antennae, legs and palpi yellow, the club of the former slightly infusate. Fourth joint of tarsi bilobed. Length 4 mm.

In size and build almost exactly similar to *S. brachypterus*, Kr., from which it is at once distinguished by the much stronger puncturation and the longer thorax.

Head large, nearly as broad as the elytra posteriorly, depressed between the eyes without central raised space, closely and deeply punctured. Antennae slender, 3rd joint much longer than 2nd, 4th to 8th gradually decreasing in length, 9th, 10th and 11th oval, stouter than the preceding, forming a club. *Thorax* much narrower than the head, a little longer than the greatest breadth which is just before the middle, narrowed gradually in front, more strongly behind, strongly and closely punctured like the head. *Elytra* (measured along the suture) half the length of the thorax, narrower at the shoulders, widened behind and strongly emarginate, more strongly and deeply punctured than the thorax. *Abdomen* cylindrical, narrowly margined, pretty coarsely and closely punctured, (but less so than the fore-parts) the last two segments more finely and sparingly punctured; the last segment with two short, rather stout spines.

♂: Last ventral segment with a shallow emargination.

Hab. S. INDIA, Nilgiri Hills, Ouchterlony Valley, 5000 feet above sea-level, by sweeping (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

12. *Stenus (Nestus) carinatus*, n. sp.

Black, shining, puncturation of the fore-parts coarse, more or less transversely confluent on the thorax. Abdomen pointed, margined, the first three visible segments each with three distinct keels at the bases, fourth with a smaller median keel only: the segments rather closely punctured in the basal depressions, much less closely towards the apical borders. Palpi and legs testaceous, the extreme apices of the femora brownish. Antennae with first seven joints brownish testaceous, the rest blackish. Fourth joints of tarsi simple. Length 3.3 mm.

In size and build almost exactly similar to *S. tricarinatus*, Kr., but easily distinguished by the carinate, margined, abdomen and the simple fourth tarsal joints.

Head a little broader than the thorax, not so broad as the elytra, impressed on either side of the front, elevated in the centre, coarsely punctured all over without any smooth space. *Antennae* rather short, 1st and 2nd joints of equal length, 3rd to 7th longer than broad, gradually decreasing in length, 8th but little longer than broad, 9th to 11th forming a club. *Thorax* convex, a little longer than broad, widest at the middle, sides rounded and equally narrowed in front and behind; puncturation, coarse, close and rugose, more or less transversely confluent on the disc, without depressions. *Elytra* ample, very slightly broader than long and about as long as the thorax, puncturation as coarse as on the latter, but not confluent. *Abdomen* distinctly pointed, the first three visible segments each with three distinct keels, one median and one on either side, the fourth with a single median keel; bases of the segments closely, but much more finely punctured than the fore-parts, the apices yet more finely and sparingly punctured; pubescence grey, scanty.

♂: Unknown.

Hab. CEYLON, Kandy (British Museum Collection).

13. *Dianous versicolor*, n. sp.

Bronze-black, shining, with distinct greenish-violet iridescence, especially on the head and abdomen. Legs, palpi and antennae (except last three joints which are dirty testaceous), black. Length 6 mm.

Head with the eyes broader than the thorax, not so broad as the elytra; bronze-green with a sheen like satin especially on the vertex, more opaque and blacker anteriorly, densely and finely punctured. *Antennae* black, the last three joints dirty testaceous, 2nd joint shorter than the 1st and 3rd, the latter very long, the following gradually decreasing in length. *Thorax* shining bronze with distinct green reflex, shining (but without the satiny gloss seen on the head), a little longer than broad, the sides dilated and rounded before the middle, narrowed and parallel behind, strongly impressed on either side at the widest part and before the base in such a manner as to form on either side a distinct reniform callus with the concavity inwards; exceedingly sparingly, scarcely perceptibly punctured, but with a fine coriaceous ground sculpture; glabrous. *Elytra* much longer than the thorax, uneven, strongly impressed behind the shoulders, on either side of the suture and less distinctly before the postero-external angles; bronze-green like the head, densely and finely punctured, finely pubescent. *Abdomen* iridescent,

finely and much less densely punctured than the elytra, finely pubescent. Anal styles long and slender.

♂: Penultimate ventral segment impressed in the middle before the posterior margin which is rather broadly emarginate, the impression is densely clothed with stiff yellowish hairs; the last ventral segment is slightly emarginate.

Hab. INDIA, Lebong, 5000 feet above the sea-level (Mr. H. E. Andrewes' Collection). Collected by Mr. H. Maxwell Lefroy.

14. *Dianous andrewesi*, n. sp.

Black, shining, with more or less metallic green or violet reflex throughout. Palpi, legs and antennae (except the last three joints) black. Length 6 mm.

Very distinct from the preceding by the strong, rugose and confluent puncturation of the thorax and elytra.

Head with eyes broader than the thorax, nearly as broad as the elytra, longitudinally impressed on either side, slightly elevated in the middle line, closely and moderately strongly punctured. Antennae black, the last two or three joints fuscous, of similar structure to the preceding. *Thorax* slightly longer than broad, moderately dilated and rounded before the middle, narrowed and parallel posteriorly, strongly impressed on either side of the disc; puncturation much coarser than on the head, rugose and confluent. *Elytra* almost twice as long as the thorax, uneven, puncturation coarse, rugose and more confluent than on the thorax. *Abdomen* iridescent, rather closely and finely punctured, with fine whitish pubescence.

Observe. Some specimens are much less metallic than others, indeed almost entirely black.

♂: Penultimate ventral segment with a small emargination at posterior border, the vicinity of which is clothed with stiff yellowish pubescence.

Hab. INDIA, Lebong, 5000 feet above the sea-level (Mr. H. E. Andrewes' Collection). Collected by Mr. H. Maxwell Lefroy.

PINOPHILINI.

15. *Pinophilus mixtus*, n. sp.

Black, rather dull, head with an almost smooth, curved, transverse space between the eyes, and the front with an almost smooth space

continuous posteriorly with it; puncturation of rest of surface rather coarse and close, with a much finer scanty puncturation on the interspaces and the smooth areas. Thorax scarcely longer than the greatest breadth. Antennae, palpi and legs reddish testaceous, base of the tibiae narrowly infusate. Length 18 mm.

Somewhat similar to *P. aegyptius*, Er., but broader, the thorax longer and with a quite different puncturation.

Head transverse, a little narrower than the thorax, with rather large, close, but not deep punctures, these at the bottoms and the interspaces more finely punctured: a curved shining transverse space between the eyes and a shining space continuous with it behind occupies the middle of the front, these spaces are finely punctured; the sides of the front are strongly punctured; pubescence yellow, scanty. Antennae slender, the 3rd to 5th joints of equal length, 6th to 11th gradually decreasing in length, but all longer than broad. *Thorax* slightly longer than broad, narrowed in a straight line from the anterior to the completely rounded posterior angles, the puncturation is much coarser than in *P. aegyptius*, Er., and the bottoms of the punctures are finely punctured, but not the interspaces; disc posteriorly with a very obsolete trace of a median impressed line. *Elytra* about a third longer than the thorax, much longer than broad, rather more strongly punctured than in *P. aegyptius*, Er., but of the same rugose character. *Abdomen* very similarly punctured to *P. aegyptius*, not iridescent, pubescence moderate, greyish.

♂: Last ventral segment rather deeply emarginate on each side, the intervening portion bordered and very slightly emarginate.

Hab. N. INDIA, Dacca (British Museum Collection).

16. *Pinophilus speculifrons*, n. sp.

Black, head shining coarsely punctured, with smooth spaces between the eyes and on the front. Thorax and elytra much less shining, the latter reddish brown. Antennae, palpi and legs reddish testaceous. Length 10.5 mm.

Head transverse, subtriangular, with coarse umbilicate punctures, except for a narrow smooth curved transverse space extending between the eyes and a triangular smooth space at the front margin; pubescence scanty, yellow. Antennae slender, all the joints longer than broad, gradually decreasing in length after the third. *Thorax* a little broader than the head, slightly broader than long, the sides parallel for the anterior half, thence gradually rounded and narrowed to the completely rounded posterior angles; anterior angles bluntly

rectangular: puncturation much less coarse than on the head, umbilicate, disc with narrow smooth central line; pubescence scanty, yellow. Scutellum punctured. *Elytra* narrower, but a little longer than, the thorax, a little longer than broad, puncturation strong, deep and close; pubescence yellow, scanty. Abdomen moderately, closely, and strongly punctured, pubescence yellow, rather long.

Hab. S. INDIA, Nilgiri Hills, Ouchterlony Valley, 3000 feet, in mud workings of Termites in tree (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

17. *Pinophilus nigripes*, n. sp.

Black, shining. Head with coarse umbilicate puncturation all over, without smooth spaces. Thorax as long as broad, the sides rounded and narrowed from the anterior to the posterior angles. Abdomen with the bases of the segments strongly and closely punctured, the rest finely and sparingly punctured. Antennae red, palpi brown, legs pitchy black. Length 12 mm.

Head transverse, sculpture coarse, close, umbilicate and without any impunctate space; temples minute. Antennae long and slender, 2nd joint shorter than 1st and 3rd, from 4th to 11th gradually decreasing in length, narrowed at the bases and all longer than broad. *Thorax* as long as broad, widest about the middle, gradually narrowed in a curved line anteriorly and more strongly, posteriorly; posterior angles obtuse; puncturation strong, close, umbilicate; disc posteriorly with trace of smooth shining median line. *Elytra* as long as the thorax, as long as broad, sides a little rounded, puncturation strong and close. *Abdomen* with the bases of the segments strongly and closely punctured and coriaceous, the posterior parts of the segments much more finely and sparingly punctured, with the ground sculpture much less distinct; pubescence close and silvery.

♂: Last ventral segment triangularly excised, the apex of the excision rounded.

Hab. NORTHERN INDIA (British Museum Collection).

18. *Oedichirus niger*, n. sp.

Apterous, entirely black or pitchy, rather shining. Antennae palpi and legs pale testaceous, the knees slightly infusate; pubescence long, yellow. Length 9.5 mm.

From the description this must be very near *O. birmanus*, Fvl., but differs in the entirely dark colour and the pale testaceous antennae and legs.

Head transversely suborbicular, sparingly and coarsely punctured, vertex more or less impunctate, pubescence long, yellow and sparing; posterior angles with a minute tooth. *Antennae* slender, 2nd joint shorter than 1st and 3rd and following much longer than broad, 4th to 7th of equal length, 8th to 11th gradually shorter. *Thorax* of the width of the head, longer than broad, rounded in front, narrowed in a straight line to the base; more or less impressed on either side of the middle line, very coarsely, closely and irregularly punctured. *Elytra* a little shorter than the thorax, narrowed at the base and widened behind, disc depressed, coarsely and rather closely punctured. *Abdomen* with the first four visible segments coarsely, rather closely, and irregularly punctured, the two last almost smooth.

♂: Last ventral segment with a broad and deep triangular excision of the posterior margin, the penultimate furnished with two long, stout backwardly directed processes.

Note. Immature specimens are reddish brown.

Hab. S. INDIA, Nilgiri Hills (Mr. H. E. Andrewes Collection). Collected by Mr. H. L. Andrewes.

19. *Oedichirus minor*, n. sp.

Black, shining; thorax with three rows of punctures on each side. *Elytra* half the length of the thorax. Abdominal segments (except the last) each with three transverse rows of large punctures. *Antennae*, palpi, and legs testaceous. Length 5.5 mm.

Head transverse, a little narrower than the thorax, temples denticulate, vertex impunctate, the front with a few large seliferous punctures. *Antennae* moderate, all the joints longer than broad, 2nd shorter than 1st, about as long as 3rd, 4th to 10th gradually decreasing in length, narrowed at the bases, 11th truncate. *Thorax* scarcely longer than broad, rounded and widened in front, strongly contracted to the base, furnished with three rows of large seliferous punctures on either side of the middle line, the median of six or seven, the intermediate of two very large ones, the external of three much smaller placed at the side margin two anteriorly, and one posteriorly. *Elytra* at the base of the width of the base of the thorax and (measured along the suture) half its length, strongly dilated and rounded at the sides, the greatest width just behind the middle, strongly emarginate posteriorly, with large, scanty, setiferous punctures. *Abdomen* with first five visible segments each with three transverse rows of large setiferous punctures, the last almost impunctate. *Anal styles* testaceous.

♂: Unknown.

Hab. CEYLON, Bogawantalawa, 5000 feet above the sea-level (British Museum Collection).

PAEDERINI.

20. *Paederus setifer*, n. sp.

Apterous, red, elytra blue, last two abdominal segments black. Antennae, palpi and legs entirely testaceous. Length 10 mm.

Very near *P. andrewesi*, Fvl., but differs by the longer, metallic blue elytra, the entirely testaceous legs and antennae, and the more numerous erect setae.

Head red, slightly transverse with rounded posterior angles, very sparingly punctured, finely setose. Antennae with all the joints elongate, gradually decreasing in length from the third. *Thorax* red, longer than broad, rounded in front, narrowed posteriorly, not margined at the sides, very sparingly punctured, finely setose. *Elytra* scarcely as long as the thorax, narrowed at the shoulders and widened behind, rather coarsely and somewhat asperately punctured, with well marked erect setae. *Abdomen* finely and rather sparingly punctured, pubescence rather long, partly erect.

♂: 7th ventral segment with moderately broad, deep excision, the sides of which are parallel.

Hab. CEYLON, Madulsima (British Museum Collection).

21. *Paederus aliceps*, n. sp.

Apterous, red, elytra very short, blue; abdomen black or reddish brown. Antennae, palpi and legs testaceous, the apex of the first infusate. Length 8 mm.

Allied to *P. capillaris*, Fvl., but differs from it by the red head and the absence of long black setae.

Head large, suborbicular, transverse, red, glabrous, very sparingly punctured. Antennae moderate, 2nd joint shorter than the 1st and 3rd, all the joints longer than broad gradually decreasing in length. *Thorax* red, scarcely as broad as the head, oval-oblong, a little narrower behind than in front, finely and very sparingly punctured. *Elytra* about half the length of the thorax, bright blue, narrowed at the shoulders and widened posteriorly, puncturation coarse, sparing and somewhat asperate, sparingly furnished with black setae. *Abdomen* black, or reddish brown, finely and very sparingly punctured, sparingly setose.

♂: 7th ventral segment deeply and narrowly incised, 4th slightly, 5th and 6th deeply impressed in the middle line.

Hab. MANIPUR (British Museum Collection).

22. *Paederus sharpi*, n. sp.

Head and last two abdominal segments black, thorax and first four visible abdominal segments red, elytra blue. Legs black, except the bases of the femora and coxae which are testaceous. Antennae brown, the first two and the last three joints testaceous. First joint of the maxillary palpi testaceous, the rest brown. Length 9 mm.

In size and superficially somewhat similar to *P. sondaicus*, Fvl., but broader and differs in the colour of the mandibles and palpi, the less testaceous femora, distinctly shorter and much more strongly punctured thorax, shorter elytra with shorter and less erect pubescence and the scarcely erect pubescence of the abdomen.

Head transversely rounded, sparingly punctured, with distinct brownish pubescence; mandibles brown; antennae with all the joints longer than broad, gradually decreasing in length from the third. *Thorax* rather short and broad, a little longer than broad, widest in front, the sides gradually rounded from base to apex, distinctly and not very sparingly punctured, sparingly pubescent. *Elytra* about a third longer than the thorax, longer than broad, parallel, moderately coarsely and moderately closely punctured with moderately close grey pubescence. *Abdomen* rather closely and finely punctured, with grey moderately close pubescence, not interspersed with erect setae.

♂: Unknown.

Hab. N. INDIA, Dacca (British Museum Collection).

23. *Paederus pubescens*, n. sp.

Head blue, thorax and first four visible segments of the abdomen red, elytra blue-black, last two abdominal segments and legs black. Anterior coxae, last joint of palpi, antennae (except the first two joints which are brownish testaceous) brown. Length 8 mm.

In stature, coloration of the body and general appearance very similar to *P. variicornis*, Fvl., but differs from it by the broader head and thorax, entirely black legs and the very distinct silvery pubescence especially noticeable on the abdomen.

Head suborbicular, a little broader than the thorax, very sparingly and very finely punctured, with distinct silvery pubescence. Antennae slender, all the joints longer than broad. Mandibles black.

Thorax oviform, not bordered at the sides, very sparingly and finely punctured, with silvery pubescence. Scutellum red. *Elytra* parallel, a little broader and one third longer than the thorax, puncturation rather fine, squamous as in *variicornis*, rather densely clothed with silvery pubescence. *Abdomen* finely and rather closely punctured, densely covered with silvery depressed pubescence, without any erect black setae.

♂: Unknown.

Hab. ASSAM (British Museum Collection).

24. *Paederus argentatus*, n. sp.

Head and elytra cyanous, thorax and first four visible segments of the abdomen, red, the last two black. Anterior coxae internally, tibiae and base of the femora, obscure brownish testaceous, the rest black. Antennae black, scarcely lighter at the base. Distinctly pubescent. Length 7 mm.

In build, size and coloration of the body very similar to *P. amoenus*, Er.; distinct by the colour of the anterior coxae, less closely punctured elytra and especially by the very distinct silvery pubescence particularly of the abdomen. From the preceding species it is distinguished by its smaller and narrower build, narrower and much more thickly punctured head, and narrower and more distinctly punctured thorax.

Head suborbicular, broader than the thorax, distinctly punctured at the sides in front, pubescence distinct, silvery. Mandibles black. *Thorax* long, oviform, distinctly but not closely punctured, the sides not bordered. *Elytra* half as long again as the thorax, parallel, more finely and less closely punctured than in *P. amoenus*, Er., and with distinct silvery pubescence. *Abdomen* finely but not very closely punctured, clothed with long silvery pubescence, not interspersed with any black setae.

Hab. N. W. INDIA, Karachi (Mr. H. E. Andrewes' Collection). Collected by Mr. T. R. D. Bell.

25. *Astenus H-signatus*, n. sp.

Black, elytra reddish testaceous, with the sides (except the postero-external angles) broadly, and a narrow median transverse band, black, forming a distinct black H-pattern. Antennae, palpi and legs testaceous. Length 5 mm.

Head subquadrate, broader than the thorax, sides behind the eyes slightly convergent to the rounded posterior angles, sculpture close, umbilicate. Antennae moderate, all the joints longer than broad,

gradually decreasing in length from the third to the tenth. *Thorax* narrower than the elytra, longer than broad, the anterior angles rounded, the sides gradually narrowed from before backwards, sculpture as on the head. *Elytra* a little longer than the thorax, reddish testaceous, with the sides except the postero-external angles, a median transverse band crossing the suture and joining the lateral bands, black; this arrangement of colour gives a very definite figure of the capital letter H. The suture is very narrowly infusate; puncturation moderately close and fine; pubescence yellow. *Abdomen* black, the posterior margins of the segments narrowly ferruginous, puncturation fine and moderately close, pubescence yellow. Anal styles rather long, slender.

♂: Last ventral segment with semicircular emargination.

Hab. ASSAM, Patkai Mountains (British Museum Collection).

26. *Sclerochiton* (?) *andrewesi*, n. sp.

Black (head slightly pitchy), opaque, postero-external angles and apical margin of elytra, narrowly testaceous. Antennae and legs testaceous. Length 2.5 mm.

This insect will probably form the type of a new genus, as it differs from *Sclerochiton* by not having the labrum bilobed, it may possibly further differ in the structure of the mouth parts, but as the specimen is unique, I am unable to dissect them. From *Echiaster* it is distinguished by the absence of teeth on the labrum.

Head large, transverse, suborbicular, broader than the elytra, eyes very large occupying the whole sides of the head, temples wanting; puncturation moderately coarse, close, umbilicate. Antennae short, the first two joints of equal length, shorter than the following, 4th shorter than 3rd, 5th to 7th orbicular, 8th to 10th transverse, 11th oval, pointed. *Thorax* much narrower than the head, longer than broad, strongly narrowed in front of the obtuse anterior angles, much less strongly narrowed behind to the rounded posterior angles; disc without impressions; puncturation similar to that of the head. *Elytra* a little longer and wider than the thorax, longer than broad, puncturation rather coarse, close and somewhat rugose, scantily pubescent. *Abdomen* slightly narrowed behind, more shining than the fore parts, rather coarsely and closely punctured on the first four segments, more finely and sparingly behind; pubescence rather long and moderately close.

Hab. S. INDIA, Nilgiri Hills (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

27. *Stilicus indicus*, n. sp.

Black, dull, elytra copper-bronze, slightly shining, with apical margins and postero-external angles testaceous. Antennae, palpi and legs reddish testaceous. Length 4.3 mm.

In size and build similar to *S. ceylanensis*, Kr., but differs by the less shining, much more closely punctured elytra, which have also irregular large punctures on the disc.

Head large, transverse as broad as the elytra, temples gradually converging behind, posterior angles rounded, densely punctured. *Antennae* with 4th joint longer than broad, 5th to 7th moniliform, 8th to 10th transverse. *Thorax* longer than broad, anterior angles distinct, obtuse, sides rather strongly narrowed backwards, puncturation coarser than that of the head, disc without smooth central line. *Elytra* a little longer than the thorax, as long as broad, finely and rather closely punctured, with some very irregular, larger punctures on the disc; finely pubescent. *Abdomen* rather closely and finely punctured and pubescent.

♂: Unknown.

Hab. ASSAM, Patkai Mountains (British Museum Collection).

28. *Hypomedon (Chloëcharis) nigriventris*, n. sp.

Narrow, parallel, reddish testaceous, elytra infusate on the disc, abdomen black posterior margins of the segments narrowly and whole of the last, reddish testaceous. Antennae, palpi and legs testaceous. Length scarcely 3 mm.

Narrower than *H. debilicornis*, Woll., and easily distinguished by the much longer and not transverse head, which is also much more closely and deeply punctured, the longer antennae and the black abdomen. In build very similar to *H. melanocephalus*, F.

Head square, as broad as the elytra, temples long, parallel, posterior angles rounded, eyes small; puncturation rather coarse, close and umbilicate, very much similar to the genus *Astenus*. *Antennae* with 2nd and 3rd joints of equal length, 4th a little longer than broad, 5th to 7th moniliform, 8th to 10th transverse, 11th short, oval. *Thorax* a little narrower than the head, about as long as broad, a little wider at the anterior angles which are obtuse, very slightly narrowed backwards to the rounded posterior angles; puncturation much less coarse, close and deep than on the head, not umbilicate: disc with a narrow, smooth, central line. *Elytra* about a third longer than the thorax, longer than broad, rather coarsely, closely somewhat rugosely punctured, obsolescent posteriorly; disc

infusate leaving the base and apex clear. *Abdomen* rather closely and not very finely punctured anteriorly, more sparingly and finely behind; pubescence moderate, yellow.

♂: Unknown.

Hab. CEYLON, Dikoya, 4000 feet above sea-level (British Museum Collection).

29. *Cryptobium nilgiriensis*, n. sp.

Entirely black, head and thorax rather shining, elytra and abdomen subopaque. Antennae red, palpi, tibiae and tarsi reddish testaceous, femora pale testaceous. Length 10 mm.

Size of *C. elephas*, Fvl., differs from this species by the head not at all enlarged behind the eyes, the thorax less contracted behind, the more shining, more coarsely punctured head, and the less coarsely punctured thorax and elytra.

Head broader than the thorax, oval oblong, temples gradually rounded and narrowed to the base with the posterior angles rounded and with close, rather coarse umbilicate puncturation, the extreme front finely wrinkled; the antennae shorter than in *C. elephas*, Fvl. 1st joint as long as the three following together, 2nd about half as long as the 3rd, 4th to 6th longer than broad, 7th to 10th scarcely longer than broad, 11th short, oval. *Thorax* narrower than the head, about a third longer than broad, a little narrowed backwards from the middle (when viewed from above); puncturation as on the head, disc with smooth median line; pubescence fuscous, sparing. *Elytra* slightly longer and a little broader than the thorax, longer than broad, not quite as coarsely punctured as the thorax; distinctly pubescent. *Abdomen* moderately, closely, and finely punctured and pubescent.

♂: Last ventral plate with deep triangular excision, the sides of which are bordered and the apex rounded; the penultimate segment scarcely perceptibly emarginate at the middle of the posterior border.

Hab. S. INDIA, Nilgiri Hills, Ouchterlony Valley, 3500 feet above sea-level in January (Mr. H. E. Andrewes' Collection). Collected by Mr. H. L. Andrewes.

30. *Cryptobium brunnipes*, n. sp.

Entirely black, head elytra and abdomen rather dull, thorax shining. Palpi, 1st joint of antennae and femora reddish testaceous, rest of antennae, tibiae and tarsi infusate. Length 10 mm.

From the description this species would appear to be closely allied to *C. sharpi*, Fvl.

Head a little longer than broad, a little broader than the thorax, not so broad as the elytra; temples long, slightly convergent posteriorly to the rounded posterior angles; puncturation rather coarse, close and umbilicate, except on the front which is finely wrinkled. *Antennae* long, the 1st joint equal in length to the four following together, 2nd shorter than 3rd, 4th as long as 2nd, 5th to 10th all longer than broad, gradually decreasing in length, 11th oval, pointed, as long as 10th. *Thorax* nearly cylindrical viewed from above, a little longer than broad, slightly narrowed posteriorly, anterior angles rectangular, posterior rounded; disc with smooth longitudinal median line throughout the whole length; puncturation coarse and umbilicate, less dense than on the head. *Scutellum* smooth, shining. *Elytra* a third longer than the thorax with much finer puncturation, close and subrugose in character; pubescence fuscous, moderately dense. *Abdomen* finely and closely punctured throughout, rather densely covered with a fuscous pubescence.

♂: Last ventral segment with a triangular excession, the apex of which is rounded.

Hab. N. INDIA, Dacca (British Museum Collection).

XXII. *Additions and corrections to my Catalogue of the
Lepidoptera Rhopalocera of Trinidad (1904).*
By W. J. KAYE, F.E.S.

[Read October 1st, 1913.]

PLATE XXX.

TEN years have nearly elapsed since I published in the Transactions of this Society for 1904 (pp. 159–231), “A catalogue of the *Lepidoptera Rhopalocera* of Trinidad.” In that interval a very large number of additional records have been made, over one hundred and forty fresh species being now added to the list, bringing the total up to four hundred and thirty species. Large as this number is, there will doubtless be some additions yet to be made especially from the southern end of the Island, which has been very little explored entomologically. Many interesting forms remain probably to be discovered in this southern district with its totally different climate to the northern side of the Island. Many of the species found there are not to be taken in the north, such as *Heliconius wallacei*, *Heliconius antiochus alba*, *Papilio sesostris*, *Papilio belus varus*, *Helicopsis cupido* and several others, all of which belong to the Guiana region. It is possible that some intermediate forms, especially in the genus *Heliconius*, will be discovered which will link up some Venezuelan forms with those of Guiana. *Heliconius antiochus salvinii* might be expected to occur with the yellow band in the hind-wing in a transitional stage, for the subspecies is an inhabitant of the lower Orinoco. In the dense shore forest of the south coast one might certainly meet with true *Heliconius melpomene* and perhaps some of its very many named forms.

The bulk of the additions to the list are to be found in the *Erycinidae* and *Hesperidae*. Many interesting records have been made, however, of some of the larger and more conspicuous species, such as *Eunica orphise*, *E. malvina*, the very rare *Dynastor macrosiris*, which was taken by Sir Gilbert Carter at Government House; the two new subspecies of *Adelpha*, *A. phylaca trinita*, *A. velia trinita*,

in addition to *A. eubaea* and *A. melona*, bringing the number of indigenous species of this genus up to seven. *Chlorippe laure* was only discovered this year by Mr. K. St. A. Rogers to the north of Quenam Bay.

Many corrections have been made in nomenclature, as well as to sundry misstatements that somehow crept into the original paper.

To Mr. P. L. Guppy I owe practically all the additional facts of life-histories, as well as various notes and records of many imagines. Very many collections, both small and large, made by various people have been examined in the past ten years, and almost without exception some fresh species have been detected in each; often even from the neighbourhood of Port of Spain fresh species turn up that have not been detected before. In the case of the larger and more conspicuous species this certainly points to fresh accessions from Venezuela. One of the latest additions is that of *Pyrameis cardui*, which, with *Hypolimnys misippus* already recorded, one can claim to be the most roving butterflies in the world and strange company for the Neotropical fauna.

Species in brackets are recorded in the original catalogue.

Family DANAIDAE.

Subfamily ITHOMIINAE.

[6. MELINAEA TACHYPETIS.]

Although decidedly scarce this species is doubtless a resident in the Island, and has been taken several times in the past few years. Mr. F. Birch secured one at Tabacquite in August 1904, and this specimen is now in my collection. There are two specimens in the late Mr. H. J. Adams' collection at Enfield that were taken in St. Ann's Valley by Mr. G. E. Tryhane.

[11. PTERONYMIA NISE.]

This species which is the ♂ of *selene*, Cramer, rightly belongs to the genus *Calloleria*. The only further captures of the species I have heard of are: 1 ♂ Caparo Valley, July 16, 1904 (F. Birch); one or two in 1906 (Caracciolo). The species is doubtless gregarious and local, and its exact habitat probably remains to be discovered.

[12. HYMENITIS OCALEA.]

This species rightly belongs to the genus *Hypoleria*. It is widely distributed and common on the northern hills.

PTERONYMIA ALETTA.

Ithomia aletta, Hew., Ex. Butt., i, t. 6, p. 31 (1854).

Specimens in Mr. H. J. Adams' collection which were taken in St. Ann's Valley by G. E. Tryhane. Caracciolo took the species also in 1906.

Range. VENEZUELA.

DIRCENNA MELANIDA.

Papilio melanida, Cram., Pap. Ex., iii, t. 231, F. ♀.

Papilio lenea, Cram., Pap. Ex., iii, t. 231, D. ♂.

A ♂ secured by Sir Gilbert Carter at the Pitch Lake in 1907. It is quite likely that many species new to the list may still be detected from this remarkable region.

Range. BRIT. GUIANA.

Family MORPHIDAE.

Subfamily BRASSOLINAE.

BRASSOLIS SOPHORAE.

Papilio sophorae, Linn., Syst. Nat. (10), p. 471, No. 83 (1758).

Brassolis sophorae sophorae, Stichel, Gen. Ins., Fasc. 20, p. 7.

Brassolis sophorae, Guppy, Board of Agric. Circular, 5, pp. 19-21, pl. 1. Life history.

The "coconut butterfly."

Taken by Mr. Caracciolo in 1906. Mayaro (*F. W. Urich*) and in many localities in the larva stage quite recently.

Range. GUIANA to SOUTH BRAZIL.

[14. OPSIPHANES FABRICII.]

The name *fabricii* can no longer stand for this species. *cassina* antedating it. The synonymy stands thus:—

Caligo fabricii, Bdv., Lep. Guat., p. 54 (1870).

Papilio cassiae, Fab. (*nec* Linn.), Syst. Ent., p. 483, No. 178 (1775).

Opsiphanes cassina, C. and R. Feld., Wien. Ent. Mon.,
vol. 6, p. 122, No. 141 (1862).

Opsiphanes cassina merianae, Stichel, Berl. Ent. Zeit.,
vol. 46, p. 518 (1901).

Opsiphanes fabricii, Kaye, Trans. Ent. Soc., p. 165
(1904) (Trinidad, loc. err.).

Opsiphanes cassina fabricii, Stichel, Gen. Ins., Fasc. 20,
p. 21 (Trinidad, loc. err.).

The subspecies of *O. cassina* that occurs in the Island is therefore *merianae*.

[16. CALIGO EURYLOCHUS.]

The var. *minor* of this species described on pp. 165 and 166 was not a var. of *eurylochus*, but of *C. teucer*. The subspecies was, however, earlier described in the same year by Stichel—in the Insekten-Börse. The synonymy, therefore, stands thus :—

Caligo teucer insulanus, Stichel, Ins. Börse, vol. 21,
p. 21, No. 25 (1904).

Caligo teucer insulanus, Stichel, Gen. Ins., Fasc. 20, p. 35
(1904).

Caligo eurylochus var. *minor*, Kaye, Trans. Ent. Soc.
Lond., p. 165, No. 16 (1904).

Caligo teucer insulanus, Fruhs., in Seitz, Macro-Lep.,
Div. II, vol. v, p. 317.

CALIGO EURILOCHUS PHRYASUS.

Caligo eurilochus phryasus, Fruhs., in Seitz, Macro-Lep.,
Div. II, vol. v, p. 322 (1912).

This species is the rarest of the genus in Trinidad. The small insular form was only recently described by Fruhstorfer from a specimen taken at Maracas Fall by A. H. Fassl. The insect has also been taken round Port of Spain by both Caracciolo and G. E. Tryhane. The range of *eurilochus* in its many subspecies ranges from North to South and from East to West over nearly the whole of Tropical America at low elevations. Larva on Banana (*Fruhstorfer*).

The *C. eurylochus* var. *minor* recorded in 1904 was not *C. eurilochus* but a form of *C. teucer*. See under *C. teucer*.

[CALIGO SALTUS.]

In the Genera Insectorum, Fasc. 20, p. 15, Stichel treats this insect as a subspecies of *Caligo ilioneus* under the name *polyxenus*, a form described by him a year previously in the Insecten Börse, vol. 20, p. 389, No. 5, 1903. If his type specimen came from Trinidad my name would become a synonym of *polyxenus*. But Fruhstorfer in "Seitz Macrolepidoptera of the World," vol. v, Div. II, p. 319, 1912, treats *polyxenus* and *saltus* as distinct subspecies. For the present I follow Fruhstorfer, and adopting the trinomial system of nomenclature the insect would be known as *Caligo ilioneus saltus*.

DYNASTOR MACROSIRIS.

Dynastor macrosiris, Westw., Gen. Diurn. Lep., pl. lix, fig. 3.

Dynastor macrosiris macrosiris, Stichel, Gen. Ins., Fasc. 20, p. 10.

Taken at Government House, Port of Spain, by Sir Gilbert Carter in 1907, and by Mr. P. L. Guppy, jun., at the same locality. Always a very rare species.

Range. GUIANA; MEXICO; HONDURAS; COLOMBIA; BOLIVIA.

Family NYMPHALIDAE.

Subfamily ACRAEINAE.

[20. ACTINOTE ANTEAS.]

[21. ACTINOTE ALALIA.]

These two *Actinote* species recorded in the catalogue as two distinct species are most probably the same. *Actinote alalia* was wrongly identified. Felder's type at Tring is quite another species. Dr. Jordan has recently described in Seitz the Trinidad insect hitherto recorded as *A. alalia* as *trinitatis*, treating it as a subspecies of *Actinote pellenia*. Typical *A. pellenia*, Hüb., occur with the subspecies, and Dr. G. B. Longstaff secured an intermediate form on April 2, 1907, about four miles from Port of Spain. The species seems to be locally quite common. Mr. H. Caracciolo has secured a long series. Mr. H. A. Trechman, and more recently Mr. K. St. A. Rogers, caught a few in January 1913.

Subfamily *HELICONINAE*.

HELICONIUS NUMATA NUMATA.

Heliconius numatus numatus, Stichel, Gen. Ins., Fasc. 37, p. 10.

Heliconius numata, Cram., Pap. Ex., vol. 4, p. 17, f. C. D., 1780; p. 251 (1782).

Range. GUIANA.

Sir Gilbert Carter took a specimen of this species at the Pitch Lake. It agrees with the form named *guiensis* by Riffarth.

HELICONIUS ETHILLA METABILIS.

Heliconius metalilis, Butl., Cist. Ent., i, p. 167 (1873).

Heliconius ethilla metalilis, Stichel, Gen. Ins., Fasc. 37, p. 13.

Heliconius eucoma metalilis, Riff., Berl. Int. Zeit., vol. 46, p. 43; Gatt. Helie., vol. 2, p. 19.

Heliconius metabilis, Kirby, Cat. Diurn. Lep., Suppl., p. 722 (1877).

In September 1906 Mr. P. L. Guppy, jun., caught at Blanchisseuse on the northern shore of the Island, a specimen of this subspecies that has its home in the mainland in Venezuela and Colombia. *Metabilis*, however, can, in Trinidad, only be regarded as an aberration of *ethilla*, such a dark form being of very rare occurrence, although intermediate specimens are less rarely taken.

Range. VENEZUELA; COLOMBIA.

[25. *HELICONIUS MELPOMENE*.]

Since the publication of the Trinidad Catalogue in 1904, it has become less and less certain about the occurrence of true *melpomene*, until it seems necessary to remove the species from the list. The specimens originally thought to be this species have proved to be large specimens of *Heliconius amaryllis euryades*. It is very probable, however, that *amaryllis* and *melpomene* will one day be proved to be one variable species. *H. amaryllis euryades* runs exceedingly close to *H. melpomene melpomene*, and the genitalia are scarcely separable.

HELICONIUS WALLACEI WALLACEI.

Heliconius wallacei, Reak., Proc. Ac. N. Sc. Phil., p. 242 (1866).

Heliconius wallacei wallacei, Stichel, Gen. Ins., Fasc. 37, p. 36 (1906).

Range. GUIANA; LOWER AMAZONS.

Not rare near the Pitch Lake (*Sir G. Carter*). Arima 2-500 ft., Jan. 15, 1913 (*K. St. A. Rogers*).

HELICONIUS SARA THAMAR.

Heliconius caerulea thamar, Hübn., Ex. Schmett, vol. i, Index (1806-19).

Heliconius rhea, Cram., Pap. Ex., i, p. 85, 154, t. 54, f. C. D. (1775-6).

Heliconius sara thamar, Stichel u. Riff., Tierr., vol. 22, p. 185 (1905); Stichel, Gen. Ins., Fasc. 37, p. 40 (1906).

Mr. F. W. Urich secured a specimen about the year 1905, and this is the only record. It is quite probable that in the south end of the Island the species may be not uncommon. It is worthy of note that neither the forms *Heliconius sara sara* nor *Heliconius sara theudela*, both of which occur in Venezuela, have been detected in Trinidad. The present subspecies nearest home being British Guiana.

Range. GUIANA; PERU; COLOMBIA; ECUADOR.

[28. HELICONIUS ERATO.]

The true *Heliconius erato* (= *Papilio vesta*, Cram. teste Stichel in Gen. Ins., Fasc. 47, p. 42) does not inhabit Trinidad. The species that "erato" stood for is *Heliconius doris*, Linn. With the typical form occur the forms *eratonius*, Stgr., and *metharmina*, Stgr.

[26. HELICONIUS VICULATA.]

Heliconius phyllis, var. *viculata*, Riff., Berl. Ent. Zeit., vol. 45, p. 188, 212; Gatt. Helic., vol. i, p. 6, 30 (1900).

Heliconius callycopis, forma *viculata*, Stichel, Berl. Ent. Zeit., vol. 47, p. 149 (1901).

I very much doubt if this is a good subspecies and whether it is not a form only of *Hel. hydara*. In Trinidad
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viculata cannot be a distinct subspecies, and it should be treated as an aberration of *Hel. hydara*. Locally elsewhere the form becomes tolerably constant.

[27. HELICONIUS RICINI.]

As pointed out by Riffarth in Gatt. Helic., vol. i, p. 13, 1907, this species should be placed in the genus *Eueides*. It is locally common and according to Chenu the larva feeds on the castor oil plant.

[30. EUEIDES ISABELLA.]

This species (*isabella* recte) occurs in the typical form as described and figured by Cramer, and also as an aberration as the form *huebneri*, Ménét. = *dynastes*, Feld. Many specimens of *isabella* can be taken to only an odd one or two *huebneri*. It is practically certain that all are the same species as intergrades occur.

Subfamily NYMPHALINAE.

[32. COLAENIS PHAERUSA.]

This species has been taken by Mr. P. L. Guppy, jun., thus confirming the record.

METAMORPHA DIDO.

Papilio dido, Linn., Syst. Nat., i, p. 782 (1758).

Colaenis dido, Bates, Journ. Ent., ii, p. 186.

Metamorpha dido, Hübn., Verz. bek. Schmett-, p. 43.

Metamorpha dido, Godm. and Salv., Biol. Cent. Am., i, p. 166; ii, p. 670.

Range. NICARAGUA to S. BRAZIL (Rio Janeiro).

Recorded by Mr. Lechmere Guppy in Trin. Field Nat. Club. G. E. Tryhane secured one or two examples in 1906. The species is evidently rare in the Island.

EUPTOIETA HEGESIA.

Papilio hegesia, Cram., Pap. Ex., t. 209, f. E. F. (1782).

Euptoieta hegesia, Staud. and Schatz, Ex. Schmett, i, pl. 36; ii, p. 118.

Euptoieta hegesia, Godm. and Salv., Biol. Cent. Am., i, p. 175; ii, p. 671.

Range. CENTRAL AMERICA to COLOMBIA and LOWER AMAZONS; WEST INDIES.

A specimen in Mr. H. J. Adams' collection from Tunapuna.

CYNTHIA CARDUI.

Papilio cardui, Linn., Faun. Suec., p. 276, n. 1054 (1761).

Range. Almost the whole world.

Three specimens were secured in 1912 by Mr. P. L. Guppy on the Queen's Park, Savannah, and one at St. Joseph.

PHYCIODES IANTHE.

Papilio ianthe, Fab., Spec. Ins., ii, p. 80, n. 354. (1781).

Eresia myia, Hew., Ex. Butt., iii, t. 3, f. 16, 17 (1864).

Range. VENEZUELA; COLOMBIA; ECUADOR; HONDURAS.

The only specimen I have seen was one taken by Mr. P. L. Guppy, jun., at Tunapuna. It is a very large individual with an exceptionally wide expanse of wing.

[39. CHLOSZYNE SAUNDERSII.]

Synchlœ saundersii, Doubl. and Hew., Gen., D. L., t. 24, p. 2 (1847).

Synchlœ mediatatrix, Feld., Reise Nov., Lep., iii, p. 395, n. 583 (1867).

Araschnia lacinia, Hübn., Zutr. Ex. Sch., p. 899, 900 (1837).

Synchlœ tellias, Bates, Ent. Mo. Mag., i, p. 84, n. 42 (1864).

Chloszyne lacinia saundersii, Kaye.

Range. MEXICO to PARAGUAY.

Dr. G. B. Longstaff took one specimen of the species at St. Juan on April 2, 1907.

This species divides up with difficulty into geographical races, but as some Paraguay and Southern Brazilian specimens are in no way different from Trinidad examples I treat the species as a unit.

EUNICA ORPHISE.

Papilio orphise, Cram., Pap. Ex., i, t. 42, E. F. (1776).

Range. COLOMBIA; VENEZUELA; GUIANA; AMAZONS.
1 ♂ Feb. 1901 (*A. Hall*) near Port of Spain.

EUNICA MALVINA.

Eunica malvina, Bates, Journ. Ent., ii, p. 195, n. 21,
t. 9, f. 2, 2a (1864).

Range. BRAZIL, Amazons.

Mr. P. L. Guppy, jun., has secured two ♂♂ at Tunapuna, one of which he has kindly presented for my own collection. Sir Gilbert Carter has taken the species at the Pitch Lake.

DYNAMINE SETABIS.

Dynamine setabis, Doubl. and Hew., Gen. D. L. t. 30,
f. 2 (1849).

Range. VENEZUELA; COLOMBIA; E. PERU.

Aripita Road, Dec. 1911, Miss M. E. Fountaine, two ♂♂.

DYNAMINE ARENE.

Dynamine arene, Hübn., Samml. Ex. Schmett (1816-1824).
Nymph. johanna, Godt., Enc. Méth., ix, p. 420, n. 221
(1823).

Range. BRAZIL, Lower Amazon, Pernambuco; ECUADOR.
Emperor Valley, Jan. 28, 1913 (*K. St. A. Rogers*). This
is the only record, but the species is scarce.

[51. CATAGRAMMA CODOMANNUS.]

C. codomannus, Fab. (1781), falls a synonym of
Catagramma astarte, Cram. 1779 (*nec* 1782, *vide*
E.M.M., vol. xiv, p. 279).

Cramer's figure of *C. astarte* is rather smaller than the type specimen of *C. codomannus* in the Banksian Cabinet, but there can be no doubt the two are the same species, but with possibly subspecific rank. *C. miles*, Bates, from the Upper Amazon, and *C. stratiotes*, Feld., from Ecuador, are both subspecies of *C. astarte*.

The Trinidad insect, which also occurs on Sta. Lucia and possibly elsewhere, is rather different from any of the foregoing, and I propose calling it *Catagramma astarte*, subsp. *antillena*.

CATAGRAMMA ASTARTE ANTILLENA (Pl. XXX, fig. 15).

Catagramma astarte, subsp. *antillena*, subsp. nov.

♂. Smaller than *astarte*, with the red band of the fore-wing narrower and more pointed at costa. The red area of hind-wing less than in *astarte* and sharply pointed marginally. Underside of fore-wing with the red areas much reduced. Underside of hind-wing like *astarte*.

Exp. ♂ 51 mm., ♀ 53 mm. (*C. astarte* ♂ 60 mm.)

CATAGRAMMA MAIMUNA.

Catagramma maimuna, Hew., Ex. Butt., ii, Catag., t. 8, f. 62, 63 (1858).

Range. UPPER AMAZONS.

A ♀ in the collection of Mr. A. Hall, which was purchased from a local collector.

PERIDROMIA IPHTHIME.

Ageronia iphthime, Bates, Ent. Mo. Mag., i, p. 115, n. 49 (1864).

Ageronia feronia, var. *iphthime*, Kirby, Cat. Diur. Lep., p. 215.

Range. CENTRAL AMERICA.

Mr. A. E. Hall took this species in the Island.

MEGALURA CORESIA.

Nymphalis coresia, Godt., Enc. Méth., ix, p. 359, n. 31 (1823).

Range. CENTRAL AND TROPICAL SOUTH AMERICA.

Occurs at the Pitch Lake (*Sir G. Carter*).

ADELPHA VELIA TRININA (Pl. XXX, fig. 2).

Adelpha velia trinina, n. s.sp.

Fore-wing very dark brown with a broad ochreous yellow band squarely indented at vein 3 internally; externally at vein 5; it is sharply cut off, and at costa there are two ochreous dots. Hind-wing very dark brown with a rather narrow, even white band. A small dark ochreous mark at anal angle. Fore-wing beneath with a conspicuous rounded black mark at tornus giving off a dark brown streak within the yellow band. Hind-wing below with the white

band bordered with brown externally followed by a wavy red line. No white marks beyond white band.

Exp. 52 mm.

The subspecies is separable from *velia* by the orange band extending to inner margin: Butler's *jurwana* may be very close or even identical with *trinina*, but the condition is bad and it is impossible to say what it looked like when fresh.

The type specimen is from Diego Martin (*Caracciolo*).

ADELPHA PHYLACA TRINITA (Pl. XXX, fig. 1).

Adelpha phylaca trinita, n. s.sp.

Allied to *A. phylaca*, Bates, of which it may be a subspecies only. It is to be separated by the greatly reduced yellow area beyond the cell and by the yellow being more broken up with the veins showing very clearly within it. The yellow just beyond the cell is suffused with whitish.

Fore-wing very dark blackish brown with 5 darker blackish lines across the cell. A broad transverse white band from vein 3 to inner margin, above this a rough V-shaped area of orange, the outer arm greatly curved to costa. Hind-wing dark blackish brown with a broad white transverse band meeting the band of the fore-wing. An orange patch at tornus containing a large and a small black dot.

Exp. 59 mm.

Port of Spain (*Caracciolo*; *W. J. Kaye*).

ADELPHA MELONA.

Heterochroa melona, Hew., Ann. N. Hist., xx, p. 258, t. 20, f. 2 (1847).

Range. TROPICAL SOUTH AMERICA.
St. Ann's Valley (*W. J. Kaye*).

ADELPHA EUBAEA.

Heterochroa eubaea, Feld., Reise Nov., Lep., iii, p. 422, n. 662 (1867).

Range. GUIANA; COLOMBIA; AMAZONS.

Kirby in his "Catalogue of Diurnal Lepidoptera," p. 234, treats this species as a var. of *A. plesauve*, but it cannot be looked upon as a geographical race of that species, for

A. plesaire also occurs, and it is very improbably an aberration. Frequently in S. America five and six species of *Adelpha* occur together, each one of which is thoroughly distinct.

Port of Spain (*H. Caracciolo*).

CHLORIPPE LAURE.

Papilio laure, Dru., Ill. Ex. Ent., ii, t. 18, f. 5, 6 (1773).

Range. VENEZUELA; BRAZIL.

North of Quenam Bay, several ♂, two ♀ (*K. St. A. Rogers*), Jan. 1913. It is remarkable that until the recent discovery of this fine species by Mr. Rogers its presence had been undetected.

PREPONA MEANDER.

Papilio meander, Cram., Pap. Ex., i, t. 12, f. A. B., p. 17 (1775).

Prepona meander, Fruhs., Iris, xvii, p. 278, 279.

Range. PERU; COLOMBIA; BOLIVIA; BRAZIL.

A single example was taken by Mr. G. E. Tryhane at St. Ann's Valley, Aug.-Sep. 1905, and is now in the collection of the late Mr. H. J. Adams.

ANAEA ERIBOTES HALLI, (Pl. XXX, fig. 11).

Anaea eribotes halli, n. s. sp.

Fore-wing much darker ground-colour than in typical *eribotes*. The basal blue area reaching up to the upper discocellular. Outer margin with dark marginal band reaching to tornus. Hind-wing also with complete dark marginal band. Basal blue area extending well beyond cell. Fore-wing on underside with the basal half from apex to inner margin blackish.

Exp. 56 mm.

One ♂ in coll. A. Hall, after whom the subspecies is named. The insect was taken at Tabaquite, and is the only specimen I have seen.

Typical *eribotes* occurs in Guiana and the Lower Amazonian region.

EUPTYCHIA TERRESTRIS.

Euptychia terrestris, Butl., P.Z.S., p. 462, n. 7, t. 39, p. 1 (1866).

Range. GUIANA; AMAZONS to E. PERU and S.E. ECUADOR; NICARAGUA.

I have only seen one specimen of this species, viz. that one in the National Collection at S. Kensington. It was taken by S. J. Tryhane probably near Port of Spain. The species is quite possibly overlooked, but it is quite distinct from *E. myncaea*, with which it could easily be confounded.

EUPTYCHIA THEMIS.

Euptychia themis, Butl., P.Z.S., 1867, p. 104, n. 1, t. 12, f. 13.

Range. MEXICO to VENEZUELA.

One specimen in National Collection.

[78. EUPTYCHIA MYNCAEA.]

Trinidad specimens of this species have a distinct look to those from Guiana. They are smaller and darker, and the ocellated spots on the underside are usually smaller. It is possible that fresh specimens from Guiana would be as dark as the comparatively fresh Trinidad specimens, but in size there is a distinct reduction in all the specimens I have seen. I propose calling the Island form *Euptychia myncaea*, subsp. *isolata*.

EUPTYCHIA PALLADIA.

Euptychia palladia, Butl., P.Z.S., 1866, p. 461, n. 6, t. 39, f. 21.

Range. BRAZIL.

A specimen in the National Collection.

Family ERYCINIDAE.

Subfamily EUSELASIINAE.

[94. HELICOPIS ELEGANS.]

This species is probably a local form only of *Helicopis selene*, Feld. The underside agrees exactly. It would be exceedingly interesting to have a ♂ from Trinidad to see if that also differed from typical ♂ *selene*. *H. selene* frequently shows some orange scaling about the black band of the hind-wing in both ♂ and ♀, but more in the ♀ than in the ♂. The Trinidad insect has the yellow scales developed and the black scaling suppressed. It should

be considered a subspecies of *H. selene* and called *Helicopsis selene*, subsp. *elegans*.

HELICOPIS CUPIDO.

Papilio cupido, Linn., Syst. Nat., i, 482, No. 145 (1758).

Helicopsis cupido, Mengel, Cat. Eryc., p. 56.

In the South end of the Island at Cedros (*F. Birch*, Feb. 6, 1905).

Range. GUIANA; LOWER AMAZONS.

MESOSEMIA MAERA.

Mesosemia maera, Hew., Ex. Butt., v, t. 12, p. 114, 115 (1873).

Mesosemia maera, Mengel, Cat. Eryc., p. 51 (1905).

Range. BRIT. GUIANA.

The species was described from a Trinidad specimen. Mr. G. E. Tryhane has found it not rarely in St. Ann's Valley.

MESOSEMIA IBYCUS.

Mesosemia ibycus, Hew., Ex. Butt., ii, t. 7, f. 68, 69 (1860).

Mesosemia ibycus, Mengel, Cat. Eryc., p. 48 (1905).

Range. GUIANA; UPPER and LOWER AMAZON.

Rather rare, but possibly very local, as are so many of the genus.

SYRMATIA DORILAS.

Papilio dorilas, Cram., Pap. Exot., i, t. 47, C. (1779).

Syrmatia dorilas, Mengel, Cat. Eryc., p. 65.

St. Ann's Valley (*F. W. Urich*).

Range. BRAZIL as far south as Sta Catharina.

NOTHEME EUMEUS.

Papilio eumeus, Fab., Spec. Ins., ii, 63, No. 280 (1781).

Notheme eumeus, Staud. and Schatz, Ex. Schmett, ii, 242, pl. 41 (1892).

Notheme eumeus, Mengel, Cat. Eryc., p. 67 (1905).

Range. GUATEMALA to the AMAZONS.

One specimen from St. Ann's Valley (*G. E. Tryhane*).

XENANDRA HELIODES.

Xenandra heliodes, Hopp., Stett. Ent. Zeit., 444 (1869).

Xenandra heliodes, Mengel., Cat. Eryc., p. "67" (recte 76).

Range. DEMERARA; BRAZIL; I. OF MARGUERITA; VENEZUELA.

St. Ann's Valley (*G. E. Tryhane*). 1 ♂ Coll. Kaye; 1 ♂ Coll. Adams.

The species is always rare.

Stichel in "Gen. Ins. *Riodinidae*," p. 221, makes this species synonymous with *X. helius*, but the two insects are distinct

XENANDRA HELIUS.

Papilio helius, Cram., Pap. Ex., iii, t. 198, B. (1780).

Xenandra heliodes, Mengel., Cat. Eryc., p. "67" = 76.

Xenandra helius, Mengel., Cat. Eryc., p. "67" = 76.

Range. VENEZUELA; I. OF MARGUERITA; GUIANA; AMAZON.

Mr. G. E. Tryhane has secured several specimens of this species in St. Ann's Valley. Ariapita Road, Dec. 1911, Miss M. E. Fountaine.

SYMMACHIA PROGNE.

Symmachia progne, Godm., Trans. Ent. Soc., p. 537, pl. xxi, f. 10 (1903).

A male of this species was taken in St. Ann's Valley, and is now in Mr. H. J. Adams' collection. The female has the transverse bands on the underside more heavily spotted.

SYMMACHIA SAGITTA, (Pl. XXX, fig. 13).

Symmachia sagitta, n. sp.

Allied to *S. menetas*, from which it differs in the white apical markings, the outermost of which is usually shaped like a blunt arrow head.

Fore-wing black at base followed by a very oblique red streak, beyond which is a large black area containing usually three, sometimes four, conspicuous white streaks and dashes. Hind-wing black at base and with the apex black. The whole of the central area bright crimson. Cilia black and a very slender black submarginal line. The extreme margin of the wing red. Abdomen with a white belt at base followed by a broad black belt, the remainder red.

Exp. 26 mm.

[108. CRICOSOMA COCCINEATA.]

This species falls as a synonym to *Pachythone lateritia*, Bates, Journ. Linn. Soc. Zool., ix, 390 (1868). There are five specimens of this insect in the Godman collection from Aunai, Essequibo, and the upper Amazon. All five are much more heavily spotted than the two Trinidad examples, but the spots are in exactly the same positions and the undersides are extremely alike. The synonymy, therefore, reads :—

Pachythone lateritia, Bates, Journ. Linn. Soc. Zool., ix, 390.

Pachythone lateritia, Mengel, Cat. Eryc., p. 90.

Lemonias coccineata, Mengel, Cat. Eryc., p. 118 (1905).

Cricosoma coccineata, Kaye, Trans. Ent. Soc., p. 185 (1904).

MESENE MONOSTIGMA.

Emesis monostigma, Erichs., Schomb. Reise, iii, 601 (1848).

Mesene monostigma, Mengel, Cat. Eryc., p. 87 (1905).

Mesene hya, Doubl. and Hew., Gen. D. L., t. 70, f. 9, ♀ (1851).

Range. GUIANA; AMAZON.

Mr. F. Birch took two specimens, both ♂, near Port of Spain on Oct. 16, 1904.

The ♀, with much more red on the fore-wing, was described and figured by Doubleday and Hewitson as a distinct species under the name *M. hya*.

MESENE SIMPLA (Pl. XXX, figs. 9, 10).

Mesene simpla, n. sp.

Allied to *triangularis*, Thieme.

♂. Fore-wing dark brown, with a median band of light orange from the middle of costa to tornus, where it slightly turns inwards to inner margin. Hind-wing unicolorous dark brown. Underside of fore-wing as above but paler. Underside of hind-wing unicolorous brown, but paler than fore-wing. The ♀ differs in having the yellow transverse band narrower and not reaching beyond vein 3; on its inner edge it is slightly curved. Both fore- and hind-wing are more rounded. On the underside it is more greyish-brown than in the ♂.

Exp. 24 mm.

Habitat. TRINIDAD, Maraval River, Jan. 29, 1913 (*K. St. A. Rogers*). ♀ in Coll. Oxford Museum; ♂ in Mus. Tring.

PARNES NYCTEIS.

Parnes nycteis, Doubl. and Hew., Gen. D. L., 464, t. 73, f. 3 (1851).

Parnes nycteis, Mengel, Cat. Eryc., p. 90.

Range. AMAZONS; GUIANA; PANAMA.

Mr. P. L. Guppy has taken this species rarely. The extremely small size of this Erycinid doubtless makes it very difficult to detect.

ANTEROS RENALDUS.

Papilio renaldus, Stoll, Suppl. to Cram., t. 13, f. 1, 1a (1790).

Anteros renaldus, Mengel, Cat. Eryc., p. 91.

Range. TROPICAL SOUTH AMERICA.

Mr. P. L. Guppy has taken a few specimens near Port of Spain.

SAROTA CHRYSUS.

Papilio chrysus, Cram., Pap. Ex., iv, t. 380, D. E. (1782).

Sarota chrysus, Mengel, Cat. Eryc., p. 95.

Helicopsis dematria, Doubl. and Hew., Gen. D. L., t. 71, f. 10 (1851).

Anteros dematria, Mengel, Cat. Eryc., p. 91.

Range. CENTRAL and SOUTH TROPICAL AMERICA.

Mr. G. E. Tryhane has taken several specimens of this insect in St. Ann's Valley.

CHARIS CHAONITES.

Charis chaonites, Hew., Ex. Butt., iii, t. 1, f. 7, 8 (1866).

Charis chaonites, Mengel, Cat. Eryc., p. 100 (1905).

Range. BRAZIL, Amazon; BOLIVIA, Yungas.

One specimen (*G. E. Tryhane*) Port of Spain. A scarce species everywhere.

CHARIS CLEONUS.

Papilio cleonus, Cram., Pap. Ex., iv, t. 380, H. I. (1782).

Charis cleonus, Staud. and Schatz., Ex. Schm., ii, 248, pl. 44 (1892).

Charis cleonus, Mengel, Cat. Eryc., p. 100.

Range. BRAZIL, Amazons.

Not rare near Port of Spain, but less common than *C. argyrodines* (= *gynsea*) or *C. avius*.

CHARIS CHELONIS.

Charis chelonis, Hew., Ex. Butt., iii, t. 1, f. 9 (1866).

Charis chelonis, Mengel, Cat. Eryc., p. 100.

One specimen in Mr. H. J. Adams' collection taken in St. Ann's Valley.

Range. BRAZIL.

CHARIS HOLOSTICTA.

Charis holosticta, Godm. and Salv., Biol. Cent. Am., ii, 703 (1901).

Charis holosticta, Mengel, Cat. Eryc., p. 104.

Two specimens taken by Mr. F. Birch at Lavenville near Port of Spain, Nov. 15, 1904. This bright yellow species is apparently always rare.

Range. NICARAGUA to VENEZUELA.

CARIA DOMITIANUS.

Hesperia domitianus, Fab., Ent. Syst., iii, 1, 315, No. 193 (1793).

Caria domitianus, Mengel, Cat. Eryc., p. 105.

Range. VENEZUELA to NICARAGUA.

La Brea in cacao plantation, Jan. 24, 1913 (*K. St. A. Rogers*).

BAEOTIS ZONATA.

Baeotis zonata, Feld., Verh. Zool. Bot. Ges., 469, No. 15 (1869).

Baeotis zonata, Mengel, Cat. Eryc., p. 106.

Range. CENTRAL AMERICA; VENEZUELA.

On flowers of black sage, Sept. 30, 1904, at Port of Spain (*F. Birch*).

On this occasion Mr. Birch took four specimens, but this is the only record.

LASAIA OILEUS.

Lasaia oileus, Godm., Trans. Ent. Soc., p. 541, pl. 22, f. 10, 11 (1903).

Lasaia oileus, Mengel, Cat. Eryc., p. 109.

Range. TROPICAL SOUTH AMERICA.
St. Ann's Valley (*G. E. Tryhane*).

ANATOLE NEPOS.

Hesperia nepos, Fab., Ent. Syst., iii, 1, 340, No. 292
(1793).

Cremna orpheus, Doubl. and Hew., Gen. D. L., t. 71, f. 8
(1851).

Anatole nepos, Mengel, Cat. Eryc., p. 111 (1905).

Range. ECUADOR to SOUTHERN BRAZIL.
St. Ann's (*G. E. Tryhane*). Rare.

LEMONIAS PIONE.

Lemonias pione, Bates, Journ. Linn. Soc., ix, 398 (1868).

Lemonias pione, Mengel, Cat. Eryc., p. 113.

Range. GUIANA; AMAZONS.

A single ♀ at Macqueripe Bay, N. Trinidad, on Jan. 1
1905 (*F. Birch*).

The specimen is paler yellow than the mainland form.

LEMONIAS EMYLIUS.

Papilio emylus, Cram., Pap. Ex., i, t. 66, G. H. (1779).

Lemonias emylus, Mengel, Cat. Eryc., p. 114.

Range. GUIANA.

Two males, Sept. 25, 1904 (*F. Birch*).

LEMONIAS RHODOPE.

Lemonias rhodope, Hew., Ex. Butt., i, Lem., t. 1, f. 6, 7
(1853).

Lemonias rhodope, Mengel, Cat. Eryc., p. 114.

Range. AMAZON.

1 ♂, St. Ann's Valley (*G. E. Tryhane*).

LEMONIAS PARTHAON.

Papilio parthaon, Dalm., Anal. Ent., p. 46 (1823).

Lemonias parthaon, Mengel, Cat. Eryc., p. 114.

Range. BRAZIL.

At Tunapuna, one specimen (*P. L. Guppy*).

NYMPHIDIUM LILINA.

Nymphidium lilina, Butl., Ent. Mo. Mag., vi, 252, t. 1, f. 8 (1870).

Nymphidium lilina, Mengel, Cat. Eryc., p. 127.

Range. MEXICO.

A single specimen in Mr. H. J. Adams' collection taken at Tunapuna sometime in 1905.

This beautiful species is rare everywhere and specimens are scarce in collections.

ARICORIS LAGUS.

Papilio lagus, Cram., Pap. Ex., ii, t. 117, F. G. (1779).

Aricoris lagus, Mengel, Cat. Eryc., p. 130 (1905).

Range. COLOMBIA; GUIANA; AMAZONS.

A single male has been taken by Mr. P. L. Guppy, jun., at Camuto.

THEOPE SYNGENES.

Theope syngenes, Bates, Journ. Linn. Soc., ix, p. 409 (1868).

Theope sysgenes (!), Mengel, Cat. Eryc., p. 135.

Range. BRAZIL, Lower Amazon.

Two specimens in St. Ann's Valley (*G. E. Tryhane*).

THEOPE APHELES.

Theope apheles, Bates, Journ. Linn. Soc. Zool., ix, 405 (1868).

Theope apheles, Mengel, Cat. Eryc., p. 133.

Range. AMAZON.

THEOPE PIERIDOIDES.

Theope pieridoides, Feld., Reise Nov. Lep., ii, 292, No. 381, t. 37, f. 19, 20 (1865).

Theope pieridoides, Mengel, Cat. Eryc., p. 133.

Range. BRAZIL, Bahia.

One specimen at Tunapuna (*P. L. Guppy*).

This is a rare species in collections.

THEOPE LYCAENINA.

Theope lycaenina, Bates, Journ. Linn. Soc., ix, 406 (1868).

Theope lycaenina, Mengel, Cat. Eryc., p. 134.

Range. LOWER AMAZONS.

Maraval in cacao plantation, Jan. 20, 1913 (*K. St. A. Rogers*).

Family LYCAENIDAE.

MITHRAS MAVORS.

Thecla mavors, Hübn., Zutr. Ex. Schmett, ff. 189, 190 (1818).

Range. GUIANA; BRAZIL, Amazons.

1 ♀, St. Ann's Valley (*G. E. Tryhane*); 1 ♂ (*Caracciolo*), 1906.

BITHYS PHOENISSA.

Thecla phoenissa, Hew., Ill. D. L., p. 100, n. 117, t. 40, f. 139, 140 (1867).

Range. BRAZIL, Para.

One ♀ in St. Ann's Valley (*G. E. Tryhane*).

CHALYBS HERODOTUS.

Hesperia herodotus, Fab., Ent. Syst., iii, 1, p. 286, n. 100 (1793).

Range. GUIANA; BRAZIL.

1 ♂ 1 ♀, St. Ann's Valley (*G. E. Tryhane*).

CALLIPSYCHE BUBASTUS.

Papilio bubastus, Cram., Pap. Ex., iv, t. 332, G. H. (1782).

Tmolus eurytulus, Hübn., Samm. Ex. Schmett, ii, t. 90 (1816-1841).

Range. MEXICO to the AMAZON VALLEY.

Rather a scarce species in the Island.

CALLIPSYCHE CYDIA.

Thecla cydia, Hew., D. L., p. 160, n. 285, t. 63, ff. 433, 434 (1874).

Range. BRAZIL, Rio; VENEZUELA.

One specimen in St. Ann's Valley (*G. E. Tryhane*).

Easily confounded with *Callipsyche thius*.

[141. TMOLUS ECHION.]

Papilio echion, Linn., Syst. Nat., 1, 2, p. 788 (1767).

Tmolus basalides, Hübn., Zutr. Ex. Schmett, f. 977, 978.

Thecla ziba, Hew., Desc. Lyc., p. 26, n. 56.

Several specimens have been taken in St. Ann's Valley, and the species is without doubt an inhabitant of the Island.

TMOLUS SIMAETHIS.

Papilio simaethis, Dru., Ill. Ex. Ent., i, t. 1, f. 3 (1773).

Range. MEXICO to S. BRAZIL.

A single specimen in the "Adams" collection from St. Ann's Valley.

TMOLUS BITIAS.

Papilio bitias, Cram., Pap. Ex., ii, t. 104, E. (1779).

Papilio syncellus, Cram., Pap. Ex., iv, t. 334, A. B. (1782).

Range. GUIANA; AMAZONS; CENTRAL AMERICA.

Found close to Port of Spain in 1904 (*G. E. Tryhane*).

Ariapita Road, Apr. 1907 (*G. B. Longstaff*).

[TMOLUS UNILINEA.]

This species which I described in my Catalogue is the same as Hewitson's *Thecla philinna*.

The synonymy stands therefore:—

Thecla philinna, Hew., Desc. Lyc., p. 19, n. 43 (1868).

Tmolus unilinea, Kaye, Trans. Ent. Soc., p. 192 (1904).

TMOLUS LABES, H. H. Druce, P.Z.S., p. 602, pl. xxxvi, f. 6. (1907).

This I consider to be a small *T. crolus* ♂. Mr. Druce compares his insect with *T. echion*. Linn., but as pointed out by me in the "Entomologist," 1908, p. 11. *T. echion*. Linn., is not synonymous with *T. crolus*. Cram., as he treats it.

TMOLUS CLEON.

Papilio cleon, Fab., Syst. Ent., p. 522, n. 335 (1775).

Thecla cleon, H. H. Druce, P.Z.S., p. 621 (1907).

Range. BRAZIL, Para, Pernambuco.

Mr. Druce gives Trinidad as a locality.

TMOLUS AZUBA.

Thecla azuba, Hew., Ill. D. L., p. 154, n. 269, t. 71, f. 408, 409 (1874).

Thecla serapio, Godm. and Salv., Biol. Cent. Am., Lep. Rhop., vol. ii, p. 93, pl. 58, ff. 8, 9 (1887).

Range. BRAZIL to PANAMA.

St. Ann's Valley (*G. E. Tryhane*); Tunapuna (*P. L. Guppy*).

TMOLUS BADACA.

Thecla badaca, Hew., Desc. Lyc., p. 12 (1868) ♂, Ill. D. L., p. 184, pl. 73, ff. 569, 570 (1877).

Thecla collucia, Hew., *l. c.*, p. 186, pl. 74, ff. 577, 578 (1877) ♀.

Thecla badaca, H. H. Druce, P.Z.S., p. 624 (1907).

Range. COLOMBIA; BRAZIL, Amazons.

Emperor Valley, Jan. 30, 1913, 100–500 ft. (*K. St. A. Rogers*).

[TMOLUS PERDISTINCTA.]

This species described and figured by me in the former list is synonymous with *Calycopis hesperitis* (No. 156 in the Catalogue, 1904). The *Thecla cabiria*, Hew., is also synonymous. The synonymy reads:—

Calycopis hesperitis, Butl. and Druce, Cist. Ent., i, p. 107 (1872).

Tmolus perdistincta, Kaye, Trans. Ent. Soc., p. 194, pl. xviii, f. 8 (1904).

Thecla cabiria, Hew., Ill. D. L., p. 195, n. 388, t. 77, ff. 623, 624 (1877).

TMOLUS COLLUSTRA.

Thecla collustra, H. H. Druce, P.Z.S., p. 600, pl. xxxv, f. 15 (1907)

Range. Unknown.

Caparo, W. Central Trinidad (*F. Birch*).

TMOLUS VESULUS.

Papilio vesulus, Cram., Pap. Ex., iv, t. 340, J. K. (1782).

Range. GUIANA.

Not uncommon near Port of Spain. Feb. 3, 1913 (*K.*

St. A. Rogers).

Maraval (*G. E. Tryhane*).

TMOLUS POLITUS.

Thecla politus, H. H. Druce, P.Z.S., p. 625, pl. xxxvi,
ff. 22, 23 (1907).

Range. GUATEMALA to BRAZIL.

I consider this to be a form of *T. beon*.

TMOLUS AZIA.

Thecla azia, Hew., Ill. D. L., p. 144, n. 245 (1873).

Range. MEXICO to the AMAZON VALLEY.

A series in Mr. H. J. Adams' collection from St. Ann's Valley.

TMOLUS PHRUTUS.

Bithys phrutus, Hübn. Zutr. Ex. Sch., ff. 703, 704 (1832).

Range. GUIANA.

One specimen from St. Ann's Valley (*G. E. Tryhane*).

Easily overlooked from its diminutive size.

TMOLUS IODINUS (Pl. XXX, fig. 12).

Tmolus iodinus, n. sp.

Fore-wing dark iron blue with the costa and outer margin rather narrowly blackish. Hind-wing similar; anal angle with a very dark red irregular spot bordered with black. A small tail-like projection at the termination of vein 3, and a much longer one at vein 2. Each of these is tipped with white. Celia black except at anal angle, where it is whitish. Underside of fore-wing brown, very dark in the basal third and palest in central area. A straight red line runs from costa two-thirds from base to vein 2. A sub-terminal blackish line. Underside of hind-wing coloured as in fore-wing. A red line from costa two-thirds from base to vein 2; it is then continued as a wavy white line forming a letter W. Red

spots with black centres at anal angle and between veins 2 and 3, close to outer margins.

Exp. 33 mm.

1 ♂ in British Museum taken by S. J. Tryhane probably near Port of Spain.

CALYCOPIIS ATRIUS.

Thecla atrius, H.-S., Samm. Schmett, p. 55, ff. 53, 54 (1853).

Range. GUATEMALA to the AMAZONS VALLEY.

Taken by Mr. F. Birch at Macqueripe Bay, Jan. 1905.

CALYCOPIIS CINNIANA.

Thecla cinniana, Hew., Ill. D. L., p. 189, n. 369, t. 75, ff. 593, 594 (1877).

Range. AMAZONS.

Ariapita Road, cacao plantation, Jan. 9, 1913 (*K. St. A. Rogers*).

REKOA DOLYLAS.

Papilio dolyllas, Cram., Pap. Ex., ii, t. iii, B. C. (1779).

Pseudolycaena spurius, Feld., Reise Nov. Lep., ii, p. 250, n. 294, t. 31, p. 23, 24 (1865).

Range. GUIANA; AMAZONS.

Ariapita Road, April 1907 (*G. B. Longstaff*).

Family PAPILIONIDAE.

Subfamily PIERINAE

ENANTIA LICINIA ACUTIPENNIS.

Papilio licinia, Cram., Pap. Ex., ii, t. 153, E. F. (1779).

Leptalis licinia, Bates, Journ. Ent., i, p. 234, n. 13 (1861).

Dismorphia acutipennis, Butl., A. M. N. H., p. 26 (1899).

Range. AMAZONS; GUIANA.

This species is a local race of *E. licinia* in which the wings are markedly narrower.

Waterworks, Maraval, Dec. 19, 1906 (*G. B. Longstaff*); St. Ann's Valley (*G. E. Tryhane*); Sta Cruz Valley, Nov. 7, 1904 (*F. Birch*).

[182. SPHAENOGONA GRATIOSA.]

Add as synonym :—

Sphaenogona semiflava, Butl., A. M. N. H. (4), xv,
p. 396, n. 1 (1875).

[185. DAPTONOURA POLYHYMNIA.]

The insect found in Trinidad agrees better with the true *lycimnia*, Cramer. *D. polyhymnia* is only a geographical form of the same species.

ITABALLIA DEMOPHILE.

Papilio demophile, Linn., Syst. Nat., i, p. 761, n. 82
(1767).

Perrhybris demophile, Kirby, Cat. Lep. Diurn., p. 478.

Itaballia demophile, Röber in Seitz Macro-Lep., Div. II,
vol. v, p. 63 (1909).

Range. TROPICAL SOUTH AMERICA.

1 ♂, St. Joseph River in June (*F. Birch*).

PERRHYBRIS MALENKA.

Pieris malenka, Hew., Ex. Butt., i, t. 1, f. 5, 6 (1852).

Range. VENEZUELA.

Two ♂♂ from Erin on the south coast, Feb. 3, 1905,
(*F. Birch*); 1 ♂ 1 ♀, St. Joseph River, June 23, 1907 (*P. L. Guppy, jun.*).

All the females seen are more yellow than specimens from the mainland, indicating either a direct influence of climate, or possibly the influence of the distasteful and abundant *Tithorea megara*.

Subfamily PAPILIONINAE.

PAPILIO SESOSTRIS SESOSTRIS.

Papilio Eques Trojanus sesostris, Cram., Pap. Ex., iii,
p. 34, t. 211, f. F. G. (1779).

Papilio sesostris sesostris, Roths. and Jord., Nov. Zool.,
vol. xiii, p. 461 (1906).

Range. ORINOCO to BOLIVIA.

Near the Pitch Lake (*Sir G. Carter*). In the dense shore forest between Irois and Cap de Ville, Feb. 7, 1905 (*F. Birch*)

[194. PAPILIO ZEUXIS.

195. PAPILIO CYMOCHLES.]

These two insects in the Catalogue, p. 206, are the same species, viz. *cymochles*. Rothschild and Jordan in their revision of the American Papilios (Nov. Zool., xiii, No. 3), treat *cymochles*, Doubl., as a subspecies of *anchises*, Linn. The Trinidad insect should therefore stand as *Papilio anchises cymochles*.

[196. PAPILIO GARGASUS.]

In Rothschild and Jordan's revision of the S. American Papilios (Nov. Zool., xiii, p. 502) the synonymy of this species is discussed at some length, and the name adopted for the species is *neophilus*, of which the Trinidad race is made a subspecies under the name *parianus*. The insect should, therefore, be known as *Papilio neophilus parianus*.

PAPILIO BELUS VARUS.

Papilio varus, Koll., Denk. K. Ak. Wiss. Math.-Nat.,
Cl. 1, p. 354, n. 8, t. 42, f. 3, 4, ♀ (1850).

Papilio belus varus, Roths. and Jord., Nov. Zool., xiii,
p. 529 (1906).

Range. GUATEMALA to VENEZUELA.
Near the Pitch Lake (*I. A. Potter*).

PAPILIO PROTESILAUS ARCHESILAUS.

Papilio archesilaus, Feld., Verh. Zool. Bot. Ges. Wien.,
xiv, p. 301, n. 180, p. 345, n. 89 (1864).

Papilio protesilaus archesilaus, Roths. and Jord., Nov.
Zool., xiii, p. 717 (1906).

Range. COLOMBIA; N. VENEZUELA; W. ECUADOR.

Presumably this species has only been seen high up on Mt. Tucuche by Sir G. Carter and others, and as far as I know it has not been captured. It is possible that the species seen may have been a form of *P. agesilaus* with the red band on the underside of the hind-wing on the "inside" of the black band.

[199. PAPILO THOAS.]

Papilio thoas nealces, Roths. and Jord., Nov. Zool.,
xiii, p. 558.

Range of the subspecies. NICARAGUA to W. ECUADOR:
eastwards to TRINIDAD and LOWER ORINOCO (Roths. and
Jord.).

Family HESPERIDAE.

Subfamily PYRRHOPYGINAE.

MYSORIA VENEZUELAE.

Venezuelae, Scudder, Rep. Peab. Acad., vi, p. 67
(1872).

Range. VENEZUELA.

St. Ann's Valley (*G. E. Tryhane*). Behind Botanical
Gardens, April 11, 1907 (*G. B. Longstaff*).

Subfamily HESPERIINAE.

EPARGYREUS TALUS.

Papilio talus, Cram., Pap. Ex., ii, t. 176, D. (1779).

Range. PERU; DEMERARA; HAITI.

MELANION HEMES.

Papilio hemes, Cram., Pap. Ex., ii, t. 103, F. (1779).

Range. PERU to GUIANA.

Two specimens from Trinidad in Mr. H. J. Adams'
collection.

TELEGONUS PARMENIDES.

Papilio parmenides, Cram., Pap. Ex., iv, t. 364, E. F.
(1782).

Range. GUIANA; BRAZIL, Amazon.

A rare species, and but a single record for the Island.
St. Ann's Valley (*G. E. Tryhane*).

PHOCIDES DISTANS.

Erycides distans, H.-S., Prod. Syst. Lep., iii, p. 60, n. 4
(1869).

Range. COSTA RICA to PARAGUAY.

St. Ann's Valley (*G. E. Tryhane*).

NASCUS CAEPIO.

Telemiades caepio, H.-S., Prod. Syst. Lep., iii, p. 68, n. 2 (1869).

Range. VENEZUELA.

St. Ann's Valley (*G. E. Tryhane*).

BUNGALOTIS SEBRUS.

Eudamus sebrus, Feld., Reise Nov., Lep., iii, p. 509, n. 885, t. 71, f. 1 (1867).

Eudamus peliguus, Hew., Desc. Hesp., p. 16, n. 28 (1867).

Eudamus gonatas, Hew., Desc. Hesp., p. 15, n. 27 (1867).

Range. TROPICAL SOUTH AMERICA.

This very variable species has only occurred once, and as it is a large and conspicuous insect and not easily overlooked it is probably scarce. Its near relative, *B. midas*, has only been taken singly, but on several occasions.

CECROPTERUS AUNUS.

Papilio aunus, Fab., Spec. Ins., ii, p. 134, n. 618 (1781).

Papilio brontes, Fab., Mant. Ins., ii, p. 87, n. 791 (1787).

Range. BRAZIL.

Taken by Dr. G. B. Longstaff.

CELAENORRHINUS ELIGIUS.

Papilio eligius, Cram., Pap. Ex., iv, t. 354, H. (1782).

Range. TROPICAL SOUTH AMERICA.

St. Ann's Valley (*G. E. Tryhane*).

EANTIS THRASO.

Urbanus vetus thraso, Hübn., Samml. Ex. Schmett (1806-1816).

Range. GUIANA.

Taken by Mr. Caracciolo, 1906.

Subfamily PAMPHILINAE.

VEHILIUS VENOSUS.

Apauustus venosus, Plötz, Stett. Ent. Zeit., p. 160 (1884).

Vehilius venosus, Godm., Biol. Cent. Am., ii, p. 591, pl. C, ff. 47-49.

Range. GUATEMALA to GUIANA.

Maraval, April 1907 (*G. B. Longstaff*).

PAMPHILA MISERA.

Pamphila misera, Schaus, P.U.S. Nat. Mus., xxiv,
p. 456 (1902).

Range. BRAZIL, Petropolis.

One ♂ from St. Ann's Valley (*G. E. Tryhane*).

CATIA PUSTULA.

Thymelicus pustula, Hübn., Zutr. Ex. Schmett, ff. 625,
626 (1832).

Range. SOUTHERN UNITED STATES; CENTRAL AMERICA.

One ♂ in Mr. H. J. Adams' collection from St. Ann's
Valley.

EUROTO COMPTA.

Pamphila compta, Butl., Trans. Ent. Soc., p. 152 (1877).

Range. COLOMBIA; GUIANA; BRAZIL, Amazon; PANAMA.
St. Ann's Valley (*W. J. Kaye, G. E. Tryhane*).

EUROTO HYPERYTHRUS.

Euroto hyperythrus, n. sp.

Fore-wing dark reddish brown. Two hyaline post discal dots
and two larger dots between veins 2, 3 and 3, 4, just below cell.
On the underside the costa broadly reddish. The outer marginal
area pale brown, the base and the cell darker brown. Hind-wing
above dark reddish brown without marks. On the underside with
the whole of the central area reddish.

Exp. 28 mm.

Near Port of Spain, June 1898 (*W. J. Kaye*).

EUROTO SIMPLISSIMA (Pl. XXX, fig. 8).

Euroto simplissima, n. sp.

Palpi, head and thorax brownish ochreous. Fore-wing
brownish ochreous. Between veins 2, 3 close to the cell is a small
white elongated spot. Between veins 3, 4 is a rounder white spot.
Three minute white dots in line one below another from costa
before apex. The lowest just above vein 6. Hind-wing with

ground-colour as fore-wing but with costa much darker. Fore-wing below with the costa and apical area brownish ochreous, the inner portion of the wing blackish with tornus paler. The spots on upperside all show through on underside except the central dot near costa. Underside of hind-wing unicolorous brownish ochreous.

Exp. 32 mm.

Habitat. TRINIDAD, Emperor Valley, Feb. 3, 1913 (K. St. A. Rogers).

EUROTO COCOA (Pl. XXX, fig. 5).

Euroto cocoa, n. sp.

Fore-wing dark brownish black with the base and midway along costa dark golden scaled. Between veins 2, 3; 3, 4; and 4, 5, are respectively three yellowish hyaline spots the first or lower of which is the largest; as a continuation of this line of spots are two points just below the costa. Hind-wing as fore-wing but considerably more scaled with greenish golden scales. Underside of fore-wing with the broad inner marginal area blackish; the costa brownish. Cilia near tornus conspicuously paler than rest of outer margin. Underside of hind-wing brownish, and slightly iridescent. A post-median row of very ill-defined paler spots. Abdomen beneath with double longitudinal white stripes.

Exp. 34 mm.

Habitat. TRINIDAD, Port of Spain, Maraval River, Jan. 29, 1913 (K. St. A. Rogers).

PHANIS SYLVIA, n. sp. (Pl. XXX, fig. 14).

Phanis sylvia, n. sp.

Antennae black, the joints indicated with small golden marks. Frons with some golden scaling. Second joint of palpi orange and black. Fore-wing very dark brownish black. A white semi-transparent rectangular spot between veins 2, 3 not far from end of cell; a similar but more square-shaped spot between veins 3, 4, placed further from the cell. Three minute points one below another from costa inwards. Hind-wing above unicolorous brownish black; below the veins showing clearly pale brownish on a pale purplish brown ground; a series of elongated grey spots between the veins midway between cell and outer margin. Underside of abdomen whitish.

Exp. 30 mm.

Habitat. TRINIDAD, St. Ann's Valley (G. E. Tryhane).

COBALOPSIS MUSA (Pl. XXX, fig. 6).

Cobalopsis musa, n. sp.

Collar golden green. Palpi yellowish beneath. Frons and thorax dark bronze green. Abdomen dark brown. Fore-wing brownish black. Two small dots, the lower one wedge-shaped, and placed immediately below the upper one, well within the cell. A large rectangular white spot between veins 2, 3, and a smaller spot between veins 3, 4. A small indistinct spot placed on vein 1 a little beyond the middle. A spot below vein 6 and a minute point just above. Hind-wing unicolorous brownish black. Underside of fore-wing as above except for a large shaded white area near tornus. Hind-wing below with a white spot within the cell and a row of six white spots beyond the middle following the curve of the outer margin.

Exp. 35 mm.

Habitat. TRINIDAD, Emperor Valley, Jan. 29, 1913 (K. St. A. Rogers); in coll. Kaye from St. Ann's Valley (G. E. Tryhane).

EUTYCHIDE OCHUS.

Eutychide ochus, Godm., Biol. C. Am., Rhop., ii, p. 546, pl. xci, ff. 14-16 (1900).

Range. GUIANA; LOWER AMAZON.
St. Ann's (G. E. Tryhane).

EUTYCHIDE CINGULICORNIS.

Cobalus cingulicornis, H.-S., Prod. Syst. Lep., iii, n. 52 (1869).

Range. GUATEMALA to the AMAZONS.
St. Ann's (G. E. Tryhane).

MNASALCAS UNIFORMIS.

Pamphila uniformis, Butl. and Druce, Cist. Ent., i, p. 113 (1872).

Range. COSTA RICA.

METISCUS ATHEAS.

Metiscus atheas, Godm., Biol. C. Am., Rhop., ii, p. 363, pl. c, ff. 20, 21 (1900).

Range. COSTA RICA to VENEZUELA.
In coll. H. J. Adams from St. Ann's Valley (G. E. Tryhane).

PAPIAS MICROSEMA.

Papias microsema, Godm., Biol. C. Am., Rhop., ii, p. 560
pl. c, ff. 14, 15 (1900).

Range. BRAZIL.

St. Ann's Valley (*G. E. Tryhane*).

CYMAENES MALITIOSA.

Goniurus malitiosa, H.-S., Corresp. Blatt. Regens.,
xix, p. 54, n. 11 (1865).

Range. CUBA.

Recorded by Crowfoot.

CYMAENES PERICLES.

Pamphila pericles, Mösch., Verh. Zool. Bot. Ver. Wien,
xlviii, p. 218 (1878).

Range. VENEZUELA; COLOMBIA.

St. Ann's Valley (*G. E. Tryhane*).

CABARIS POTRILLO.

Thanaos potrillo, Lucas, Sagra, Hist. Cuba, p. 641
(1856).

Range. COLOMBIA; VENEZUELA; JAMAICA; C. AMERICA.
St. Ann's (*G. E. Tryhane*).

S. American specimens have the spots reduced in size
and often in number.

MEGISTIAS LABDACUS.

Megistias labdacus, Godm., Biol. C. Am., Rhop., ii,
p. 572, pl. C, ff. 6, 7 (1900).

Range. CENTRAL AMERICA and VENEZUELA.

St. Ann's Valley (*G. E. Tryhane*).

MNASITHEUS SIMPLICISSIMA.

Pamphila simplicissima, H.-S., Corresp. Blatt. Regens.,
p. 159 (1870).

Cobalus nigrutilus, Mab., Compt. Rend. Soc. Ent. Belg.,
xxvii, p. lxii.

Range. MEXICO to VENEZUELA.

Botanical Gardens, June 1901 (*W. J. Kaye*).

PHLEBODES TIBERIUS.

Apustus tiberius, Mösch., Verh. Zool. Bot. Ges. Wien, p. 329 (1882).

Range. PANAMA; GUATEMALA; COLOMBIA; MEXICO.

In coll. H. J. Adams from St. Ann's Valley (*G. E. Tryhane*).

PERIMELES REMUS.

Hesperia remus, Fab., Ent. Syst., Supp., p. 434 (1798).

Range. GUIANA; ECUADOR; VENEZUELA to MEXICO.

Ariapita Road, 800 ft., April 1907 (*G. B. Longstaff*).

PRENES NYCTELIUS.

Hesperia nyctelius, Latr., Enc. Méth., ix, p. 746, n. 47 (1823).

Range. BRAZIL.

Maraval (*G. B. Longstaff*), Dec. 19, 1906. Not rare (*W. J. Kaye*).

ONOPHAS COLUMBARIA.

Pamphila columbaria, H.-S., Corresp. Blatt. Regens., p. 159 (1870).

Range. BRAZIL.

In coll. H. J. Adams.

NYCTUS TRIANGULARIS (Pl. XXX, fig. 7).

Nyctus triangularis, n. sp.

Collar golden. Fore-wing dull brown, the costa paler brown. Inner margin basal two-thirds yellowish brown. A yellowish subhyaline trapezoidal spot within the cell. Larger spots between veins 1, 2; 2, 3; 3, 4; a small spot between veins 4, 5. Two small adjacent spots between 6, 7 and 7, 8. Hind-wing with three small spots placed transversely.

Exp. 42 mm.

St. Ann's Valley (*G. E. Tryhane*).

FLACILLA AECAS.

Papilio aecas, Cram., Pap. Ex., iv, t. 343. A. B. (1782).

Range. BRAZIL, Amazons; GUIANA.

CALLIMORMUS FILATA.

Apaustus filata, Plotz, Stett. Ent. Zeit., p. 158 (1884).

Range. GUIANA; VENEZUELA; AMAZONS.

St. Ann's Valley (*G. E. Tryhane*).

CALLIMORMUS CORADES.

Ancyloxypha corades, Feld., Verh. Zool. Bot. Ges., xii,
p. 477, n. 66 (1862).

Range. MEXICO to S. BRAZIL.

St. Ann's Valley (*G. E. Tryhane*).

ATRYTONE NOCTIS (Pl. XXX, fig. 16).

Atrytone noctis, n. sp.

Head and collar dark golden brown. Fore-wing dark golden brown with some dark golden scaling especially on basal half of costa. Inner margin narrowly golden on basal half. A little golden scaling beyond cell. Hind-wing coloured as fore-wing with dark golden hairs. Cilia pale yellowish becoming golden at anal angle. Underside of fore-wing black with costa and very broad apex pale yellowish green. A pale yellow portion of a band below the pale apex. Underside of hind-wing uniformly pale yellowish green with faint indication of a yellowish band.

Exp. 28 mm.

St. Ann's Valley (*G. E. Tryhane*).

COBALOPSIS ROGERSI (Pl. XXX, fig. 3).

Cobalopsis rogersi, n. sp.

Head, thorax and abdomen shot dark bronze green. Fore-wing dark blackish brown. Three white dots arranged in a curve beyond end of cell near apex. A large angular white spot between veins 2, 3, lying close to cell. A smaller square white spot between veins 3, 4, lying further from the cell. Underside of fore-wing with the base very dark blackish, the outer margin and the area just beyond end of cell brownish. Underside of hind-wing with the central area of wing the darkest, the margin paler. Underside of abdomen with two narrow white stripes.

Exp. 40 mm.

Habitat. TRINIDAD, Emperor Valley, Jan. 28, 1913
(*K. St. A. Rogers*).

PADRAONA TRYHANA (Pl. XXX, fig. 3).

Padraona tryhana, n. sp.

Antennae with the shaft ringed black and orange, the tip black above and orange beneath. Palpi beneath pale yellow with a few black hairs; above the second joint is velvety black. Head, thorax and abdomen, clothed with dark golden scales. Fore-wing deep golden; the broad outer margin blackish and an irregular mark joining the band near apex and running to base of wing also blackish. Along vein 2 the marking is extended outwards; lying within the cell in the centre of the dark irregular patch is a small orange spot. Hind-wing dark golden with the costal half blackish extending inwards to inner margin and outwards and downwards to form an outer margin but terminating abruptly in an irregular patch. Anal angle wholly orange.

Exp. 34 mm.

Habitat. TRINIDAD, St. Ann's Valley (*G. E. Tryhane*).

VETTIUS LAUREA.

Hesperia laurea, Hew., Desc. Hesp., p. 28, n. 13 (1868).

Range. BRAZIL.

CARYSTUS MARCUS.

Papilio marcus, Fab., Mant. Ins., ii, p. 87 (1787).

Range. PANAMA to FRENCH GUIANA.

Not rare in the Island.

PERICHARES SALIUS.

Papilio salius, Cram., Pap. Ex., i, t. 68, E. (1779).

Range. GUIANA.

St. Ann's Valley, not rare (*W. J. Kaye*).

PARAIDES ANCHORA.

Hesperia anchora, Hew., Trans. Ent. Soc., p. 487, n. 3 (1866).

Range. BRAZIL, Amazon.

A very rare species in collections, but one which is at once recognisable by the central silver spot on the underside of the hind-wing.

Near Port of Spain (*H. Caracciolo*).

ADDENDA TO THE FAMILY HESPERIDAE.

* *MYSCELU* *ROGERSI*, n. sp.

Intermediate between *oethrus*, Hew., and *phoronis*, Hew., but nearer *phoronis*, from which it differs chiefly in having whitish transparent spots instead of yellow; in having the veins of the fore-wing heavily scaled with black and in the great reduction of the yellow scaling below.

Fore-wing very dark reddish brown with the costa blackish. A submedian band of three whitish transparent spots, the two uppermost of which have a straight edge on their inner margins. Between veins 3, 4; 4, 5 are two similar spots the upper one very attenuated exteriorly. Between veins 5, 6 is a smaller triangular spot. Between veins 6, 7; 7, 8 is a pair of similar spots lying close to one another with a third spot between veins 8, 9 lying apart from the other two and having its exterior edge just touching the interior edge of the paired spots. Outer margin broadly blackish. Hind-wing with ground colour as fore-wing, with a large transparent spot within the cell followed by a rather broken blackish band which is markedly dented at veins 3, 4. A narrower but much more sinuous band between this and outer margin. Hind-wing beneath with the inner half of wing lemon yellow edged with a broad black band. Outer half wholly brown except for the sinuous black band.

Exp. 57 mm.

Habitat. TRINIDAD, Siparia, N. of Quenam Bay, Jan. 22, 1913 (*K. St. A. Rogers*).

EPARGYREUS ASANDER, Hew. Emperor Valley, Jan. 8, 1913.

EANTIS BUSIRIS, Cram. Siparia, Jan. 13, 1913.

PYTHONIDES LUCULLA, Hew. Emperor Valley, Jan. 1913.

PYTHONIDES PELOPEA, G. & S. Emperor Valley, Jan. 17, 1913.

ACHLYODES CALIGINEA, Mab. Emperor Valley, Jan. 1913.

CHIOMARA MITHRAX, Moesch. Emperor Valley, Jan. 1913.

EPEUS VELEDA, Godm. Emperor Valley, Jan. 1913.

MORYS CERDO, Bdv. St. Clair, Dec. 31, 1912.

PARPHORUS STORAX, Mab. Botanical Gardens, Jan. 3, 1913.

All the above ten species have been taken by Mr. K. St. A. Rogers.

PRENES OCOLA, Edw. "Trinidad" in coll. Godman.

XENIADES PTERAS, Godm. Chaguanas, Nov. 5, 1913 (*J. L. Guppy*).

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Horace Knight del.

West, Newman chr

NEW SPECIES AND FORMS OF TRINIDAD BUTTERFLIES.

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EXPLANATION OF PLATE XXX.

(See *Explanation facing the PLATE.*)

JANUARY 21, 1914.

XXIII. *New or little known Heterocera from Madagascar.*

By Sir GEORGE H. KENRICK, F.E.S.

[Read November 5th, 1913.]

PLATES XXXI, XXXII.

IN the autumn of 1910 I found that Mr. Felix B. Pratt, who had been collecting for me with his brother in Dutch New Guinea, was willing to take another trip.

After consultation with Sir Geo. Hampson as to the most likely country for undescribed insects, I decided to ask Mr. Pratt to make a brief expedition to Madagascar on my account.

He arrived early in January 1911 at Tamatave, and acting on my instructions, made search for a locality in the forest at an elevation of about 3,000 ft. This I have found to be the best altitude for general collecting in the tropics, and he was working in about latitude 18° South.

He was directed to a station, Nunamang, some distance along the line from Tamatave to Anantanarivo, but found when he arrived that it did not at all fulfil the conditions he wanted, and he therefore fell back upon Perinet, and from thence worked to a place rejoicing in the name of Nalamagaotna, which is some 2,500 ft. above the sea and has plenty of deep wooded valleys.

Almost all the insects taken were found here, both butterflies and moths, and the latter were for the most part taken at light, with the aid of a magnesium lamp placed in a verandah surrounded with white sheets.

Unfortunately, fever contracted in New Guinea attacked him here, and he was obliged to seek medical advice at Anantanarivo and rest there for some time; but before returning home he went again to his old locality, and succeeded in nearly doubling the number of insects taken, finally returning with about 3,000 moths and 600 butterflies. Considering that he was in the country barely three months, and that part of the time was spent in finding a good locality, he evidently did well. On the other hand, any one going at a different time of year would certainly take other species, and possibly both the higher

and lower localities would yield a number of different forms.

Madagascar seems to be free from many of the ordinary tropical diseases, but malaria is undoubtedly present.

As with the butterflies, the moths have a very decided African appearance, but apart from some universally distributed species, there are quite a number common to Ceylon and even to New Guinea. It would hardly be an exaggeration to say that most of the moths taken in Madagascar can be distinguished from those on the mainland, but the distinction in many cases is not marked, and is sometimes one of size only.

On the other hand, there are many entitled to specific rank, and I now submit descriptions and figures of some of these.

I think it quite likely that some of these have been already described, but without seeing the types, I have found it very difficult to identify them from some of the descriptions, and the types themselves are not easily found. In any case I hope the figures will be useful, and the names can easily be altered if necessary.

I have great pleasure in acknowledging the kind assistance received from Sir Geo. Hampson and his co-workers at the Natural History Museum, South Kensington.

Fam. COSSIDAE.

Cossus parvulus, n. sp.

Head, palpi, tarsi, and collar dark brown; antennae paler, whitish above: thorax pale brown above, patagia white: underside white, abdomen white above; at sides yellowish-brown. F.w. whitish, especially at base and costa, covered with the usual Cossid reticulations: including a fairly marked median line passing through a dark spot at end of cell. There are five black dots on the costa. From the inner margin an ill-defined darker triangular patch extends towards the costa. Underside dark but paler on costa. H.w. uniformly dark grey, fringes paler spotted with darker.

Exp. 40 to 62 mm.

Cossus crucis, n. sp.

Head, palpi, legs, and collar pinkish brown; antennae cinnamon, the upper side of shaft white. Thorax white above, pale grey

below. Abdomen pale grey with whitish tuft. F.w. dull white, the veins showing dark. Between veins 4 and 5 are two fine angulated lines crossing at right angles: there is also a transverse dark line beyond end of cell and numerous dark reticulations. H.w. uniformly dull grey, fringes pale spotted with darker, in some specimens there is a pinkish hue on the f.w.

Exp. 70 mm.

Duomitus occultoides, n. sp.

Head, legs, and thorax chocolate, dusted with white, the patagia entirely white; antennae pale orange, abdomen pinkish grey, white at base. F.w. dark grey; a conspicuous white patch along the cell and separated from the inner margin by a greyish band. In the patch are numerous dark reticulations and beyond is an oblique dark band followed by two irregular white patches. Costa paler, but dark at the tip. H.w. dark grey with spotted fringes.

Exp. ♂ 80 mm., ♀ 90 mm.

Duomitus castaneus, n. sp.

Head, legs, and thorax, white; antennae chestnut; abdomen silky yellowish-white. F.w. white with numerous chestnut reticulations. There is a faint post-median oblique line or shade, and another nearer the base. H.w. similar but much duller.

Exp. ♂ 70 mm., no ♀ taken.

Duomitus combustus, n. sp.

Head, legs, thorax, antennae, and abdomen ochreous-brown; at the base of the thorax beyond the ends of the patagia are two round patches of black scales. F.w. rather heavily scaled dull amber: an oblique band of darker tint from base to costa and after a paler interval, a second darker band from inner margin towards the tip of wing which is, however, not reached. There are numerous dark reticulations. H.w. uniform dull amber, fringes same colour.

Exp. ♂ 70 mm., no ♀.

Resembles *D. flavitincta* from S. Africa.

Chrysotypes cupreus.

Head, legs, palpi, and antennae bronze with a pink tinge, collar rather darker; abdomen similar. F.w. shining copper with pink reflections especially on costa and apex; the whole delicately reticulated with fine brown lines. Two antemedian and two post-median lines, the latter angulated and divergent towards costa,

enclosing a darker shade. From the angle a curved thin line reaches the costa, and beyond this is a narrow curved band cutting off the apex. H.w. similar, but more tinged with yellow.

Exp. 60 mm.

Seeing that the specimens of *C. dives* sent home were all males and these were all females, I thought at first they might be the two sexes of one species; but in addition to the colour being different, the disposition of the lines is very dissimilar. The antennae are more strongly pectinated than in *C. dives*.

PSEUDOCOSSUS, gen. nov.

F.w. cell with 2 internal veins: 2 3 4 5 from angle, 6 7 8 from upper angle, 9 from just before end of cell 10 from half way along cell, a strong vein between costa and cell. 1a forked at end. H.w. 1a forked, 1b plain, 2 before end of cell: 3 4 5 from end of cell, 6 7 from upper angle: a strong vein between costa and cell 1, internal vein, palpi distinct, porrect, terminal joint minute: antennae annulated, fine, legs with tibia densely bordered with hair: tarsi bare, frenulum well developed.

Pseudocossus uliginosus, n. sp.

Head, palpi, legs, antennae, thorax, and abdomen purplish-brown. F.w. dull purplish-brown: following the cell a dark blotch bordered with paler. H.w. uniformly dull brown, fringes paler.

Exp. ♂ 50, ♀ 66 mm.

Six specimens, all bad.

Fam. PSYCHIDAE (section *Acanthopsyche*).

ERIOPTERYX, gen. nov.

F.w.—Vein 1b anastomosing with 1c: 6 from end of cell: 7 and 8 stalked: 9 from end of cell: 10 from near end of cell: cell two-thirds of wing. H.w.—1b and 1c free: 4 and 5 from end of cell: 7 absent: 9 and 10 anastomosing: body longer than wings, wings well clothed with scales, especially within the cell on underside.

Eriopteryx funebris, n. sp. (Plate XXXII, fig. 20.)

Abdomen, antennae, and wings smoky brown, thorax slightly paler, fringes rather darker.

Exp. ♂ 40 mm.

Five specimens, all somewhat worn.

Fam. LASIOCAMPIDAE.

Gonometa ferox, n. sp. (Plate XXXI, fig. 12.)

Head, antennae, palpi, and front of thorax, fiery orange: legs and thorax black, abdomen black ringed with pale orange, tuft orange. Wings dull black semihyaline without markings.

Exp. 70 mm. 1 ♂.

A striking insect.

Gonometa attenuata, n. sp. (Plate XXXI, fig. 13.)

Head, palpi, and underside of thorax, dull orange; antennae, legs, thorax above, and abdomen, dark chestnut. F.w. dark chestnut with a white lenticular mark at end of cell. H.w. smoky brown with paler hairs at base.

Exp. 46 mm. 1 ♂.

Lerodes vulpicolor, n. sp. (Plate XXXII, fig. 18.)

Head, palpi, legs, antennae, thorax, and abdomen foxy red. F.w. foxy red, a black spot with white centre at end of cell; a dark, postmedian, very oblique line, followed by a line of black crescents, the convex side being outwards. H.w. uniformly red-brown. Underside red-brown, with a very faint central line in both wings.

Exp. 32 mm.

Lerodes albolunatus, n. sp. (Plate XXXII, fig. 19.)

Head, legs, palpi, antennae, and thorax, below pale ochreous. Thorax above, and abdomen reddish fuscous. F.w. smoky chestnut fading into ochreous towards outer margin; a sharply defined oblique white patch at end of cell, touching the outside of this is an oblique dark straight line, and this is followed by a curved series of dark dots becoming faint near the apex. H.w. smoky fuscous. Underside uniformly fuscous.

Exp. 30 mm.

Lerodes albosparsatus, n. sp. (Plate XXXII, fig. 17.)

Head, legs, antennae, palpi, and thorax dark brown; abdomen dark brown with a coppery tinge. F.w. dark brown fading into pale ochreous at outer margin; along the inner margin are some patches of white scales. A curved basal, median, and postmedian dark line. H.w. ochreous, shaded with darker; a transverse faint darker line.

Exp. 30 mm.

Chrysopsyche pratti, n. sp. (Plate XXXI, fig. 14.)

Head, legs, palpi, thorax greenish-golden; shaft of antennae pale; pectinations black; abdomen golden. F.w. greenish-golden varying a good deal; faintly indicated darker median and post-median lines in some specimens hardly visible; beyond this is an irregular band of silvery scales not reaching the costa. H.w. similar in colour with a broader, and less well-defined band of silvery scales: the base and inner margin clothed with golden hairs.

Exp. 54 mm.

Gastropacha malgassica, n. sp. (Plate XXXI, fig. 8.)

Head, legs, and palpi pinkish-brown; shaft of antennae black, pectinations orange. Thorax pinkish-buff, collar rather greyer, abdomen chestnut. F.w. bright chestnut, a whitish basal patch followed by an angulated antemedian line dark edged internally with paler. At the end of the cell is a distinct white figure of 8. There is a fine oblique dark line running from apex to middle of inner margin slightly angulated at the end, beyond this line the wing is broadly iridescent with a purplish gloss, and beyond this again, is a line of 5 faint dots, while at the margin the colour is again chestnut. H.w. pale chestnut with darker hairs at base and inner margin. Fringes edged with white.

Exp. 66 mm.

Taragama olivacea, n. sp. (Plate XXXII, fig. 15.)

Head, legs, and palpi smoky olive; shaft of antennae black, pectinations orange; thorax olive-grey. F.w. olive-grey dusted with paler shining scales; a faint oblique angulate antemedian line darker. An irregular white dot at end of cell; a fine dark oblique line extending from costa before apex to middle of inner margin. H.w. dark grey with a faintly defined darker transverse line. Fringes of h.w. edged with white. Underside uniformly smoky with transverse shade. Some specimens are of a browner tint.

Exp. 46 mm.

Taragama deceptrix, n. sp. (Plate XXXII, fig. 16.)

Head, legs, palpi, thorax and abdomen dark chestnut; shaft of antennae black, pectinations reddish. F.w. ground colour, pinkish-chestnut, paler along the costa and on the inner margin, where a patch of paler hairs continues the outline of the h.w. so as to give the impression that these extend over the f.w.; above this patch the wings are of a rich chestnut; at the end of the cell

is a minute crescent-shaped yellow mark edged with darker. There is a trace of a darker antemedian line, and of an angulated postmedian line reaching to angle of wing. H.w. chestnut, with a transverse darker shade.

Exp. 46 mm.

Fam. LYMANTRIIDAE.

Dasychira castanea, n. sp. (Plate XXXII, fig. 30.)

Head, legs, thorax, and abdomen dull orange; antennae black, tegulae and patagia chestnut. F.w. pale ochreous with all the markings chestnut; these consist of a series of transverse angulated bars, of which the 2nd, 4th, and 6th are wider than the others. H.w. dull orange with a faint black stria, most marked near the angle. Underside dull orange, the h.w. with three irregular black striae; fringes paler.

Exp. 46 mm.

Dasychira rufotincta, n. sp. (Plate XXXII, fig. 33.)

Head pale, palpi and legs pale, with black markings; antennae pale above with pectinations darker; thorax pale, with dark collar and a dark mark on the patagia; on the top almost hidden are a few crimson hairs in the male. Abdomen dark grey. F.w. ground colour pinkish broadly suffused with white on the costa; an interrupted basal black line, an oblique angulated antemedian line, two postmedian angulated lines, including a dark grey space; an irregular subterminal line. H.w. dark grey slightly rufous at base: fringes pale spotted with black. Underside, f.w., costa with a pink edge upon which are three black dots. H.w. with lunule and three ill-defined striae.

Exp. ♂ 48, ♀ 70 mm.

Dasychira didymata, n. sp. (Plate XXXII, fig. 24.)

Head, thorax, palpi, legs, and abdomen pale ochreous; antennae pale ochreous, with a dark spot on upper side near the middle. F.w. pale ochreous, with dark transverse angulated lines of the usual pattern, but in addition are dark brown markings as follows; a short interrupted basal line, a short streak on inner margin, a streak reaching from mid-costa to cell, and then turning outwards, a spot beyond this on costa, and darker markings on subterminal line, especially at lower angle; a marginal row of black dots. H.w. pale pink, fringes pale ochreous. ♀ with markings similar but

paler, and ground colour grey. A female specimen which may be this species has the hind-wings pale ochreous, but it is evidently worn.

Exp. ♂ 34, ♀ 50 mm.

Dasychira brunneata, n. sp. (Plate XXXII, fig. 25.)

Near to *didymata*, but of stouter build. Head, antennae, legs, palpi, thorax and abdomen pale brown, the latter rather paler. F.w. ochreous suffused with reddish-brown: an oblique basal dark brown streak, an angulated antemedian broad line, a short dark streak in cell; a postmedian dark line from costa interrupted at cell, a subterminal band of 8 whitish spots angulated on the exterior, a terminal line of dark spots. H.w. ochreous, passing into pink at the base, fringes paler.

Exp. 40 mm. 1 ♂.

Dasychira aurantiaca, n. sp. (Plate XXXII, fig. 34.)

Head, palpi, thorax whitish-grey; legs grey with black spots; antennae grey above, pectinations orange; abdomen dull orange, tuft grey. F.w. dull orange suffused with white with numerous transverse black lines: one at base followed by a darker shade, a partly double antemedian line: a grey spot at end of cell margined with paler, followed by two parallel oblique angulated lines; a subterminal row of black dots; fringes pale, spotted with black. H.w. dark orange with black lunule and an ill-defined transverse dark shade. Underside of both wings with dark lunule and angulated transverse striae.

Exp. 42 mm. 1 ♂.

Dasychira viridipicta, n. sp. (Plate XXXII, fig. 26.)

Head, legs, palpi, antennae, thorax, and abdomen buff, crests green. F.w. buff with dull green markings; a basal green patch stretching nearly half-way along the costa, bounded externally by a curved and angulated line, but leaving a small buff patch on inner margin. At two-thirds of costa is another triangular green patch, the inner margin of which is black. At the lower angle is a third quadrate patch; fringes buff spotted with green. H.w. pale ochreous; fringes concolorous.

Exp. 38 mm. 1 ♂.

Dasychira ocellata, n. sp. (Plate XXXII, fig. 27.)

Head, palpi, legs, antennae, thorax, and abdomen brown. F.w. brown suffused with green at base; a dark brown spot in the

middle of the wing and a narrow brown streak on inner margin; beyond this is a transverse bar of green bounded outwardly by an angulated dark line. Towards the costa the brown colour becomes deeper, and together with two darker lines, forms a paler ocellus beyond which is a faintly-defined white patch with a dark brown mark above and then a paler band turning green at lower angle. There is a fine black marginal line, fringes brown. H.w. pale ochreous with a lunule and darker broken stria, fringes pale.

Exp. 34 mm. 1 ♂.

Near to *maligna*, Butl.

Dasychira dubia, n. sp. (Plate XXXII, fig. 23.)

Head, and thorax white, antennae white with a smoky patch near the tip, pectinations brown, palpi and legs white with black points, abdomen white with darker crest, tuft white. F.w. white with transverse angulated black and grey lines: a short black streak near base of hind margin, an interrupted basal line, followed by an obscure and broken line, then an angulated antemedian line, a dot in the cell and a curved black mark at the end. The postmedian line is double and widely separated at the costa, beyond is a subterminal scalloped line, and there are 9 conspicuous black dots on the margin, fringes white. H.w. grey, slightly paler at base, some obscure marginal dots.

Exp. 40 mm. 1 ♂.

Near to *concolor*, but with white thorax and much paler.

Dasychira miselioides, n. sp. (Plate XXXII, fig. 28.)

Head, legs, antennae, palpi pale brown; thorax and abdomen the same, with a few paler hairs, the crests of the abdomen darker. F.w. dark brown shaded with green, purple, and pale buff; the green colour is found at the base, along the costa and inner margin, and between the median lines; also in the subterminal line. There is a small white lunule near angle of wing from which the subterminal angulated line stretches to the costa; fringes dark spotted with paler. H.w. uniformly ochreous, a darker subterminal line; fringes same colour as wing. Underside of both wings with traces of central lunule and a faint stria beyond.

Exp. 40 mm. ♂'s only.

Some specimens have a dark mark at base of wing, and others a dark line below and parallel to cell.

Dasychira abbreviata, n. sp. (Plate XXXII, fig. 36.)

Head, palpi, and antennae brown; legs pale, the femora greenish, tarsi darker; thorax greenish; abdomen pale below darker above especially near the thorax. F.w. whitish-green; a darker green patch at base bordered with pink and terminated by a darker antemedian line; before this on the inner margin is a dark blotch, there is a dark mark at end of cell and beyond this an angulated postmedian faint line, dark at the costa; this is followed by traces of a subterminal line and the wing is suffused with brownish-pink. H.w. nearly white with a faint mark at angle. Underside of both wings showing lunule and striae.

Exp. 38 mm. 1 ♂ only.

Dasychira luteolata, n. sp. (Plate XXXII, fig. 31).

Head, thorax, palpi, and legs whitish; antennae white above pectinations brown; abdomen ochreous, the first 3 segments with dark line in centre. F.w. whitish-ochreous dusted with brown scales; a darker patch on the costa before the antemedian line and another after the postmedian; the antemedian is only indicated, but the postmedian is very plain, and consists of an oblique sharply angulated dark line; beyond this is an obscure subterminal line and a marginal row of black dots; a faint crescent mark at end of cell. H.w. ochreous with indications of a central lunule and a darker border. Beneath both wings are ochreous, and have darker lunules.

Exp. 50 mm. 1 ♀.

Dasychira aureotincta, n. sp. (Plate XXXII, fig. 32.)

Head, thorax, legs, and palpi, white; antennae reddish; abdomen white at base, then orange, with last segment and tuft whitish. F.w. white, the usual lines indicated by scattered black scales, making the wing look grey: a faint double crescent at end of cell, and a fairly distinct angulated postmedian line. H.w. dark grey; fringes of both wings pale; underside uniformly grey.

Exp. 56 mm. 1 ♀.

Dasychira nigrosarsata, n. sp. (Plate XXXII, fig. 22.)

Head, palpi and pectinations of antennae buff; legs black barred with white; shaft of antennae black, thorax and crests of abdomen reddish, remainder of abdomen buff, with scattered grey scales near extremity in the female. F.w. ♂ ground colour dark brown,

a basal-median and postmedian angulated transverse black line; the basal line with white on both sides, the other two lines with white at costa only, the whole wing covered with minute black dots. H.w. orange, with ill-defined fuscous margin; underside orange, with dark central lunule in both wings. In the ♀ the dark lines are ill-defined, but there is no indication of a central lunule.

Exp. ♂ 42, ♀ 70 mm.

Orgyia malgassica, n. sp. (Plate XXXII, fig. 21.)

Head, thorax, and legs greenish-grey, palpi and antennae brown, abdomen smoky, paler beneath. F.w. greenish-grey with white marks on the costa at the origin of the transverse lines; basal line black paler on the outer side antemedian line nearly straight, postmedian line angulated at costa and then straight, both black; near the end of the cell is a dark patch followed by an irregular paler blotch, subterminal line angulated and pale. H.w. uniformly dark smoky, fringes paler.

Exp. ♂ 32 mm.

The fact that only males were taken is perhaps an indication that the females have only partially developed wings, and the species should be regarded as an *Orgyia*.

In some specimens both hind-wings and underside are much paler.

Lymantria nigrostriata, n. sp.

Head, thorax, and terminal joint of palpi buff, legs black with white hairs on the tibiae, antennae dark brown, abdomen buff, but darker on back. F.w. white with scattered black scales, rather more numerous at base of wing, along the costa, and at end of cell. H.w. white, without black scales, and rather yellower on inner margin.

Exp. 38 mm. 1 ♂.

Lymantria parvula, n. sp. (Plate XXXII, fig. 29.)

Head, legs, antennae, and thorax grey; palpi darker; abdomen tinged with ochreous. F.w. whitish at base then dark grey extending to nearly the postmedian line before which is an irregular white band; the postmedian line itself is angulated and at the angle appears in the form of two dark dashes, beyond this the wing is pale grey becoming a little darker at the apex, a terminal row of

dark spots, fringes paler. H.w. brownish-grey with two faint striae and a fine dark marginal line.

Exp. 37 mm. 1 ♀.

From the serrated antennae I judge this to be a *Lymantria*, but it is very small.

Euproctis variegata, n. sp.

Head, legs, antennae, and forelegs black; top of thorax black with a few crimson hairs at collar, patagia cream-colour. Abdomen Indian-yellow, slightly darker at extremity. F.w. dark brown with irregular markings of cream-colour. A blotch at the base followed by an irregular interrupted antemedian band; this is followed by a large blotch upon the costa extending just below the cell and containing a lunule at end of cell, the postmedian line is followed by a broad band in some parts extending to both sides of the line, the wing is terminated by a series of 5 irregular blotches and 2 round spots. H.w. uniformly pale orange. Underside pale orange, the dark marks showing through h.w. with 2 darker striae.

Exp. 50 mm. 1 ♂.

Euproctis aureoplaga, n. sp.

Near to *ochrea*, Butl., but with indistinct orange lines basal-, ante- and postmedian, and subterminal; a large reddish spot near end of cell, and anal tuft black instead of brown.

Exp. 46 mm. 1 ♂.

Euproctis miniata, n. sp.

Head, palpi, antennae, legs, and thorax orange; abdomen whitish-ochreous. F.w. dull orange with bands of pink blotches, the first of a triangular shape at base, the next formed of 3 irregular blotches, then a series representing the postmedian line, then others forming a very irregular subterminal band. H.w. very pale ochreous.

Exp. 40 mm. 1 ♀.

Euproctis canariensis, n. sp.

Head, legs, palpi, and thorax, bright canary-yellow; end of antennae and tarsi dark, abdomen grey with numerous yellow hairs. F.w. bright canary-yellow, slightly darker at apex: basal line very faint, antemedian fine angulated and brown, preceded by two dots, postmedian line do. do., followed by two dots near apex: between the two lines is a straight brown band slightly divided near

costa. H.w. much paler, with faint lunule. Underside with a few brown spots.

Exp. 50 mm. 1 ♀.

Euproctis castaneo-striata, n. sp.

Head and thorax white, antennae dark, palpi and legs buff with darker tarsi; abdomen white. F.w. white with basal line chestnut; the antemedian and postmedian lines, which are broad, make a V-shaped mark extending from inner margin to costa; the end of the cell shows as a lunule in the postmedian line.

Exp. 38 mm. 1 ♂.

Euproctis griseo-striata, n. sp.

Head, antennae, palpi, legs, and thorax grey, abdomen pale buff. F.w. white, basal line very faint and antemedian and postmedian lines fine but well marked, dark grey, between them but not entirely filling the space is a V-shaped grey mark as with the last species: beyond this is a faint subterminal line and a row of marginal dots. H.w. uniformly white.

Exp. 42 mm. 1 ♀.

Imaus malgassica, n. sp. (Plate XXXII, fig. 35.)

Head, palpi, antennae, and legs, brownish-grey: thorax grey with a few concealed crimson hairs: abdomen yellowish. F.w. pale brownish-grey with the usual transverse angulated lines all of a deeper tint. H.w. slightly angulated, whitish and semihyaline, fringes paler.

Exp. 38 mm. 1 ♂.

Redoa sericea, n. sp.

Head yellowish, palpi black, antennae, legs, thorax and abdomen white. F.w. silky white, slightly tinged with smoky colour on costa. H.w. silky white, fringes long, white, and on the h.w. near the body consisting of long hairs.

Exp. ♂ 36 mm., ♀ 54 mm.

Caviria roseicoxa, n. sp. (Plate XXXI, fig. 11.)

Palpi brown above, white below, antennae shaft white, pectinations brown, head, thorax, and abdomen pure white, legs white, the back of the coxae pink. F.w. thickly covered with dense white silvery scales. H.w., as f.w., but without the silvery appearance.

Exp. 52 mm.

Fam. ARCTIADAE.

Pericallia pratti, n. sp. (Plate XXXI, fig. 9.)

Palpi, antennae, and legs black. Head orange, thorax orange with central blue-black spot, and with similar spots both on tegulae and patagia. Abdomen orange above with paired black spots at sides and black underside. F.w. dull orange with 5 transverse blue-black bands edged with buff: the first is interrupted before reaching the inner margin, where it is represented by a dot, the second angulated outward from costa and then nearly straight, the third more angulated and irregular on the outer side, the fourth has a large lunule in the upper part, the fifth extends to vein 5 and is then interrupted appearing as a round spot between 2 and 3; the hind margin has a dot at the apex then 3 rounded dashes, then a very small dot followed by a large round spot with an angular dot at the angle. H.w. pale orange, a linear blue-black mark at end of cell and 6 marginal blue-black spots the one at the angle very small, 3 larger spots form an interrupted submarginal band.

Exp. 68 mm. 1 ♂.

I have placed this insect in the genus *Pericallia*, but I find that at South Kensington several somewhat similar insects have been placed together and at present are waiting for a generic name.

Phryganopteryx rectangulata, n. sp. (Plate XXXI, fig. 1.)

Although this insect agrees in most respects with *P. strigilata*—the type—it differs in both sexes in the peculiar shape of the hind-wings, which are quite rectangular with rounded corners, while the upper edge of the wing is covered with rough scales. Head grey, antennae grey-black at base, palpi grey with black points, legs ochreous: thorax pale grey with 4 black spots and a trace of red hair in centre, patagia greyish with darker centres, tegulae with two crimson spots, abdomen yellowish-ochreous below with yellowish hairs extending over the first 3 segments, above scarlet, with a row of black marks down the centre and paired black spots at sides, tuft ochreous.

Exp. 50 mm.

Diacrisia nigrocincta, n. sp. (Plate XXXI, fig. 10.)

Head, thorax, and abdomen orange, antennae, palpi, and legs black, paired black spots on underside of the abdomen, the four

middle segments on the upper side black in both sexes. Wings pale orange without marking.

Exp. ♂ 50 mm., ♀ 60 mm.

Fam. LITHOSIIDAE.

Ilema cramboides, n. sp. (Plate XXXI, fig. 2.)

Near to *sordida* and *aspersa*, both of which were taken, but I am inclined to regard it as distinct. The insect is lighter than *sordida*.

The ground colour of the f.w. is much yellower than in these species, and the irrorations are brown: on the costa opposite end of cell they are numerous enough to form a spot and a line proceeds outwards from this near to the apex and then curves back to a point on the inner margin opposite to the mark on the costa. H.w. ochreous, fringes spotted.

Exp. 38-46 mm.

Ilema cribroides, n. sp. (Plate XXXI, fig. 3.)

Palpi black, antennae ochreous, head and legs white, tegulae and patagia without spots; a black spot at the back of the head, another on the front of the thorax and a third at the back; abdomen smoky above, whitish below. F.w. white, all the usual spots are more or less elongated and black, one on the costa at base, three along the middle of the disk, the remainder forming a curve starting in the middle of the costa and ending in the middle of the inner margin. H.w. uniformly dark grey, fringes white, but the ♀ has the h.w. white.

Exp. 36-48 mm.

Ilema inornata, n. sp. (Plate XXXI, fig. 4.)

This insect, as far as I can see, only differs from *marginata* in the absence of the crimson band on the costa, head, and thorax. It is however not a sexual difference as I have five specimens, including both sexes, and all are precisely alike.

Exp. 34 mm.

Ilema funeralis, n. sp. (Plate XXXI, fig. 5.)

Legs, antennae, and palpi, black. Head and thorax crimson; abdomen crimson below and smoky above, tuft pink. F.w., central area crimson, shading outwardly into orange, the remainder which

is fully half the wing, blue-black; a small black spot at base of wing. H.w., central portion pinkish-orange with a broad smoky border. Underside similar.

Exp. 32 mm. 1 ♂.

Ilema humilis, n. sp. (Plate XXXI, fig. 7.)

Antennae, head, legs, and palpi, uniform mouse-colour; abdomen rather paler. F.w. rather pointed mouse-colour with 3 faint marks, one in the middle of costa, one in the middle of hind margin, and one beyond cell. H.w. straw-colour, fringes paler.

Exp. 30 mm.

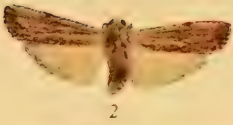
Ilema inconspicualis, n. sp. (Plate XXXI, fig. 6.)

This species is near to *notifera*, Saalmüller, but may be distinguished by the fore-wings not being so pointed and the costa straighter; the irrorations are much denser, and the spots on the costa and inner margin are wanting.

Exp. 40 mm. 1 ♂.

EXPLANATION OF PLATES XXXI, XXXII.

[See *Explanation facing the PLATES.*]



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NEW HETEROCERA FROM MADAGASCAR.

EXPLANATION OF PLATE XXXI.

- FIG. 1. *Phryganopteryx rectangularata*, p. 600.
2. *Ilema cramboides*, p. 601.
3. *I. cribroides*, p. 601.
4. *I. inornata*, p. 601.
5. *I. funeralis*, p. 601.
6. *I. inconspicualis*, p. 602.
7. *I. humilis*, p. 602.
8. *Gastropacha malgassica*, p. 592.
9. *Pericallia pratti*, p. 600.
10. *Diacrisia nigrocincta*, p. 600.
11. *Caviria roseicoxa*, p. 599.
12. *Gonometa ferox*, p. 591.
13. *G. attenuata*, p. 591.
14. *Chrysopsyche pratti*, p. 592.

EXPLANATION OF PLATE XXXII.

- FIG. 15. *Taragama olivacea*, p. 592.
16. *T. deceptrix*, p. 592.
17. *Lerodes albosparsatus*, p. 591.
18. *L. vulpicolor*, p. 591.
19. *L. albolunatus*, p. 591.
20. *Eriopteryx funebris*, p. 590.
21. *Orgyia malgassica*, p. 597.
22. *Dasychira nigrosparsata*, p. 596.
23. *D. dubia*, p. 595.
24. *D. didymata*, p. 593.
25. *D. brunneata*, p. 594.
26. *D. viridipicta*, p. 594.
27. *D. ocellata*, p. 594.
28. *D. miselioides*, p. 595.
29. *Lymantria parvula*, p. 597.
30. *Dasychira castanea*, p. 593.
31. *D. luteolata*, p. 596.
32. *D. aureotincta*, p. 596.
33. *D. rufotincta*, p. 593.
34. *D. aurantiaca*, p. 594.
35. *Imaus malgassica*, p. 599.
36. *Dasychira abbreviata*, p. 596.



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NEW HETEROCERA FROM MADAGASCAR.

XXIV. *On the Hymenopterous genera Trichogramma, Westw., and Pentarthron, Riley.* By R. C. L. PERKINS, D.Sc., M.A., F.E.S.

[Read February 5th, 1913.]

PLATE XXXIII.

It has for a long time been an uncertain question amongst students of the Chalcid group of Hymenoptera, as to whether the genera *Trichogramma* and *Pentarthron* are distinct, or the latter a mere synonym of the former. In the latter part of last year (1912) Prof. E. B. Poulton of the Hope Department of Zoology at Oxford was so kind as to offer me the opportunity of examining at leisure the unique type of Westwood's *Trichogramma evanescens*. The specimen is very old and bears the label "*Trichogramma evanescens*, Westw., Phil. Mag., minute sp. Chalcidiae, at Chelsea, June 11th, 1828."

A preliminary examination with a strong lens and compound microscope showed one fore-wing to be in good preservation, though with a good deal of dust and dirt obscuring the details of the hairy clothing. The other fore-wing was torn and the one lower wing was crumpled. A projection from the head proved to be the long scape of one antenna, but the critical joints were missing, and there were no parts of the antennae gummed on the card. After making drawings of the entire front wing, as well as could be managed without cleaning, the specimen was relaxed and much of the dirt removed. The gum with which the insect had been stuck down swelled up greatly (being probably tragacanth) and was with much difficulty separated from the insect, even the upper surface of the wing not being free from it. Subsequently the specimen was mounted in Canada balsam and fresh drawings of the wing made.

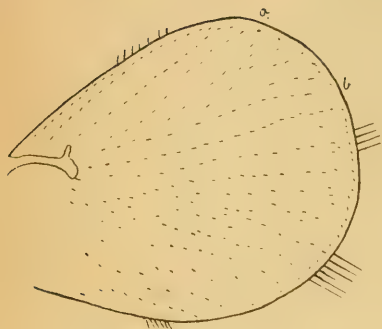
The front wing, as can be seen from figure 1, agrees in all essential characters with that of *Pentarthron*. Compared with a species of the latter from Hawaii (fig. 2) the one really notable difference is that whereas in *T. evanescens* there are only two hairs placed transversely on the

wing beneath the lower extremity of the stigmal vein, in the Hawaiian species there is a long row of these hairs, meeting at right angles (or nearly so) with the inner extremity of the second hair-line from the dorsal margin of the wing. The hair-lines, marked *a* and *b*, which converge basally to enclose a triangular space, include irregularly disposed hairs, which are rather different from those of fig. 2, and altogether less numerous than those in the same area of *P. flavum* of Hawaii, shown in fig. 3. Whether the differences in the clothing of this area are even of specific value is very questionable. It is worth remarking that in all Hawaiian forms of *Pentarthron*, however they may differ in colour of body or wings, the transverse hair-line from the lower end of the stigmal vein always remains conspicuous and consists of many hairs.

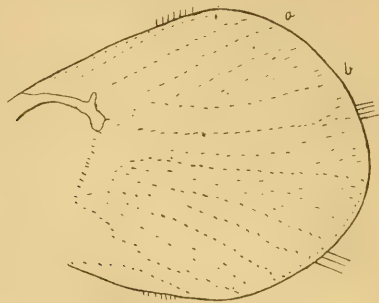
The neuration of *Trichogramma* and *Pentarthron* appears identical, for the apparent form of the veins appears a little different in different examples of a species, owing to slight differences in mounting, the pressure on the wing, etc. In fig. 6 the neuration of *P. flavum* is shown, in fig. 7 that of *T. evanescens*. The position of the macrochaetae, indicated by black dots, is practically the same and their number (8) is also the same in each. The marginal cilia of the fore-wing are slightly longer in *T. evanescens* than in Hawaiian *Pentarthron*.

It is much to be regretted that the antennae of the type of *Trichogramma* are wanting, as these organs alone could absolutely settle the question of the identity of the two genera or their distinctness. Fig. 4 is the antenna of *T. evanescens* after Westwood,* and it is extremely different from that of *Pentarthron* (antenna of *P. flavum*, fig. 5), nor is it like the antenna of any *Trichogrammid* with which I am acquainted. The antennae of all the forms of *Pentarthron* ♀ I have examined are very similar, consisting of a long scape, an elongate pedicel, followed by an extremely short transverse ring-joint, two short funicle joints and a great solid club, or 6 joints in all. Westwood

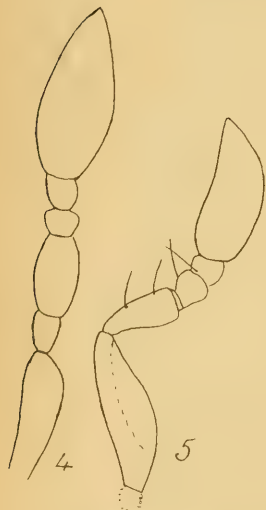
* Since this was written I have seen the figure of *T. evanescens* (presumably copied from Westwood's paper) in Wytzman's Gen. Insectorum. This figure represents the antennae quite differently from that in Westwood's "Classification," and the whole insect bears no resemblance to the type specimen. In fact it is so unlike, that it cannot even be considered as a caricature of the species.



1



2



4

5



3



6



7

R. C. L. Perkins, del.

C. Hentschel.

TRICHOGRAMMA, Westw. and PENTARTHON, Riley.

figures no ring-joint, but its position is occupied by a great elongate funicle joint, longer than the two following together.

In spite of this I believe that *Trichogramma* and *Pentarthron* will prove to be the same, for the antennae of *Trichogrammids* usually distort and shrivel (often beyond recognition) on drying, and even in balsam preparations, unless they are carefully prepared, are often far from satisfactory. Westwood's figure is drawn with the antenna forming a straight line, but I suspect that it was made from a specimen in which the pedicel was partly hidden beneath the scape. In a specimen that I possess, this gives an appearance of a division of the large pedicel joint, rather similar to the 2nd antennal joint, that he figures. The regular fringe of hairs that he gives to the two short funicle joints, is probably due to clothing, similar to that found in *Pentarthron*, viewed in a particular way. In some aspects it may be seen also on the club of the latter.

No doubt Lepidopterists, who have collected eggs of moths, especially those of *Pyralidina* and *Tortricina*, in the field, must have often bred British examples of *Trichogramma*, and I should be very glad to receive examples of these for comparison with the type. Being amongst the smallest of all known insects many specimens may emerge from a single moth's egg.

EXPLANATION OF PLATE XXXIII.

- FIG. 1. Front wing of *Trichogramma evanescens*, Westw. The marginal cilia are only partly shown, so as to indicate their length at different parts of the wing-margin.
2. Front wing of *Pentarthron* sp. from the Hawaiian Islands.
3. Portion of front wing of *P. flavum*, Perkins, from the same locality.
4. Antenna of *Trichogramma evanescens*, Westw. (from the figure in his "Introduction to Modern Classification of insects," vol. ii, p. 155, fig. 9). The hairs on the funicle are omitted.
5. Antenna of *Pentarthron flavum*. Four conspicuous setae on the pedicel and funicle joints are shown.
6. Neuration of *P. flavum*.
7. Neuration of *T. evanescens*.

XXV. *Pseudacraea eurytus hobleyi*, Neave, its forms and its models on Bugalla Island, Lake Victoria, with other members of the same combination. By G. D. HALE CARPENTER, D.M., Oxon., Member of the Royal Society's Sleeping-sickness Commission.

[Read November 5th, 1913.]

PLATES XXXIV-XXXVI.

THE following is a complete account of all the forms of *Pseudacraea eurytus hobleyi*, their *Planema* models, and other mimics in the same group, which I caught on Bugalla Island in 1912 and January-February, 1913. I wish, firstly, to express my indebtedness to Prof. Poulton for the great help he has given me in the preparation of this paper, especially in the preparation of the plates, the arrangement of which is entirely due to him. It seemed best to publish the results in tabular form, in spite of the greater bulk of such a paper, because by such means a graphic representation of the numerical differences between models and mimics is brought home to the reader as he sees the long array of blank spaces under the headings of the models.

I have taken the opportunity of figuring, on Plate XXXIV, some of the most interesting transitional forms of *Ps. eurytus hobleyi* from Bugalla Island, and of showing the close relationship of a single female (fig. 11) to a typical West African female of *eurytus*, L., from the Lagos district, represented in fig. 12, with its model *Planema epaea*, Cram., in fig. 13.

On Plate XXXV I have figured three of the most interesting of the families of *Ps. eurytus hobleyi* bred from known female parents captured on Bugalla Island. An account of two of the families, B and E (figs. 1-8), together with other synepigonic groups from the same locality, has already been published in these Transactions (1912, pp. 706-16). The third family, J (figs. 9-16), is recorded in Proc. Ent. Soc. 1913, pp. ix-xi. These breeding experiments conclusively prove that all the forms of *eurytus hobleyi* tabulated in the present paper form a single interbreeding community.

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Plate XXXVI represents, in figs. 14-17, some of the intermediate forms of *eurytus hobleji* captured by me in Damba Island (1911)—a part of the series of which nearly the whole was described by Prof. Poulton in our Proceedings (1911, pp. xci-v; 1912, pp. xix-xxiii). Figs. 1-7 represent typical *Planema* models, and figs. 8-13, typical *Pseudacraea* mimics captured by Mr. C. A. Wiggins, D.P.M.O. of the Uganda Protectorate—fair examples of his great collection of these forms of which a part is published in "I. Congr. Internat. d'Ent.," 1910, vol. ii, p. 483. Fig. 10 represents the male-like female, *poggeoides*, of *Ps. eurytus hobleji*, rare on Bugalla and Damba, even rarer near Entebbe, but common to the E. of the Nile, where *Pl. poggei* is found, but *Pl. macarista* absent (Proceedings, 1912, pp. lxx-lxxi). Plate XXXVI illustrates the intermediate forms of *Pseudacraea* that are relatively common on Damba as compared with the mainland—those intermediates that will be here shown by a much larger mass of evidence to be also characteristic of Bugalla. In correspondence with this resemblance between the *Pseudacraea* mimics of the two islands, Prof. Poulton has shown (*l. c.*) that the *Planema* models are relatively rare on Damba, and they are shown in the following tabular statement to be relatively rare on Bugalla. It must furthermore be borne in mind that the 127 Bugalla *Planemas* include 75 *epaea paragea*, and that special reasons for this large proportion are given later (p. 611). Mr. C. A. Wiggins' collection, between May 23 and Aug. 31, 1909, is analysed in our Proceedings, 1912, p. xciii, where it is shown that 244 *Planemas* and 82 forms of *eurytus hobleji* were taken. What a contrast to the respective figures—127 and 356—for Bugalla!

In the tabular statement on p. 608 the numerical relations between the various *Planema* models and their mimics on Bugalla can be seen at a glance.

There were also taken during this period 17 *Mimacraea poultoni*, Neave, of which one specimen might be considered to be an outlying member of Combination IB, as it had the orange of the hind-wings replaced by white. There was considerable variation amongst these *Mimacraeas*: one being of a paler yellow was a beautiful mimic of *Acraea viviana*, Staud. In the locality where the mimetic *Lycaenids* were taken, the model for the normal form of *poultoni* appeared to be *Acraea alicia*, E. M. Sharpe.

Combination	Models.	Forms of <i>Pseudacraea eurytus hobleyi</i> , Neave.	Other Mimics.
Ia.	<i>Planema poogei nelsoni</i> , Grose-Smith. ♂ ♀	2 ♀ 0 ♀ forms mimetica <i>poogoides</i> , Poulton (♀ <i>hobleyi</i> with ♂ coloration)	<i>Ps. kuenowi hypoxantha</i> , Jord. ♂ <i>Papilio dardanus</i> , Brown. ♀ ♀ f. m. <i>planemoides</i> , Trimen. 1
Ib.	<i>Planema macarista</i> , E. M. Sharpe. ♂	10 ♂ f. m. <i>hobleyi</i>	<i>Acraea alciope</i> , Hew. 11 ♀ f. m. <i>aurivillii</i> , Staud. ♀ f. m. <i>alicia</i> , Grose-Smith., approaching typical western form (1) Non-mimetic ♂ (5) <i>Precis ravana</i> , Grose-Smith. ♀ 23 Non-mimetic ♂ (24)
II.	<i>Planema macarista</i> ♀ <i>Planema alcinoe camerunica</i> , Auriv. ♀ Not mimicked ♂ (8)	7 ♀ 2 ♀ f. m. <i>tirikensis</i> , Neave.	<i>Acraea jodutta</i> , F. 3 ♀ f. m. <i>jodutta</i> , F. (3) Non-mimetic ♂
III.	<i>Planema epaea paraquea</i> , Grose-Smith. ♂ ♀	Forms transitional between ♂ <i>hobleyi</i> , ♀ <i>tirikensis</i> and ♂ ♀ <i>obscura</i> , Neave. ♂ 23 ♀ 22 f. m. <i>obscura</i> . ♂ 7 ♀ 19	<i>Papilio cynorta</i> , F. 0 ♀ f. m. <i>peculiaris</i> , Neave. ♂ (1) Non-mimetic
IV.	<i>Planema tellus eumelis</i> , Jord. ♂ (<i>platyzantha</i> , Jord.) ♀	Forms transitional between ♂ ♀ <i>obscura</i> and ♂ ♀ <i>terra</i> , Neave. ♂ 26 ♀ 11 f. m. <i>terra</i> ♂ 56 ♀ 48	<i>Acraea jodutta</i> , 6 ♀ f. m. <i>dorothaeae</i> , E. M. Sharpe
	Total Planemas	Total <i>Ps. eurytus</i>	
		127	356

COMBINATION IA.

The model, *Planema poggei nelsoni* (Plate XXXVI, figs. 3, 4), was the scarcest of all the Planemas on Bugalla Island: I only succeeded in taking 2 males and no females during the 14 months I was there.

Its chief mimic, *Pseudacraea kuenowi hypoxantha*, was not so uncommon, 3 males and 6 females having been taken. This fine *Pseudacraea* seemed to vary very little indeed: a marked contrast to the protean *Ps. eurytus hobleyi*. I found it quite easy to distinguish the living *kuenowi* from the ♂ *hobleyi*: its flight is very much bolder, it seems even more alert, with brisker movements; and when seen on the flowers of bushes which it frequents, it appears to carry the wings in a slightly different manner. I have never been deceived by its likeness to the model as in the case of *hobleyi*.

Two females of *eurytus hobleyi* fall into this combination. They belong to the form *poggeoides* (Plate XXXVI, fig. 10), with a yellow band across the fore-wing. This is not quite of the same tint as the orange band of the male, and corresponds with the band of *poggei* rather than of the ♂ *macarista*.

A single specimen of the *planemoides* female of *Pap. dardanus* was obtained. It is worth noting that, although I had been collecting for two years before I came across this interesting butterfly, I was completely deceived by it. It was flying slowly in front of me in an open space in the forest belt, and my first thought was "What an enormous *Planema*!", so much did its general appearance and flight resemble its model. When captured, it lay perfectly still in the net, as does its model, instead of fluttering wildly like so many Papilios. This specimen is of particular interest, for from ova obtained from it I was able to rear the family exhibited at a meeting of the society (Proceedings, 1913, p. liii) and figured on Plate XXXIX of the present volume. It is worth mentioning that I only collected one other *dardanus* female on Bugalla—of the form *hippocoön*, F.

COMBINATION IB.

Of the model, the male *Pl. macarista* (Plate XXXVI, fig. 2), 10 were taken.

Acraeine mimics are represented by the female of *Acraea alciope*—synaposematic with the male *macarista*:

though many of these females have such a broad brownish border to the white band on the hind-wing that they are to some extent intermediate between the typical eastern Uganda ♀ form *aurivillii*, and the typical western female. Of the 17 *alciope* which were taken 5 were males, 11 were of the eastern form of female (*aurivillii*), and one transitional towards the typical western form, which closely resembles the male *Pl. alcinoe* mentioned below. The single transitional ♀ resembled this model so closely that I was quite deceived by it even after I had seen the specimens in the cabinet. The male *Acraea alciope* stands by itself, and does not mimic anything in either E. or W. Africa. The scarcity of this species on Bugalla Island is remarkable—and probably due to scarcity of its food-plant, which I never saw there. On another island, where I was previously (Damba), the food-plant was abundant, and *alciope* was extremely common.

The *Pseudacraea* mimic is the male of the mimetic form *hobleyi*, of *Ps. eurytus hobleyi* (Plate XXXV, fig. 12; XXXVI, fig. 9). This mimic is abundant on Bugalla, 28 having been captured. The resemblance is so close that I was often deceived until I had learnt to distinguish them.

Another Nymphaline member of this combination is *Precis rauana*, whose male is non-mimetic, but the female mimics well the male *macarista*: 24 males and 23 females were taken. This species is not often seen actually *within* the forest, but is to be found along the border-line between the forest and the open grass-land, or at the edge of the forest on the shore. In both these localities may be found beds of a thick-leaved aromatic Labiate herb, which may be the food-plant of the larva of this species. It is to be found also on the flowers of the "Gamboge" tree, *Haronga madagascariensis*, Chois. (*Hypericineae*), which particularly favours such localities, and attracts numbers of all the butterflies mentioned in this paper.

Precis rauana has the typical, very dashing and rapid flight of the genus to which it belongs, and is unlike that of its model. But the general impression gained from its appearance leaves no room for doubt that the female is a mimic of the male *Pl. macarista*. The male, having no white on the hind-wings, is not mimetic of this *Planema*, but on the other hand a fresh specimen often has such a rich crimson suffusion over the light-coloured band on the wings that I think it presents a decidedly *Acraeine*

appearance when one gets a glint of crimson as it flashes past. Another interesting point is that this butterfly seems, at first, to rely for its protection upon the appearance of its upper surface. It is not always an easy species to catch; and if one strikes at it and fails, it will settle again and open and close its wings, displaying the colouring of the upper sides. If, however, one follows up and strikes again so that it is really alarmed, it will fly off and make use of the markedly procryptic, dead-leaf like appearance of the *underside*, sitting motionless with the wings brought together over its back. I endeavoured to obtain ova from captive females, putting them with branches of the aromatic herb before mentioned, but was unsuccessful. The early stages are, I believe, not known.

COMBINATION II.

Seven examples of the principal model, the female of *Pl. macarista* (Plate XXXVI, fig. 1), were taken. A second model is provided by the female of *Pl. alcinoe camerunica*, of which 2 were captured, together with 8 males. The resemblance between these two female *Planemas* is extraordinarily close, so that it was a very long time before I was able to differentiate them. The male *alcinoe* is totally different and is of a type common in W. Africa, but comparatively rare in Uganda.

The black-and-white female of *Acraea jodutta*—the *jodutta* form of female—is beautifully synaposematic with the two *Planema* models. Of this mimic 3 were taken.

The models are closely mimicked by the abundant female of the form *tirikensis* (Plate XXXV, figs. 5, 6, 9; XXXVI, fig. 8) of *Pseudacraea eurytus hobleyi*, of which 40 were taken.

COMBINATION III.

The model is the eastern form, *paragea* (Plate XXXVI, fig. 7), of the western species *Planema epaea*. Of this 41 males and 34 females were taken, so that it seems not uncommon. But these figures give a quite disproportionate idea of its relative abundance in the forests. I happened to hit upon a locality at the edge of the forest where the species seemed to collect in numbers owing to the attractiveness of certain flowers, and I naturally made a point of visiting this locality every evening, since I wanted as many specimens as I could obtain. Had I

merely caught what I saw in the forests, it is doubtful if a dozen specimens would have been obtained. The Bugalla specimens are interesting as they are all very light-coloured, like the lightest forms obtained by Mr. Wiggins at Entebbe and presented by him to the Hope Department. They contrast very markedly with the 4 specimens which were all that I obtained in the forests of Damba Island, and were very dark indeed (Proc. Ent. Soc., 1912, pp. xxiii, lxxxvi).

The form of *eurytus hobleyi* mimetic of *paragea*, namely *obscura* (Plate XXXV, figs. 1, 10, 11, 13-16; XXXVI, fig. 13), was the least abundant of all the mimics into which this *Pseudacraea* subdivides, only 7 fully mimetic males and 19 such females being obtained.

The only other known mimic of *paragea*, namely the form *peculiaris* of *Papilio cynorta*, I did not obtain, much to my disappointment. The species does occur on the island, however, for I caught a single male, which is totally different in appearance from the female. It would be extremely interesting to ascertain whether the island female is also much paler than usual, following the model.

COMBINATION IV.

The model is *Pl. tellus eumelis (platyxantha)*, of which the male and female are alike (see Plate XXXVI, figs. 5, 6): 24 males and 9 females were captured. This species exhibits in a marked degree the nonchalance of a typical model. I spent a long time one evening trying to get a photograph of this butterfly on a clump of mauve Composite flowers, *Erlangea tomentosa*, S. Moore, which were extraordinarily attractive to all these butterflies; and although it frequently took alarm and flew away, it as frequently returned after a very short time. Indeed, I could almost have caught it in my hand.

There is one synaposematic *Acraea* in this Combination, namely *A. jodutta*, of which 3 males and 6 females of the *dorotheae* form were taken. The resemblance of this latter female form to *Pl. tellus* is extremely close, and until I had learnt the generic differences between *Acraea* and *Planema* I was always confusing the two. The specimens showed some variation: in one or two cases the black bar between the subapical and inner marginal tawny areas on the fore-wing is broken through, forming a variety comparable to those of *Ps. terra*, described on p. 613.

The form of *Ps. eurytus hobleji*, mimetic of *Pl. tellus*, namely *terra* (Plate XXXV, figs. 2, 4; XXXVI, figs. 11, 12), was the most abundant of all the forms, 104 being taken altogether. Of these, 39 males and 26 females corresponded with the type, while 6 males and 20 females differed only by having the tawny subapical area on the fore-wing suffused with white scales to a greater or less extent. In 11 males and 1 female the black bar between the subapical and the inner marginal area was thinned or broken through, so that, in the most completely developed variety (No. 33 in list: Plate XXXIV, fig. 7) there is one large tawny area on the fore-wing of irregular shape, and bordered with black. An even more extreme form from Damba Island is represented on Plate XXXVI, fig. 16. To this variety Grünberg has given the name *impleta*.

TRANSITION IN BUGALLA ISLAND BETWEEN THE MIMETIC FORMS OF *Ps. eurytus hobleji*.

I now come to the most interesting points, which this paper is intended to demonstrate. It will be seen in the tabular statement (pp. 618 et seqq.) that there are very many forms of *Pseudacraea eurytus hobleji* not belonging to any of the types, but described as transitional.

(1) Between ♂ *hobleji* with ♀ *tirikensis* and *obscura* there are 45 of these intermediates, (2) between *obscura* and *terra* 37, and (3) between *terra* and ♂ *hobleji* with ♀ *tirikensis* 74.

Classes (1) and (3) are principally shown to be intermediate by the development in various degrees of the under basal patch on the under surface of the hind-wing, a feature that is characteristic of the ♂ *hobleji* and its ♀, *tirikensis*, but is absent from the typical *terra* and very faintly represented, and of a yellowish tint in the typical *obscura*. In (3), the umber triangle may be bordered, on the site of the white band of *hobleji* and *tirikensis*, with whitish yellow, much paler than the rest of hind-wing under surface of *terra*. Furthermore the transition towards the ♀ pattern *tirikensis* in (1) and (3) is shown upon the upper surface by the whitish or whitish grey tint of the pale areas, especially the subapical bar, and, although to a less extent, the inner marginal patch of the fore-wing (Plate XXXIV, fig. 10; XXXV, figs. 3, 7, 8; XXXVI, figs. 14, 15). A slight tendency towards transition between *terra* and *hobleji* is also sometimes seen in an orange

suffusion at the costal end of the white bar crossing the hind-wing, a tendency which is feebly developed in the specimen figured on Plate XXXV, fig. 12, and is only strongly marked in a single specimen from Bugalla (Plate XXXIV, fig. 9, No. 57 on the list). This interesting example is a male with fore-wings like the typical *hobleyi*, but hind-wings above of the *terra* form. Below, the hind-wings show the umber triangle of *hobleyi* well developed. There is little doubt that this specimen is a blend of *terra* and *hobleyi*, but, as regards the former examples, with slight orange suffusion, it must be remembered that the ♂ *Pl. macarista* itself often exhibits the same coloration. Indeed, in W. Uganda, Mr. Neave collected 2 examples of *Pl. pseudeuryta*, Hew., with the pattern of *macarista*, but the hind-wing bar on the upper surface entirely orange; and one of these was accompanied by a ♂ *hobleyi* with the same colouring. It is therefore probable that the forms here referred to are a mimetic modification of the ♂ *hobleyi*.

Class (2), the intermediates between *obscura* and *terra*, form a far more perfect transitional series. Commencing with a *terra* which shows merely a slight dusky suffusion at the margins of the orange areas, and a little dark colour along the nervures, one can trace the gradual increase of the *obscura* dark colour until one reaches a point midway between the two forms (*e. g.* Plate XXXVI, fig. 17); beyond this the *terra* colour is more and more swamped until one gets to specimens of *obscura* showing only a sprinkling with orange scales on the inner margin of the fore-wing. S. A. Neave's type of *obscura*, in the Hope Department, is really one of these intermediate forms. What may be considered the *real obscura* has no orange colouring on the upper surface, and it is a much better mimic of its model, *Planema epaea paragea*.

The commonest form, of all those on the island, is *terra*, the least common, *obscura*. The latter appears to be the least stable: it is, in fact, quite difficult to find one which shows no transition towards *terra*, *hobleyi* or *tirikensis*, and even those not transitional exhibit considerable variation. On the other hand, the forms *hobleyi* and *tirikensis* appear to be the most stable: they are very true to type and show extraordinarily little variation. It has already been shown that they very strongly impress their most characteristic feature, the umber basal triangle, on the hind-wings of

both *terra* and *obscura*, but it is almost impossible to find a specimen which one could describe as *hobleyi* or *tirikensis* influenced by *terra* or *obscura*. The specimen mentioned on p. 614 (Plate XXXIV, fig. 9), with fore-wings of *hobleyi* pattern and hind-wings of *terra* pattern, is the only exception to this which I have caught on Bugalla, out of the 356 *Pseudacraea*s. It has been pointed out on p. 614 that the ♂ *hobleyi* with an orange suffusion on the hind-wing are probably mimetic rather than transitional. I would suggest that, in Uganda at any rate, *hobleyi* and *tirikensis* are the most stable forms, and from them the others have been developed, namely *terra* and *obscura*.

The extraordinary number of transitional forms on Bugalla Island contrasts markedly with their scarcity on the mainland. In the very large collection presented by Mr. C. A. Wiggins to the Hope Department, which has been made in the neighbourhood of Entebbe on the mainland shore of the lake, only 25 miles or so to the N.E. of Bugalla Isle, there are relatively very few transitional specimens, and three out of the four mimetic patterns, viz. *hobleyi*, *tirikensis*, and *terra*, seem to keep very true to type. An account of the transitional forms observed in an examination of the 1909 material from Entebbe is published in "I. Congr. Internat. d'Ent.," 1910, vol. ii, p. 497. Among them was a form somewhat similar to that represented on Plate XXXIV, fig. 9, but much nearer to *terra* than this Bugalla specimen. *Obscura* appears to be an exception and to be variable on the mainland, but this form seems to be rare in the neighbourhood of Entebbe, and Mr. Wiggins' collection contains only a few specimens. Mr. Neave's much longer series from many localities in Uganda show great variety.

The explanation of this relative variability of the forms of *P. eurytus hobleyi* on Bugalla, and on Damba too, seems to be as follows :—

The various *Planema* models which abound on the mainland, are relatively extremely scarce on these islands. The figures for Bugalla and for a part of the Wiggins collection have been given on p. 607, and it was also pointed out on p. 611 that the number of *Planema epaea paragea* was not a correct measure of their true relative abundance. I believe this scarcity on the island is due to scarcity of food-plant. I know the food-plants of both *macarista* and *poggei*—creepers which I never saw at all on Bugalla Island.

Now on the island it is quite conceivable that an enemy of the *Pseudacraeas* might never see a *Planema* at all: at any rate the latter are so extremely scarce that they can have little protective value, and the *Pseudacraeas* would gain little by resembling models that are much less common than themselves. Consequently any form of *Pseudacraea* that is produced will have as much chance of surviving as the most perfect mimic, and the transitional forms appear almost as abundantly as the types. On the mainland, however, conditions are very different. Owing to the abundance of *Planemas*, their presence is of definite protective value to the *Pseudacraeas*, and varieties that are produced which do not conform rigidly to the types of the models are put at a disadvantage in the struggle for existence, and are destroyed by enemies in preference to the types. On the mainland the mimics are kept rigidly up to the mark, and transitional varieties between *hobleyi*, *tirikensis* and *terra* are by comparison rarely to be found. It may perhaps be argued that there is some condition productive of greater variability on the island, but not on the mainland. But though intermediate varieties are scarce on the mainland, yet they *do* occur, and it is difficult not to believe that they are rarely caught by collectors because they are so much more destroyed by enemies than are those which more closely resemble the models. If, as I believe, this explanation be the correct one, it supplies the strongest possible proof of the reality of mimicry and of the power of natural selection to preserve it—indeed it is a crucial test.

LOCALITIES REFERRED TO IN THE FOLLOWING TABLES.

Bugalla is a large island made up of broad northern and southern portions connected by an intermediate and comparatively narrow section. A narrow arm runs eastward from the northern part, Buninga, and meets at a right angle a less narrow northward extension from the southern part. At the angle of Kerinya, as this isthmus is called, and near its N.E. shore, my camp was situated on a forest-ringed grassy hill about 150 ft. above lake level. The place is known as Lutoboka or Fort Stanley. Kerinya itself is bordered right down to the shore with forest, behind which grassy downs rise to a height of about 350 ft. The forest belt is in some places very narrow, not more

than 20 yards through. The localities indicated by letters in the tables are as follows :—

A. A narrow hippopotamus track through the forest belt which is here about 300 yards wide. There were no open spaces in its course. The butterflies were chiefly captured at the two ends.

B. Another path to the N.W. of A. The forest is here so narrow that the path is only about 20 yards long.

C. The sandy beach at the edge of the forest to the E. of my camp.

“On shore.” A similar locality to the N. of camp.

D. At the landward edge where the forest is replaced by grass near the end of track A.

“At edge of forest.” These words are used for the continuation of the forest edge N.W. from D to the end of track B.

E. The continuation of the forest edge S.E. from the landward end of track A. While all the other localities hitherto mentioned are only a few feet above lake level, the forest edge at E rises south-eastwards up to about 150 ft.

NYMPHALINE MIMICS.			PAPILIONID MIMICS.			
<i>Pseudacraea kuenowi hypoxantha</i> ♂ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i>		<i>Precis rauana</i>		<i>Papilio dardanus</i>	<i>Papilio cynorta</i>
	Serial number		♀ mimics I	♂ non-mimetic	♀ <i>f. planemoides</i> mimics IA	♂ non-mimetic
		♀ "poggeoides" mimicking IA ♂ "hobleyi" " IB ♀ "tirikensis" " II ♂ "obscura" " III ♀ "terra" " IV				
	1					
	1	♂ <i>terra</i> , f.-w. black, subapical bar thin.				
	2	♂ transitional, midway between <i>terra</i> and <i>obscura</i> .				
	3	♂ <i>terra</i>				
	4	♂ <i>terra</i> .				
	5	♂ <i>hobleyi</i> .				
	6	♀ <i>tirikensis</i> .				
1	7	♂ <i>terra</i> , f.-w. subapical area slightly suffused white.				
	8	♂ <i>obscura</i> , f.-w. inner margin slightly suffused <i>terra</i> orange.				
	9	♂ like 2.				
	10	♂ transitional, ground colour of <i>obscura</i> ; trace of yellow suffusion f.-w. inner margin; h.-w. whitish at base especially at site of band of <i>hobleyi</i> , basal triangle strong below.				
	11	♂ <i>hobleyi</i> .				
	12	♀ <i>terra</i> .				
	13	♀ <i>terra</i> .				
	14	♀ <i>obscura</i> with trace of <i>terra</i> colour.				
	15	♂ <i>hobleyi</i> .				
	16	♀ <i>terra</i> .				
	17	♀ <i>terra</i> .				
	18	♀ <i>obscura</i> .				
	19	♂ <i>terra</i> , transitional to <i>obscura</i> ; inner marginal f.-w. area very slightly suffused at edge with dark colour of <i>obscura</i> .				
	20	♂ <i>terra</i> , like 19, but subapical area small.				
	21	♂ <i>terra</i> , like 20.				
	22	♂ <i>terra</i> , transitional to <i>hobleyi</i> ; subapical area white, inner marginal area rather dusky; h.-w. at base suffused with white, and basal triangle below well marked.				
	23	♀ <i>terra</i> , subapical area white, faintly suffused yellow; distinct basal amber suffusion h.-w. below.				
	24	♀ <i>obscura</i> , transitional to <i>tirikensis</i> ♀. F.-w. inner marginal and subapical areas and base of h.-w. whitish; distinct basal amber suffusion h.-w. below.				
	25	♂ <i>hobleyi</i> .				
	26	♂ <i>terra</i> .				
	27	♂ <i>terra</i> , very slight amber suffusion base h.-w. below.				
	28	♀ <i>tirikensis</i> .				

On Dec. 1, 1912, a *planemoides* female was taken, locality B in forest. From ova deposited by it 12 males, 3 *planemoides* females and 7 *hippocoon* females were reared.

No females were captured.
A single male was taken in forest, locality A, Apr. 22, 1912.

NYMPHALINE MIMICS.			
Forms of <i>Pseudacraea eurytus hobleyi.</i>			
<i>Pseudacraea kuenowii hypoxantha.</i> ♂ mimics IA	Serial number	♀ "poggeoides" mimicking IA ♂ "hobleyi" " " IB ♀ "tirikensis" " " II ♂♀ "obscura" " " III ♂♀ "terra" " " IV	<i>Precis rauana</i>
			♀ mimics I ♂ non-mimetic
	29	♀ transitional from <i>terra</i> to <i>tirikensis</i> ; f.-w. subapical bar white, and inner marginal area very pale; h.-w. basal triangle very strongly developed.	
	30 ♂ 31 ♂ 32 ♂ 33 ♂	<i>hobleyi.</i> <i>hobleyi</i> , very dwarfed. <i>obscura</i> , h.-w. basal triangle fairly marked below. <i>terra</i> , variety somewhat resembling form " <i>fulvaria</i> "; it looked very different from typical <i>terra</i> on wing. F.-w. subapical and inner marginal areas enlarged, and black bar between them broken through, only represented at its outer part by tooth projecting from hind margin to about middle of wing.	
	34 ♂ 35 ♂	transitional <i>terra</i> , slightly suffused with <i>obscura</i> ; dark colour on nervures and at margins of orange. <i>terra</i> , variety approaching 33, but subapical area slightly whiter than rest, and black tooth from hind margin just touches with its tip the costal black.	
	36 ♂ 37 ♂ 38 ♂ 39 ♂ 40 ♂ 41 ♀ 42 ♀ 43 ♀	<i>terra.</i> <i>terra.</i> <i>terra.</i> <i>terra</i> , h.-w. basal suffusion marked below. <i>hobleyi.</i> <i>tirikensis.</i> <i>terra</i> , f.-w. subapical bar white. <i>obscura</i> , transitional, large pale areas.	1
	44 ♂ 45 ♂ 46 ♀	<i>terra</i> , h.-w. basal triangle well marked below. transitional, like 2. <i>terra</i> , ragged and deformed.	
	47 ♂ 48 ♀ 49 ♀ 50 ♀ 51 ♀	<i>hobleyi.</i> <i>tirikensis.</i> <i>terra</i> , slight umber basal suffusion h.-w. below. <i>terra</i> , h.-w. as above: f.-w. subapical area suffused white. <i>obscura</i> , slight basal suffusion h.-w. below.	
	52 ♂ 53 ♂ 54 ♀ 55 ♀ 56 ♀	<i>obscura</i> , fairly marked basal suffusion h.-w. below. transitional between <i>obscura</i> and <i>terra</i> . F.-w. subapical area very small and richly coloured, inner marginal orange represented by two patches orange suffusion: slight basal suffusion h.-w. below. <i>poggeoides.</i> <i>terra</i> , transitional to <i>tirikensis</i> ; f.-w. subapical area slightly suffused white; distinct basal triangle h.-w. below. <i>terra</i> , transitional to <i>tirikensis</i> ; f.-w. subapical area white, inner marginal area suffused white. H.-w. below bar has marked basal triangle.	
	57 ♂	remarkable specimen. F.-w. of ♂ <i>hobleyi</i> pattern, h.-w. of <i>terra</i> , with basal triangle so well marked that it is also visible above.	1
	58 ♀	<i>tirikensis.</i>	
	59 ♀ 60 ♀ 61 ♀	<i>tirikensis.</i> <i>obscura</i> , like 51. transitional, midway between <i>obscura</i> and <i>terra.</i>	

NYMPHALINE MIMICS.			
<i>Pseudacraea kuenowi hypozanitha</i> ♂ mimics ♀ IA	Forms of <i>Pseudacraea eurytus hobleyi</i>		<i>Precis rauana</i>
	Serial number		♀ mimics I ♂ non-mimetic
		♀ " <i>poggeoides</i> " mimicking IA ♂ " <i>hobleyi</i> " " IB ♀ " <i>tirikensis</i> " " II ♂ " <i>obscura</i> " " III ♂ " <i>terra</i> " " IV	
	62	♂ <i>obscura</i> , slight umber suffusion base h.-w. below.	
	63	♂ <i>terra</i> .	
	64	♂ <i>terra</i> .	
	65	♂ <i>terra</i> .	
	66	♂ <i>tirikensis</i> .	
	67	♂ <i>obscura</i> .	
	68	♀ <i>obscura</i> , h.-w. rather pale above; distinct umber basal suffusion below.	
	69	♀ <i>terra</i> , like 55.	
	70	♂ <i>obscura</i> , like 62.	
	71	♀ <i>terra</i> , like 50.	
	72	♂ <i>hobleyi</i> .	
	73	♀ <i>tirikensis</i> .	
	74	♀ <i>tirikensis</i> .	
	75	♀ <i>terra</i> , white subapical area, f.-w.; very slight basal umber suffusion h.-w. below.	
	76	♀ <i>terra</i> , like 56.	
	77	♀ <i>terra</i> , black bar on f.-w. thinned.	
	78	♀ <i>terra</i> , transitional to <i>obscura</i> ; slight dusky suffusion on margin of f.-w. inner marginal area.	
	79	♀ <i>terra</i> , like 49.	
	80	♂ <i>terra</i> , variety. Black subapical bar broken through at its middle, the black costal area suffused with orange at its posterior border, with one well-defined round mark at end of cell.	
	81	♀ <i>terra</i> , like 77.	
	82	♀ <i>obscura</i> : transitional to <i>tirikensis</i> ; h.-w. marked basal umber below.	
	83	♀ <i>obscura</i> .	
	84	♂ <i>terra</i> .	
	85	♂ <i>hobleyi</i> .	
	86	♀ transitional, like 61.	
	87	♀ <i>terra</i> .	
	88	♀ <i>obscura</i> , like 51.	
	89	♂ <i>terra</i> , like 27.	
	90	♂ <i>terra</i> .	
	91	♂ <i>terra</i> , f.-w. subapical area very slightly suffused white; h.-w. basal area very slightly suffused umber.	
	92	♀ <i>terra</i> .	
	93	♀ <i>terra</i> , like 50.	
	94	♂ <i>terra</i> , like 1.	
	95	♂ <i>hobleyi</i> .	

NYMPHALINE MIMICS.			Forms of <i>Pseudacraea eurytus hobleyi.</i>	<i>Precis rauana</i>		
<i>Pseudacraea kuenowi hypoxantha</i> ♀ mimics. IA	Serial number				♀ mimics I	♂ non-mimetic
		♂	♀	mimicking		
	96	♂		transitional, from <i>obscura</i> to <i>hobleyi</i> . F.-w. white subapical area; faintly indicated inner marginal area of <i>hobleyi</i> ♀; h.-w. pale at base, well marked basal triangle below.		
	97	♂		<i>terra</i> .		
	98	♂		<i>terra</i> , like 39.		
	99	♂		transitional, between <i>terra</i> and <i>obscura</i> . F.-w. subapical area small and whitish; inner marginal area contracted, of <i>terra</i> colour; h.-w. rather pale yellow at base.		
	100	♀		<i>terra</i> .		
	101	♀		<i>terra</i> , like 50.		
	102	♀		<i>terra</i> , f.-w. areas large and whitish, with black bar between much thinned.		
	103	♂		<i>terra</i> , like 19.		
	104	♀		<i>terra</i> , subapical f.-w. area large and white.		
	105	♀		transitional between <i>obscura</i> and <i>tirikensis</i> . F.-w. subapical area cream coloured, inner marginal area duskiely suffused. H.-w. pale cream at base, tending to white in position of <i>tirikensis</i> band; basal triangle below distinct.		
	106	♂		<i>hobleyi</i> , white h.-w. bar suffused yellow at periphery.		
	107	♀		<i>tirikensis</i> .		
	108	♂		<i>terra</i> .		
	109	♂		transitional, like 2.		
	110	♂		transitional from <i>obscura</i> to <i>hobleyi</i> , <i>obscura</i> ground colour; f.-w. subapical area small, cream coloured; inner marginal area suffused with yellow; h.-w. pale creamy white at base; basal triangle below distinct.		
	111	♀		<i>terra</i> , f.-w. subapical area very large.		
	112	♀		<i>obscura</i> , transitional to <i>tirikensis</i> ; h.-w. rather pale at base, with well marked basal triangle below.		
	113	♀		<i>terra</i> , like 50.		
	114	♀		<i>terra</i> , like 50.		
	115	♀		<i>terra</i> , f.-w. subapical area suffused white anterior and posterior ends; inner marginal area very slightly paler than h.-w.; basal triangle distinct.		
	116	♂		<i>terra</i> , like 27.		
	117	♀		<i>terra</i> , f.-w. subapical area white, and anterior border of inner marginal area suffused white.		
	118	♀		<i>terra</i> , like 117.		
	119	♀		<i>terra</i> , f.-w. subapical area suffused white anterior and posterior ends.		
	120	♀		<i>obscura</i> , like 51 (parent of series B).		
	121	♂		<i>terra</i> .		
	122	♂		<i>terra</i> , transitional to <i>hobleyi</i> ; f.-w. subapical area white, h.-w. at basal triangle distinct below.		
	123	♀		<i>obscura</i> , like 51 (parent of series D).		
	124	♀		<i>obscura</i> , f.-w. subapical area white, inner marginal area and most of h.-w. creamy.		

DATE.	LOCALITY.	ACRAEINE (<i>Planema</i>) MODELS.								ACRAEINE MIMICS.					
		I		II		III		IV		<i>Acraea jodutta</i>			<i>Acraea alciope</i>		
		A		B		<i>alcinoe camerunica</i>	<i>epaea paragea</i>		<i>tellus eumelis</i>		♀ <i>jodutta</i> mimics II	♀ <i>dorothea</i> mimics IV	Non-mimetic ♂	♀ <i>aurivillii</i> mimics IB	Non-mimetic ♂
		<i>poggei nelsoni</i>		<i>macarista</i>	<i>macarista</i>		♂	♀	♂	♀					
1912. July 16	At edge of forest (D)														
July 17	At edge of forest (D)														
July 19	At edge of forest (D)														
July 21	At edge of forest (D)														
July 21	In forest (A) . . .														
July 22	In forest (C). . .													1	
July 23	At edge of forest (D)														
July 24	At edge of forest (D)					1									
July 26	At edge of forest (D)														
July 28	At edge of forest (D)														
July 29	At edge of forest (D)								1						
July 30	At edge of forest (E)						2	2							
July 31	At edge of forest (E)						3	3							

NYMPHALINE MIMICS.			<i>Precis ravana</i>	
<i>Pseudacraea kuenowi</i> <i>hypoxantha</i> ♂ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i>		♀ mimics I	♂ non-mimetic
	Serial number	♂ ♀ "poggeoides" mimicking IA ♂ "hobleyi" " " IB ♂ "tirikensis" " " II ♂ "obscura" " " III ♂ "terra" " " IV		
	125 ♀	<i>terra</i> .		1
	126 ♀	<i>terra</i> , like 119.		
	127 ♀	<i>obscura</i> , transitional to <i>tirikensis</i> , like 24.		1
	128 ♂	<i>terra</i> , f.-w. black subapical bar of very irregular outline and almost cut through at anterior and posterior ends. This specimen looked distinctly different from type on wing: there is also a narrow streak of light fulvous at the black apex of the cell.		
	129 ♂	<i>terra</i> , like 7.		
	130 ♀	<i>tirikensis</i> .		
	131 ♂	<i>terra</i> , f.-w. subapical area has faint trace white suffusion at posterior end.		
	132 ♂	<i>terra</i> , like 27.		
	133 ♂	<i>obscura</i> .		
	134 ♂	transitional, midway between <i>obscura</i> and <i>terra</i> ; h.-w. shows marked basal triangle below.		
	135 ♀	<i>terra</i> , like 119.		
	136 ♀	<i>terra</i> , like 119.		
	137 ♀	<i>terra</i> , like 115.		
	138 ♀	<i>terra</i> , like 115.		
	139 ♂	<i>terra</i> } recorded as captured, but since mislaid.		
	140 ♀			
	141 ♂	<i>terra</i> .		
	142 ♂	<i>obscura</i> , transitional to <i>hobleyi</i> ; f.-w. inner margin shows slight suffusion yellow; h.-w. basal triangle below distinct.		
	143 ♂			
	144 ♀	<i>terra</i> .		
	145 ♀	<i>terra</i> .		
	146 ♂	<i>hobleyi</i> , like 105.		
	147 ♀	<i>tirikensis</i> .		
	148 ♂	<i>terra</i> , f.-w. inner marginal area small; h.-w. basal triangle well marked below.		2
	149 ♂		<i>hobleyi</i> .	
	150 ♂		<i>terra</i> , f.-w. inner marginal area small; h.-w. basal triangle well marked below.	
	151 ♂		<i>terra</i> , like 150.	
	152 ♀	<i>tirikensis</i> (parent of series E).		
	153 ♂	<i>obscura</i> .		
	154 ♀	<i>obscura</i> .		
1	155 ♂	<i>terra</i> , like 91.		1
	156 ♀		<i>terra</i> , like 50.	
	157 ♀	transitional between <i>obscura</i> and <i>tirikensis</i> . All pale markings of <i>obscura</i> white, and basal triangle on h.-w. very marked.	1	1
	158 ♀		<i>terra</i> , f.-w. subapical area suffused white at each end; h.-w. shows distinct basal triangle below.	
	159 ♂	<i>obscura</i> , like 32.		
	160 ♀		<i>terra</i> , transitional to <i>tirikensis</i> . Ground-colour very dark; f.-w. subapical area white; h.-w. basal triangle marked.	

NYMPHALINE MIMICS.				
<i>Pseudacraea kuenowi hypoxantha</i> ♂ ♀ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i> .		<i>Precis rauana</i>	
	Serial numbers		♀ mimics I	♂ non-mimetic
		♀ "poggeoides" mimicking IA ♂ "hobleyi" " IB ♀ "tirikensis" " II ♂ ♀ "obscura" " III ♂ ♀ "terra" " IV		
	161 ♂ 162 ♀	<i>terra</i> , like 39. <i>obscura</i> .		
	163 ♂ 164 ♂	<i>terra</i> . <i>terra</i> , f.-w. subapical and inner marginal area whitish; h.-w. basal triangle distinct below.		
1	165	♀ <i>terra</i> (parent of series F).		
	166 ♂ 167 ♂	<i>obscura</i> , like 32. <i>terra</i> , faint dusky suffusion f.-w. inner margin; subapical area white.		
	168	♀ <i>tirikensis</i> .		2
	169 ♂ 170 ♀	<i>obscura</i> , all pale areas rather whitish. <i>terra</i> , like 49.		
			1	1
	171 ♂ 172 ♂ 173 ♂ 174 ♀ 175 ♀ 176 ♀	<i>obscura</i> , transitional to <i>hobleyi</i> : trace yellow suffusion f.-w. inner margin; h.-w. whitish at base, basal triangle marked below. <i>hobleyi</i> . transitional, like 2. <i>tirikensis</i> (parent of series G). <i>obscura</i> , like 24. <i>terra</i> , f.-w. subapical area white, inner marginal area suffused white; trace basal triangle h.-w. below.		
			1	2

DATE.	LOCALITY.	ACRAEINE (<i>Planema</i>) MODELS.								ACRAEINE MIMICS.						
		I		II		III		IV		<i>Acraea jodutta</i>			<i>Acraea alciope</i>			
		A		B		<i>alcinoe camerunica</i>		<i>epaea para-gea</i>		<i>tellus eume-lis</i>		<i>jodutta</i> ♀ mimics II	<i>dorothea</i> ♀ mimics IV	Non-mimetic ♂	<i>aurivillii</i> ♀ mimics IB	Non-mimetic ♂
		<i>poggei nelsoni</i>		<i>macarista macarista</i>		♀	♂ not mimicked	♂	♀	♂	♀					
♂	♀	♂	♀													
1912. Aug. 6	At edge of forest (E)			1			3									
Aug. 7	On shore . . .															
Aug. 8	At edge of forest (D)															
Aug. 8	At edge of forest (E)						1								(one female is transitional between the eastern and western forms.)	
Aug. 9	At edge of forest (D)														1 (broad orange border to h.-w. white bar.)	
Aug. 9	At edge of forest (E)						2	1								
Aug. 10	Near camp, at edge of forest . . .													1		
Aug. 10	At edge of forest (D)										1 (white f.-w. subapical area.)			1 (intermediate between E. and W. forms.)		
Aug. 10	At edge of forest (E)						2	2								
Aug. 10	In forest (B) . .					1										
Aug. 11	In forest (A) . .															
Aug. 11	At edge of forest (E)					1										
Aug. 11	At edge of forest (D)								1							

		NYMPHALINE MIMICS.			
<i>Pseudacraea kuenowi hypoxantha</i> ♂ ♀ mimics IA	Serial number	Forms of <i>Pseudacraea eurytus hobleyi</i>		<i>Precis tauana</i>	
		♂	♀	♀ mimics I	♂ non-mimetic
		♂	♀ "poggeoides" mimicking IA		
			"hobleyi" " IB		
		♂	"tirikensis" " II		
		♂	"obscura" " III		
		♀	"terra" " IV		
	177	♀	<i>tirikensis</i> , like 54.		
	178	♀	<i>terra</i> , like 176.		
				1	
					2
	179	♀	<i>tirikensis</i> .		
				1	
	180	♂	transitional, like 2.		
	181	♂	transitional, midway between <i>obscura</i> and <i>terra</i> , with trace of basal umber suffusion on h.-w. below.		
	182	♀	<i>obscura</i> , like 124.		
1	183	♂	<i>obscura</i> .	2	1
	184	♂	<i>obscura</i> .		
	185	♀	<i>obscura</i> .		
	186	♂	<i>terra</i> .		
	187	♀	<i>tirikensis</i> .		
	188	♀	<i>terra</i> , like 78.		
	189	♀	<i>terra</i> , like 119.		
	190	♂	<i>terra</i> .		
	191	♂	<i>terra</i> , like 19.		
	192	♀	<i>tirikensis</i> .		
	193	♀	<i>tirikensis</i> . Both h.-ws. symmetrically shorn off near base.		
	194	♀	<i>terra</i> , f.-w. inner marginal area slightly suffused white.		

NYMPHALINE MIMICS.					
<i>Pseudacraea kuenowi hypoxantha</i> ♂ ♀ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i>			<i>Precis rauana</i>	
	Serial number	♂	♀	♀ mimics I	♂ non-mimetic
		♂	♀ "poggeoides" mimicking IA "hobleyi" " " IB "tirikensis" " " II "obscura" " " III "terra" " " IV		
	195	♂	<i>obscura</i> .	1	1
	196	♂	<i>terra</i> , like 1.		
	197	♀	<i>terra</i> , f.-w. subapical area whitish.		
	198	♀	<i>obscura</i> , transitional to <i>terra</i> ; f.-w. inner margin has very slight yellow suffusion.		
	199	♂	<i>hobleyi</i> .		
	200	♂	<i>terra</i> , like 7.		
	201	♂	transitional, like 2.		
	202	♀	<i>tirikensis</i> .		
				1	
	203	♂	<i>terra</i> , like 27.		
	204	♀	<i>terra</i> , f.-w. subapical and inner marginal areas slightly suffused white.		
	205	♀	transitional from <i>obscura</i> to <i>tirikensis</i> . F.-w. subapical area large and cream coloured; inner marginal area slightly suffused yellow; h.-w.; cream coloured, with paler band at base; basal triangle marked below.		
	206	♂	<i>terra</i> , like 122.		
	207	♂	<i>terra</i> , like 91.		
	208	♀	<i>terra</i> , like 50.		
	209	♂	<i>obscura</i> .		
	210	♂	<i>terra</i> .		
	211	♀	<i>terra</i> .		
	212	♀	<i>terra</i> , f.-w. subapical area white, with yellow along nervures; h.-w. below shows distinct basal umber suffusion.		
	213	♀	<i>terra</i> , like 212.		
	214	♀	<i>terra</i> , like 176.		
	215	♀	<i>obscura</i> , f.-w. subapical area large and whitish. Margin of one h.-w. very ragged and torn as if by lizard.	1	

DATE.	LOCALITY.	ACRAEINE (<i>Planema</i>) MODELS.						ACRAEINE MIMICS.						
		I		II		III		IV		<i>Acraea jodutta</i>		<i>Acraea alciope</i>		
		A	B	<i>alcinoe camerunica</i>		<i>epaea para-gea</i>		<i>tellus eume-lis</i>		<i>jodutta</i> ♀ mimics II	<i>dorothea</i> ♀ mimics IV	Non-mimetic ♂	<i>aurivillii</i> ♀ mimics IB	Non-mimetic ♂
		<i>poggei nelsoni</i>	<i>macarista macarista</i>	♀	♂ not mimicked	♂	♀	♂	♀					
1912. Aug. 20	At edge of forest (E)							1	1	1				
Aug. 21	At edge of forest (E)			1				2						
Aug. 22	At edge of forest (E)					1								
Aug. 24	At edge of forest (E)				1	1								
Aug. 26	At edge of forest (D)									1 (black f.-w. bar broken at hind margin, so that sub-apical and inner marginal areas are continuous; they are suffused with white near costa)			1	
Aug. 26 " 27	At edge of forest (E)					1	2	2 1	1	1				
								(f.-w. subapical area white, and inner marginal area suffused white)						
Aug. 28	At edge of forest (D)								1					

NYMPHALINE MIMICS.				
<i>Pseudacraea kuenowi hypoxantha</i> ♂ mimics ♀ IA	Forms of <i>Pseudacraea eurytus hobleyi</i>		<i>Precis rana</i> a	
	Serial number	♀ "poggeoides" mimicking IA ♂ "hobleyi" " " IB ♀ "tirikensis" " " II ♂ "obscura" " " III ♂ ♀ "terra" " " IV	♀ mimics I	♂ non-mimetic
	216 ♂	<i>terra</i> , like 39.		
	217 ♂	<i>terra</i> , like 122.		
	218 ♀	<i>terra</i> , like 78.		
	219 ♂	<i>terra</i> , f.-w. subapical area suffused white at both ends.		
	220 ♂	<i>terra</i> , variety; f.-w. subapical area large and connected with inner marginal area by isthmus, the black bar being broken at costal end and the cell suffused with yellow.		
	221 ♂	<i>hobleyi</i> . F.-w. band slightly suffused white at posterior end.		
	222 ♀	<i>tirikensis</i> .		
	223 ♀	<i>tirikensis</i> .		
	224 ♀	<i>terra</i> , like 119.		
	225 ♂	<i>terra</i> .		
	226 ♂	<i>hobleyi</i> .		
	227 ♀	<i>tirikensis</i> .		
	228 ♀	<i>terra</i> .		
	229 ♀	<i>obscura</i> .		
	230 ♀	<i>terra</i> , like 176.		
			2	
	231 ♂	<i>hobleyi</i> .		
	232 ♂	<i>terra</i> .		
	233 ♂	<i>terra</i> .		
	234 ♂	<i>terra</i> .		
	235 ♂	<i>terra</i> , like 27.		
	236 ♂	<i>terra</i> , like 27.		
	237 ♂	<i>obscura</i> , transitional to <i>hobleyi</i> . F.-w. subapical area white; h.-w. basal amber suffusion marked below.		
	238 ♀	<i>tirikensis</i> .		
	239 ♀	<i>terra</i> , like 78.		
	240 ♀	<i>terra</i> , like 42.		
	241 ♀	<i>terra</i> , transitional to <i>tirikensis</i> . F.-w. subapical area small and white; inner marginal area small, suffused white; h.-w. below shows distinct basal triangle.		

		NYMPHALINE MIMICS.			
<i>Pseudacraea kuenowi</i> <i>hypoxantha</i> ♂ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i>			<i>Precis rauana</i>	
	Serial number			♀ mimics I	♂ non-mimetic
			♀ "poggeoides" mimicking IA ♂ "hobleyi" " " IB ♀ "tirikensis" " " II ♂ "obscura" " " III ♀ "terra" " " IV		
	242	♂	<i>terra</i> .		
	243	♀	<i>terra</i> , f.-w. black bar thinned.		
	244	♀	<i>terra</i> , like 243.		
	245	♀	<i>obscura</i> .		
	246	♀	<i>obscura</i> , like 51.		
	247	♂	<i>terra</i> , like 27.		
					1
	248	♂	transitional, like 34.		
	249	♀	<i>terra</i> .		
	250	♂	<i>terra</i> .		
	251	♂	<i>terra</i> , like 7.		
	252	♀	<i>obscura</i> , h.-w. shows well-marked umber basal suffusion below.		
	253	♂	transitional, like 2.		
	254	♀	<i>terra</i> , like 49.		
	255	♂	transitional, like 2.		
	256	♂	<i>terra</i> , like 27.		
	257	♂	<i>obscura</i> , like 143.		
	258	♂	<i>obscura</i> , like 143.		
	259	♂	<i>obscura</i> , like 143.		
	260	♀	<i>terra</i> .		
	261	♀	<i>obscura</i> , like 24.		
	262	♂	<i>terra</i> .	1	1
	263	♂	<i>obscura</i> , transitional to <i>hobleyi</i> . F.-w. subapical and inner marginal areas pale cream; also h.-w. Basal umber suffusion on h.-w. below marked.		
	264	♂	<i>obscura</i> , like 143.		
	265	♀	<i>tirikensis</i> .		
	266	♀	<i>obscura</i> , like 51.		

NYPHALINE MIMICS.

<i>Pseudacraea kuenowi</i> <i>hypoxantha</i> ♂ mimics IA	Forms of <i>Pseudacraea eurytus hobleji.</i>		<i>Precis rauana</i>	
	Serial number		♀ mimics I	♂ non-mimetic
		♀ "poggeoides" mimicking IA ♂ "hobleji" " IB ♀ "tirikensis" " II ♂ "obscura" " III ♀ "terra" " IV		
	267	♀ 'obscura, like 51.		
	268	♀ obscura, like 43.		
	269	♀ tirikensis.	2	1
	270	♀ obscura, like 51 (parent of series H).		
	271	♀ terra, like 56. Both h.-ws. have large part of periphery missing, the damage on right side also extending to hind margin of f.-w. ? attack by bird.		
	272	♂ obscura, like 8.	1	2
	273	♀ terra, like 104.		
	274	♀ terra, like 104.		
	275	♀ tirikensis, f.-w. white subapical area suffused yellow on outer margin.		
1	276	♂ obscura, like 143.		
	277	♂ terra. F.-w. shows slight suffusion with yellow on costa just internal to subapical area. This was enough to give the specimen an appearance different from the typical form on the wing.		
	278	♂ obscura, like 263.		
	279	♀ tirikensis.		
	280	♀ terra.		
	281	♀ terra.		
	282	♂ obscura, like 32.		
	283	♀ transitional, like 29 : ground-colour very dark.		
	284	♂ obscura, like 143.		1
	285	♀ tirikensis.		
	286	♀ obscura, like 51.		
	287	♂ terra, like 27.		
	288	♀ terra. F.-w. subapical area white : inner marginal area dusklily suffused.	3	
	289	♂ terra, like 19.		
	290	♂ transitional, like 2.		
	291	♀ terra.		
	292	♂ hobleji.		
				1
	293	♂ terra.		
	294	♀ terra.		
	295	♂ terra, like 122.		
	296	♀ tirikensis (parent of series J).		
	297	♂ hobleji.		

NYMPHALINE MIMICS.

<i>Pseudacraea kuenowi hypoxantha</i> ♂ ♀ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i>		<i>Precis rauana</i>	
	Serial number		♀ mimics I	♂ non-mimetic
		♀ "poggeoides" mimicking IA ♂ "hobleyi" " IB ♀ "tirikensis" " II ♂ ♀ "obscura" " III ♂ ♀ "terra" " IV		
	298	♂ terra.		
	299	♂ terra.		
	300	♀ terra.		
	301	♀ obscura, like 43.		
	302	♂ hobleyi.		
	303	♂ obscura, like 62.		
	304	♂ terra, like 39.		
	305	♂ terra, like 122.		
	306	♂ terra, like 122.		
	307	♂ hobleyi.		
	308	♀ terra, like 42 (parent of series K).		
	309	♂ terra.		
	310	♂ terra		
	311	♀ tirikensis.		
	312	♀ tirikensis.		
	313	♀ terra, pale ground-colour; f.-w. subapical area large and cream coloured; inner marginal area dusky suffused.		
	314	♀ tirikensis.		
	315	♀ tirikensis.		
	316	♂ terra, like 27.		
	317	♂ transitional like 2.		
	318	♀ obscura, like 51.		
	319	♂ hobleyi.		
	320	♀ terra.		
	321	♂ terra.		
	322	♂ hobleyi, white h.-w. band small, suffused yellow anteriorly.		
	323	♂ obscura, transitional to hobleyi: h.-w. rather whitish at base, and basal triangle well marked below.		
	324	♀ remarkably interesting specimen coming very near to the typical <i>W. eurytus</i> . Ground-colour of <i>tirikensis</i> ♀. F.-w. subapical area, in size and position that of <i>terra</i> , is white: inner marginal area contracted, also white. H.-w. has white base, and close to origin is slightly suffused with yellow. Black border to white is broader than in typical <i>tirikensis</i> . Basal amber suffusion below h.-w. poorly developed.		
	325	♀ obscura, like 43.		
	326	♂ terra, like 91.		
	327	♀ terra, like 50.		

DATE.	LOCALITY.	ACRAEINE (<i>Planema</i>) MODELS.						ACRAEINE MIMICS.						
		I		II		III		IV		<i>Acraea jodutta</i>			<i>Acraea alciopae</i>	
		A	B	<i>alcinoe camerunica</i>		<i>epaea para-gea</i>	<i>tellus eume-lis</i>		<i>jodutta</i> ♀ mimics II	<i>dorothea</i> ♀ mimics IV	Non-mimetic ♂	<i>aurivillii</i> ♀ mimics Ib	Non-mimetic ♂	
		<i>poggei nelsoni</i>	<i>macarista macarista</i>	♀	♂ not mimicked	♂	♀	♂						♀
1912.														
Nov. 13	At edge of forest (E) —continued													
Nov. 18	In forest (C) . . .													
Nov. 23	At edge of forest (E)													
Nov. 24	On shore													
Dec. 1	At edge of forest (E)		1											
Dec. 6	At edge of forest (E)													
Dec. 6	At edge of forest (D)													
Dec. 8	In forest (A) . . .													
Dec. 9	At edge of forest (E)													
Dec. 13	At edge of forest (E)													
Dec. 16	At edge of forest (D)		1											
Dec. 19	At edge of forest (E)													
Dec. 20	At edge of forest (E)													
Dec. 21	At edge of forest (E)													
Dec. 27	At edge of forest (E)													
Dec. 30	At edge of forest (E)													
1913.														
Jan. 5	In forest (A) . . .													
Jan. 8	In forest (B) . . .													
Jan. 12	In forest (A) . . .							1						
Jan. 25	At edge of forest (E)									1				
Jan. 26	In forest (A)													
Feb. 13	At edge of forest (E)					1	1							

		NYMPHALINE MIMICS.				
<i>Pseudacraea kuenowi hypoxantha</i> ♂ ♀ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i>				<i>Precis rauana</i>	
	Serial number				♀ mimics I	♂ non-mimetic
		♀	" <i>poggeoides</i> "	mimicking	IA	
		♂	" <i>hobleyi</i> "	"	IB	
		♀	" <i>tirikensis</i> "	"	II	
		♂	" <i>obscura</i> "	"	III	
		♀	" <i>terra</i> "	"	IV	
		328	♀	<i>tirikensis</i> .		
		329	♀	<i>terra</i> , f.-w. subapical area very large; black bar thinned.		
		330	♀	<i>obscura</i> .		
		331	♀	<i>obscura</i> .		
					1	
		332	♀	<i>terra</i> , like 204.		
		333	♀	<i>tirikensis</i> .	1	1
		334	♂	<i>terra</i> .		
1						
		335	♂	<i>terra</i> .		1
		336	♂	<i>hobleyi</i> .		
		337	♀	<i>terra</i> , like 42.		
		338	♂	<i>hobleyi</i> .		
		339	♀	<i>tirikensis</i> .		
		340	♂	<i>terra</i> , like 39.		
		341	♀	<i>terra</i> , f.-w. subapical area large and suffused white; black bar very much thinned; distinct basal umber h.-w. below.		
		342	♀	<i>terra</i> , like 158.		
		343	♀	<i>terra</i> , transitional to <i>obscura</i> : f.-w. subapical area small and whitish; inner marginal area duskily suffused.		
		344	♂	<i>terra</i> , f.-w. subapical and inner marginal areas contracted; h.-w. below shows distinct basal umber suffusion.		
		345	♀	<i>terra</i> , like 111.		
1		346	♂	<i>hobleyi</i> .		
		347	♂	<i>terra</i> .		
		348	♀	<i>tirikensis</i> .		
					1	
		349	♂	<i>terra</i> , like 39.		
		350	♀	<i>obscura</i> .		
		351	♀	<i>terra</i> .		
		352	♀	<i>terra</i> , like 50.		
		353	♂	<i>terra</i> , like 344.		
		354	♂	<i>hobleyi</i> .		
		355	♀	<i>obscura</i> .		

EXPLANATION OF PLATE XXXIV.

The figures are about $\frac{5}{8}$ of the natural size.

Transitional forms of *Pseudacraea eurytus hobleiyi*, Neave, from Bugalla Island, one female (fig. 11) resembling a typical western female of *eurytus*, L., from the Lagos district, represented in fig. 12 with its model, *Planema epaea*, from the same locality, in fig. 13.

Figs. 1-8 a series of the form *terra*, showing a very gradual transition from an almost typical example (1) to three specimens (6-8) in which the subapical bar is distinctly continuous with the great triangular patch of the fore-wing. Fig. 8 represents a not quite typical form of the var. *impleta*, Grünb.

- FIG. 1. At edge of forest (Locality D), Sept. 7, 1912. Form *terra*, ♀. No. 260 in list. The black bar between subapical and inner marginal yellow areas is thinned.
2. In forest (A), April 7, 1912. Form *terra*, ♀. No. 77 in list. The thinning of the black bar is marked.
3. At edge of forest (E), Sept. 15, 1912. Form *terra*, ♂. No. 277 in list. The slight yellow suffusion of black costal border gave the specimen a different appearance on the wing. This specimen has been noted in Proc. Ent. Soc., Dec. 4, 1912, p. cxxxviii.
4. At edge of forest (E), Nov. 13, 1912. Form *terra*, ♀. No. 329 in list. Black bar nearly broken through.
5. At edge of forest (D), July 17, 1912. Form *terra*, ♂. No. 128 in list. Like 4. There is a streak of bright fulvous colour on the black apex of the cell. This specimen looked different from the type on the wing.
6. At edge of forest (E), Aug. 21, 1912. Form *terra*, ♂, variety. No. 220 on list. The black bar is broken through at the inner end.
7. In forest (A), Feb. 27, 1912. Form *terra*, ♂, variety. No. 33 on list. Like 6 but process has been carried farther.
8. In forest (C), April 13, 1912. Form *terra*, ♂, variety. No. 80 on list. Black bar broken through in its middle, and a well-marked fulvous spot in the black area of the cell.

Explanation of Plate XXXIV.

- FIG. 9. In forest (C), March 19, 1912. ♂ transitional specimen. No. 57 in list. Fore-wings of pattern of ♂ *hobleyi* form; hind-wings of pattern of *terra* form, with the basal triangle of *hobleyi* superposed.
10. In forest (A), Feb. 26, 1912. ♀ transitional specimen. No. 29 in list. Pattern of *terra*, but fore-wing subapical area white like ♀ f. *tirikensis*: inner marginal area very pale, and basal triangle of *hobleyi* strongly marked below.
11. In forest (A), Nov. 3, 1912. ♀. A form of *tirikensis* closely approaching a typical western ♀ of *eurytus*. No. 324 on list. The only specimen of this W. African type taken in Uganda.
12. In forest, 1 mile E. of Oni, near Lagos, W. Africa, Dec. 11, 1910. W. A. Lamborn. One of the typical western females of *eurytus*; mimics 13. Represented for comparison with 11.
13. In clearing of Oni camp, near Lagos, Oct. 16, 1910. W. A. Lamborn. *Planema epaea*. ♀. Model for No. 12: it does not occur on Bugalla Island, and has never been taken in Uganda, where it is represented by the dingier *epaea paragea*. A single typical ♂ has however been taken on the far Western border of Uganda (Semliki Valley) by Sheffield Neave.



Alfred Robinson, photo

About $\frac{2}{3}$ of Natural Size.

Pseudaeraca eurytus hobleyi, Ec. Transition from terra to impleta (1—8), from terra to δ hobleyi (9), terra to tirikensis (10). Tirikensis (11), resembling a typical Western δ eurytus (12), mimetic of δ *Planema ebata* (13). (12) and (13) from Lagos, 1910; W. A. Lamborn. (1—11), Bugalla Island, N.W. Victoria Nyanza, 1912; G. D. H. Carpenter.

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EXPLANATION OF PLATE XXXV.

The figures are about $\frac{1}{2}$ of the natural size.

Three families of *Pseudacraea eurytus hobleyi*, Neave, with their female parents. An account of Series B (1-4), and E (5-8), is published in Trans. Ent. Soc., 1912, pp. 706-716; of Series J (9-16) in Proc. Ent. Soc., 1913, pp. ix-xi.

- FIG. 1. ♀ parent of 2, 3, 4 (Series B). In forest (A), Bugalla Island, L. Victoria, June 30, 1912. (No. 120 in list, *q. v.*) Form *obscura*, ♀.
2. Offspring of 1. Emerged Sept. 3. Form *terra*, ♀.
 3. Offspring of 1. Emerged Sept. 6. Form *obscura*, ♀. Fore-wing subapical bar whitish, a trace of golden suffusion on inner margin, hind-wings pale, with umber suffusion at base on underside. This is a transitional specimen. (See Proc. Ent. Soc., 1912, p. cxxxvi.)
 4. Offspring of 1. Emerged Sept. 8. Form *terra*, ♀. A little white suffusion to subapical bar of fore-wing.
 5. ♀ parent of 6, 7, 8 (Series E). At edge of forest (D), Bugalla Island, July 24, 1912. (No. 152 in list, *q. v.*) ♀ form *tirikensis*, the ♀ of the ♂ form *hobleyi*.
 6. Offspring of 5. Emerged Sept. 28, 1912. Form *tirikensis*, ♀.
 7. Offspring of 5. Emerged Oct. 4, 1912. A transitional form, ♀ *obscura*, with well marked basal umber suffusion.
 8. Offspring of 5. Emerged Oct. 6. ♂. A transitional form, with golden suffusion of *terra* on *obscura* basis, hind-wings below show umber suffusion indicative of *hobleyi*.
 9. ♀ parent of 10-16 (Series J). Same locality as 1, Oct. 13, 1912. (No. 296 in list, *q. v.*) ♀ form *tirikensis*.
 10. Offspring of 9. Emerged Dec. 7. ♂ form *obscura*, suffused with a little of the yellow of *terra*.
 11. Offspring of 9. Emerged Dec. 8. ♂ form *obscura*, suffused with a little of the yellow of *terra*.
 12. Offspring of 9. Emerged Dec. 9. ♂ form *hobleyi*. The white hind-wing bar is tinted with yellow at its costal end.
 13. Offspring of 9. Emerged Dec. 10. ♀ *obscura*.

Explanation of Plate XXXV.

- FIG. 14. Offspring of 9. Emerged Dec. 10. ♂ *obscura*, with a trace of *terra* like 10.
15. Offspring of 9. Emerged Dec. 9. ♂ *obscura*, with a trace of *terra* like 10.
16. Offspring of 9. Emerged Dec. 13. ♀ *obscura*.

In every specimen there is a marked umber suffusion at base of hind-wing under surface, derived from the parent form, *hobleyi*. An eighth member of this family, a typical ♂ *hobleyi*, failed to emerge.

♀ PARENT B
Obscura.



♀ PARENT E
Tirikensis.



♀ PARENT J
Tirikensis.



Alfred Robinson, phot.

About $\frac{1}{4}$ of Natural Size.

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Pseudacraea eurytus hobleyi. Three families with their female parents, shewing *terra* (2, 4) produced by *obscura* (1), and *obscura* (10, 11, 13-16), by *tirikensis* (9). Three others (3, 7, 8) are transitional between *obscura* and *terra*, (6) is *tirikensis* and (12) *hobleyi*. Bugalla Island, N.W. Victoria Nyanza, 1912: G. D. H. Carpenter.

EXPLANATION OF PLATE XXXVI.

The figures are rather under half natural size.

Figs. 1-7 represent the chief *Planema* models from the forests in the neighbourhood of Entebbe, where all were collected by Mr. C. A. Wiggins, together with their mimics, shown in figs. 8-13 ("I. Congr. Internat. d'Ent.," 1910, vol. ii, p. 483).

FIG. 1. ♀ *Planema macarista*. Captured Aug. 14, 1909, by C. A. Wiggins, in the forest on the E. slope of Kitabi Hill (about 4000 ft.), about two miles N.E. of Entebbe. The chief model of 8 and of Combination II (p. 611). The ♀ *Pl. alcinoe* is a subordinate model of Combination II in Uganda.

2. ♂ *Planema macarista*. Captured Aug. 22, 1909, as fig. 1. The model of 9, and of Combination Ib (p. 609).
3. ♂ *Planema poggei*. Captured July 11, 1909, as fig. 1. The model of 10, and of Combination Ia (p. 609).
4. ♀ *Planema poggei*. Captured July 11, 1909, as fig. 1. The model of 10, and of Combination Ia (p. 609).
5. ♂ *Planema tellus eumelis*. Captured Aug. 22, 1909, as fig. 1. The model of 11, 12, and of Combination III (p. 611).
6. ♀ *Planema tellus eumelis*. Captured Aug. 14, 1909, as fig. 1. The model of 11, 12, and of Combination III (p. 611).
7. ♀ *Planema epaea paragea*. Captured July 23, 1910, by native collector in the forest S.W. of Kitala Hill, about four miles N.E. of Entebbe. The model (with sexes alike) of 13 (with sexes alike), and of Combination IV (p. 612).
8. *Pseudacraea eurytus hobleyi*, ♀ form *tirikensis*, mimetic of 1, and captured at the same time and place.
9. *Pseudacraea eurytus hobleyi*, ♂ form *hobleyi*, mimetic of 2, and captured at the same time and place.
10. *Pseudacraea eurytus hobleyi*, ♀ form *poggeoides*, mimetic of 3 and 4. This ♀ form, with the pattern of 8 and nearly the colouring of 9, is relatively very rare in the Entebbe district, but rather less so in Damba and Bugalla. It becomes common to the E. of the Nile, where 1, the model of 8, is unknown, but where 3 and 4 persist. The figured specimen was captured by C. A. Wiggins in the same

Explanation of Plate XXXVI.

locality as its models 3, 4, on July 18, 1909 ("I. Congr. Internat. d'Ent.," 1910, vol. ii, p. 486-7, n. 3).

- FIG. 11. ♂ *Pseudacraea eurytus hobleyi*, ♂ ♀ form *terra*. Captured at the same time and place as 5, the male of its model.
12. ♀ *Pseudacraea eurytus hobleyi*, ♂ ♀ form *terra*. Captured at the same time and place as 6, the female of its model.
13. ♀ *Pseudacraea eurytus hobleyi*, ♂ ♀ form *obscura*. Captured by a native collector, July 30, 1910, in the forest on lake shore, E. of Kitala Hill about two miles N.E. of Entebbe (about 3800 ft.). Mimics 7. This mimetic form is not nearly so common in the Entebbe district as it is in the neighbouring islands in Lake Victoria.

Figs. 14-17, all forms of *Ps. eurytus hobleyi*, intermediates between the forms 8-13. The examples figured were captured on the E. side of Damba Island, 1911 (Proc. Ent. Soc., 1911, pp. xci-v; 1912, pp. xix-xxiii). Transitional forms occur, but are relatively rare in the neighbourhood of Entebbe, where the models, 1-7, are much commoner than the mimics. They are relatively abundant on Damba and Bugalla, where mimics, resembling 8-13, are much commoner than the models.

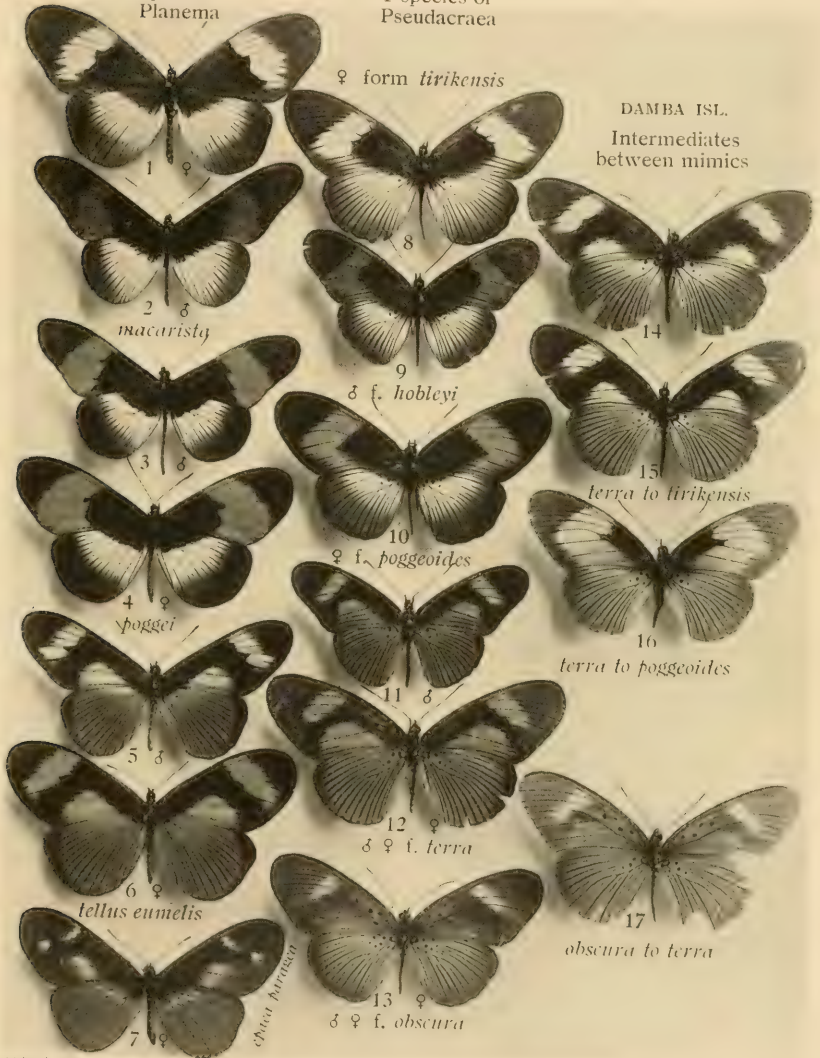
- FIG. 14. ♀ transitional between *terra* and *tirikensis*, the ♀ *hobleyi*. Captured July 1-15, 1911, on the shore.
15. ♀ transitional between *terra* and *tirikensis*. Captured Aug. 16-31, in deserted banana plantations, overgrown by jungle.
16. ♀ of the var. *impleta*, Grünb., transitional between *terra* and ♂ *hobleyi* or ♀ *poggeoides*. Captured, Dec. 3, along a game track in forest.
17. ♀ transitional between *obscura* and *terra*. Captured Sept. 17-30, in jungle similar to 13.

FORESTS NEAR ENTEBBE

Acraeinae Models
4 species of
Planema

Nymphaline mimics
1 species of
Pseudacraea

DAMBA ISL.
Intermediates
between mimics



Alfred Robinson, photo.

Andre & Steigh, Ltd

Rather under 1/2 Natural Size.

Mimetic forms of the Nymphaline Butterfly *Pseudacraea curyus hobleyi* and their Acraeinae models from forests in the neighbourhood of Entebbe (C. A. Wiggins, 1909). Intermediates between the mimics from Damba Island, N.W. Victoria Nyanza, where the models are relatively scarce. (G. D. H. Carpenter, 1911).

NYMPHALINE MIMICS.					
<i>Pseudacraea kuenowi hypoxantha</i> ♂ ♀ mimics IA	Forms of <i>Pseudacraea eurytus hobleyi</i>			<i>Precis rauana</i>	
	Serial number			♀ mimics I	♂ non-mimetic
		♀	" <i>poggeoides</i> " mimicking IA		
		♂	" <i>hobleyi</i> " " IB		
		♀	" <i>tirikensis</i> " " II		
		♂	" <i>obscura</i> " " III		
		♀	" <i>terra</i> " " IV		
1					
	356	♀	<i>tirikensis</i> .		

EXPLANATION OF PLATES XXXIV-XXXVI.

[See *Explanations facing the PLATES.*]

XXVI. *Pseudacraea boisduvali*, Doubl., and its models, with especial reference to Bugalla Island. By G. D. HALE CARPENTER, D.M., Oxon.

[Read November 5th, 1913.]

PLATES XXXVII AND XXXVIII.

THIS paper owes very much to the kind help and advice of Prof. Poulton, who is, indeed, the author of its being, for it would never have been undertaken except for his suggestion, nor carried through without his aid and advice. The arrangement of the plates is entirely due to him.

On Bugalla Island, in the Sesse Archipelago, Lake Victoria, during 1912 and January to February 1913, I was able to catch a good series of *Pseudacraea boisduvali*, Doubl., viz. 8 ♂♂ and 12 ♀♀. It frequents the forest, but is most easily caught when it comes to the edge to feed from the flowers of the bush *Haronga madagascariensis*, Chois. (*Hypericineae*), which particularly flourishes where the belt of forest suddenly comes to an end and is replaced by open grass-land. The single large bushes when in flower are extraordinarily attractive to many kinds of insects, and I have seen Planemas, and the forms of *Pseudacraea eurytus*, L., mimicking them, together with *Pseudacraea boisduvali* and various synaposematic red and black Acraeas (*A. egina*, Cram., *A. zetes*, L., and *A. perenna*, D. and H.), all together at the same time, with numerous other insects of the Lycoid synaposeme.

There is considerable difference of opinion as to the appearance of this fine *Pseudacraea* on the wing. Mr. G. A. K. Marshall wrote in 1897 (Trans. Ent. Soc., 1902, p. 504) as follows—"I feel quite satisfied that *Pseudacraea trimenii* [*boisduvali trimenii*] is a mimetic and not a protected species. In spite of its larger size it looks wonderfully like *Acraea acara* on the wing, and the first few examples I caught completely took me in. Their flight is like that of all *Pseudacraeas* and *Euralias*—slow and sailing—so long as they are not disturbed; but if struck at and

missed they are off like a shot and do not often give one a second chance." The Rev. K. St. Aubyn Rogers, however, who has had experience of this species at Rabai, near Mombasa, is of a somewhat different opinion. In his "Bionomic Notes on British East African Butterflies" (Trans. Ent. Soc., 1908, p. 526) he says, speaking of the difference in flight between the model and the mimic: "Its flight is more lofty and sustained, and when alarmed it goes off at a great rate." This is exactly my own experience, and is the usual case with a mimic of the Nymphaline group: they seem to feel that their appearance will not bear close examination, and if pursued with intent will trust rather to their flight than to their appearance. (Cf. the note on *Precis rauana* in my paper on the *Pseudacraea eurytus hobleji* group, pp. 610, 611). I have never been deceived by *boisduvali*, as I have by *eurytus hobleji*. The *Pseudacraea* has a very much stouter appearance than its Acraeine model, which is a thin-bodied insect of comparatively feeble flight. When at rest on a flower-head the *Pseudacraea* is always on the alert and is difficult to catch, as it takes alarm before one gets within striking distance. The *Acraea*, however, if struck at, and missed, in most cases will return to the same spot.

Rogers (*l. c.*, p. 526) noticed that the integuments of the *Pseudacraea* are very tough, and I have noticed the same thing myself. Although the butterfly is not so resistant to a pinch on the thorax as is its model, yet it is certainly more resistant than *Pseudacraea eurytus hobleji*, with which I have had a large experience.

If one compares the series of 8 males and 12 females from Bugalla Island (Plate XXXVIII, figs. 2, 6, 7, 8, 9, 10) with specimens from other parts of Africa (Plate XXXVII, figs. 2, 4, 11, 13), the island forms appear to be intermediate between the Eastern and South-eastern forms on the one hand and the West Coast forms on the other hand, and in this they agree with specimens caught by S. A. Neave on the mainland of Uganda—a male and a female from the N. shore of the lake near Kampala, and a male and two females from the W. shore in Buddu. Let us consider the *males* first.

The mimetic resemblance of the male Pseudacraea boisduvali both East and West.—In the Hope Collection at Oxford is a long series of the Eastern form, as follows, following an order from N. to S. :—

30 caught by the Rev. K. St. A. Rogers at Rabai,
near Mombasa, Br. E. Africa.

1 caught by the Rev. H. Rowley, from "the Zambesi."

2 caught by C. F. M. Swynnerton in S.E. Rhodesia
(Chirinda forest).

6 caught by G. A. K. Marshall in Natal.

1 caught by G. H. Burn in Natal.

22 bred by the late A. D. Millar at Durban, Natal.

These 62 males show that more than half of the Eastern examples have a well-developed orange-yellow subapical bar on the fore-wing (Plate XXXVII, fig. 11). This same peculiarity is well marked also in the model of the Eastern *boisduvali* (or *boisduvali trimeni*, Butl.), namely the *acara*, Hew., race of *Acraea zetes*, L. (fig. 10). In some males of *trimeni*, on the other hand, this bar has almost or quite disappeared (as in 5 from Mombasa, 4 from Durban, and 1 from S.E. Rhodesia), or else is very faintly represented by that part of it near the hind-margin of the wing (as in 9 from Mombasa and 6 from Durban). Subtracting these, we get $62 - 25 = 37$, out of 62, with well-developed orange bar, so that this form is slightly predominant in the *East* and *South-east*; and specimens with a less but still fairly well-developed orange area are very common. In the specimens from *West Africa*, of which, however, there are only 2 males and 1 female in the Hope Department, this orange area hardly appears; the Sierra Leone specimen shows no trace of it (Plate XXXVII, fig. 2), and an Angola specimen only that end of it close to the hind-margin of the wing.

Now in the Uganda males (Plate XXXVIII, figs. 2, 6, 7), in *no* case is the orange bar so well developed as in the 37 Eastern males, and in only half of them is it in the same condition as in the Angola specimen. Hence, as regards the non-development of the orange bar, the Uganda males approach most nearly to the Western form. The Western form, as was first pointed out by Haase (see pp. 651, 652), mimics *Acraea egina* and not *Acraea zetes*, and the Uganda males also mimic *A. egina*, although *zetes* abounds on Bugalla Island.

There is another point of interest in the mimicry of the male *Acraea zetes acara* by *Pseudacraea boisduvali trimeni* (formerly *Ps. trimeni*, when the East African form was regarded as a distinct species). Many specimens of ♂ *zetes*

from Natal, Rhodesia, etc., show a white irradiation of the centre of the hind-wing, and this is also present in a certain number of the *Pseudacraeas* from the same localities. This white irradiation has been beautifully shown in Eltringham's magnificently illustrated "African Mimetic Butterflies," Oxford, 1910 (Plate 6).

At Mombasa, in British East Africa, however, where the *zetes* are still of the Eastern form with a well-marked orange bar on the fore-wings, none of the Oxford specimens show the white irradiation, and neither do the *boisduvali*, save for the minutest trace along a few nervules, which is only visible on very close inspection, as in fig. 11, Plate XXXVII. In the photograph the white is more conspicuous than in the actual specimen.

Now let us turn to another point. The *Western* form of the male (which we may now call *boisduvali boisduvali* in contradistinction to the Eastern *boisduvali trimeni*), as illustrated by the two specimens in the Hope Department, shows, at the base of the fore-wings, a very marked suffusion with black, which replaces the red colour over approximately the basal half of the wing. This is particularly well shown in the specimen from Sierra Leone (Plate XXXVII, fig. 2), but the other, from Angola (Hewitson, 1873), which is in poor condition, does not show this so clearly. It may be remarked here that as we reach the more southern latitudes of the tropical West Coast an Eastern affinity begins to appear not only in *Ps. boisduvali* but in other species as well. The darkening of the fore-wing basal area is exactly the change most needed to produce a likeness to *Acraea egina*, which differs from *A. zetes acara*, amongst other less conspicuous points, in having the red colour on the fore-wing replaced by black over this very part of the surface. (Compare figs. 1 and 10 on Plate XXXVII.) Now, out of the whole number of specimens of the East African male *boisduvali trimeni* in the Hope Department, only one, taken by the Rev. K. St. Aubyn Rogers near Mombasa, Dec. 29, 1906, shows this black suffusion over the base of the fore-wing at all well marked. This was described as an interesting link between *trimeni* and *boisduvali* proper by Trimen in an appendix to Rogers' paper on the "Bionomics of East African Butterflies" in these Transactions, 1908, p. 552. But, on comparing the males from Uganda (8 from Bugalla Island and 2 from the mainland) one finds this basal black very

well marked indeed in 6 of the 8 island specimens (Plate XXXVIII, figs. 2, 6, 7), and one of the two mainland specimens (from Kampala). In another island specimen, and the second mainland male (from Buddu) the basal suffusion is less marked, though it is nevertheless more pronounced than in the Eastern *trimeni* form. In the remaining island male the basal black is only just noticeable (as it is in one specimen bred by the late A. D. Millar in Natal and the one caught by Rogers near Mombasa).

If we then consider these two points, namely, the degree of development of the orange subapical area, and the basal black suffusion, the conclusion is irresistible that the ♂ *Ps. boisduvali* in Uganda (Plate XXXVIII, figs. 2, 6, 7) is intermediate between the *trimeni* form of the East with well-developed orange bar and no basal black (Plate XXXVII, fig. 11), and the true *boisduvali* form of the West, with no orange and well-developed basal black (Plate XXXVII, fig. 2), but that on the whole it is nearer to the latter and more closely resembles *Acraea egina*, the Western model, than *Acraea zetes*, the Eastern model, although, as I have said, *zetes* is plentiful enough on the island.

In testing this conclusion by comparing the figures on Plates XXXVII and XXXVIII, it is necessary to make allowance for the difficulty of representing black, red and orange in their full values by means of a plate prepared from a photograph, however good. By screening, long exposure, and sensitive plates, Mr. Alfred Robinson has produced very fine results, but the added advantage of colour is indispensable for the adequate representation of such butterflies as the forms of *Pseudacraea boisduvali* and their models.

As regards the red spots along the black margin of the hind-wing, the Bugalla *Pseudacraeas* come nearer to *zetes*, but this is a comparatively inconspicuous feature. It is an extraordinarily interesting thing that *boisduvali* should, on the West Coast, forsake its Eastern model for another species (a representative of which is present as *egina areca*, Mab., on the East Coast), although its Eastern model has a common Western form, *zetes zetes*. Large collections made without prejudice might explain this by showing that *egina* is predominant in the West as *zetes acara* certainly appears to be in the East, but this is yet to be done.

A further complication is introduced into this intricate question by the interrelation between the two species of *Acraea* themselves and their place in a large combination of dark fore-winged *Acraeas* in West Africa. In this combination *egina* is probably the predominant form, and has played the principal part in the Western modification of *zetes*. Thus, in the Western ♂ *zetes* (Plate XXXVII, fig. 5) the red area of the fore-wing is much contracted, resembling the smaller area of *egina* (fig. 1). Specimens of this kind occurred on Bugalla Island (fig. 7), some showing it even more markedly than the one figured. Others, however, were still of comparatively Eastern form (fig. 8), so that, on Bugalla Island, there was a true mixture of the two geographical races, as is so often found in Uganda where East and West *do* meet around the shore of the great Lake Victoria.

It may be noted that on Bugalla itself *egina* and perhaps *perenna*, D. and H., are the only *Acraeas* which are likely to have taken any part in the transformation of *zetes*.

It will be of interest here to note the gradual development of our knowledge of the relationship between *Pseudacraea boisduvali* and its *Acraeine* models. Trimen says, in an appendix to Rogers' paper mentioned above, 1908, p. 552: "in 1869 (Trans. Linn. Soc. Lond., xxvi, p. 517)," and later in 1887 and 1889 ("S. Afr. Butterflies," i, p. 298; iii, p. 405), "I showed how closely in both sexes *trimenii*, the South-Eastern form, copied *Acraea acara*, Hewits., of the same region, just as *boisduvalii* mimicked the West African *Acraea zetes*, Linn." Later on he continues (p. 553): "I am now able, . . . to record the occurrence in a British East African series . . . of a ♂ *trimenii* from 'Rabai, near Mombasa (K. St. A. Rogers) . . .,' in which the sub-apical bar of fore-wing is very much reduced and narrowed (while the red spots in the hind-marginal border of hind-wing are unusually large),—having the fore-wing fuscous suffusion largely developed, so that the usual red ground colour is obliterated except for a large sub-quadrate space at posterior angle as in *P. boisduvalii*, and a slight sub-basal trace. This example is a most distinctly intermediate link between the Western and Eastern forms . . ."

In a footnote he adds: "Haase (Untersuch. über die Mimicry, etc., 1893, p. 43, taf. 4, ff. 26–28) showed that *boisduvalii* mimicked *A. egina*, Cram., more closely than

A. zetes, at any rate as far as the ♂ is concerned, that sex having a red patch along outer portion of inner margin of fore-wing, just as in *egina* ♂, and larger than is exhibited by *zetes* ♂, while in hind-wing larger black spots characterise both *egina* and *boisduvalii*. On the other hand, as regards the presence of red spots in the hind-marginal border of hind-wing, *boisduvalii* resembles *zetes* and not *egina*."

Prof. Poulton alludes to this curious changing of resemblance to another model on the West Coast, in a note to Rogers' account of *Ps. trimeni*, as follows (*l. c.*, p. 528):—

"There can be no doubt that the eastern sub-species *trimenii*, with its conspicuous subapical yellow-ochreous fore-wing bar, mimics *Acraea acara* (in which the apical portion of the fore-wing is warm reddish-ochre), and bears no very close resemblance to *areca* or to any of the other large red black-marked, eastern *Acraeas*. The western *boisduvalii*, on the other hand, is a much closer mimic of *Acraea egina*, the western representative of *areca*, than it is of *zetes*, the representative of the eastern model of *trimenii*. This is all the more remarkable because *zetes* is replaced by *acara* in the Cameroons, as I was astonished to find in the collection of the Brussels Museum.

"This mimetic relationship is unusual, and is all the more remarkable because the eastern mimic is transitional into the western, the eastern model into the western *zetes*, the western model into the eastern *egina*."

The mimetic resemblance of the female Pseudacraea boisduvali.—It is the mimicry by the Bugalla Isle female which finally clinches the evidence that the Western *Pseudacraea boisduvali* mimics *Acraea egina*; for there exists on the island a peculiar variety of female *egina*, which is evidently drawing the local female *Pseudacraea* towards itself.

This island female of *A. egina*, named *alba* by Eltringham (*Trans. Ent. Soc.*, 1913, p. 412), approaches very closely to the subspecies *medea* of Cramer, which is also an island form and at present only known from Prince's Island in the Gulf of Guinea. The female *medea*, Cram., is dull white with all the spots very large and prominent (Plate XXXVIII, fig. 5)

The Bugalla females of *egina* (figs. 3 and 4) only differ from *medea* in that the hind-wings are not so white but exhibit a very slight brownish tint, so that they are to some extent intermediate between the typical *egina* and

the Prince's Island form. On the lower surface, the wings show a little more yellowish tint than in the true *medea*, in this also being intermediate between the type and this subspecies.

Unfortunately I only caught four specimens, not realising at the time the interest attaching to them, so that I cannot show from my own experience that they are the only form of female *egina* on Bugalla Island. That they are the only form is also indicated by Grünberg (Trans. Ent. Soc. Lond., 1913, p. 412), and I hope to put the matter beyond doubt on my return to Bugalla; for *egina* is an abundant species there. I was struck with the general likeness of this pale form to *Planema consanguinea albicolor*, Karsch (*arenaria*, E. M. Sharpe), when seen at a little distance on a flower head.

Now the Bugalla females of *Pseudacraea boisduvali* are also peculiar in the large development of a white suffusion on the fore-wings. This varies much in degree in the twelve specimens, but in that which shows it best (Plate XXXVIII, fig. 10) there is a white subapical area, and much of the basal half of the fore-wing is whitish, a pinkish tint being confined to the base. The hind-wings are of a dull brownish, like those of a typical ♀ *egina*, but there is a whiter patch on the anterior margin. The likeness of this specimen to its model (Plate XXXVIII, figs. 3 and 4) is further accentuated by the row of heavy black spots just internal to the subapical white patch on the fore-wing. These spots are only just indicated in the other specimens (figs. 8, 9), but they form a characteristic marking of the model.

In none of the 12 Bugalla females is there the large *yellow* subapical patch which is a conspicuous feature of the Eastern ♀ *boisduvali*, which resembles *Acraea zetes acara*, though in 9 of them the white patch which takes its place has a trace of yellow suffusion at the hind-marginal end.

In these points they agree with Neave's 3 specimens from the mainland of Uganda. None of Neave's, however, show the white suffusion over the base of the fore-wing, so characteristic of the Bugalla specimens, and not shown in any of the 39 Southern and Eastern forms. The *Western* female of *boisduvali* is represented in the Hope Department by two specimens, one of which comes from Sierra Leone, and was purchased in 1901 from Watkins and Doncaster. In this (Plate XXXVII, fig. 4),

which mimics the *typical* female *egina* (fig. 3), the fore-wings are grey-brown with neither white nor yellow subapical area, and only a faint trace of pinkish brown suffusion at the anal angle. The hind-wings are red brown, resembling those of the *egina* female. The second Western ♀, taken by Neave in the S.E. of the Congo State, about 150–200 miles W. of Kambove, in 1907, has the typical appearance of an Eastern female. This is in accordance with the affinities displayed by other species from the same area.

The conclusion is that the female, as well as the male, *Pseudacraea boisduwali*, of Bugalla Island, L. Victoria, follows the typical Western form in mimicking *Acraea egina* instead of *Acraea zetes*; the evidence being peculiarly convincing because the ♀ *egina*, but not the ♀ *zetes*, appears as a striking local form which is mimicked by the ♀ *Pseudacraea*. In the male the resemblance to the model is not quite so perfectly developed as in the Western form, it being intermediate between that and the Eastern form, although much nearer to the former, as in certain other Uganda species which range from East to West.

Addendum.

Since writing the above I have had, through the kindness of Mr. Roland Trimen, F.R.S., an opportunity of examining the *Ps. boisduwali* in his private collection, containing a fine series of specimens bred in 1910 by the late A. D. Millar, at Durban.

In this series there are 12 males and 13 females.

Of the 12 males, 6 were of the typical, highly-coloured Eastern form with very conspicuous large orange-yellow subapical area on the fore-wing. In 4 males the orange area was smaller, and from two only was it absent. One of the specimens with much orange had well-defined black suffusion over the base of the fore-wing, but none of the others exhibited any signs of this.

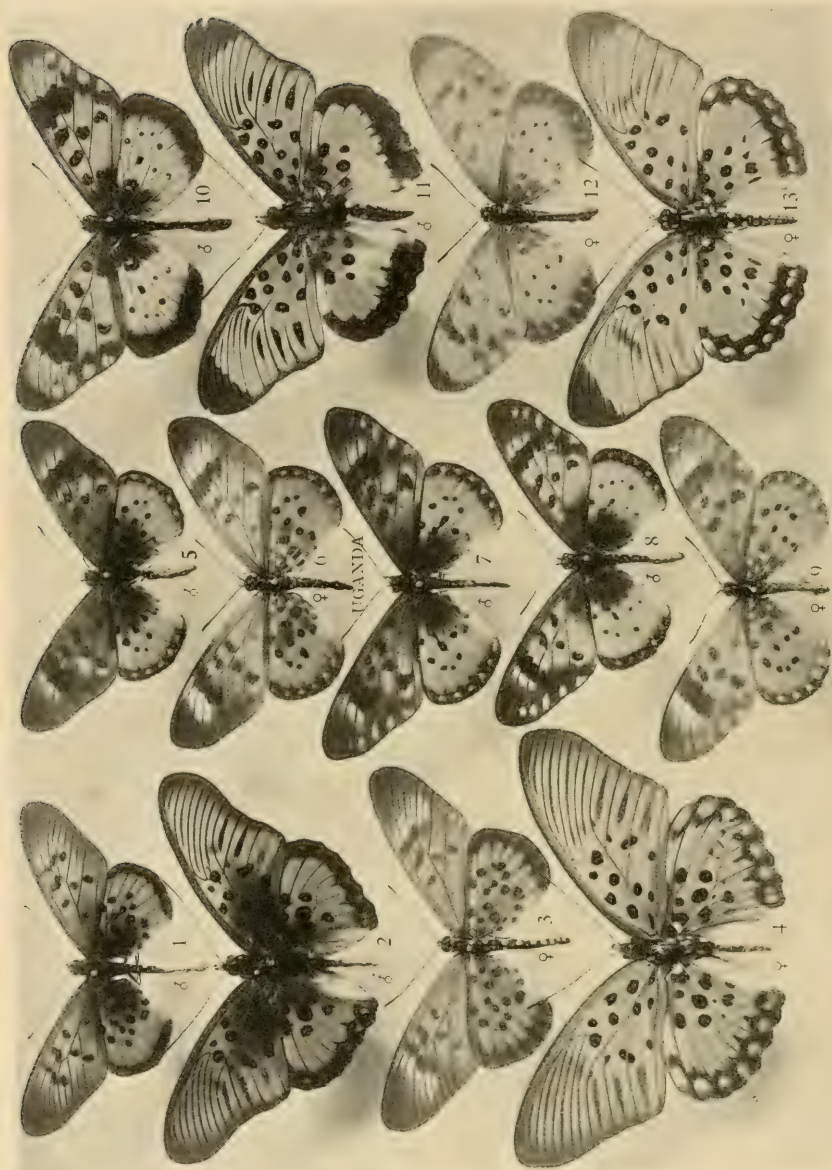
Of the 13 bred females, 10 were of the typical Eastern form, with well-marked orange areas on the fore-wing; the other 3 had the yellow much reduced, or whitish in colour.

Mr. Trimen also has 2 females, caught, one in Zululand and one at Malvern in Natal. These are typically Eastern, and one has a very slight suffusion with white on the hind-wing about the centre.

EAST

WEST

WEST



André & Steigh, Lid.

Slightly under $\frac{2}{3}$ of Natural Size.

Alfred Robinson, photo.

Mimicry in the Western (2, 4) and Eastern (11, 13) races of the Nymphaline, *Pseudacraea boisduvali*. Resemblance between the Western *Acraeas*, *egina* (1, 3)—the model of Western *boisduvali*—and *zetes* (5, 6). Affinity of Uganda (*Bugalla* I.) *zetes*—Western (7, 9), and transitional (8) towards the Eastern *zetes acara* (10, 12)—the model of Eastern *boisduvali*.

EXPLANATION OF PLATE XXXVII.

The figures are slightly under $\frac{2}{3}$ of the natural size.

The Western and Eastern races of the Nymphaline butterfly *Pseudacraea boisduvali*: its Acraeine models, *Acraea egina*, Western, and *A. zetes acara*, Eastern. Resemblance between *egina* and *zetes* in the West. Western and intermediate affinities of the Uganda (Bugalla Isle) *zetes*.

All the examples figured here and on Plate XXXVIII are in the Hope Department, Oxford University Museum.

- FIG. 1. *Acraea egina* ♂. W. A. Lamborn. Oni camp, nr. Lagos, between Dec. 1, 1908, and Dec. 3, 1909. The model for 2.
2. *Ps. boisduvali boisduvali* ♂. Sierra Leone (Watkins and Doncaster). Mimics 1.
3. *Acraea egina* ♀. W. A. Lamborn. Oni camp, nr. Lagos. Bred June 29, 1910. Model for 4.
4. *Ps. boisduvali boisduvali* ♀. As male fig. 2. Mimics 3.
5. *Acraea zetes* ♂. W. A. Lamborn. Larva in forest nr. Oni camp, nr. Lagos. Bred June 23, 1910. Pupated June 14. This shows the Western form of *zetes*, approaching *egina* (cf. 1).
6. *Acraea zetes* ♀. As 5 for data.
7. *Acraea zetes* ♂. G. D. H. Carpenter. Open grass-land on Bugalla Island; L. Victoria, nearly 4000 ft. above sea-level. First half Sept. 1912. Shows the Western type of *zetes*, approaching 5, but not so completely as some other specimens from the island.
8. *Acraea zetes* ♂. Same locality and captor as 7. This approaches more closely the Eastern type *zetes acara*, but has only a trace of the ochreous subapical tint.
9. *Acraea zetes* ♀. Same locality and captor. Taken *in coitū* with a male like 7.
10. *Acraea zetes*, subspecies *acara*, ♂. Rev. K. St. Aubyn Rogers, Rabai, 14 miles N.W. of Mombasa, 700 ft. above sea-level. May 22, 1909. Thoroughly Eastern type. Model for 11.
11. *Ps. boisduvali trimeni* ♂. Same locality and captor as 10. July 15, 1911. Mimics 10.
12. *Acraea zetes* ♀, subspecies *acara*. Same locality and captor. April 24, 1906. Model for 13.
13. *Ps. boisduvali trimeni* ♀. Rev. K. St. A. Rogers. Ndzo-vuni, 25 miles North of Rabai. Dense forest, 300-600 ft. June 10, 1911. Mimics 12.

EXPLANATION OF PLATE XXXVIII.

The figures are slightly under $\frac{2}{3}$ of the natural size.

The Nymphaline butterfly *Pseudacraea boisduvali* and its Acraeinae model *Acraea egina* on Bugalla Isle, Lake Victoria, nearly 4000 ft. above sea-level.

The males of both model and mimic are of the Western type of pattern. The female model is a remarkable pale form peculiar to the island, but recalling the female of Prince's Island in the Gulf of Guinea. The Bugalla females of the mimic exhibit various degrees of approach to the pale *egina* females.

All the examples here represented, except that shown in fig. 5, were captured by G. D. H. Carpenter.

FIG. 1. *Acraea egina* ♂. Open grass-land, June 7-14, 1912. The model for 2, 6, 7. Pattern resembles that of Western male (Plate XXXVII, fig. 1).

2. *Ps. boisduvali* ♂. Forest edge, lake shore, March 12, 1912. Mimic of 1: the pattern is more Western in character than 6 and 7 in the almost complete absence of the subapical bar of the fore-wing.

3. *Acraea egina* ♀ form *alba*, Eltringham. Forest edge, Aug. 9, 1912.

4. *Acraea egina*, ♀ form *alba*. Forest edge, Aug. 16, 1912.

Figs. 3 and 4 are the models for 9 and 10. These are two of the four *alba* forms alluded to in the text which so very closely approach 5, and differ from the Western mainland female (Plate XXXVII, fig. 3.)

5. *Acraea egina*, subspecies *medea*, Cram., ♀. Prince's Island, W. Africa, March 30, 1901.

6. *Ps. boisduvali* ♂. Forest edge, Dec. 24, 1912. Mimic of 1. Intermediate between 2 and 7.

7. *Ps. boisduvali* ♂. Forest edge, Sept. 5, 1912. An interesting transitional male: it has the yellow subapical area, which is much more developed in the Eastern *trimeni* form, but possesses also the basal black suffusion of the Western form, the true *boisduvali*. It thus combines Eastern and Western characters. Cf. 2 and 6.

8. *Ps. boisduvali* ♀. Forest path, Jan. 5, 1913. The specimen which comes nearest to the typical Western form, having no white suffusion and very little pink suffusion over the brown.

9. *Ps. boisduvali* ♀. Forest path, March 10, 1912. This specimen, intermediate between 8 and 10, shows a moderate amount of white suffusion, mimicking 3 and 4.

10. *Ps. boisduvali* ♀. Forest edge, lake shore, Sept. 27, 1912. This one, of all the females, best shows the white suffusion which produces likeness to 3 and 4.



Alfred Robinson, photo.

Slightly under $\frac{2}{3}$ of Natural Size.

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δ *Pseudacraea boisduvali* (2, 6, 7) with Western pattern, only slightly transitional towards Eastern race, and mimicking δ *Acraea egina* (1) with Western pattern. ♀ *boisduvali* (8, 9, 10), mimicking remarkable white *Bugalla* ♀ *egina alba* (3, 4)—a form recalling the ♀ *egina medea* (5), Prince's I., Gulf of Guinea. All except (5) Bugalla Island, N.W. Victoria Nyanza: 1912. G. D. H. Carpenter.

Of the captured males, there are 5 typically Eastern (all from Malvern in Natal), two having some white on the hind-wing. In 2 others from Malvern the yellow on the fore-wings is reduced, and in 2 more there is no yellow, one of them having very slight black suffusion over the base of the fore-wing. In both, the marginal red spots on the hind-wing are rather large. These are transitional forms between typical E. and W. specimens.

EXPLANATION OF PLATES XXXVII AND XXXVIII.

[See *Explanations facing the PLATES.*]

XXVII. *The inheritance of small variations in the pattern of Papilio dardanus, Brown.* By G. D. HALE CARPENTER, D.M., Oxon.

[Read November 5th, 1913.]

PLATES XXXIX AND XL.

THE work of which this paper is an account was undertaken, at the suggestion of Prof. Poulton, in regard to my family of *P. dardanus* bred from ova laid by a parent of the form *planemoides*, Trim., and exhibited at the meeting of this society on June 4, 1913 (Proceedings, pp. liii-lvi). The resulting female offspring—3 *planemoides* and 7 *hippocoön*, F. (Plate XXXIX), suggested very strongly that the influence of the pattern of the parent is communicated to the pattern of the offspring of a different type. In order to prove this, careful measurements were made of the large divided white spot in the cell of the fore-wing of the 7 *hippocoön* forms, which was in most cases sharply marked and easy to measure. This spot is represented in the *planemoides* form by an orange area in the corresponding position, which at its outer end is not sharply marked, but continuous with the broad orange area forming the band across the fore-wing (Plate XXXIX, figs. 1, 4, 6). In fig. 8 it is seen that part of the orange area in the cell has become separated off, as in *hippocoön*. The spot was measured from the middle of its base at the costa to the extreme tip (often placed on a detached portion), along its longitudinal axis which, if prolonged, leads to the base of a nervure.

[The origin of vein 5 (radial 2) is nearest to the point where the prolonged axis of the spot cuts the end of the cell, and there is little doubt that this is the vein to which the author measured. The marking is often more highly developed on the under surface, and it is there seen that the prolonged spot abuts against the lower or inner marginal half of the middle disco-cellular.—E. B. P.]

Inasmuch as the actual size of the spot will vary, *absolutely*, because of the different size of the individual butterflies, it is necessary to have a common standard by which a small
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butterfly can be compared with a larger one. This standard was obtained by expressing the length of the spot as a fraction of the distance from the base of the spot to the base of the nervure [vein 5] along the same axis. The resulting figures are given in percentages; and the different values express the relation between one specimen and another. In one case (Plate XXXIX, fig. 9), the percentage was 102, the spot being so large that its apex extended beyond the cell. The measurements of the spots on *both* fore-wings were taken, and the *average* used for the calculation, as it was found that there were often slight differences between the two sides. By the use of needle-pointed adjustable "dividers" it was found quite practicable to get as near as 0.25 of a millimetre.

It at once became obvious on comparing measurements of the *hippocoön* offspring (Plate XXXIX) derived from *planemoides* with 6 other broods (A-F) of *hippocoön* bred by Mr. W. A. Lamborn near Lagos, W. Africa, from *hippocoön* parents (see A, D, and E on Plate XL), that in the former brood the spot is uniformly large, and that in the latter the specimens are grouped together round a certain average size, which is never so large as the average in the 7 offspring of *planemoides*, and varies for each family. (See *Chart* on p. 663.)

This grouping is very well shown indeed in Brood A, in which the parent and fourteen offspring (Plate XL, figs. 1-15) all fall between the figures 50 and 59.5. In other families, although the majority of specimens fall well together there are a few outlying members, but the highest member of any family only comes up to the lower members of the family from the *planemoides* parent (Plate XXXIX). It is impossible to avoid the conclusion that the large size of the spot in the *hippocoön* offspring of *planemoides* is due to the influence upon them of the large size of the corresponding area in the parent, *whose pattern, however, is of quite a different type.*

If the photographs of the three *planemoides* offspring (Plate XXXIX, figs. 4, 6, 8) be compared with *hippocoön* (figs. 2, 3, 5, 7, etc.), an interesting point becomes apparent. Fig. 8, and to a less extent figs. 4 and 6, show in the apical half of the fore-wing a pattern very close to that of *hippocoön*. Fig. 8 in particular exhibits features like those of fig. 9, in which the outer part of the intracellular spot runs out to join the large subapical patch. This latter area in the

photograph of fig. 8 is quite clearly differentiated from the rest of the orange band in the fore-wing, but if one looks at the *specimen* this difference is not so marked. There is therefore some difference in the two parts of the orange band more clearly perceived by the photographic plate than by the human eye. Fig. 8 enables one to realise more clearly how the pattern of the more typical *planemoides* form such as 4 and 6 can influence the *hippocoön* form, and cause the intracellular spot to be of larger size than usual. The pattern of *hippocoön* may be similarly recognised on the under surface of the 3 *planemoides* offspring, where, indeed, the demarcation between the paler orange of the subapical bar of the former pattern is rather more distinctly marked off from the darker orange of the latter than on the upper surface, the junction between the two tints, as it obliquely crosses area 4 (between veins 4 and 5), being faintly emphasised by a slightly deeper shade of the same colour.

Prof. Punnett, F.R.S., in the July number of "Bedrock," 1913, protests "against Prof. Poulton's assumption that any small variation may be inherited," and says "in no clear case has it been shown to exist."

The specimens just mentioned seem to constitute a pretty clear case in which quite a small and relatively unimportant part of the whole pattern of one type derives its unusually large size by heredity from the corresponding area, much larger and less well-defined in shape, of a parent whose pattern is quite different.

Not only is the average size of the spot in the seven specimens under consideration larger than the average of any other brood, but individuals have a larger spot than any of the specimens in the Hope Department from all parts of Africa.

It may be said that it is not fair to compare the *planemoides* family with Mr. Lamborn's families, because W. African specimens have *all* the white areas of the wing contracted in size, thus following their model *Amauris niavius*, L., whose Western form has smaller white areas than the Eastern form *dominicanus*.

An answer to this is provided by the *dardanus* families reared at Durban in Natal by Mr. G. F. Leigh, as well as by the other examples from S.E. Africa; for it will be shown on p. 662 that the average length of the spot in all these *hippocoön* is actually less than that of the

W. African *hippocoön*, although the rest of the pattern is larger. In other words, the spot varies independently of the rest of the pattern.

The Natal families reared by Mr. G. F. Leigh were discussed in great detail by Prof. Poulton in a paper on "Heredity in six families of *P. dardanus*, Brown, subsp. *cenea*, Stoll" (Trans. Ent. Soc., 1908, p. 427), in which the same spot now under discussion was considered, not from the point of view of its size, but as to whether it was divided in two or not. It was shown (*loc. cit.*, p. 444) in one family (No. 5) bred from a *cenea* parent in which this spot was divided, that 9 out of 14 *cenea* offspring also had the spot divided, as also in the only *hippocoön* offspring. Compare this with Family 4 in the same table, and it is seen that the parent *hippocoön* had the spot undivided, and this was also the case in 5 out of 8 *cenea* offspring, 2 out of 3 *hippocoön* offspring, and all of the 3 *trophonius* offspring.

And yet Prof. Punnett says that in no clear case has the inheritance of small variations been shown to exist!

In view of this statement attention may be redirected to sundry papers of Prof. Poulton on this very point as exhibited in the species under discussion. I have shown how the influence of the pattern of a *planemoides* parent is felt by the offspring of the *hippocoön* form as regards size of a certain spot. In the Trans. Ent. Soc., 1906, pp. 283, 313, Prof. Poulton shows that the influence of the colour of the parent form *trophonius* is felt by offspring of *cenea* form; and again in the Proc. Ent. Soc., 1911, p. xxxvii, he says with regard to another family: "Several of the *cenea* offspring exhibit the influence of the *trophonius* parent in the richer, deeper tinge of the basal patch of the hind-wing."

Again, in Trans. Ent. Soc., 1908, p. 436, he shows how the influence of a parent form *hippocoön* is exhibited in the colour of the *cenea* offspring.

[Since Dr. Carpenter's return to Africa I have observed the following examples of the inheritance of small features that can be made out by a careful comparison between the patterns of the three families represented on Plate XL.—E. B. P.]

(1) Parent D (fig. 16) differs from E (31) in having a larger white area on the hind-wing. This area in its offspring as shown in 17-21 and 30, is larger than in E's

offspring, as shown in 32, 33 and 28. (See also Proc. Ent. Soc., 1912, p. cxxxii.)

(2) The same area is also of a different shape in the two parents, being rounded in E, squarish in D, differences that are clearly recognisable in their respective offspring as shown on Plate XL.

(3) The triangular white patch on the inner margin of the fore-wing is larger, has a more flattened apex, and a longer base in D and its 14 offspring, than in A (fig. 1) and its 14 offspring.

(4) Of the two small spots at the costal end of the sub-apical white bar crossing the fore-wing, the basal one is minute and the outer large in A and most of its offspring, while in none of them is the basal spot as large as the outer. In E on the other hand the basal spot is relatively large and the outer absent: in 6 out of its 7 offspring the basal spot is relatively large as compared with nearly all the offspring of A; while in one (fig. 33) this feature is nearly as in the parent, although the outer spot is represented by a small dot. In the *planemoides* parent (Plate XXXIX, fig. 1) and most of its offspring these two spots are about equal in size, and in only one (fig. 11) is there a wide difference between them.

(5) Other features peculiar to the families, but unrecognisable in the parents, because of their poor condition, are also almost certainly hereditary. To this category belong figs. 10, 12, 13, and 14, in which the white area on the hind-wing is increased by a circumferential greyish extension, giving to the outline a peculiar and characteristic appearance (Proc. Ent. Soc., 1912, pp. xvi, xvii).

Measurement of all the specimens of *hippocoön* in the Hope Department (242) produced interesting results. The West African type is represented by one from Cape Coast Castle, one from "Tropical W. Africa" (Doncaster), 3 from "W. Africa" (Saunders), and 77 (38 shown on Plate XL) caught or bred by Mr. W. A. Lamborn in the vicinity of Lagos. The average ratio of the spot to the cell in these 82 specimens is 64%—individuals going as low as 44% and as high as 86%, with every intermediate grade.

Passing eastward we come to the Western Uganda specimens with which I have included those from a few localities much further east, but always westward of Entebbe:—The "N. W. shore of L. Victoria"—3 specimens;

“ Buddu, W. shore of the Lake ”—7 specimens; Toro—5 specimens; Unyoro—1 specimen; “ neighbourhood of L. Wamala ”—1 specimen; the Semliki valley—1 specimen.

These 18 specimens, all collected by Mr. S. A. Neave, seem rather a heterogeneous lot, but the average size of the spot is practically the same as in the West Coast forms, viz. 65·2 %. Individuals range between 39·7 % and 86·9 %.

From the northern shore of the lake in the neighbourhood of Entebbe, from the islands, and from the neighbourhood of Kisumu on the Eastern shore come altogether 85 specimens. From Entebbe Mr. C. A. Wiggins sent 55 specimens, and Mr. Sheffield Neave contributed 8, and 5 more from Kampala. There is a single specimen from the Mabira forest (Wiggins) and 8,—seven of them represented on Plate XXXIX—from Bugalla Island (G. D. H. Carpenter).

From the neighbourhood of Kisumu on the E. shore of the lake come 7 specimens contributed by C. A. Wiggins and one by A. Vincent. These specimens are included with those from Entebbe rather than with the other specimens from E. Africa which are of the subspecies *tibullus*, Kirby, and come from localities far removed from the E. shore of the lake.

The average for these 85 specimens is not far from the West Coast average: but there is a greater range of variation, viz. from 38 % to 102 % (Plate XXXIX, fig. 9). Passing eastwards we come now to the locality of the subspecies *tibullus*, Kirby, and *polytrophus*, Jordan. These are represented by 11 *hippocoön* caught by K. St. A. Rogers near Mombasa, 2 by the same collector on the slopes of Kilimanjaro, 1 from Taveta by C. A. Wiggins, 4 from Kikuyu Escarpment by W. Doherty (these latter belong to the subspecies *polytrophus*), and a single specimen (Doncaster) from German East Africa. I have also included in this group, perhaps unjustifiably, a single specimen collected by S. A. Neave in Eastern Usoga, in the far E. of Uganda, whose spot-cell ratio was 78·2 %. The average figure for these 20 specimens is 78 %, and they are a fairly uniform lot, all coming between 71·4 % and 90·5 %, with the exception of one at 62·5 %.

There is another fine series of the subspecies *tibullus* collected by C. F. M. Swynnerton at Chirinda, Gazaland, S.E. Rhodesia. These 21 specimens have an average spot-cell ratio of 80 %, and are also a very compact group, ranging from 70·4 % to 91·2 %.

Finally the *hippocoön* form of the Southern race of *dardanus* is represented in the Hope Department by 12 specimens from the neighbourhood of Durban caught or bred by G. F. Leigh; one from Malvern, Natal, by G. A. K. Marshall; one from Cape Colony near King Williamstown, by J. P. M. Weale.

It must be remembered that the *hippocoön* of the S.E. coast has the main white areas on fore- and hind-wings *larger* than in the West Coast forms, corresponding to the *dominicanus*, Trim., form of its model *Amauris niavius* in E. Africa. Unfortunately, owing to the mixed character of the offspring from a parent in Durban, the number of *hippocoön* females in any family is small. The figures are as follows: From a *hippocoön* parent, whose spot-cell ratio was 68·3 %, there were three *hippocoön* forms, the figures for which were 60 %, 56·7 %, 47·2 %. From a *trophonius*, Westw., parent there were only two *hippocoön* offspring, whose figures were 52·9 % and 54·5 %. From a *cenea*, Stoll, parent two *hippocoön* offspring, 58·6 % and 64·5 %.

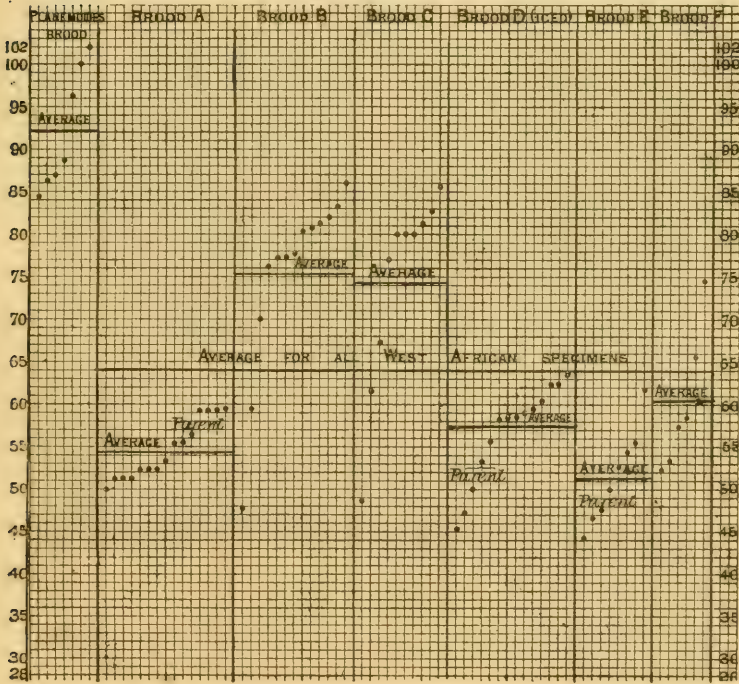
Since writing the above I have had an opportunity, through the kindness of Mr. Roland Trimen, F.R.S., of measuring the spot in five specimens in his private collection—3 from Natal and 2 from Cape Colony. These 19 Southern specimens range from 47·2 % to 77·5 %, with an average ratio of spot to cell of 61·2 %. It will be seen that the comparison of the average size of the West African spot with that of the Southern and Eastern form suggests a point of considerable importance to the argument developed in this paper. The *hippocoön* of Natal, which mimics *Amauris niavius dominicanus*, has the important white areas of the wings *larger* than in the *hippocoön* of the West Coast, mimicking *Amauris niavius* in which the white areas are also smaller than in the Eastern model. But the intra-cellular white spot, which is not of so much importance for the mimetic likeness, is, on the *average*, actually *smaller* in the Natal and Cape Colony forms than in the West Coast forms.

The above-described relationship disposes of an argument which might be stated against the conclusion here drawn (that the large size of the spot in *hippocoön* derived from *planemoides* is due to the hereditary influence of this small feature), namely the objection that the size of the spot in the *hippocoön* offspring is not due to a separate factor,

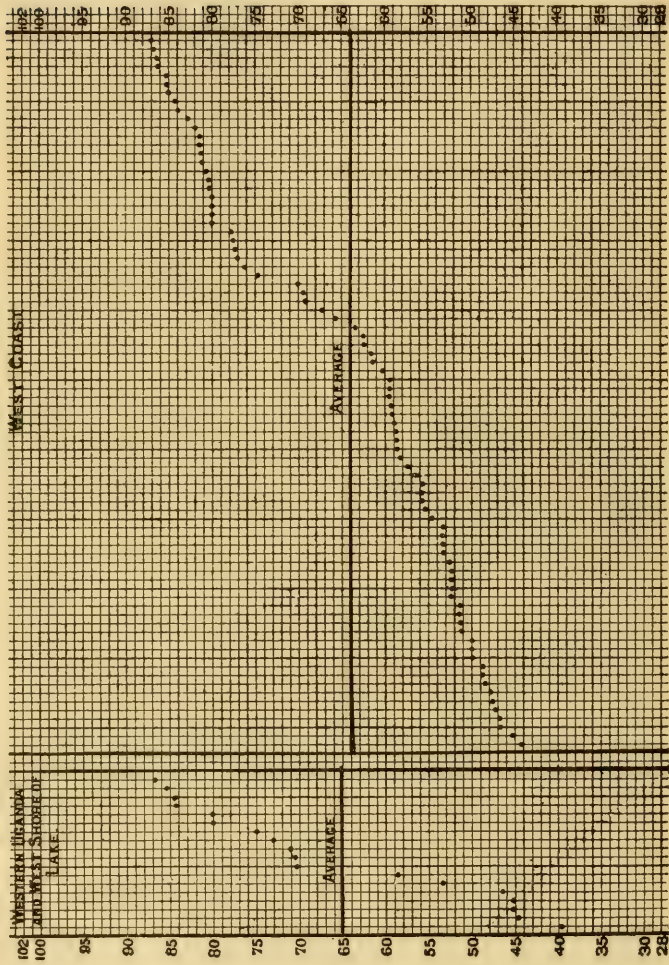
but simply part of the general scheme of enlarged white areas in the Southern and Eastern form as compared with the Western.

But the spot is, on the average, actually smaller in the Natal forms than in the Western forms, whereas the reverse in the case with the large white areas which are of most importance for the mimetic resemblance. Furthermore the 7 *hippocoön* offspring of the female *planemoides*, like the other examples of *hippocoön* from Uganda, belong to the Western and not to the Eastern type; and yet the spots of these 7 specimens are the largest of all.

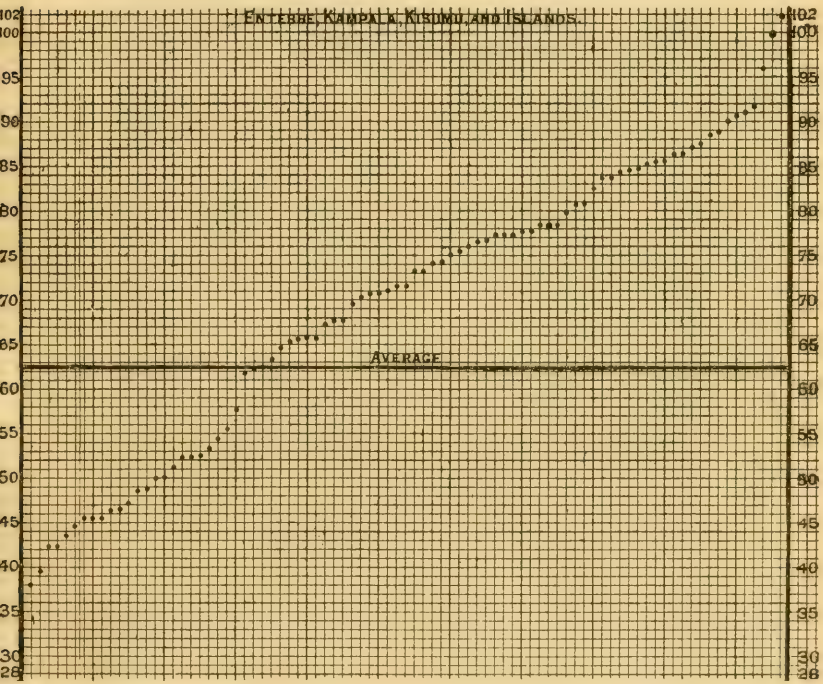
SPOT-CELL-RATIO IN *HIPPOCOÖN* OFFSPRING FROM A *PLANEMOIDES* PARENT (BUGALLA ISLAND) AND FROM SIX *HIPPOCOÖN* PARENTS (LAGOS DISTRICT).



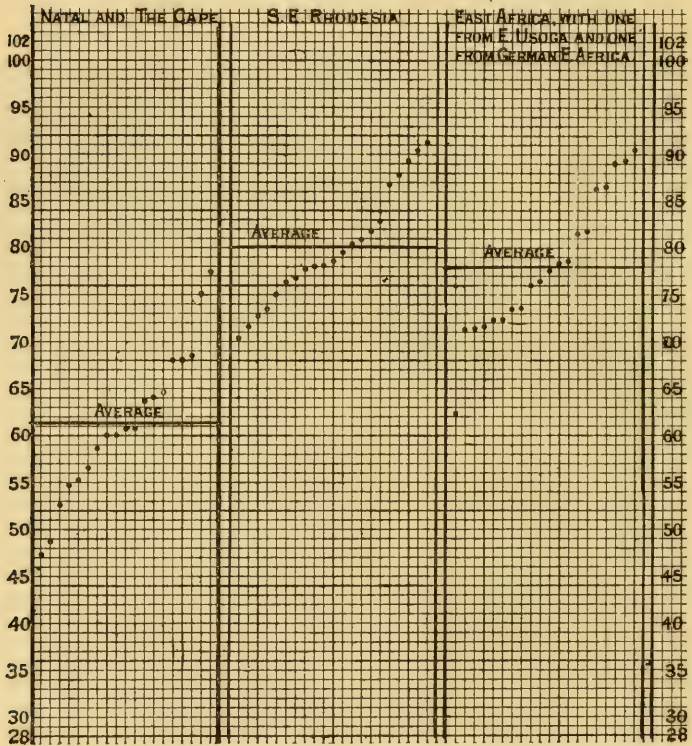
SPOT-CELL-RATIO IN *HIPPOCÖON* FROM WEST COAST, W. UGANDA, AND W. SHORE OF VICTORIA NYANZA.



SPOT-CELL-RATIO IN *HIPPOCOÖN* FROM ENTEBBE, KAMPALA, ISLANDS IN N.W. VICTORIA NYANZA, AND KISUMU.



SPOT-CELL-RATIO IN *HIPPOCOÖN* FROM EAST AFRICA, S. E. RHODESIA, AND S. AFRICA.



EXPLANATION OF PLATES XXXIX AND XL.

[See Explanations facing the PLATES.]

EXPLANATION OF PLATE XXXIX.

All figures are about half of the natural size.

Females,—3 *planemoides* and 7 *hippocoön*—and one of the 12 males bred by G. D. H. Carpenter from a *planemoides* female, also represented in the Plate, captured on Bugalla, Sesse Archipelago, N.W. of Lake Victoria, Dec. 1, 1912.

The specimens represented here and on Plate XL are in the Hope Department, Oxford University Museum.

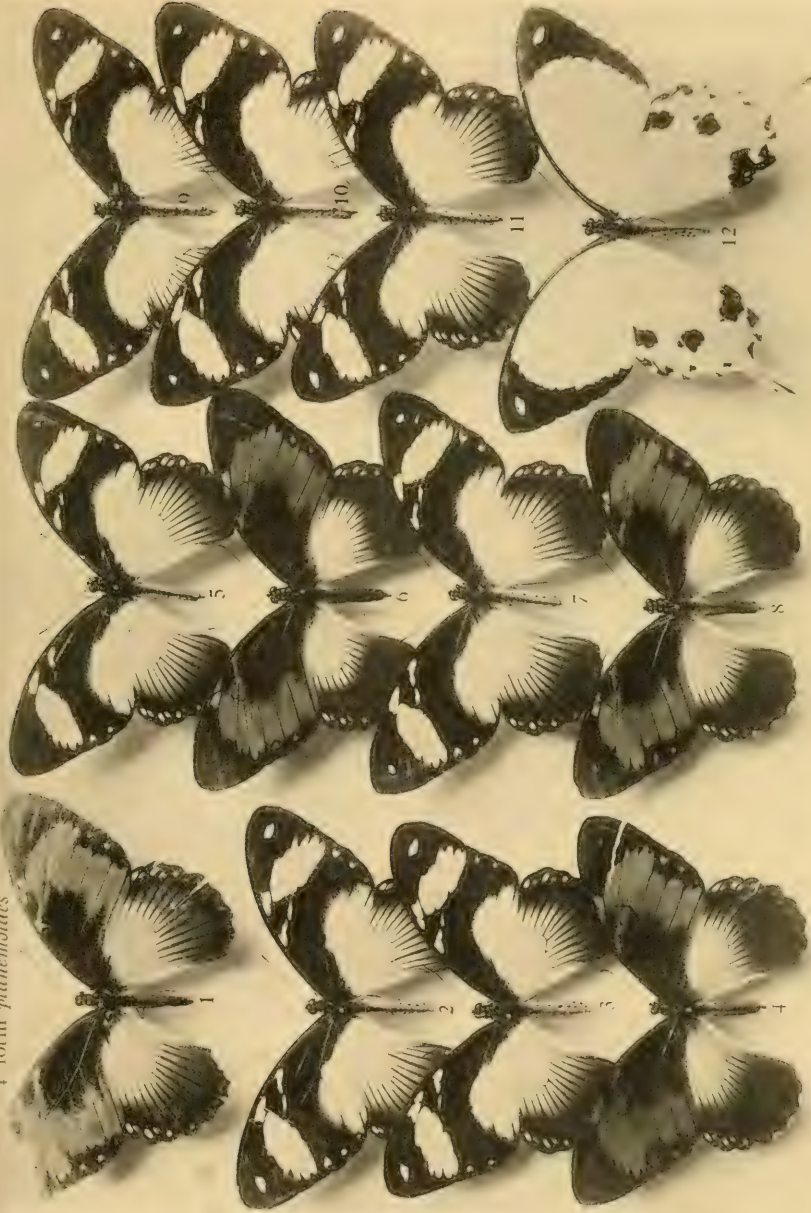
The *hippocoön* offspring are seen to resemble their *planemoides* parent in the great length of the marking in the cell of the fore-wing, and to contrast in this respect with the *hippocoön* figured on Plate XL.

The order of the figures 2–12 does not correspond with the order of emergence from the pupae, which was as follows:—First 2 and 4; then 6 and 12; then 3; then 5, 7, 8, and 10; then 9; lastly 11.

FIG. 1. Parent *planemoides*, captured in forest Dec. 1, 1912.

2. *Hippocoön*, emerged Jan. 23, before dawn; pupated Jan. 8, 1913.
3. *Hippocoön*, emerged Jan. 24, about 9 a.m.; pupated Jan. 8.
4. *Planemoides*, emerged Jan. 23, before dawn; pupated Jan. 8.
5. *Hippocoön*, emerged Jan. 25, before dawn; pupated Jan. 9.
The subapical spot is minute and only present on the right side.
6. *Planemoides*, emerged Jan. 24, before dawn; pupated Jan. 9.
7. *Hippocoön*, emerged Jan. 25, before dawn; pupated Jan. 9.
8. *Planemoides*, emerged Jan. 25, before dawn; pupated Jan. 9.
9. *Hippocoön*, emerged Jan. 25, 3 p.m.; pupated Jan. 9.
10. *Hippocoön*, emerged Jan. 25, before dawn; pupated Jan. 9.
11. *Hippocoön*, emerged Jan. 28, before dawn; pupated Jan. 12.
12. Male, emerged Jan. 24, before dawn; pupated Jan. 8.

FABIANI
♀ form *planemoides*



Alfred Robinson, photo.

Half the Natural Size.

Papilio dardanus Brown, male and two female forms. One ♂ (12) and all ♀ offspring—*hippocoon* (2, 3, 5, 7, 9, 10, 11) and 3 *planemoides* (4, 6, 8)—bred (1912-13) from a *planemoides* ♀ parent (1), on Bugalla I., Sesse Archipelago, N.W. Victoria Nyauza, by G. D. H. Carpenter.

André e Steigeb, Ltd.

EXPLANATION OF PLATE XL.

All figures are just over $\frac{1}{3}$ of the natural size.

Females of three families of *Papilio dardanus*, Brown, bred by W. A. Lamborn from female parents, also represented in the Plate, captured in the Lagos district of W. Africa, 1911 and 1912. Parents and offspring are all of the *hippocoön*, F., form.

The white mark in the cell of the fore-wing is clearly seen to be much shorter than the corresponding feature in the *hippocoön* offspring of a *planemoides* parent shown on Plate XXXIX.

Slight family differences between the white patterns are also represented in the Plate. Figs. 10, 12, 13, and 14 are examples of Family A in which the white area of the hind-wing is increased by a circumferential greyish extension, barely visible in figs. 9, 11, and 15. In Family D the same white area, as shown in figs. 17-21, and 30, is larger and more angular in shape than in Family E, as represented in figs. 32, 33, and 38—differences which appear in the respective parents—figs. 16 and 31, and are clearly hereditary. Family differences between the fore-wings are similarly evident when careful comparison is made (p. 659).

Figs. 1-15. Brood A (= Family I, W. A. L., described in Proc. Ent. Soc., 1912, pp. xii-xvii).

FIG. 1. Parent caught $1\frac{1}{2}$ m. E. of Oni, nr. Lagos, Oct. 19, 1911.

- | | | | | |
|-----|-----------------|---------|----------------|--|
| 2. | Offspring of 1. | Emerged | Nov. 30, 1911. | |
| 3. | „ | „ | Dec. 1, 1911. | |
| 4. | „ | „ | Dec. 2, 1911. | |
| 5. | „ | „ | Dec. 2, 1911. | |
| 6. | „ | „ | Dec. 2, 1911. | |
| 7. | „ | „ | Dec. 3, 1911. | |
| 8. | „ | „ | Dec. 3, 1911. | |
| 9. | „ | „ | Dec. 3, 1911. | |
| 10. | „ | „ | Dec. 6, 1911. | |
| 11. | „ | „ | Nov. 30, | Shows faintest trace of "tail" on margin of hind-wing. |
| 12. | „ | „ | Dec. 1, 1911. | Shows faintest trace of "tail" on margin of hind-wing. |

Explanation of Plate XL.

- FIG. 13. Offspring of 1. Emerged Dec. 1, 1911. Shows more distinct trace of "tail" on margin of hind-wing.
14. " " " Dec. 2, 1911. Shows still more distinct trace of "tail" on margin of hind-wing.
15. " " " Dec. 2, 1911. Shows faint trace of "tail" on margin of hind-wing.

The degree of development of vestigial tail may be estimated by comparing figs. 11-15 with 9, 10, 30, and 38.

16-30. Brood D (= Family IV, W. A. L., described in Proc. Ent. Soc., 1912, pp. cxxxi-cxxxiv).

16. Parent, from same locality as 1, May 1, 1912.

The pupæ of this brood were exposed to temperature much reduced by ice, with a view to ascertaining if shock would cause more of the female imagines to revert to the ancestral tailed condition, than is the case with Family 1 (see specimens 11-15). Traces of tails can be seen in specimens 17-21, but no better marked than in 11-15 which were not treated with ice. It must, however, be remembered that four other families reared in a normal temperature by Mr. Lamborn (*loc. cit.* pp. xii-xvii, cxxxi-cxxxiv), showed no trace of "tails"; also that 17-20 exhibit a squarish outline rather more markedly than 11-15, an appearance due to the reduction of all undulations along the margin of the hind-wing except the one that represents the "tail."

17. Offspring of 16. Emerged June 6, 1912. Shows trace of "tail" at the angle of the squarish outline of hind-wing.
18. " " " June 7, 1912. Shows trace of "tail" at the angle of the squarish outline of hind-wing.
19. " " " June 7, 1912. Shows trace of "tail" at the angle of the squarish outline of hind-wing.
20. " " " June 7, 1912. Shows trace of "tail" at the angle of the squarish outline of hind-wing.
21. " " " June 7, 1912. Shows faint trace of "tail."
22. " " " June 5, 1912.

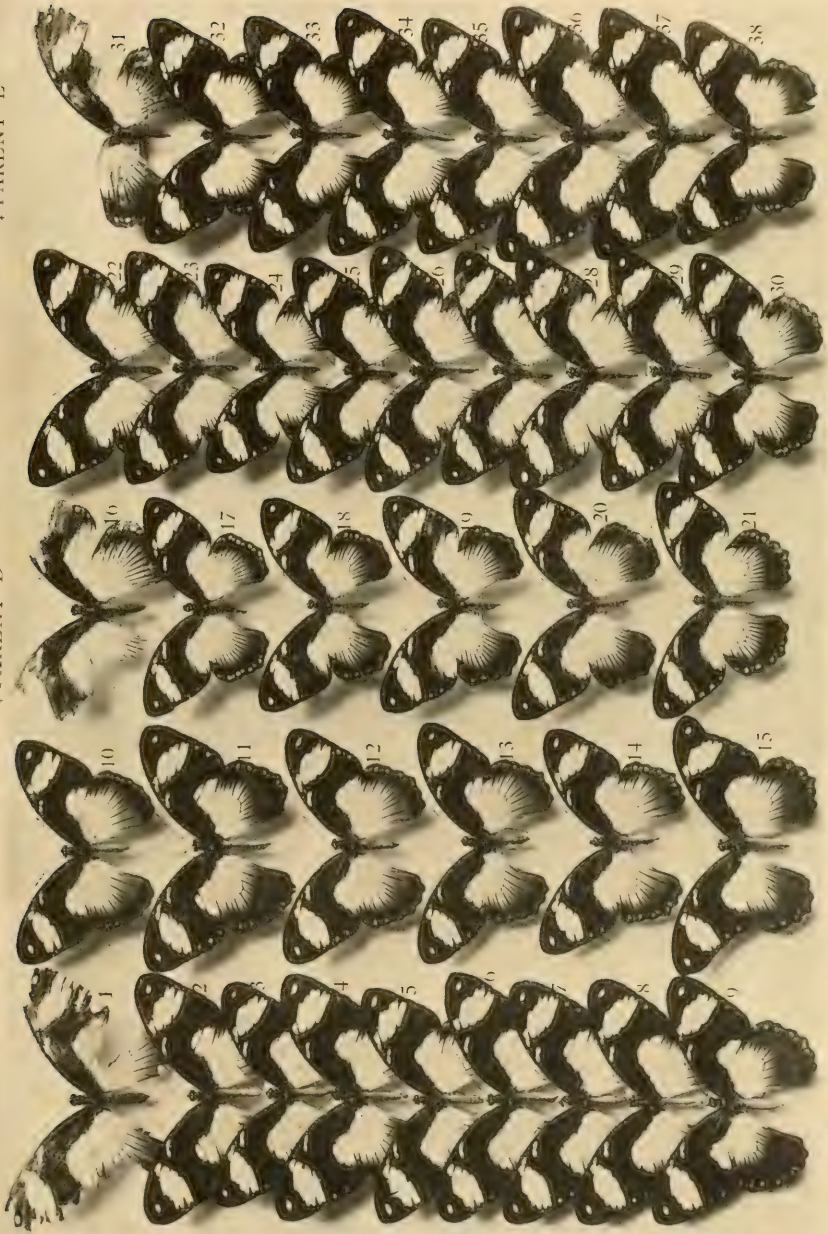
Explanation of Plate XL.

- FIG. 23. Offspring of 16. Emerged June 6, 1912.
- | | | | | |
|-----|---|---|---|---------------|
| 24. | „ | „ | „ | June 6, 1912. |
| 25. | „ | „ | „ | June 6, 1912. |
| 26. | „ | „ | „ | June 7, 1912. |
| 27. | „ | „ | „ | June 7, 1912. |
| 28. | „ | „ | „ | June 7, 1912. |
| 29. | „ | „ | „ | June 9, 1912. |
| 30. | „ | „ | „ | June 7, 1912. |
- 31-38. Brood E (= Family V, W. A. L., described in Proc. Ent. Soc., 1912, pp. cxxxi-cxxxiv).
31. Parent, in forest, Oni, nr. Lagos, June 18, 1912.
32. Offspring of 31. Emerged July 30, 1912.
- | | | | | |
|-----|---|---|---|---------------|
| 33. | „ | „ | „ | Aug. 1, 1912. |
| 34. | „ | „ | „ | Aug. 1, 1912. |
| 35. | „ | „ | „ | Aug. 1, 1912. |
| 36. | „ | „ | „ | Aug. 2, 1912. |
| 37. | „ | „ | „ | Aug. 2, 1912. |
| 38. | „ | „ | „ | Aug. 2, 1912. |

♀ PARENT E

♀ PARENT D

♀ PARENT A



Alfred Robinson, photo.

Just over $\frac{1}{3}$ of Natural Size.

André & Steigh, Ltd.

Papilio dardanus, Brown, ♀ form *lufpocoou*, F. All the ♀ offspring bred 1911-1912, from ♀ Parents A (1), D (16), and E (31), at Oni, 70 m. E. of Lagos, by W. A. Lamborn. Nos. 11-15 and 17-21 (pupae of Fam. D were artificially cooled) show vestigial "tails" to hind wings. Slight differences as regards the white pattern may be recognised between the families.

XXVIII. *Notes on various Central American Coleoptera: supplement.* By GEORGE CHARLES CHAMPION, F.Z.S.

[Read December 3rd, 1913.]

SINCE the publication of my Notes on Central American beetles (*antea*, pp. 58-169), three interesting new species of the Ptinid genus *Trichodesma*, all from one locality, Acapulco, on the western coast of Mexico, have been detected in the British Museum, and one new Dascillid, a *Scirtes*, from Guatemala, has been received from Mr. O. E. Janson. The present contribution includes a description of these insects, and is a supplement to my previous paper on the same subject.

Fam. PTINIDAE.

Trichodesma sublineata, n. sp.

Elongate, convex; piceous, the antennae and tarsi obscure ferruginous; variegated with a dense clothing of whitish and brown pubescence intermixed with long, erect, pallid hairs, the brown pubescence on the elytra condensed into interrupted lines which terminate abruptly in front of the anteriorly sinuate, sharply defined whitish apical patch, those near the suture becoming transversely coalescent posteriorly, the dorsal hump of the prothorax with two fulvous spots in front and two others behind, the spots separated by a whitish median line, the elytra with various matted tufts of erect blackish-brown hairs—one on the disc of each below the base (between which is a common, V-shaped, blackish-brown mark) and six in a common transverse row at about one-third from the apex, the humeri also with a small tuft of dark brown hairs. Head densely punctulate and subgranulate; antennae moderately long, joints 4-8 small, subequal, the dilated joints 9-11 elongate, 9 as long as 5-8 united. Prothorax transverse, the sides arcuate before the middle and sinuously, obliquely converging behind, the hind angles obliterated; finely granulate, the dorsal hump large, angular and compressed. Elytra a little wider than the

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prothorax, long, subparallel; coarsely, confusedly punctate on the disc, the punctures becoming seriatly arranged towards the sides.

Length $6\frac{1}{4}$, breadth 3 mm. (♀?)

Hab. W. MEXICO, Acapulco (*Höge*).

One specimen. Larger and broader than the N.-American *T. gibbosa*, Say; the prothorax relatively wider, distinctly sinuate at the sides posteriorly, and without tufts of matted hairs on the dorsal hump; the elytra interruptedly lineate with brown, and each with a conspicuous tuft of blackish-brown hairs on the disc below the base in a line with the common, V-shaped, sutural mark, and a common transverse series of six smaller tufts preceding the large, sharply-defined, whitish apical patch. It is just possible that this insect may prove to be referable to the unidentified Mexican *T. imperator*, Cast., but the latter has the base of the elytra differently marked, to judge from the brief description.

Trichodesma discigera, n. sp.

Elongate, convex; piceous, the antennae, mouth-parts, and tarsi obscure ferruginous; densely clothed with pale brown and whitish pubescence abundantly intermixed with very long, erect, pallid hairs; the elytra with a sharply-defined, large, common, rounded (somewhat saddle-shaped), sparsely fusco-pubescent space before the middle, followed by a broad, common, arcuate, irregular brown fascia (extending to the outer margin and enclosing a short oblique whitish streak on each elytron near the suture and several blackish spots), and also bearing several dense tufts of erect blackish hairs—one very large, oblong, placed at about one-third from the base, and just within the outer limit of the discoidal patch, and three in a transverse series at about the apical third, the inner one rather large, the others small—the humeri also with a dark spot. Head densely punctulate and subgranulate; antennae moderately long, joints 4–8 small, subequal, the dilated joints 9–11 elongate, 9 about as long as 5–8 united. Prothorax transverse, the sides strongly arcuate before the middle and sinuously, obliquely converging behind, the hind angles just traceable; finely, conspicuously granulate; the dorsal hump large, angular, and compressed, without definite matted tufts of hair, apparently lineate, due to the parting of the pubescence. Elytra much wider than the prothorax, long, subparallel; with irregular rows of very coarse, deep punctures, the larger tufts of hair arising from the third interstice.

Length $5\frac{1}{2}$, breadth $2\frac{2}{3}$ mm. (♀?)

Hab. W. MEXICO, Acapulco (*Höge*).

One specimen. This peculiar form must be nearly related to *T. sellata*, Horn, from Lower California [redescribed by Fall, in *Trans. Am. Ent. Soc.*, xxxi, p. 175 (1905)], which has more numerous tufts of blackish hairs on the elytra (the one enclosed within the discoidal patch being probably more developed in the present species), and a tuft of short stiff brown hairs on the dorsal hump of the prothorax, this latter being absent in *T. discigera*.

Trichodesma convexa, n. sp.

Elongate, broad, robust; piceous, the antennae and the tips of the tarsi obscure ferruginous; variegated with brown, fulvous, and white pubescence, the white pubescence condensed into a transverse streak on each side of the depressed basal portion of the prothorax, and a narrow, interrupted, angulate, median fascia and a few small scattered spots on the elytra, the alternate interstices of the latter here and there set with dense oblong patches of slightly longer, semierect, dark brown hairs, the legs and antennae with long projecting hairs. Head densely punctulate and subgranulate, broadly hollowed down the middle; antennae moderately long, joints 4-8 small, subequal in length, 5 and 7 a little wider than 6 and 8, the dilated joints 9-11 long, 9 as long as 4-8 united. Prothorax broad, as wide as the elytra, the sides arcuate before the middle and obliquely, sinuously converging behind, the hind angles obliterated; finely granulate, the dorsal hump moderately developed, arcuate as seen in profile, and arising from near the base. Elytra long, convex, subparallel, the apices broadly produced and abruptly truncate, the humeri somewhat obtuse; rather coarsely punctate-striate, the interstices moderately convex, densely punctulate, and sparsely, finely granulate.

Length $6\frac{1}{4}$, breadth 3 mm. (♀)

Hab. W. MEXICO, Acapulco (*Höge*).

One specimen. The very broad prothorax, with rounded dorsal hump, the broadly produced, abruptly truncate apices of the elytra, and the absence of the usual long erect villosity from the upper surface of the body, give this insect a very different facies from most of the described species of *Trichodesma*. The Guatemalan *T. truncata*, Ch. (*antea*, p. 138), is, however, intermediate in this respect, and, like *T. convexa*, has a rather large, pentagonal, sharply margined mesosternal process, which is received in

repose between the somewhat widely separated anterior coxae.

Fam. DASCILLIDAE.

Scirtes planicornis, n. sp.

Rotundate-elliptic, somewhat depressed, shining; pitchy-black, the apices of the femora, the tibiae, and tarsi testaceous, the antennae testaceous, becoming gradually infusate towards the apex; finely pubescent. Head, prothorax, and scutellum closely, very minutely, punctate; head broad, the eyes large; antennae about as long as the body, joints 2 and 3 short, subtransverse, equal, 4-10 very elongate, flattened, considerably widened, becoming narrower towards the apex, 4 shorter than 5; prothorax short, convex, narrowing from the base, sharply margined; elytra thickly, finely punctate, the punctures much coarser than those on the prothorax, narrowly margined at the sides, the subhumeral callosities prominent.

Length $2\frac{1}{2}$, breadth $1\frac{1}{2}$ mm. (σ ?)

Hab. GUATEMALA, San Gerónimo in Baja Vera Paz (*Champion*: Mus. Brit.).

One specimen, sent to the late M. Jacoby as a Halticid, and thus overlooked, till detected by Mr. O. E. Janson when the collection of that author passed into his hands. Amongst the 21 species of *Scirtes* enumerated by me from Central America in 1897 (*Biol. Centr.-Am., Coleopt.*, iii, 1, pp. 606-617), *S. planicornis* can only be compared with *S. longicornis*, from Panama, which has a minute third antennal joint, etc.*

* The recently described *S. championi*, Picado, from Costa Rica, again, is a very different form.

XXIX. *New South American Butterflies*. By W. F. H. ROSENBERG, F.Z.S., F.E.S., and G. TALBOT, F.E.S.

[Read December 3rd, 1913.]

THE types of the species here described are in the collection of W. F. H. Rosenberg.

PIERIDAE.

Dismorphia orise denigrata, subsp. nov.

Much lighter in colour than the typical form from Cayenne. The margin and black bands are narrower and the vitreous areas larger. This form is more common in collections than typical *orise*, and inhabits the Upper Amazons, Peru, Bolivia and Ecuador.

ITHOMIIDAE.

Aprotopos ceto cetoides, subsp. nov.

Similar to *ceto*, Feld., but without the reddish-brown ground-colour of that species, the vitreous areas being tinged with yellowish-brown.

♂ upperside, fore-wing. Differs from *ceto* in the more broadly black apex and smaller apical spots. The distal edge of the spot in 6 is not level with that of the other spots as in *ceto*. The proximal edge of this band of spots is sharply defined and not invaded by black at vein 4, as in *ceto*. The space between the median and fifth apical spot is broader than it is in *ceto*. The distal edge of the cell-spot is straight and not rounded. The median spot is narrower distally owing to abbreviation of the lower part separated by vein 2. The streak bordering the median below the cell is faint or absent. On the hind-wing the spot outside the cell is smaller and more rounded proximally. The band separating this spot from the basal area is narrower, being narrowest at vein 3.

Underside similar to the upper.

A ♀ in the British Museum from Colombia agrees with the above male in colour and in the absence of the streak below the median of the fore-wing. Agrees with *ceto* female in having less black except that the black distal band on the hind-wing is much wider.

Type, a ♂ from Pozuzo, E. Peru, 800 m. Length of fore-wing 40 mm. 3 ♂♂ from Pozuzo, E. Peru, 800 m.

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Melinaea orestes clara, forma nov.

This form of *orestes*, Salv., is easily distinguished by the absence of any marking on the hind-wing except a spot at the inner margin near the base. Differs also from *orestes* in that the black inner margin of the fore-wing reaches the distal margin, so that the prong of the yellow fork at the outer angle is equal to or narrower than the prong above it. Typical *orestes* was described from Pozuzo.

On the underside of the fore-wing, the grey streak on the inner margin is extended to the first submedian and reaches the distal margin in a curve.

On the underside of the hind-wing a black subcostal band extends from the base to near the apex, bordered by the costal vein and filling the upper part of the cell. Length of fore-wing 58 mm.

Type, a ♂ from Yahuar Mayo, S.E. Peru, 1200 feet, April and May 1912. A series of males from this locality (October and November 1910), where it is found in company with typical *orestes*.

Melinaea orestes is synonymous with *chinch*a, and has nothing to do with *flavosignata* as described in Seitz, "Macrolepidoptera of the World," vol. ii, p. 122.*

Napeogenes seminigra, sp. nov.

Nearest to *rowena*, Hew., but the yellow band is absent and also the two spots at the end of the cell. The black band on the hind-wing is also characteristic.

♂ upperside. Fore-wing brown, outer half black extending to vein 2 and filling the cell at the apex. A black wedge-shaped spot in the cell and a small similar spot in the angle at the base of 2. Costa black, wider near the base. A broad black stripe at the inner margin. Hind-wing brown, costal and outer margin black and proximally dentate. A central black band extending far beyond 5 to the inner margin.

Underside similar to the upper. Fore-wing with a marginal row of 6 white dots. Hind-wing with 2 white dots at the apex; a yellow streak at the base.

♀ similar to the ♂. Inner marginal streak of the fore-wing narrower, as also the black band of the hind-wing.

Head and thorax black, collar and patagia brown. Abdomen

* Although this is here treated as a form, it is not unlikely that examination of the genitalia may show it to be a separate species. We have received about equal numbers of *clara* and typical *orestes* from the same locality, and have not seen yet any intermediates.

dark brown above, yellow below. Antennae yellow, black at the base.

Type, a ♂ from Yahuar Mayo, S.E. Peru, 1200 feet, October and November 1910. A series from the same locality. Length of fore-wing 25 mm.

Collection Adams in British Museum 1 ♂, 2 ♀♀, Chaquimayo, S. Peru, 2500–3000 feet, August to October 1910.

Leucothyris polymacula, sp. nov.

Nearest to *orestilla*, Hew. May be at once distinguished from *orestilla* by having the discal band of spots on the fore-wing separated into seven spots, and a narrower band on the hind-wing, and thus somewhat resembling the smaller species *attalia*, Hew.

♀ upperside. Fore-wing dark brown with vitreous spots as follows—

One filling lower half of cell, one at its apex shaped somewhat like the letter B, two beyond the cell close together, a smaller one near the costa, three at the apex, one proximally of the lower apical spot, two in cellule 3, one near the margin and one near the cell, two below in 2, the one near the cell almost touching that above it. Hind-wing dark brown with a discal band of 6 spots separated only by the brown veins, the two upper being a little farther apart. This band is 7 mm. wide at the inner margin, and 6 mm. at the apex where it ends at vein 6; there is a faint spot in 6.

Underside as the upper, reddish-brown, margins dark brown. Fore-wing with four white spots at the apex. Hind-wing with a row of six double marginal white spots. Base and costal area black; lower part of cell, costal and submarginal band and veins reddish-brown.

Type, ♀ from Huancabamba, N.E. Peru. Length of fore-wing 40 mm. The ♂ does not differ from the ♀. A ♂ and ♀ in the British Museum from Huancabamba. 3 ♂♂ Collection Adams in British Museum from Uruhuasi, S. Peru, April to May 1910.

NYMPHALIDAE.

Boloria tessellata, sp. nov.

This very distinct species is nearest *modesta*, Blanch. Readily distinguished by the reddish-brown ground-colour of the hind-wing underside and orange-brown of the upperside.

♂ upperside. Ground-colour orange-brown powdered with black at base. Fore-wing: a black spot in the cell near the base, another beyond it extending across the cell, one across the end of the cell. Beyond the cell a short streak at the costa, a spot below it in 6 directed basally, two spots below in 5 and 4 parallel to the cell end; all these spots are joined. A spot in 3 near the cell, joined by a thin streak to the spot in 4; a curved spot in 2 near the cell and similarly joined to that in 3; a spot in 1c midway between cell and margin; a spot in 1c near the base. A quadrate subapical spot larger than all the others and joined to the costa. A submarginal row of 7 black spots, in 1c-7, the first at the apex and joined to the costa, the second smaller and joined to the first, the third larger, the fourth small, the fifth and sixth larger and of equal size, the seventh smaller in 1c. A marginal row of six black spots. Fringes black, chequered with white between the veins.

Hind-wing: a spot in the cell near the base of vein 2, a streak at the cell end. A wavy line beyond the cell from the costa to inner margin interrupted between veins 4 and 6, and thickening posteriorly. A curved row of six rounded black spots midway between cell and margin in 1c-6; a marginal row of seven smaller black spots in 1c-7. Margin black, divided between the veins by the ground-colour. Fringes black chequered with white between the veins.

Underside of fore-wing orange-brown; apex and a narrow marginal border as far as vein 2, reddish-brown. Black spots as above but more faintly marked. Two yellowish spots placed transversely in the red-brown apex and joined to the costa, and a quadrate yellowish spot below the outer one and joined proximally to the black spot of the submarginal series; below this the proximal edge of the margin is whitish. Fringes chequered with yellowish.

Hind-wing ground-colour deep reddish-brown; basal two-thirds of costa narrowly edged with yellow. A yellowish streak at the base lying partly in the cell. At end of cell a wavy yellowish line from the costa to inner margin, and edged with black proximally. A similar discal line edged with black distally and interrupted between 4 and 6, the anterior portion joined at vein 6 to a yellowish streak at the costa. A submarginal curved band of confluent yellowish spots in cellules 2-6, with a faint spot in 1c. The proximal edge with a row of black spots as on the upperside, distal edged with reddish-brown divided by the black veins, and beyond this a narrow margin of bluish-grey from the costa to the anal angle where it is curved inward to join the black distal bordering of the discal band. A pale yellow streak along vein 4 between the yellow spot in 4 and the discal line. A distal marginal border of ground-

colour 1 mm. in width. Fringes chequered with yellowish. Antennae black above greyish below; club orange-yellow below. Palpi deep orange-yellow above, greyish below. Head, thorax and abdomen black above and covered with deep orange-yellow hair. Underside of thorax and abdomen greyish, legs yellowish. Length of fore-wing 19 mm.

♀ similar to the ♂.

Type from Quenche, S. Peru, 14,000 feet, January 1910.

A series of both sexes. In Collection Adams, British Museum. 10 ♂♂, 3 ♀♀, with same locality and date.

Pyrameis huntera altissima, subsp. nov.

This is a mountain form allied to the forms *rubra*, Stgr., and *braziliensis*, Moore. The two apical dots are white as in typical *huntera*. Agrees with *rubia* and *braziliensis* in the greater amount of black and the markings being more red than yellowish. On the underside the markings are white and not tinged with yellow; the marginal line on the hind-wing underside is continuous as in typical *huntera*.

A series from Agualani, S.E. Peru, 9000 feet, July and August 1905. Limbani, S.E. Peru, 9500 feet, April and May 1904. One specimen from Baños, Rio Pastaza, E. Ecuador, 6100 feet, January 1911.

Eresia neptoides, sp. nov.

Allied to *letitia*, Hew. Readily distinguished by the dark powdering of the spots and especially by the straight marginal line on the hind-wing. Ground-colour brownish-black.

♂. Upperside of fore-wing with white markings powdered with brown as follows: A streak in the cell from the base to the apex and nearly filling it. A triangular spot beyond the cell formed of three streaks, the larger behind vein 8 and the smaller behind 5. Beyond this an oval apical spot, its distal two-thirds obscured by the ground-colour, its lower edge white. An apical marginal row of 5 spots in 2-6, the upper three small, the fourth obsolete, the fifth larger, white and well defined. A median quadrate patch in cellule 2, not filling the base of the cellule, the upper part touching the cell and extending into 3, and as a slight dusting below 2. A rounded spot in 2 distally of the large one and nearer to it than to the margin, its lower and outer edge partly invaded by the ground-colour. A spot below it in 1c and touching the large spot at vein 2. Base faintly red-brown. Hind-wing with a white discal band

traversed by the dark veins, its proximal edge well defined and passing through the centre of the cell, its distal edge powdered with the ground-colour. This band extends from vein 7 to the inner margin near the base, a faint streak beyond 7. A marginal yellowish straight line at 1 mm. from the margin. A white spot at the apex. Fringes smoky-brown.

Underside similar to the upper. Fore-wing with the spots larger and silvery white. The costa, apex and distal margin reddish-brown. Spot at the apex white, the fourth absent, the fifth white and joined to the lower part of the oval spot. The triangular spot extends to the costa.

Hind-wing with the disc silvery white posteriorly darker, edged distally with a reddish-brown band 1 mm. wide, bordering the costa at the apex and narrowing at the inner margin near the base; the band is edged proximally and distally with black, and is widened at the base to fill the lower part of the cell. Remainder of the costa silvery-white, cellule 7 brownish-black. A silvery-white distal marginal border traversed by a thin brownish-black line which is obsolete at the apex. Margin narrowly edged with brownish-black. Fringes smoky-brown.

Antennae brownish-black, club bearing a white spot. Upper surface of head, thorax and abdomen brownish-black; palpi brownish-black fringed with white hair. Lower surface of thorax and abdomen white, the latter with a mesial brownish-black line.

Length of fore-wing 25 mm.

Type, a ♂ from El Porvenir, E. Peru, 900 m., April 1908. 7 ♂♂ from this locality.

Eresia letitia nigra, subsp. nov.

Allied to *neptoides* but distinguished by the marginal line on the hind-wing being crenulate as in *letitia*.

Upperside of fore-wing: the spots composing the triangular patch beyond the cell are shorter than in *neptoides*; the three apical spots are obscured by the ground-colour, and there is a spot in 3 near the margin which is absent in *neptoides*. The median quadrate patch is shorter, the two spots composing it being reduced distally. The spot in 1c below vein 2 is only marked by a faint powdering. Base red-brown.

Hind-wing with the band narrower and more obscured by the ground-colour on its distal edge than in *neptoides*. The submarginal line is bluish-white, thicker than in *neptoides*, and crenulate as in *letitia*.

Underside. The red-brown markings are paler than in *neptoides*. On the fore-wing the apical patch is larger, and the distal spot in cellule 2 is smaller. On the hind-wing the silvery discal area is more obscured distally by violet and a patch of dark brown at vein 5. The silvery-white costal border is extended to fill the basal half of cellule 7. The red-brown at the base is edged distally by dark brown, and the red-brown marginal band is crenulate and not edged with black proximally. The silvery-white at the apex is of greater extent. Length of fore-wing 26 mm.

Antennae without the white spot on the club as described in *neptoides*.

Type, a ♂ from Huancabamba, N.E. Peru. 9 ♂♂ from this locality.

In Collection Adams, British Museum, 2 ♂♂ Chanchamayo, Peru; 1 ♂ La Merced, Peru, 2000–3000 feet, January to February 1903; 1 ♂ San Remon, Peru, 3000 feet, 1904; 1 ♂ Rio Colorado, Peru, 2500 feet, 1904; 1 ♂ Oxypampa, N. Peru, 7200 feet. The specimen from San Remon has the band on the hind-wing yellowish.

SATYRIDAE.

Callitaera mimica, sp. nov.

Allied to *polita*, Hew., from which it differs in the broad distal band of the hind-wing. This character causes it to present a remarkable resemblance to *Haetera hypaesia*, Hew.

♂ upperside. Fore-wing diaphanous with a smoky tinge. Costal and distal margins narrowly dark brown. A narrow stripe of dark brown runs from near the origin of vein 9 to the inner margin near the outer angle, and thickens posteriorly. A similar but narrower stripe crosses the cell, almost touching the costal border and terminating at the inner margin just before vein 1a.

Hind-wing diaphanous with a smoky tinge. A broad dark submarginal band unites with a narrower marginal band forming a distal band 5–10 mm. in breadth being widest at vein 3. A hyaline spot is placed in each cellule within the band forming six spots; 2 at the apex are close together, and the fifth is concave on its distal edge. A black eye-spot with a white pupil is placed distally of the second spot and a similar ocellus at the fifth spot. A faint curved line of dark brown stands distally in the cell and another faintly distinguishable curved line runs from just below the origin of vein 2 to the inner margin between the two submedians.

Underside of fore-wing similar to the upper except that the

base of the costa is ferrugineous. Hind-wing similar to the upper except that the eye-spots are ringed with ferrugineous. ♂ ♀ Length of fore-wing 36 mm.

♀ resembles the ♂ but wings more rounded.

Abdomen black, ventral surface grey with a mesial streak of black.

Type, ♂ and ♀, La Selva, San Juan, Choco, Slopes of Colombia, 4600 feet. 1 ♂, 1 ♀ Pueblo Rico, W. Colombia, 5200 feet. 1 ♂ Siato, W. Colombia, 5200 feet, 1 ♀ Colombia. In British Museum 1 ♀ Colombia.

Pierella albofasciata, sp. nov.

Allied to *hortona*, Hew., but differs conspicuously in the white band of the fore-wing, and the white patch of the hind-wing.

♂ upperside. Fore-wing deep purplish brown. A white band, narrowly margined with blue, 3 mm. in breadth and 10 mm. in length, crosses the end of the cell, commencing at vein 10 and terminating on 3, and entering the cell at the lower discocellular.

Hind-wing deep purplish brown and bearing a patch of white 5 mm. square which stands between 4 and 6 close to the cell, not touching 4 and extending a little beyond 6. This is bordered by pale blue which is of greater extent distally.

Underside. Fore-wing coffee-brown in the apical and distal part, the cell being dusted with the same colour at the base and apex. The remainder is yellowish-grey. A white band as on the upperside, being continued by two brown lines diverging to the inner margin, the space between them much paler than the basal area, being of the same colour as the hind-wing. The cell is crossed by a curved brown line proximally of which are two black dots. A similar line crosses the submedian space near the base.

Hind-wing yellowish-grey traversed by three almost parallel brown lines running from the costal to the inner margin. The first near the base is slightly waved, the second lies just outside the cell, and the third about 4 mm. beyond. Three black dots at the base, two in the cell and one below the median. A submarginal row of five black dots placed on the intraneural folds in cellules 2-6. The margin from the apex to vein 5 is narrowly brown.

♀ larger, but upperside similar to ♂. Underside, the line across the cell is straight. The distal part of the hind-wing separated by the third transverse line is brown like the outer part of the fore-wing but lighter. The submarginal spots are ringed with lilac.

Head, thorax, and abdomen dark purplish brown above, pale ochre-yellow below. Palpi and legs pale ochre yellow. Length of fore-wing 32 mm.

Type, a ♂ from Yahuarmayo, S.E. Peru, 1200 feet, April to May 1912.

3 ♂♂ from Yahuarmayo, S.E. Peru, April to May 1912.
1 ♂ from Yahuarmayo, S.E. Peru, October to November 1910. 1 specimen in the British Museum with no locality, from the Hewitson Collection.

Antirrhoea watkinsi, sp. nov.

Nearest to *ornata*, Butl. Differs in the darker ground-colour, whiter spots, and smaller patches and spots on the hind-wing. A kidney-shaped spot of androconia in the first median space of the fore-wing as in *hela*, Feld.; this is absent in *ornata*. ♂ upperside, ground-colour dark brown lighter towards the base. On the fore-wing a band of deep purplish-brown formed of confluent spots extending from vein 7 to the lower submedian, its distal edge parallel to the margin and about 5 mm. from it. Distal and proximal edges outlined with paler brown than the ground-colour. The lower three spots of the band are the larger. The first, second, fourth, fifth and sixth bear each a bluish-white spot in the centre, the one in the first being a dot. Hind-wing with a discal band a little paler than the ground-colour and enclosing spots of deep purplish-brown and bluish central dots. The first in cellule 6, a larger in 5, a smaller in 4, these three being confluent; one of oval shape in 3, a similar in 2, and a minute spot in 1c. These spots are placed distally in the band.

Underside yellowish-brown, much speckled and irrorated with darker brown. A wavy brown line at 9 mm. from the apex on the fore-wing running nearly parallel to the margin and continued on the hind-wing to the inner angle. A heavy deep brown zigzag line from the apex of the fore-wing to the outer margin being farthest from the margin at vein 4. A similar line on the hind-wing widely margined with brown proximally and almost parallel to the discal line. The white pupils of the spots on the upperside appear obscurely below. Antennae reddish-brown; upperside of head, palpi, thorax and abdomen dark brown, lower surface yellowish. Length of fore-wing 37 mm.

♀ larger and marked as in the ♂.

In the specimens in the Collection Adams there is no spot in 1c on the hind-wing. The band on the fore-wing is margined with yellowish-brown. On the hind-wing the two apical spots are

confluent and ringed with yellowish-brown. The spots in 2 and 3 are similarly ringed.

A single ♂ from Yahuar Mayo, S. Peru, 1200 feet, April to May 1912. In Collection Adams, British Museum, 1 ♀ La Merced, Peru, 2500 feet, May to June 1903; 1 ♂ San Ramon, Peru, 3000 feet, October 1903; 1 ♂ Perené, Peru.

Lymanopoda umbratilis, sp. nov.

This species exists in two distinct forms and an intermediate form, and is of great interest as exhibiting the tendency to the production of white forms at high elevations.

The pattern on the upperside recalls *nivea*, Stgr.

♂ upperside. Fore-wing: apical half beyond cell to vein 4 and distal margin to vein 2 deep brown. A subapical patch, nearer to the cell than to the apex, cellules 2 and 3, except their bases and distal thirds, the whole of cellule 1, and the cell are paler coffee-brown. Three white dots in the apex, the upper being the larger. A dark eye-spot with a white pupil in cellule 3, within the pale area, and a smaller one below it in 2.

Hind-wing of the same coffee-brown colour as the pale areas of the fore-wing and somewhat darker at the base. A deep brown spot in 5 near the margin, one in 4 near the cell, one in 2 at three-fifths from the cell, and a barely distinguishable dot below it in 1c.

Underside of fore-wing similar to the upper but lighter. The pale areas are reddish-brown, the apex ferruginous, the inner margin greyish. The two ocelli stand out distinctly as well as the three apical dots.

Hind-wing ferruginous with darker markings. A white streak slightly irrorated with ground-colour, in the lower part of the cell between vein 2 and the base of vein 5; an oblong patch of dark reddish-brown above it. A discal band of dark reddish-brown, narrowing to the inner margin, and sending out a streak from cellule 3 to the anal angle; three white dots in the band in 3-5, and two in the streak in 1c and 2. A narrow submarginal zigzag band of dark reddish-brown which is thickest and further from the margin between veins 2 and 4.

Antennae, head, abdomen and upperside of thorax and palpi deep brown. Underside of palpi and thorax grey. Length of fore-wing 21 mm.

Type, a ♂ from Uruhuasi, S. Peru, 7000 feet, March and April 1910. A series from the same locality. In Collection

Adams, British Museum, 8 ♂♂ with same locality and date. One of these is very dark and the upperside pattern faintly visible.

Lymanopoda umbratilis, form *intermedia*, forma nov.

In this form the pale markings on the upperside are much lighter in colour than in typical *umbratilis*, and mark a transition to the next form. We have seen no gradations between the three forms.

In Collection Adams, British Museum, 4 ♂♂ from Uruhuasi, 7000 feet, March to April 1910.

Lymanopoda umbratilis, form *leucotecta*, forma nov.

In this, the extreme form, the light areas are white, leaving the costa, apex and distal margin and a patch beyond end of cell deep brown. The base is powdered with brown. The ocelli stand out distinctly on the white ground and there is a third near the margin in the first submedian. The hind-wing is white with some brown powdering at the apex and the anal angle. The four dark spots are distinct.

Underside of fore-wing similar to the upper. The dark areas are reddish-brown, paler at the base. A white patch at end of cell divided longitudinally by a brown streak. Hind-wing as in *umbratilis* but much lighter in colour. Abdomen greyish below.

In a specimen in Collection Adams, the dark area at end of cell is joined to the marginal brown and cuts off a subapical patch. In three other specimens a well-defined streak borders the cell between veins 4 and 2.

Type, a ♂ from Uruhuasi, S. Peru, 7000 feet, March to April 1910. In Collection Adams, British Museum, 6 ♂♂ bearing same date and locality.

Lymanopoda caudalis, sp. nov.

This peculiar species differs in shape from all others in the genus and has apparently no near ally.

Fore-wing with apex pointed and outer margin convex. Hind-wing with outer margin undulate and produced at vein 4 to a short blunt tail 3 mm. in length.

♂ upperside, deep ferruginous brown, paler towards the base.

Underside paler. Fore-wing with a curved submarginal row of white dots standing in a faint band of lighter ground-colour. One spot in cellule 1c near the angle, the second and third in 2 and 3

placed more proximal and one above the other, the fourth and fifth in 4 and 5 and above the first, the sixth in 6 and above the second and third. Spots 1, 2 and 3 have dark rings. The hind-wing has the inner margin silvery-white and is dusted with this colour up to the base. A curved submarginal row of seven white spots lying in a narrow and faint band of lilac powdering from the apex to the inner angle in cellules 1c-7. Length of fore-wing 29 mm.

Type from Pozuzo, E. Peru, 800 mm. A ♂ in the British Museum from the same locality.

XXX. *The Culicidae of Australia.*—I. By FRANK H. TAYLOR, F.E.S., Entomologist to the Australian Institute of Tropical Medicine.

[Read December 3rd, 1913.]

PLATES XLI—XLIV.

THE present paper contains descriptions of three new genera and seventeen new species besides new records for several previously described forms.

The new species are distributed in the following genera : *Calomyia* (one), *Grabhamia* (one), *Culicada* (six), *Leucomyia* (two), *Culicelsa* (two), *Caenocephalus* (one), *Chrysoconops* (one), *Dixomyia* (one) and *Uranotaenia* (two).

The female of *Anisocheleomyia nivipes*, Theob., is also recorded for the first time.

The type specimens have been deposited in the Institute collection.

LIST OF SPECIES DEALT WITH.

- Nyssorhynchus annulipes*, Walker.
Calomyia priestleyi, gen. et sp. nov.
Stegomyia tasmaniensis, Strickland.
Scutomyia notoscripta, Skuse.
Grabhamia flindersi, n. sp.
Culicada demansis, Strickland.
 „ *vandema*, Strickland.
 „ *tasmaniensis*, Strickland.
 „ *nigra*, n. sp.
 „ *annulata*, n. sp.
 „ *clelandi*, n. sp.
 „ *squamosa*, n. sp.
 „ *cumpstoni*, n. sp.
 „ *annulipes*, n. sp.
Leucomyia annulata, n. sp.
 „ *annulirostris*, n. sp.
Culicelsa simplex, n. sp.
 „ *fuscus*, n. sp.
Culex occidentalis, Skuse.
Caenocephalus concolor, gen. et sp. nov.

Chrysoconops littleri, n. sp.

Dixomyia elegans, gen. et sp. nov.

Uranotaenia propria, n. sp.

„ *albescens*, n. sp.

Anisocheleomyia nivipes, Theobald.

Nyssorhynchus annulipes, Walker.

Theobald, Mon. Culicid., I, p. 164 (1901); III, p. 104, (1903).

Additional Locality. TASMANIA, Launceston (*F. M. Littler*).

CALOMYIA, n. g.

Head clothed with narrow-curved and upright forked scales with spindle-shaped ones in the centre and bordering the eyes, and flat ones on the sides; palpi slightly less than one-third the length of the proboscis, four jointed, the third joint very long, apical joint minute and nipple-shaped; proboscis long.

Thorax with narrow-curved, broad flat and spindle-shaped scales; scutellum with broad flat scales. Wings with linear lateral scales and broad median flat ones; fork-cells long.

The above genus is very distinct; systematically it would come between *Quasistegomyia* and *Kingia*.

Male unknown.

Calomyia priestleyi, n. sp.

Head clothed with narrow-curved, upright forked, spindle-shaped and flat lateral scales. Palpi four jointed, black scaled. Thorax clothed with bronzy narrow-curved and pale spindle-shaped scales, and two prominent patches of broad flat scales; scutellum flat scaled. Abdomen with basal banding and median basal spots with lateral spots. Legs basally banded.

♀. Head black, clothed with white narrow-curved and dense black upright forked scales with a median line of white spindle-shaped ones, and a narrow border of flat white spindle-shaped ones round the eyes, a small patch on either side of the flat pale ones, border bristles round the eyes long and black with three overhanging the eyes from the centre; palpi about one-third the length of the proboscis, black clothed with black iridescent scales, four jointed, the second about half the length of the third which is very long, the fourth nipple-shaped and minute; proboscis black scaled, long, comparatively slender, nearly as long as the abdomen; antennae 14 jointed, dark brown, clothed with white pubescence, verticillate

hairs black, the base of the second segment yellow, basal lobes black clothed with blackish hairs on their inner surfaces; clypeus black; eyes purplish black.

Thorax black, clothed with bronzy narrow-curved scales with two very prominent patches of pure white broad flat scales on the sides at the base of the middle third, and pale spindle-shaped ones in the middle; posterior third with two lateral rows of cream-coloured spindle-shaped scales and numerous broad white flat ones with a small prealar patch of white flat ones, a lateral row of black bristles on each side extending the whole length of the thorax, border bristles black, prothoracic lobes prominent clothed with white flat scales and black bristles; scutellum black, densely clothed with broad white flat scales, border bristles black, eight to the mid lobe; pleurae black, clothed with broad white flat scales and mixed yellow and black hairs.

Abdomen black, clothed with black iridescent scales, first segment clothed with white scales and pale creamy yellow hairs, second segment with white basal banding which expands into broad lateral patches, segments three to seven with basal white spots those on segments six and seven forming comparatively large triangles, apical segment unspotted, segments three to six with basal lateral patches, seventh with broad lateral stripe the full length of the segment; posterior border bristles black, lateral border bristles black and fairly dense on the fifth to seventh segments; venter black, clothed with pale scales, segments six and seven with white scales and numerous black hairs.

Legs clothed with black iridescent scales; the basal half of the hind femora pale creamy beneath and with a creamy white apical patch above; first tarsals of fore and mid legs with very broad creamy white bands, not quite basal, second tarsals of fore legs with an almost basal creamy white spot, of mid legs with creamy white banding, almost basal, remaining tarsi unbanded; hind legs with the first three tarsals with creamy white banding, not quite basal on the first and basal on the second and third, fourth and fifth unbanded; ungues of fore and mid legs equal, uniserrate, of hind legs equal and simple.

Wings with the costa black scaled; the base of sub-costal and first longitudinal veins clothed with black iridescent flat scales; veins clothed with brown lateral linear and median fairly broad scales; fringe dark brown; first fork-cell longer and considerably narrower than the second, the base of the latter nearer the base of the wing; stem of the first fork-cell two-thirds the length of the cell, stem of the second about two-thirds the length of its cell, anterior basal cross-vein slightly longer than and a little more than twice its own length

from the anterior cross-vein; the sub-costal vein terminates a short distance in front of the supernumerary cross-vein. Halteres creamy yellow.

Length 9 mm.

Habitat. QUEENSLAND, Townsville (*Dr. H. Priestley*).

Date of Capture. 27/3/1913.

Observations. Described from a single specimen. It is a very handsome mosquito, the iridescent scales being very conspicuous. It is isolated from other Australian species by its head and thoracic ornamentation; the leg banding is also distinctive. We have much pleasure in dedicating this handsome species to its discoverer.

Stegomyia tasmaniensis, Strickland.

(Pl. XLI, figs. 1 and 2.)

Entomologist, xliv, No. 578, p. 249 (1911).

Additional Localities. TASMANIA, Launceston, Mount Arthur (*F. M. Littler*).

Scutomyia notoscripta, Skuse.

Proc. Linn. Soc., N.S.W., III, 2nd series, p. 1738 (1888).

Additional Localities. TASMANIA, Underwood, Launceston (*F. M. Littler*).

Grabhamia flindersi, n. sp.

Thorax clothed with deep bronzy narrow-curved scales. Abdomen clothed with brown scales. Legs black, unbanded.

♀. Head black, clothed with dark brown narrow-curved scales with numerous white and black upright forked ones, the sides with a small patch of mixed whitish and brown flat ones; eyes black and silvery bordered with long blackish bristles; palpi black scaled with a few scattered black bristles; proboscis black mottled with black and white scales; antennae dark brown, second and third segments paler, basal lobe blackish brown, verticillate hairs dark brown, short, pile grey; clypeus black.

Thorax dark brown, clothed with deep bronzy narrow-curved scales, prealar bristles dense, blackish brown; scutellum dark brown, clothed with short white narrow-curved scales, mid lobe with six black border bristles, lateral lobes with five; metanotum reddish brown, prothoracic lobes with mixed brown and white narrow-curved scales; pleurae brown, densely clothed with white flat scales.

Abdomen brown, clothed with brown scales with narrow apical

white banding and conspicuous white apical lateral spots; venter white scaled with scattered brown ones.

Wings with the veins clothed with mixed white and brown scales, costa black; fork-cells short, the first slightly longer but narrower than the second, the base of the latter nearer the base of the wing than that of the former; stem of the first fork-cell half the length of the cell, stem of the second about two-thirds the length of its cell; anterior basal cross-vein slightly longer than the anterior cross-vein and about one-third its length distant from it; fringe brown. Halteres with the stalk and knob creamy white.

Legs with the femora densely mottled white and brown scales, with an apical white spot, the apical third of the fore femora with numerous and moderately long brown spines; tibiae and tarsi covered with blackish brown scales, the former and the first two tarsals mottled with white scales; unguis equal each with a small tooth.

Length 8 mm.

Habitat. BASS STRAITS, Flinders Island (*Dr. J. B. Cleland*).

Date of Capture. 20/11/1912.

Observations. Described from two specimens taken by *Dr. Cleland*. It would seem in some respects, to be closely related to *G. australis*, *Strickland*.

Culicada demansis, *Strickland*.

Entomologist, xlv, No. 577, p. 202 (1911).

Strickland states in his description that he was unable to state the character of the unguis from his single specimen. They are all equal and uniserrate.

Additional Locality. TASMANIA, Mount Arthur (*F. M. Littler*).

Culicada vandema, *Strickland*.

Entomologist, xlv, No. 577, p. 202 (1911).

Additional Localities. N.S. WALES, Bulli (*Dr. J. B. Cleland*); TASMANIA, Mount Arthur (*F. M. Littler*).

Culicada tasmaniensis, *Strickland*.

(Pl. XLI, figs. 3 and 4.)

Entomologist, xlv, No. 576, p. 181 (1911).

Additional Locality. TASMANIA, Low Head (*F. M. Littler*).

Culicada nigra, n. sp.

Head clothed with pale scales, thorax dark brown. Abdomen with white basal banding. Legs black, tarsi with white basal banding.

♂. Head black, clothed with creamy narrow-curved and light brown upright forked scales with white flat lateral ones, border bristles black with creamy yellow ones overhanging the eyes from the centre; eyes purplish black; clypeus black; proboscis black; palpi black with white basal banding on all the segments, apex of the first, the second and apical segments clothed beneath with dark brown hairs, those on the last two segments pale at the base; antennae dark brown, basal lobes black, plumes brown, penultimate and apical segments long and brown, verticillate hairs at the base of the apical segments long and black.

Thorax blackish brown, light chestnut brown in front of the scutellum, clothed with creamy white narrow-curved scales remainder with creamy ones, lateral border bristles black; scutellum brown, posterior half paler, clothed with creamy white narrow-curved scales, border bristles light brown; metanotum chestnut brown, prothoracic lobes prominent, dark brown, clothed with white flat scales and brown bristles; pleurae brown, densely clothed with white flat scales and a few pale yellowish bristles.

Abdomen clothed with black scales with white basal banding, first segment clothed with white scales and dense pale hairs, eighth segment mottled with white scales; genitalia mottled with white scales; posterior border bristles pale yellow, lateral ones long, pale yellow; venter white scaled.

Legs black; femora, tibiae and first tarsals pale beneath; knee spot pale; tarsals one to four of fore and mid legs with white basal banding, all tarsi of hind legs with white basal banding; ungues of fore and mid legs unequal, the larger with two teeth, the smaller with one, hind equal uniserrate.

Wings with the costa clothed with black scales, remaining veins clothed with dark brown scales; anterior basal cross-vein as long as the anterior cross-vein and half its own length distant from it; first fork-cell longer and narrower than the second, their bases level, stem of the first fork-cell about three-quarters the length of the cell, stem of the second as long as the cell; fringe brown. Halteres with pale stems and dusky knobs.

Length 7-7.5 mm.

Habitat. TASMANIA, Launceston (*F. M. Littler*).

Observations. Described from two specimens. It comes nearest to *C. demansis*, Strickland, from which it can be

separated by the different clothing of the posterior portion of the thorax and scutellum and the much less prominent leg banding.

Culicada annulata, n. sp.

(Pl. XLI, fig. 5.)

Head black. Thorax clothed with brown narrow-curved scales. Legs black, banded.

♂. Head black, clothed with pale whitish narrow-curved and black upright forked scales, with white flat lateral ones; eyes deep black; antennae pale, nodes black, basal lobes black, penultimate and apical segments dark brown, plumes brown; proboscis black with a narrow creamy white band towards the apex of the middle third with a few ventral brown hairs before the base of the band; palpi black scaled, longer than the proboscis, first segment with a creamy band on its basal third, second and third segments with basal creamy banding, the latter creamy at the apex, the apical third of the first segment and remaining segments with black ventral hairs.

Thorax black, clothed with brown narrow-curved scales, with pale reflections, with a few white narrow-curved ones in front of the scutellum; prothoracic lobes prominent, clothed with brown narrow-curved scales, border bristles dark brown; metanotum black; pleurae dark brown paler towards the coxae, and clothed with white flat scales.

Abdomen clothed with black scales with broad white basal banding, first segment dark brown clothed with pale hairs, seventh and eighth segments with a small white apical patch of scales; posterior border bristles golden yellow, lateral ones brown, long; genitals black clothed with black hairs; venter white scaled, most of the segments with dark apical bands.

Legs black; femora white scaled beneath; tibiae with narrow faint apical and basal banding; hind legs with a pale knee spot; tarsals one to three with narrow pale basal banding; ungues of fore and mid legs very unequal, the larger with a single tooth, hind ungues equal and simple.

Wings with the costa black, veins clothed with brown scales, fringe brown; first fork-cell longer and narrower than the second, base of the latter nearer the base of the wing than that of the former; stem of the first fork-cell about four-fifths the length of the cell, stem of the second about five-sevenths the length of its cell; anterior basal cross-vein longer than the anterior cross-vein and about one and a half times its own length distant from it. Halteres pale.

Length 5.5 mm.

♀. Head similar to ♂; palpi black scaled, white scaled at the apex; antennae black, verticillate hairs black. Legs with the ungue equal and simple. Wings with the anterior basal cross-vein longer than the anterior cross-vein and twice its own length distant from it.

Length 6 mm.

Habitat. QUEENSLAND, Townsville (14/4/13 and 6/5/13) (*F. H. Taylor*).

Observations. Described from a single ♂ and two ♀ specimens. It is close to *C. squamosa* but is easily separated from it.

Culicada clelandi, n. sp.

(Pl. XLI, fig. 6; XLII, fig. 7.)

Head black, clothed with creamy and brown scales. Thorax clothed with golden narrow-curved scales. Abdomen clothed with violet black scales and with basal banding. Legs unbanded.

♀. Head black, clothed with creamy yellow narrow-curved and brown upright forked scales with lateral patches of creamy flat ones; antennae black, basal lobes pale brown, clothed with brown scales, second segment pale, verticillate hairs black, pubescence pale; palpi pale, black scaled; proboscis black scaled; clypeus dark brown; eyes black and silvery.

Thorax bright chestnut brown, with three black lines terminating opposite the wing roots, clothed with golden narrow-curved scales, lateral border bristles black; scutellum pale brown, clothed with narrow-curved golden scales, posterior border bristles brown; prothoracic lobes brown, clothed with brown and creamy yellow narrow-curved scales and brown bristles; metanotum brown; pleurae dark chestnut brown, clothed with patches of creamy yellow flat and narrow-curved scales and scattered yellow bristles.

Abdomen clothed with violet black scales, first segment with pale scales and yellowish bristles, segments two to six with creamy white basal banding, seventh mostly with creamy white scales, second to seventh segments with creamy white lateral patches, posterior border bristles pale; venter white scaled.

Legs black scaled, femora white scaled beneath on basal two-thirds, femoro-tibial joint pale scaled, tarsi unbanded; ungues of fore and mid legs equal, uniserrate, hind equal and simple.

Wings with the costa black scaled, veins clothed with dark brown scales; first fork-cell longer and narrower than the second, their bases almost level; stem of the first fork-cell less than half the length of its cell, stem of the second about two-thirds the length of the cell, anterior basal cross-vein slightly more than its own

length distant from the anterior cross-vein; fringe dusky. Halteres pale.

Length 6-6.5 mm.

Habitat. BASS STRAITS, Flinders Island.

Date of Capture. 21/11/1912.

Observations. Described from four ♀ specimens. A species easily distinguished by the narrow-curved scales on the pleurae, thoracic markings and ungues from *C. tasmaniensis*, Strickland. We have much pleasure in dedicating this species to its discoverer.

Culicada squamosa, n. sp.

(Pl. XLII, fig. 8.)

Head black; thorax dark brown with mixed brown and pale narrow-curved scales with two small patches of *upright forked scales*. Abdomen with basal banding. Legs with apical and basal banding to the tarsi.

♀. Head black, clothed with creamy narrow-curved scales and creamy upright forked ones in the centre and dark brown ones on the sides, flat scales on the sides creamy, border bristles pale; eyes purple black; antennae black, basal lobes black, second segment with the basal half creamy, verticillate hairs black; palpi four jointed, third very long, fourth minute and nipple-shaped, black scaled, with the apex white, clothed with numerous black hairs; proboscis black scaled with a broad median creamy white band.

Thorax dark brown, clothed with mixed brown and pale creamy narrow-curved scales, with two small spots, one on either side of the wing roots, of elongate outstanding flat scales; scutellum yellowish brown clothed with pale narrow-curved scales posterior border bristles black; pleurae brown with white flat scales and a few brown bristles; metanotum brown.

Abdomen clothed with black scales and creamy white lateral spots, first segment clothed with black scales and numerous yellowish hairs, segments two to five with pale creamy white basal banding, segments six to eight with basal and apical pale creamy white banding; venter with the first three segments white scaled, fourth and fifth black scaled with basal white banding and a small median patch of white scales, remainder black scaled with basal white banding.

Legs black, femora and tibiae mottled with white scales, knee spot creamy yellow, fore, mid, and hind legs with the first three tarsals with basal and apical creamy yellow banding, the fourth

basally banded in the fore and mid legs, in the hind legs the fourth and fifth with basal banding. Ungues equal and simple.

Wings with the costa black scaled, remaining veins clothed with dark brown scales; first fork-cell longer and narrower than the second, their bases about level; stem of the first fork-cell about half the length of its cell, stem of the second not quite the length of its cell; anterior basal cross-vein twice its length distant from the anterior cross-vein; the anterior and supernumerary cross-veins parallel; fringe dusky. Halteres with pale stems and dusky knobs.

Length 7.5 mm.

Habitat. QUEENSLAND, Townsville.

Date of Capture. 12/4/1913 (F. H. T.).

Observations. Described from two specimens; easily distinguished from other species by the elongate outstanding flat scales on the thorax.

Culicada cumpstoni, n. sp.

(Pl. XLII, fig. 9.)

Head clothed with pale narrow-curved and upright forked scales and pale flat lateral ones. Thorax chestnut brown. Abdomen black with white lateral spots. Legs black with broad white basal bands.

♀. Head black, clothed with pale creamy narrow-curved scales and creamy and black upright forked ones with pale creamy white flat lateral ones with a border of small creamy narrow-curved scales bordering the eyes, the latter purplish black and silvery with a tuft of yellow hairs overhanging them from the centre; clypeus black; proboscis black; palpi black scaled, white scaled at the base, second segment with an apical band, apex white scaled; antennae black, verticillate hairs black, pubescence pale, basal lobes black on their inner edges and clothed with small creamy white flat scales, second segment with the basal two-thirds densely clothed with creamy white flat scales.

Thorax chestnut brown, clothed with creamy narrow-curved scales mixed with a few narrow-curved black ones, prealar bristles creamy; prothoracic lobes brown, prominent, clothed with creamy spindle-shaped and flat scales with brown hairs; scutellum brown, clothed with creamy narrow-curved scales, posterior border bristles brown with a few yellowish ones on the mid lobe behind the brown ones; metanotum pale brown; pleurae brown clothed with patches of creamy white small and large flat scales.

Abdomen clothed with flat scales, first segment clothed with white scales and black ones in the centre and yellowish hairs, second segment basally banded white, third with a distinct white basal banding, fourth and fifth segments unbanded, sixth to eighth segments mottled with pale scales, posterior and lateral border bristles pale, second to fifth segments with small white lateral spots; venter mottled with dark brown and pale scales.

Legs black, femora mottled with white scales above, beneath with the basal half white scaled, apical half mottled with white scales, knee spot ochraceous, first three tarsals of fore and mid legs with white basal banding, fourth and fifth black, first to fourth tarsi of hind legs with broad white basal banding, fifth black; unguis all equal and uniserrate.

Wings clothed with dark brown scales; fringe brown; first fork-cell longer and narrower than the second; base of the former nearer the base of the wing than that of the latter; stem of the first fork-cell about one-third the length of its cell, stem of the second scarcely half the length of the cell; anterior basal cross-vein about the same length as the anterior cross-vein and nearly twice its own length distant from it. Halteres with pale stems and dark knobs.

Length 7 mm.

Habitat. VICTORIA, Melbourne; TASMANIA, Underwood.

Date of Capture. 23/10/1912.

Observations. Described from a single specimen taken by Dr. Cumpston. We have also received it from Mr. F. M. Littler from Tasmania. It is somewhat closely related to *C. demansis*, Strickland.

Culicada annulipes, n. sp.

(Pl. XLII, figs. 10 and 11.)

Head black. Thorax clothed with golden yellow narrow-curved scales. Legs black with creamy white basal banding. Abdomen with basal banding.

♀. Head black, clothed with creamy yellow narrow-curved scales and mixed creamy and black upright forked ones, with a small patch on either side of flat black ones surrounded above and below and at the back with creamy white flat scales, eyes purple black and silvery; clypeus black; palpi clothed with mixed black and creamy white scales; antennae black, basal lobes pale, clothed with small white flat scales, second segment with the basal two-thirds creamy, clothed with black flat scales, verticillate hairs black,

pubescence pale; proboscis creamy yellow with base and apex black.

Thorax brown with two sub-median light reddish brown broad stripes on the anterior half, clothed with golden brown narrow-curved scales, mixed with a few white ones, there is a large patch of white narrow-curved scales in front of the scutellum; the latter brown, clothed with white narrow-curved scales, posterior border bristles black on the lateral lobes and yellowish brown on the mid lobe; prothoracic lobes brown, prominent, clothed with creamy narrow-curved scales above and creamy flat ones on the sides with a few dark hairs; pleurae brown, densely clothed with white flat scales and scattered pale hairs; metanotum reddish brown.

Abdomen black scaled with incomplete white, triangular, basal banding and lateral white patches, first segment clothed with grey white scales and pale hairs, the patches on segments five to seven extending the length of the segment, sixth segment with an incomplete apical band also, seventh clothed with mixed black and creamy white scales; posterior border bristles pale; venter densely clothed with white scales.

Legs purplish black with the femora mottled above with white and purplish black scales, beneath with basal half white scaled, apical half mottled with black and white scales; tibiae blue black mottled with white above and below, knee spot ochraceous, prominent; first tarsals mottled with white scales on their basal two-thirds, not so prominent on the hind legs, fore and mid legs with the first to fourth tarsals with basal creamy white banding, fifth with a basal spot, in the hind legs all the tarsi are basally banded with creamy white; ungues equal, uniserrate.

Wings with the costa violet black scaled, rest of the veins clothed with dusky brown scales; fringe dusky; first fork-cell longer and narrower than the second; stem of the first fork-cell scarcely half the length of its cell, stem of the second fork-cell two-thirds the length of the cell, base of the former nearer the base of the wing than that of the latter; anterior basal cross-vein slightly longer than the anterior cross-vein and about half its own length distant from it; sub-costal vein with a dense clothing of black scales at its base.

Length 5.5-6 mm.

Habitat. BASS STRAITS, Flinders Island (*Dr. J. B. Cleland*); TASMANIA, Launceston (*F. M. Littler*); VICTORIA, Melbourne (*Dr. J. H. L. Cumpston*).

Date of Capture. Melbourne, 23/10/1912; Flinders Island, 21/11/1912.

Leucomyia annulata, n. sp.

(Pl. XLII, figs. 12 and 13.)

Head clothed with creamy and black scales. Thorax clothed with white and brown narrow-curved scales. Legs black, tarsi basally banded. Abdomen with basal white banding.

♀. Head black, clothed with creamy white narrow-curved and numerous creamy upright forked scales with a patch of black upright forked ones above the creamy flat lateral ones; clypeus black; palpi black scaled with a small spot of white scales on the base of the fourth segment and with the apex white scaled; proboscis black scaled with a fairly broad white band; antennae dark brown, basal lobes creamy on their outer surface and black on their inner, the latter clothed with white flat scales, verticillate hairs black, pubescence pale; eyes purple black and silvery, border bristles black except in the centre where they are yellow.

Thorax dark brown, clothed with creamy narrow-curved scales with a brownish tinge in some lights on the anterior two-thirds, posterior third clothed with pale narrow-curved scales, the tuft of elongate flat scales white; scutellum pale brown with a basal median dark brown patch, clothed with white narrow-curved scales, posterior border bristles dark brown; metanotum dark brown; pleurae brown clothed with patches of pale creamy scales with scattered pale and black bristles.

Abdomen pale, clothed with black scales and basal white banding on segments two to eight, segments seven and eight with white apical banding also and white lateral basal spots, first segment clothed with white scales and numerous pale hairs, posterior border bristles pale, lateral ones brown, numerous; venter dark brown scaled with basal and apical white banding.

Legs black scaled; femora, tibiae and first tarsals mottled with white scales, the former with the basal two-thirds white beneath, fore femora with a subapical spot of white scales above, knees white, hind tibiae with white apical banding, first tarsals with white basal and apical banding, indistinct in the fore and mid legs, second to fourth tarsals with white basal banding, all tarsi of hind legs with white basal banding; ungues equal and simple.

Wings brown scaled; costa dark brown scaled; fringe dusky; first fork-cell longer and narrower than the second, their bases about level, stem of the former slightly less than half the length of the cell, stem of the latter about two-thirds the length of its cell; anterior basal cross-vein shorter than the anterior cross-vein and about two and a half times its own length distant from the

mid. Halteres creamy yellow with apical half of stem and knobs brown.

Length 5 mm.

♂. Similar to ♀. Palpi with first segment dark brown with a narrow creamy apical band, second segment black with basal and apical creamy banding, apical segment black with narrow basal creamy banding; with the apical half creamy clothed with creamy hairs, with black hairs on the apex of the first, the second and basal half of the third segments; proboscis black with a white band towards the apex of the middle third, with some fairly long black hairs beneath at the apex of the middle third; antennae pale, nodes dark, penultimate and apical segments brown.

Thorax with the anterior third with white narrow-curved scales and white elongate flat scales at the roots of the wings, posterior portion with dark brown narrow-curved scales; scutellum with brown narrow-curved scales. Abdomen with the lateral border bristles brown and dense; genitalia brown, clothed with brown hairs. Ungues of fore and mid legs unequal, uniserrate; hind equal and simple.

Length 5.5 mm.

Habitat. QUEENSLAND, Townsville (*Dr. H. Priestley*).

Date of Capture. 28/3/1913 ♀, 30/4/1913 ♂.

Observations. Described from a perfect ♂ and ♀. The colour of the scales on the anterior portion of the thorax in the ♀ is somewhat different to that of the ♂, but there are no other distinctions to separate the two specimens. The tuft of hair on the under surface of the ♂ proboscis in this and the following species can only be looked upon as sexual as it is not present in the ♀. It is distinguished from *L. australiensis*, Theob., by its banded proboscis, the absence of ochraceous scales on the wings, and the simple ungues of the ♀.

Leucomyia annulirostris, n. sp.

Head black, clothed with pale creamy white scales. Thorax brown mostly with white scales. Legs brown with basal and apical banding. Abdomen with basal and apical creamy white banding.

♂. Head black, clothed with pale creamy white narrow-curved scales and mixed creamy white brown upright forked scales with lateral patches of creamy white flat ones; eyes purple black and silvery; proboscis black scaled with a creamy white band towards the base of the apical third; hairy beneath at the base of the band; clypeus black; antennae pale, last two segments brown, basal

lobes black, nodes black, plumes brown; palpi black scaled, first segment with a narrow pale band on its apical third and a narrow apical one, second segment with a creamy basal band, apical segment with broad creamy yellow apical and narrow basal banding and clothed with greyish hairs, the apex of the first and the whole of the second segments clothed with black hairs.

Thorax brown with anterior two-thirds white scaled, posterior third with mixed brown and white scales with a few elongated outstanding pale flat scales in front of the wing roots; scutellum paler than thorax, sparsely clothed with white narrow-curved scales, and with brown ones to the mid lobe, posterior border bristles brown, twelve to the mid lobe, five to the lateral lobes; prothoracic lobes prominent, brown, clothed with pale narrow-curved scales and pale hairs; metanotum brown; pleurae dusky brown, clothed with patches of white flat scales and pale hairs.

Abdomen black scaled with white basal banding; first segment clothed with black scales and yellowish hairs, segments two to six with white basal banding, seventh with basal and apical creamy banding, in one specimen the eighth segment has the basal band forming a broad triangular patch which is connected to the apical band by a narrow stripe of creamy scales, and with a broad lateral creamy patch, eighth segment clothed with creamy scales; genitalia with the basal lobes brown, clothed with pale hairs posterior and lateral border bristles pale yellow; venter clothed with white and black scales with numerous pale yellow hairs.

Legs black scaled; femora, tibiae and first tarsals mottled with white scales, knees pale, femora pale beneath, tibiae pale at the apex; first and second tarsals with creamy basal and apical banding, third and fourth with basal banding, fifth pale scaled, first three tarsals of hind legs with creamy basal and apical banding, fourth and fifth tarsals with creamy basal banding; ungues of fore and mid legs very unequal, uniserrate, hind equal and simple.

Wings with the veins clothed with brown scales; fringe brown; first fork-cell longer and narrower than the second, their bases level; stem of the first fork-cell less than half the length of its cell, stem of the second two-thirds the length of the cell; anterior basal cross-vein longer than the anterior cross-vein and twice its own length distant from it. Halteres with pale stems and dark knobs.

Length 6 mm.

♀. Similar to ♂. Antennae brown, basal lobes dusky, clothed with white scales, second segment with the basal half creamy, verticillate hairs black, pubescence pale; nodes pale; palpi black scaled with a few black bristles, apex creamy yellow; clypeus black.

Thorax with the anterior two-thirds fawn coloured, creamy in some lights, elongate outstanding flat scales mixed pale and black, lateral border bristles black. Ungues equal and simple.

Length 7 mm.

Habitat. QUEENSLAND, Townsville (Dr. H. Priestley and F. H. Taylor); Ching Do (F. H. Taylor).

Date of Capture. 26/1/1913 (Ching Do), March and April (Townsville).

Observations. Described from one ♀ and several ♂ specimens. It is distinguished from *L. sinensis*, Theob., by the absence of lateral abdominal spots, larger size, etc.

Culicelsa simplex, n. sp.

(Pl. XLIII, figs. 14 and 15.)

Head clothed with light brown narrow-curved scales and white lateral ones. Thorax dark brown with brown narrow-curved scales. Abdomen black with basal banding and lateral basal spots. Legs brown with pale basal banding.

♀. Head dark brown, clothed with light brown narrow-curved and dark and pale upright forked scales with white lateral ones; border bristles dark brown, pale ones overhanging the eyes from the centre; eyes purplish black; antennae dark brown, basal lobes blackish, base of second segment pale; palpi black scaled, apex with a few snow white scales; proboscis black with a very broad median creamy band.

Thorax dark brown, clothed with pale golden brown narrow-curved scales; scutellum dark brown clothed with pale narrow-curved scales, border bristles dark brown; metanotum dark brown; pleurae dark brown clothed with flat white scales.

Abdomen black scaled with narrow white basal banding and lateral white basal spots; first segment clothed with numerous pale bristles, seventh with an incomplete apical white band; venter white scaled with dark brown apical bands.

Legs brown; femora with the basal half densely mottled with white scales beneath, those of the fore and mid legs with a pale apical ring, hind femora forming a pale knee joint with the tibiae; hind tibiae pale at the apex; tarsals one to three with creamy white basal banding, remainder unbanded; unguis equal and simple.

Wings with the costa black, veins densely clothed with dark brown scales; fringe brown; first fork-cell longer and narrower than the second, the base of the latter nearer the base of the wing; stem of the first fork-cell slightly more than half the length of the

cell; stem of the second as long as its cell; anterior basal cross-vein about two and a half times its length from the anterior cross-vein. Halteres with pale stems and dark knobs.

Length 4-5 mm.

Habitat. QUEENSLAND, TOWNSVILLE (*Dr. H. Priestley* and *F. H. Taylor*).

Observations. Described from specimens collected in houses during May. It is distinguished from *C. annulirostris*, Skuse, by the much wider band on the proboscis, its brown legs and the lateral basal spots on the abdomen. It is also readily distinguished from *C. parvus*, Taylor.

Culicelsa fuscus, n. sp.

Head clothed with pale scales. Thorax clothed with golden narrow-curved scales. Abdomen with white basal banding. Legs unbanded.

♂. Head black, clothed with creamy white narrow-curved scales with numerous creamy white and a few brown upright forked ones, a small patch of white flat ones on each side; antennae pale, about two-thirds as long as proboscis, nodes black, penultimate and apical segments brown, basal lobes brown, plumes dense, brown; palpi longer than proboscis, second joint very long, brown scaled, apex with a few hairs on ventral surface, third and four segments dark brown scaled with numerous dark brown hairs; proboscis with the basal two-thirds pale, apical third brown; eyes purplish black.

Thorax brown, pale in front of the scutellum, clothed with golden narrow-curved scales; scutellum yellowish, clothed with pale yellowish narrow-curved scales; metanotum light brown, pleurae brown; prothoracic lobes brown.

Abdomen brown scaled with basal white banding, the first segment brown scaled with pale hairs, penultimate and apical segments clothed with creamy white scales; posterior border bristles yellow, lateral border bristles pale brown; venter white scaled.

Legs black with bronzy reflections; femora pale beneath; ungues of fore and mid legs equal, uniserrate, hind ungues small, equal and simple.

Wings with the costa dark brown scaled; veins clothed with brown scales; first fork-cell longer and narrower than the second, base of the latter scarcely nearer the base of the wing than that of the former; stem of the first fork-cell half the length of its cell, stem of the second two-thirds the length of the cell; anterior basal cross-vein longer than and about twice its own length distant from

the anterior cross-vein; fringe light brown. Halteres, stems pale with dusky knobs.

Length 3 mm.

Habitat. QUEENSLAND, Townsville.

Date of Capture. 31/3/1913 (*F. H. Taylor*).

Observations. Described from two ♂ specimens which were taken in water-butts on house properties. It is easily separated from its congeners by its unbanded legs, fore and mid ungues and small size.

Culex occidentalis, Skuse.

Proc. Linn. Soc. N.S. Wales, III, 2nd series, p. 1729 (1888); Theobald, Mon. Culicid., I, p. 419 (1901); III, p. 179 (1903).

Additional Locality. TASMANIA, Launceston (*F. M. Littler*).

CAENOCEPHALUS, n. g.

Head clothed with narrow-curved and upright forked scales and flat lateral ones; palpi of ♂ three-jointed, shorter than the proboscis, apical segment broadly spatulate, of ♀ apparently three-jointed, second joint longest and flattened, third minute and nipple-shaped.

Thorax clothed with small narrow-curved scales; prothoracic lobes clothed with small flat and narrow-curved scales; scutellum covered with narrow-curved scales.

Wings longer than the abdomen; veins clothed with small flat median and lateral linear scales; fork-cells short.

Caenocephalus concolor, n. sp.

(Pl. XLIII, figs. 16 and 17.)

Head clothed with pale narrow-curved scales and long thin brown and creamy upright forked ones with white flat ones on the sides. Thorax pale. Legs unbanded. Abdomen brown scaled with broad white basal banding and lateral basal spotting.

♂. Head dark, clothed with creamy narrow-curved and creamy and brown upright forked scales and flat lateral ones; eyes purplish black, bristles bordering them brown; antennae pale, fifteen jointed, densely plumose, the latter brown, basal lobes brown, penultimate and apical segments brown; palpi pale, first segment black scaled, swollen at the apex, second and apical segments brown scaled, the latter broadly spatulate with outstanding scales,

apex of the first segment, second and base of apical segment clothed with fairly long brown bristles; proboscis black, clypeus brown.

Thorax pale with a broad chestnut brown stripe extending to the wing roots, clothed with small black and creamy narrow-curved scales; prothoracic lobes brown, clothed with pale narrow-curved and flat scales and brown chaetae; scutellum basally pale, remainder brown, clothed with white narrow-curved scales, posterior border bristles dark brown, prealar bristles dark brown; metanotum light brown; pleurae pale, clothed with mixed creamy and brown flat scales and brown hairs.

Abdomen pale, clothed with brown scales with broad white basal banding to the segments; first segment brown, clothed with white scales and brown hairs, lateral border spots white; genitals with the basal lobes brown, densely hairy, inner margins pale, claspers pale, long, with the basal half swollen, posterior border bristles pale, lateral ones brown and dense; venter brown scaled with basal white banding.

Legs black, femora white scaled beneath, knee spots white, tibiae pale at the apex; unguis of fore and mid legs unequal the larger with two teeth, the smaller with one, hind equal and uniserrate.

Wings with the veins brown scaled; costa dark brown; fringe brown; first fork-cell longer and narrower than the second, base of the latter nearer the base of the wing than that of the former; stem of the first fork-cell slightly more than half the length of its cell, stem of the second scarcely as long as the cell; anterior basal cross-vein longer than the anterior cross-vein and twice its own length distant from it.

Length 5 mm.

♀. Similar to ♂. Head with the brown upright forked scales more numerous than in ♂; antennae dark brown, verticillate hairs short, dark brown, pubescence pale, dense, basal lobes and second segment paler; palpi clothed with dark brown scales, second segment flattened, apex pale scaled. Abdomen with the second and third segments with the white basal banding broader than in the ♂. Legs with the unguis all equal and simple.

Length 5 mm.

Habitat. N.S. WALES, Cronulla.

Time of Capture. Bred from larvae found in salt-water pools in rocks 13/11/1911 (*Mrs. J. B. Cleland*).

Observations. Described from specimens presented to the Institute by Dr. J. B. Cleland. It is a very distinct species, easily distinguished by the palpi and unguis of both sexes.

Chrysoconops littleri, n. sp.

Head clothed with pale scales. Abdomen and legs black, unbanded. Wings with brown scales.

♀. Head black, clothed with creamy yellow narrow-curved and thin yellowish brown upright forked scales with white flat lateral ones, border bristles brown with a fairly thick tuft of pale golden ones overhanging the eyes from the centre; eyes black, clypeus black; palpi black scaled with numerous black hairs; proboscis black; antennae black, verticillate hairs black, basal lobes pale yellow.

Thorax chestnut brown, clothed with pale golden narrow-curved scales, chaetae black, lateral ones densest above the roots of the wings; prothoracic lobes prominent, brown, clothed with brown narrow-curved scales and bristles; metanotum brown; scutellum brown, clothed with pale golden narrow-curved scales, mid lobe with eight black border bristles, lateral lobes with four; pleurae pale brown, clothed with scattered pale flat scales and mixed black and pale bristles.

Abdomen black, clothed with black scales with violet reflections, posterior border bristles pale golden, long, first segment densely clothed with long pale bristles; last segment densely clothed with pale golden bristles, venter apparently black scaled.

Legs black scaled, unbanded; femora pale scaled beneath; apical tarsi with pale reflections; unguis small, equal and simple.

Wings with the costa black, sub-costal and first longitudinal veins with dark brown scales, remaining vein scales light brown; first fork-cell considerably longer and narrower than the second, base of the former nearer the base of the wing than that of the latter; stem of the first fork-cell about one-fourth the length of the cell, stem of the second one-third the length of its cell; anterior and anterior basal cross-veins about the same length, the latter three times its own length distant from the former; fringe brown. Halteres pale.

Length 4.5 mm.

Habitat. TASMANIA, Mt. Arthur, near Launceston (*F. M. Littler*).

Observations. A species easily distinguished from other Australian *Chrysoconops*, its nearest ally being *C. nigra*, Theob., from Angola. We have much pleasure in dedicating it to its discoverer.

DIXOMYIA, n. g.

Head clothed with flat scales with a broad stripe of narrow-curved and hair-like scales with broad upright fan-shaped ones with

serrated apices; palpi very short, three jointed, antennae fourteen jointed, second segment one-third longer than the third, pubescence very dense; proboscis with apex swollen.

Thorax clothed with narrow-curved scales; scutellum clothed with flat scales; prothoracic lobes clothed with flat scales.

Wings with small median flat scales and with broad asymmetrical flat ones on each side of the veins only; fork-cells small, the first narrower and much longer than the second.

♂. Unknown.

This is a very distinct genus on account of the fan-shaped scales on the head and the squamose character of the wings. Its build and palpi suggest the *Aedinae*.

Dixomyia elegans, n. sp.

(Pl. XLIII, fig. 19; XLIV, fig. 18.)

Head clothed with narrow-curved and flat scales with broad fan-shaped ones behind. Thorax clothed with narrow-curved scales; scutellum flat scaled. Abdomen unbanded with lateral spots. Wings with small median flat and broad asymmetrical scales on the veins. Legs with ochraceous apical and basal banding.

♀. Head black, clothed with patches of black and creamy yellow flat scales with a broad median stripe of pale narrow-curved and hair-like scales with numerous black and a few white broad fan-shaped ones with serrated apices; clypeus black; antennae black, basal lobe with small white flat scales and minute hairs, second segment one-third longer than the third, segments two to seven with pale apical rings, verticillate hairs brown, pubescence pale, dense; palpi pale, black scaled, apex pale; proboscis creamy mottled with black scales, base with a broad black band, apex swollen, black, tip creamy yellow; eyes black and silvery.

Thorax black, clothed with black narrow-curved scales with broad stripe, gradually widening towards its apex, of golden yellow ones on the anterior two-thirds, bristles dark brown to black; prothoracic lobes clothed with small white flat scales and scanty dark bristles; scutellum clothed with black flat scales with a median patch of creamy yellow ones on the mid lobe, posterior border bristles dark brown, pleurae pale creamy with patches of black, clothed with white and black flat scales, the latter towards the prothoracic lobes; metanotum black.

Abdomen clothed with black scales with coppery reflections, posterior border bristles yellowish, with white lateral spots on segments four to six; venter apparently dark scaled.

Legs black, femora white scaled beneath with a few pale scales above, knee spot pale; tibiae mottled, fore tibiae with a large creamy yellow scaled spot on the apical half; first three tarsi of the fore and mid legs with basal and apical yellowish banding, fourth with yellowish basal banding; first four tarsals of hind legs with yellowish basal and apical banding, fifth with basal banding; unguis small, equal and simple.

Wings with the costa black scaled, spinose; veins clothed with broad dark brown and pale asymmetrical lateral scales and small dark brown and pale median flat ones; first fork-cell narrower and much longer than the second, base of the former considerably nearer the base of the wing than that of the latter; stem of the first fork-cell one-fifth the length of its cell, stem of the second fork-cell about half the length of the cell; anterior basal cross-vein the same length as the anterior cross-vein and slightly more than twice its own length distant from it; fringe grey. Halteres with white stems and black knobs.

Length 4 mm.

Habitat. QUEENSLAND, Townsville (*Dr. H. Priestley*).

Date of Capture. 30/4/1913.

Observations. Described from a single specimen. It is a very distinct and easily recognisable species.

Uranotaenia propria, n. sp.

(Pl. XLIV, fig. 20.)

Head black with blue black and pale bluish white scales. Thorax clothed with dark brown scales. Abdomen black scaled. Legs black.

♂. Head black, clothed with deep blue black scales with pale bluish white ones bordering the eyes, the latter purplish black; proboscis black; palpi pale; antennae brown, basal lobes black, base of second segment pale; clypeus black.

Thorax dark brown, clothed with brown narrow-curved scales with a short prealar bluish white line of scales; prothoracic lobes prominent, clothed with white flat scales—bluish in some lights; scutellum brown, clothed with brown scales; pleurae brown with bluish white flat scales; metanotum dark brown.

Abdomen pale brown, clothed with black scales; venter pale.

Legs black, unbanded, first tarsals of fore legs very short—not quite half the length of the second, slightly curved, with a large dorsal, basal, protuberance which is clothed with long semi-recumbent scales which are spoon-shaped at their apices, apex of

joint also with a protuberance and clothed with fairly long scales; unguis sickle-shaped equal and simple.

Wings with costa black scaled and spinose, veins clothed with dark brown median scales and pale lateral ones; first fork-cell considerably shorter and narrower than the second; stem of the first fork-cell nearly three times the length of its cell, stem of the second a little more than twice the length of the cell; anterior basal cross-vein longer than the anterior cross-vein and twice its own length distant from it. Halteres with pale stems and black knobs.

Length 2.5 mm.

Habitat. QUEENSLAND, Townsville (*Dr. H. Priestley*).

Observations. Described from a single specimen taken in a house at night-time. It can be easily separated from other Australian species by the bluish head and thoracic scales and the peculiar tarsal joint of the fore legs.

Uranotaenia albescens, n. sp.

(Pl. XLIV, figs. 21 and 22.)

Head clothed with brown scales with a narrow border of pure white ones round the eyes. Thorax black, clothed with brown scales. Abdomen with the first three segments densely clothed with pure white scales. Legs blackish brown, tarsi pale.

♂. Head clothed with pale bronzy black broad flat and black upright forked scales and a narrow border of white flat ones to the eyes forming a patch on the sides of the head; eyes black; antennae with basal lobes and internodes pale, nodes black, penultimate and apical segments brown, plumes brown, very dense; palpi clothed with black scales and a few dark hairs; proboscis pale with the apex clothed with dark brown scales.

Thorax black with the anterior lateral areas brown, clothed with dull bronzy narrow-curved scales with black lateral border bristles, dense above the wings; a line of pure white flat scales on the sides in front of the wings; prothoracic lobes black, clothed with densely applied snow white flat scales and a few black bristles; pleurae brown with two patches of snow white flat scales; scutellum yellowish with the posterior half of the mid lobe dark brown, clothed with dark brown scales, posterior border bristles black, four to the mid lobe and three to the lateral lobes; metanotum brown.

Abdomen black, segments one to five clothed with dense white flat scales, the first with numerous pale yellow hairs also, segments

two to four with their lateral margins covered with coppery brown scales, fifth with coppery brown basal banding, sixth and seventh segments clothed with coppery brown scales, apical segment with a few pale scales, posterior border bristles pale yellow; venter clothed with white and creamy scales.

Legs with the femora and tibiae blackish brown above, yellowish brown beneath, first two tarsals of the fore and mid legs brown scaled, pale beneath, third, fourth and fifth creamy, tarsi one to three of hind legs brown scaled, pale beneath with the apex of the third creamy, fourth and fifth creamy; unguis of fore and mid legs unequal, hind equal, sickle-shaped.

Wings with the costa, subcostal and first longitudinal veins clothed with dark brown flat scales, rest of the veins clothed with grey scales; first fork-cell much shorter and narrower than the second, stem of the former nearly twice the length of the cell, stem of the latter about two-thirds the length of its cell; anterior basal cross-vein slightly longer than the anterior cross-vein and once and two-thirds its own length from it. Halteres with creamy stem and black knob.

Length 2 mm.

♀. Similar to ♂; antennae brown, basal half of the second segment creamy, verticillate hairs brown; palpi brown, clothed with black scales and a few dark hairs; proboscis brown; wings similar to ♂ with the median scales on the second and fifth veins brown in addition to the costa, subcostal and first longitudinal veins, the apical two-thirds of the costa is spiny in both sexes; fringe pale brown; the marginal cell is very narrow and the middle third of the second sub-marginal cell is very broad in both sexes.

Length 2.5 mm. (*viz.*).

Habitat. QUEENSLAND, Townsville.

Date of Capture. Bred from larvae 21/7/1912; adults taken 31/3/1913 (*F. H. Taylor*).

Observations. A very conspicuous species on account of its abdominal markings, and easily separated from *U. pygmaea*, Theob., by its abdominal markings and squamose character of the wings and legs. Adults were found in kerosene tins and water-butts during a mosquito survey of a portion of Townsville, it also breeds in clear, shallow, grassy pools of water.

Larval characters.

Length 3.5 mm. to apex of eighth segment, length of its siphon .5 mm., tapering very slightly towards its apex.

General colour of living mature larva pale yellowish brown, siphon pale yellow.

Head black, antennae black, apical spines fairly stout, dark brown, five in number, the one on inner margin stoutest; six spines on frontal angles of thorax; chaetae in two groups each group composed of six chaetae; first two abdominal segments with lateral brown chaetae—four in each group—remaining segments with lateral hexad tufts of setae; comb on eighth segment composed of eight triangular comb-scales, siphon tuft of thirteen setae; pecten scales ten in number their individual character could not be made out; at the apex of dorsal surface of ninth segment is a tuft of nine long brown setae, at its base also is a tuft of seven minute fine brown hairs; the apex of the ventral surface also bears numerous brown setae.

Full-grown specimens (in confinement) seem to feed almost exclusively at the surface and are predaceous on other larvae, although well supplied with food.

Their position when at rest is almost horizontal to the surface, in that respect resembling Anopheline larvae.

Pupa: Length 3 mm. Thoracic region yellowish brown.

Abdominal segments light brown. Pinurae moderately long, tapering to a fine point, the middle third with very short spines on its outer edge.

The duration of the pupal stage varies from three to seven days, the average being four days.

Larvae collected 9/7/1912, pupae formed 17/7/1912, adults emerged 21–28/7/1912.

Anisocheleomyia nivipes, Theobald.

Entomologist, xxxviii, p. 52 (1905); Mon. Culicid., IV, p. 571 (1907).

♀. Similar to ♂; antennae pilose, fairly dense; the creamy white border of thoracic scales terminates about half way to the roots of the wings; scutellum with four dark brown border bristles to the mid lobe and three to each of the lateral lobes; below the dense creamy white scaled area on the pleurae is a similar area of black flat ones extending to the base of the coxae; metanotum dark brownish black. Coxae and trochanters clothed with white flat scales; last three tarsals of fore leg grey scaled, last two and apex of ante-penultimate of mid and hind legs creamy white; ungues equal and simple, those of the hind legs being shorter and straighter:

Length 2 mm. (*vix*).

Habitat. QUEENSLAND, Townsville.

Date of Capture. Bred from a pupa 26/7/1912.

Observations. This is the first record of the ♀ of this species. A single specimen was bred from a mixed lot of larvae consisting of *Uranotaenia albescens*, n. sp., *Nyssorhynchus annulipes* (Walker) and *Culicelsa vigilax* (Skuse).

EXPLANATION OF PLATES.

PLATE XLI.

FIG. 1.	<i>Stegomyia tasmaniensis</i> , Strickland.	♀ Head.
2.	" " "	♀ Wing.
3.	<i>Culicada tasmaniensis</i> , Strickland.	♀ Head.
4.	" " "	♀ Wing.
5.	" <i>annulata</i> , n. sp.	♀ Wing.
6.	" <i>clelandi</i> , n. sp.	♀ Head.

PLATE XLII.

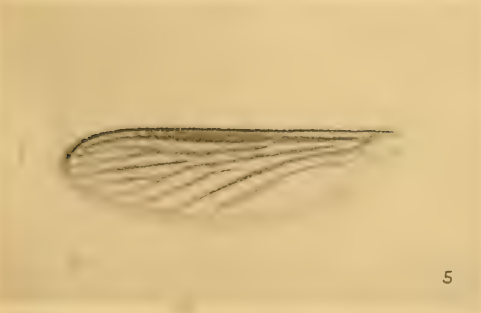
7.	<i>Culicada clelandi</i> , n. sp.	♀ Wing.
8.	" <i>squamosa</i> , n. sp.	♀ Head.
9.	" <i>cumpstoni</i> , n. sp.	♀ Wing.
10.	" <i>annulipes</i> , n. sp.	♀ Head.
11.	" " "	♀ Wing.
12.	<i>Leucomyia annulirostris</i> , n. sp.	♂ Head.
13.	" " "	♂ Wing.

PLATE XLIII.

14.	<i>Culicelsa simplex</i> , n. sp.	♀ Head.
15.	" " "	♀ Wing.
16.	<i>Caenocephalus concolor</i> , n. sp.	♂ Head.
17.	" " "	♀ Wing.
19.	<i>Dixomyia elegans</i> , n. sp.	♀ Wing.

PLATE XLIV.

18.	<i>Dixomyia elegans</i> , n. sp.	♀ Head.
20.	<i>Uranotaenia propria</i> , n. sp.	♂ Fore tarsal.
21.	" <i>albescens</i> , n. sp.	♂ Head.
22.	" " "	♀ Head.



Photo, F. H. Taylor.

C. Hentschel.

AUSTRALIAN CULICIDAE.



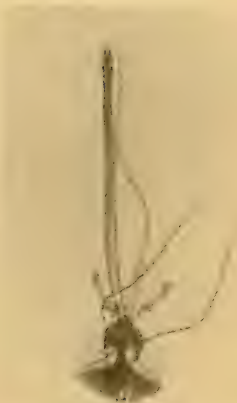
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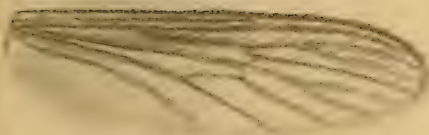
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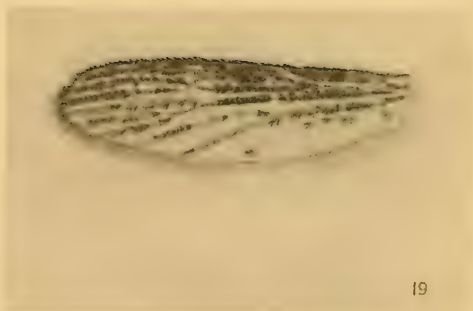


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Photo, F. H. Taylor.

C. Hentschel.

AUSTRALIAN CULICIDAE.



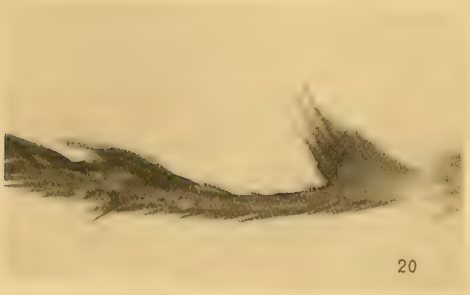
Photo, F. H. Taylor.

C. Hentschel.

AUSTRALIAN CULICIDAE.



18



20



21



22

Photo, F. H. Taylor.

C. Hentschel.

AUSTRALIAN CULICIDAE.

THE
PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF
LONDON
FOR THE YEAR
1913.

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THE
PROCEEDINGS
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ENTOMOLOGICAL SOCIETY
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FOR THE YEAR 1913.

Wednesday, February 5th, 1913.

Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the Chair.

Nomination of Vice-Presidents.

The PRESIDENT announced that he had nominated as Vice-Presidents for the ensuing session the Rev. F. D. MORICE, M.A., and Messrs. J. E. COLLIN and J. H. DURRANT.

He also spoke a few words of thanks for his election to the Presidency and made suggestions as to the more effective circulation of exhibits.

Exhibitions.

MOTHS FROM BRITISH HONDURAS.—Mr. A. E. GIBBS exhibited a number of insects, principally Syntomid moths, from British Honduras, and read the following notes:—

A short time ago I received from Dr. F. L. Davis, F.E.S., of Belize, British Honduras, a most interesting box of insects. They are mostly Syntomid moths, and exhibit some remarkable instances of mimicry. They were collected by Dr. Davis in June, 1912, at Castile on the Belize or Old River, about fifty miles in the interior of the colony. He spent two weeks in this spot, which did not prove such a good collecting-ground

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as he expected; but he suggests that he went too soon after a very long hot dry season and would have done better if he had delayed his visit for a couple of months. Castile is a large open savannah with primaeval forest on one side, and it was on the edge of this forest that he made nearly all his captures. In the tracks through the dense forest he found hardly any Lepidoptera. The most interesting insects he took were Syntomid moths of wasp-like and fly-like appearance, which were present in abundance. At the edge of the forest were patches of a small shrub with white flowers, and it was on these flowers that he took nearly all his specimens. Dr. Davis says that he found the early morning hours, from sunrise to about 10.30 a.m., the best time. After that the sun appeared to be too hot for them, and, with the exception of one or two of the more brilliant species, they all disappeared. The species which simulate Aculeates and Diptera were found in abundance on the flowers before mentioned, and were easily captured. One of the most interesting moths sent is *Amycles anthracina*, Walk., which is a very close mimic of a wasp, a specimen of which Dr. Davis has sent, and I have placed the model and the mimic side by side for comparison. Both wasp and moth were very common, crawling together over the flowers, and, experienced as Dr. Davis is, he tells me that he made a mistake once and got a slight sting. Another insect of which Dr. Davis sent two specimens, is *Chrysostola augusta*, which was described by Druce in "Biologia Centrali Americana," from a specimen sent home without a body by Champion from Guatemala. This type specimen is now at South Kensington, and was the only one in the national collection until I presented one of those collected by Dr. Davis. Druce's description should be completed as under:—

Abdomen yellow, terminal segments black with purple reflections; a black dorsal spot on the first and second segments.

The collection also contains an undescribed species of *Loxophlebia*, for which I propose the name *davisi*. Of the two specimens sent I hope to present one to South Kensington. The following is the description:—

LOXOPHLEBIA DAVISI.

Head black, palpi in front, margins of frons, ring round neck and antennae in front near tip white; thorax orange; white stripes on fore tarsi; abdomen brown-black, with white spot on first segment, and a blue shading at ventral extremity; wings hyaline, with orange patches at base, veins and margins black. Fore-wings with apex broadly black and margin widened at tornus, a black line on upper discocellular. Hind-wings with terminal band and basal two-thirds of inner margin widened.

Expanse 31 mm.

Habitat. BRITISH HONDURAS, Castile, Belize River, June, 1912, Dr. Davis. Type in British Museum, co-type in coll. Gibbs.

There are three species of *Macrocneme*, dark-coloured insects with brushes of long hairs on the tibiae and tarsi, one of which is either a small specimen of *M. jalapensis*, so far only known from Mexico, or possibly it may be a new species. Of the other two, *M. auripes* is recorded from both British Honduras and the neighbouring republic of Guatemala, while *M. nigratarsia* has been found in the latter country. Two insects having a superficial resemblance but belonging to different genera are *Dinia aeagrus* and *Mesolasia haemorrhoidalis*, both handsome insects, the latter especially so. Dr. Davis has noticed that these insects remain on the wing in the sunshine through the hot hours of the day.

There are half-a-dozen specimens of that attractive moth, *Belemia jovis*, one of the Arctiadae, and they exhibit some amount of variation in the dimensions of the scarlet band on the fore-wing, which in one of them is almost obliterated. Another moth belonging to the same Family is the beautiful *Agyrta dux*, Walk., which has the appearance of an Ithomiid that flies with it in the early morning hours before the sun is very hot. Dr. Davis says that on the wing it is almost impossible to distinguish one insect from the other.

Among the insects of other Orders sent by Dr. Davis, especially interesting is an Hemipteron, a species of *Umbonia*,

probably *U. orozimbo*, Fairm., which he found some years ago in the western district. They have a thorn-like process on the pronotum, and were in numbers on the stem of a small shrub, which Dr. Davis thinks was unprovided with spines, but these insects, ranged down the stem, gave the appearance of a very prickly plant, and one dangerous to handle. They remained perfectly motionless, thus adding to the deception.

There are two beetles which Mr. Champion has kindly identified for me. One of them, a Longicorn, *Crioprosopus thoracicus*, White, a very handsome insect, recorded in the "Biologia" from Honduras only, comes with the moths from Castile, and is the only specimen Dr. Davis has met with. The other, a Buprestid, *Euchroma goliath*, Lap. and Gory, appears to be a commoner beetle of wider range.

Appended is a list of the Syntomidae and Arctiadae collected by Dr. Davis at Castile, British Honduras, in June, 1912:—

SYNTOMIDAE.—*Pheia albisigna*, Walk., *Loxophlebia masa*, Druce, *L. inimitata*, Druce, *L. davisii*, n. sp., *Rhynchopyga flavicollis*, Druce, *Chrysostola (Dycladia) augusta*, Druce, *Macrocneme auripes*, Walk., *M. nigratarsia*, Hampson, *M. ? jalapensis*, Sch., *Dinia aeagrus*, Cram., *Mesolasia haemorrhoidalis*, Stoll, *Trichura druryi*, Hb., *Argyroeides minuta*, Druce, *Epanycles imperialis*, Walk., *Napata leucotelus*, Butl., *Aclytia punctata*, Butl., and ab. 1, Hampson, *Heliura rhodophila*, Walk., *Amycles anthracina*, Walk., *Eryphioides tractipennis*, Butl.

ARCTIADAE.—*Belemia jovis*, Butl., *Agyrta dux*, Walk. (*Isostola superba*, Druce).

THE FORMS PICEA AND GAGATES OF FORMICA FUSCA.—Mr. DONISTHORPE exhibited ♂♂ and ♀♀ of *Formica fusca*, var. *picea*, Nyl., from the New Forest, and a ♀ from Belgium, and pointed out that it was standing in the British lists as *gagates*, Latr. He gave a history of var. *picea* as British, and exhibited ♀♀ and a ♀ of the true *F. fusca*, sub-sp. *gagates*, Latr., from Vienna, and illustrated the structural differences between the two forms on the blackboard. He pointed out that *gagates* has not occurred in Britain.

COLEOPTERA, CHIEFLY FROM HINDHEAD.—Mr. Arthur J. RICHARDS, who was present as a visitor, exhibited several scarce Coleoptera, giving the following data :—

One specimen of *Dytiscus dimidiatus*, taken in a ditch near Birchington, Kent, May 1st, 1908.

One specimen of *Emus hirtus*, found dead under rotten fungi, Sept. 15th, 1910, at Hindhead.

One specimen of *Onthophagus taurus*, taken in cow-dung, at Hindhead, May 15th, 1910.

One specimen of *Odontaeus mobilicornis*, taken by Mr. H. Watkins at Hindhead, June 10th, 1910, at light.

One specimen of *Trichius abdominalis*, taken at Thursley, June, 1909.

One specimen of *Oxythyrea stictica*, taken in a flower of the Blue Delphinium, July 22nd, 1910, at Hindhead.

Three specimens of *Acanthocinus aedilis*, taken at Hindhead : one ♂, May 15th, 1909, and one ♂ found dead in a rotten pine stump, on which was a live ♀ with one antenna missing, in June, 1910.

One specimen of *Monohammus sutor*, taken at Hindhead, Aug. 11th, 1910.

He added that on June 26th, 1910, some alder bushes in the Devil's Punchbowl, Hindhead, swarmed with *Agelastica alni*; not knowing at the time what the species was, and concluding that it was something very common, he had only taken a few specimens, and had never seen another since.

Commander WALKER commented on the exhibit, and observed that the collection was a remarkable one, nearly all the species being of great rarity in Britain.

COCOONS OF MOTHS FROM THE LAGOS DISTRICT.—Mr. W. A. LAMBORN exhibited cocoons of *Deilemra antinorii*, Oberth., together with the moths that emerged from them. He explained that the examples were particularly favourable because the larvae had not been unduly crowded, and were provided with large leaves on which they constructed their cocoons. The result was that the cocoons themselves and the arrangement of the spheres upon them presented a very natural appearance, and showed the resemblance to the cocoons of a

Braconid parasite far more clearly than the more crowded examples that he had sent before and had been exhibited to the Society by Prof. Poulton.

He also exhibited two cocoons of the Lymantriid moth *Euproctis lanaria*, Holl. He had observed that, in the construction of the cocoon, the pupa itself was hidden in the lower part, close to the leaf upon which the structure was built, and that the larva spun above this foundation a spherical, thin-walled fabric which remained perfectly empty. The chrysalis itself was of a pale greenish colour and very well hidden within the yellow silk with which the larval hairs were interwoven. The upper portion of the cocoon was, on the other hand, free from hairs and transparent, so that an enemy could easily see into it.

Prof. Poulton, after studying these Lymantriid cocoons with him in the Hope Department, had inquired of Dr. Jordan and Mr. E. Meyrick, F.R.S., but neither of these naturalists knew of any example at all similar to the ones now exhibited. Prof. Poulton had also written to Dr. Chapman who (Dec. 26, 1912) called his attention to the cocoon spun by the larva of *P. auriflua*, L., which, when going into hibernation, spins a very fair cocoon and then sheds its skin and spins another cocoon, leaving the cast skin in the outer one. Dr. Chapman also mentioned the cocoon of *Orgyia aurolimbata*, Gn., described by him in the "Entomologist's Record" (xv, No. 5, 1903). In this species "the interior of the female cocoon is furnished by the larva when constructing it with a longitudinal partition, separating it into two chambers. One of these is occupied by the pupa, and when the moth emerges she leaves this chamber containing the empty pupa case and enters the other, and so is separated by the diaphragm or partition from the empty pupa case. . . ." Dr. Chapman also mentioned *Hastula hyerana*, Mill., which "hibernates in its cocoon as a larva. After making the cocoon the larva rests for a time, then casts its skin and completes its cocoon in which the cast larval skin is embedded. Some months later the larva pupates. In spinning their cocoons, most larvae make an outer hammock in which the real cocoon is slung. This is a necessity to make a place in which the true cocoon can be laid down properly,

but in some cases this outer hammock, usually flimsy and indeterminate, is really cocoon-like, and has outer lashings. I think *C. neustria*, L., does something like this. This outer hammock obviously affords a basis from which to evolve a double cocoon. We might go so far as to say that the pad and girdle of Papilionids are the cocoon, and that the carpet first spun is the outer hammock. In any case, the outer framework and the inner true cocoon are a foundation for various details to be evolved."

SEXES OF *GONOMETA SUBFASCIA*, WALKER.—Mr. J. A. DE GAYE, F.L.S., who was present as a visitor, exhibited 5 ♂♂ and 8 ♀♀ of *Gonometa subfascia*, Walker, which came from the Rev. Lake S. Noble's collection made in Lagos, S. Nigeria, in 1910. Mr. de Gaye explained how the males were captured while they were trying to get into the breeding cage in which were two newly-hatched females. Mr. de Gaye further stated that he conducted breeding experiments of that interesting species in the hope of getting more males, but the larvae died shortly after the third ecdysis. In support of the statement that the male moths exhibited were those of *Gonometa subfascia*, Walker, Mr. de Gaye quoted a description of male specimens obtained by Sir Gilbert Carter from bred larvae. This description is contained at full length in Mr. W. F. Kirby's "Butterflies and Moths," volume iv, which Mr. de Gaye produced. The male *Gonometa subfascia* is figured on page 130.

Prof. POULTON observed that Dr. Lamborn's previous experiences had made it almost certain that, in spite of the great difference in size and appearance, these insects were the ♂ and ♀ of the same species, but that this evidence had not been considered sufficient at S. Kensington; Mr. de Gaye's experience, however, had now placed the matter beyond doubt.

PAPILIO DARDANUS, BROWN, FEMALE FORM LEIGHI.—Prof. POULTON exhibited the *leighi* female together with one *trophonius*—two members of a family bred by Mr. G. F. Leigh from a female parent of the latter form (Proceedings, 1912, pp. cxxxiv-cxxxvi). The two female offspring belonged to Mr. D. Longsdon, F.E.S., who had kindly lent them in order that they might be shown to the Meeting. Prof. Poulton also

exhibited the female parent (*trophonius*) which had been presented to the Hope Department by Mr. Leigh.

Comparing Mr. Longsdon's example of *leighi* with the two Oxford specimens, Nos. 36 and 48 (the type of the female form), described on pp. xxxv-xliii of these Proceedings (1911), it was evident that the resemblance was stronger to 36 than to 48. The specimen was, in fact, rather nearer to *planeoides* than either of the described examples. The hind-wing patch was pale, like that of 36, and even whiter on the costal side of the cell than in this specimen. The two most costally placed of the sub-marginal hind-wing spots were white, the others fulvous. In the fore-wing, the apical spot (absent from the under surface) was much smaller and the sub-apical bar larger than in either 36 or 48. The three fulvous sub-marginal spots below the bar were as in 36. The most costally placed spot of the bar was white, as in the two Oxford specimens, but larger even than in 48, and there was an additional small white spot on its inner side. The fulvous markings below the fore-wing cell were nearer to those of 36, but were more strongly developed than in this specimen. The spot within the cell resembled that of 36, but its inner end was even paler. The resemblance to 36 rather than to 48 was stronger on the under surface, where, however, the increase in extent and in whiteness of the pale markings was even more pronounced than in either of the Oxford specimens. This was especially the case with the strongly developed "costal gap," and the markings below the fore-wing cell which were much larger than on the upper side and nearly white.

Mr. Longsdon's *trophonius* resembled the parent in the absence of the apical fore-wing spot, but differed in that the spot within the cell was much smaller. The sub-apical bar was faintly tinged with fulvous especially over its costal half. The worn condition of the parent rendered it impossible to decide whether it formerly resembled the offspring in this respect.

FURTHER SYNEPIGONIC PSEUDACRAEAS OF THE EURYTUS, L., GROUP, BRED BY DR. G. D. H. CARPENTER ON BUGALLA, IN THE SESSE ARCHIPELAGO.—Prof. POULTON exhibited two

sets of parent and offspring, J and K, recently received from Bugalla. He also communicated the following notes written by Dr. Carpenter :—

“ Dec. 23, 1912.

“ There is a synepigonic family of *Ps. eurytus* (J)—the largest I have sent—but only 7! There were over 20 eggs, but some failed to hatch: some of the young larvae died out of spite, and when they were full grown I lost one or two owing to the fact that I had not enough boxes with close-fitting lids, and when they began to wander sooner than I had expected, looking for eligible sites for pupation, they escaped. Finally, several *would* try to hang themselves on the side of the box and the pupae fell down and were hopelessly crippled, and died :—Altogether rather a sad story! These, however, that I do send seem to bear out what I said before, that one can't breed a *pure terra* from a *pure hobleyi*, and that *obscura* is apparently more nearly related to *hobleyi* than *terra* is, seeing that it *can* be bred from *hobleyi*.

	Pupated.	Imago.	
1.	Nov. 22.	Dec. 7.	♂ <i>obscura</i> with a trace of <i>terra</i> .
2.	Nov. 23.	Dec. 8.	♂ <i>obscura</i> with a trace of <i>terra</i> .
3.	Nov. 24.	Dec. 9.	♂ <i>hobleyi</i> . Nearly typical but with the hind-wing bar faintly tinged with fulvous, especially on its outer edge and costal end. The umber tint of the triangle appeared on the upper surface to a rather unusual extent.
4.	Nov. 25.	Dec. 10.	♀ <i>obscura</i> .
5.	Do.	Dec. 10.	♂ <i>obscura</i> with a trace of <i>terra</i> .
6.	Do.	Dec. 9.	♂ <i>obscura</i> with a trace of <i>terra</i> .
7.	Do.		♂ typical <i>hobleyi</i> , but did not clear itself from pupal skin, and died.
8.	Nov. 29.	Dec. 13.	♀ <i>obscura</i> .

“J. The female parent, of the form *hobleyi* was captured in the forest, just above lake level, on Oct. 13, 1912. The parent was a nearly typical form, with the umber colour of the triangle at the base of the hind-wing under surface appearing on the upper to a rather unusual extent. The white bar crossing the hind-wing was prolonged on to the fore so far that a narrow neck connected it with the sub-apical white bar of this wing.

“There were so many young larvae that I could not follow the careers of each individual, and therefore only give dates of pupation. The ova hatched between Oct. 22 and Oct. 26.”

Prof. Poulton pointed out that the uniformity of the 4 ♂♂ and 2 ♀♀ of *obscura* was very striking. In this respect the family resembled E. (Trans. Ent. Soc., 1912, p. 714). The trace of *terra* was slightly the strongest in ♂ No. 6, then in ♂♂ Nos. 1, 2, and 5, diminishing in that order; but the differences were very small, even between the extremes. The two females resembled each other, except that the sub-apical fore-wing bar was much fainter in 8. The traces of the umber triangle on the hind-wing under surface were distinct in all six *obscura* forms. In spite of these and other indications of transition, there could be no doubt that the offspring of this family and of E had segregated nearly completely into *obscura* and *hobleyi*, although the proportions of J were not what we should expect from a *hobleyi* parent, whether regarded as dominant or recessive. It would be very interesting if much larger families could be reared.

K. The female parent, of the form *terra*, with fore-wing sub-apical bar nearly white and with a faint trace of the umber triangle, was captured in the forest, just above lake level, on Oct. 23, 1912. In reading the above description allowance must be made for the fact that the specimen was much worn.

The single offspring pupated Dec. 5, and the imago appeared Dec. 18. It was a nearly typical male *terra*, with the sub-apical bar of a rather pale fulvous, and a faint trace of the umber triangle.

Prof. Poulton also stated that he had received a consignment of Bugalla plants from Dr. Carpenter, and that they had

been kindly named by the authorities at Kew. The food-plant of the forms of *Pseudacraea hobleyi*, Neave—a large tree with very hard wood—was now determined (cf. Proc., 1912, p. cxxxvii) as *Chrysophyllum* sp. near *C. kayei*, S. Moore—(*Sapotaceae*). The *Pseudacraea* butterflies and also especially *Planema arenaria* were much attracted by the mauve flowers of the Composite plant *Erlangea tomentosa*, S. Moore. Prof. Poulton also mentioned, in reference to the exhibit of the larvae and pupae of the Hysid moth "*Callioratis*" *pactolicus*, Butl. (Proc., 1912, pp. lxxxii, lxxxiii), that the food-plant was the Leguminous plant *Crotalaria striata*, DC.

CORNISH PHRYXUS LIVORNICA.—MR. B. HAROLD SMITH exhibited 35 specimens of *Phryxus livornica* taken at light, in South Cornwall, during the last half of May, 1912.

A PROBABLE GYNANDROMORPH OF *ACIDALIA VIRGULARIA*.—MR. A. BACOT exhibited a specimen of *A. virgularia* having the right wings melanic, the left wings of normal grey coloration. The edges of the grey and melanic areas showed a sharp median longitudinal line. As the right wings were noticeably smaller than the left, the specimen would probably prove on examination to be gynandromorphic.

MR. L. B. PROUT said that the specimen was no doubt a gynandromorph; he observed that a similar specimen had been described by Habich, of Vienna.

RHOPALOCERA FROM THE WESTERN HIMALAYAS AND TURKESTAN.—MR. N. D. RILEY exhibited on behalf of M. André Avinoff a collection of Rhopalocera made on a journey in the Western Himalayas. M. Avinoff, who was present as a visitor, gave the following account of his expedition, speaking in admirable English:—

The Rhopalocera now exhibited were collected during a journey of seven months' duration made by him from Srinagar in Kashmir to Russian Turkestan, travelling by way of Sonamarg, Zoji-la Pass, Leh—whence an excursion into Rupshu near the Tibetan frontier was very interesting—from Leh by caravan through the Kardong Pass, Nubra, Saser Pass, Karakorum (18,500 ft.), Kilian Pass, Karkalyk, Kashgar, Alai valley to Och, and so to Russian Turkestan.

From Srinagar the fauna above 5,500 ft. was purely

palaeartic; Kashmir below that having a fauna characterised by some Chinese elements, which run into India only by the southern slopes of the Himalayas (as *Papilio*, *Apatura*, *Neptis*, *Ypthima*). From Srinagar to the top of the Himalayas the fauna has some similarity with that of Chitral, the Mts. of Bokhara and the eastern Alai Mts. (*Vanessa rizana* and *V. cashmirensis*, *Erebia kalinda*, *Thecla sassanides*; the endemic *Argynnis jerdani* and the SpHINGID, *Macroglossa rubra* are closely allied to the Turkestan forms *A. hegemone*, as found in the Alai Mts., and *M. ducalis*). The Ladakh from Zoji-la has some zoogeographical affinity with the Russian Pamir (*P. machaon ladakensis*, the short-tailed form, is only found on the Pamir plateau, *Pieris deota*, *Colias eogene*, *Erebia manni*, the *Satyris huebneri* group, *Lycaena ariana*, *L. amphissa*, *Chrysophanus aditya*—which has closely related forms in Pamir). Rupshu has very little connection with other parts of Ladakh and Kashmir, purely Tibetan forms being found there, e. g. *Parnassius acco*, *P. aedestis*, f. nov., *P. n. sp.* allied to *P. cephalus*, Gr. Gr., *Pieris deota*, *Colias stoliczkana*, *Paroeneis pumilus*, *Melitaea balbita*, etc. It is interesting to note that *P. acco*, *P. aedestis* and *C. stoliczkana* are only found, apart from this locality, in Amdo, Koko Nor and Sikkim. *Colias ladakensis* seems also to be very near to *C. nina* from S. Thibet. All these facts seem to show that the fauna of Rupshu is closely allied to that of Thibet as we know it from collections made in Amdo and Sikkim. The Karakorum is also a part of the same zoogeographical region (*Parnassius acco*, *P. simo* and the *P. sp.* referred to above). Kilian is, however, part of another mountain system allied to the Chinese Turkestan, Tian-Chien, etc. (*P. epaphus huwei*, *P. simo subdiaphana*, *Colias cocandica*, *Satyris heidenreichi*—the big Turkestan form, etc.).

During the same period another collection was made in Aksu (Tian-Chien), amongst which was found the celebrated *Parnassius loxias* of which previously only three specimens were known.

Paper.

The following paper was read by Commander WALKER.
 “*Trichogramma*, Westw., probably synonymous with *Pentar-*

thron, Riley (Hymenoptera)." By R. C. L. Perkins, M.A., D.Sc., F.Z.S.

Wednesday, March 5th, 1913.

Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society :—Miss BLANCHE A. CONEY, The Poplars, Pucklechurch, Glos.; Messrs. LACHLAN GIBB, 38 Blackheath Park, Blackheath, S.E.; GERALD F. HILL, Govt. Entomologist, Northern Territory, South Australia, Port Darwin, N.T.S.A.; LOWELL MASON, 22 and 23 Club Arcade, Durban, Natal.

Nomenclature Committees.

At the request of the President, the Rev. G. Wheeler, one of the Secretaries, announced that the Council had nominated Messrs. J. H. DURRANT, L. B. PROUT and C. O. WATERHOUSE to act as the Representatives of the Society on the National Committee on Nomenclature. The Council also recommended the appointment of a permanent Nomenclature Committee for the Society itself and suggested that it should consist of five *ex officio* and two elected members, with power to add to their number when necessary, the former being the three representatives of the Society on the National Committee, the British Representative on the International Committee and the Secretary of the Society; the Council also proposed the names of Mr. G. T. BETHUNE-BAKER and Dr. K. JORDAN as the elected members. No alternative was suggested and the recommendations of the Council were unanimously adopted. The present Committee of the Society therefore consists of the following Fellows :—Messrs. G. T. BETHUNE-BAKER, J. H. DURRANT, C. J. GAHAN, Dr. K. JORDAN, Messrs. L. B. PROUT, C. O. WATERHOUSE and the Rev. G. WHEELER.

Delegates to the International Congress of Zoology.

The Secretary also announced that the Council had nominated Lord WALSINGHAM, the Hon. WALTER ROTHSCHILD

and Dr. KARL JORDAN as the Delegates of the Society to the 9th International Congress of Zoology.

He also read a letter from Lord Walsingham stating that he had given notice of a proposition to be made at the Congress that the present International Committee on Entomological Nomenclature shall be constituted a Commission with equal powers to those of the Commission on Zoological Nomenclature, and asking whether he might say that he was confident that he was expressing the wishes of the Entomological Society of London in making this proposal.

The Hon. W. ROTHSCHILD pointed out that this would somewhat clash with the instructions given by the Congress of Entomology to the International Committee to take steps that Entomology should be adequately represented on the existing Zoological Commission, these instructions having been originally suggested by the Entomological Society. He added that Entomologists far exceeded in number any other branch of Zoologists and that the forms of animal life they dealt with far outnumbered all others, so that to be adequately represented their voice must preponderate.

Dr. JORDAN observed that there was no possibility of Lord Walsingham's proposal being carried, but that it might be useful in helping forward the claims of Entomologists. He explained that by the present rules of the Zoological Congress only three members of the Committee retired, so that three was the largest number of Entomologists that could be put on to the Committee this year, the Congress having no power to alter its rules, but only to recommend alterations to the next Congress.

After some discussion Mr. L. B. PROUT proposed and the Hon. W. ROTHSCHILD seconded a Resolution "that the Entomological Society does not see its way to officially endorsing Lord Walsingham's proposal."

Mr. J. E. COLLIN proposed to add as a rider "but hopes that as many Entomologists as possible will be placed on the existing Commission."

Mr. J. H. DURRANT proposed as an amendment "that the Entomological Society prefers that Lord Walsingham should bring forward his proposal as his own personal motion."

This was seconded by Mr. DONISTHORPE, but being accepted by the proposer and seconder of the original resolution was put as a substantive motion and carried.

Nature Reserves.

The Hon. N. CHARLES ROTHSCHILD, being called upon by the President, brought before the notice of the Entomological Society of London, a recently formed society, the Society for the Promotion of Nature Reserves, and briefly outlined its objects.

Mr. Charles Rothschild stated that it was the wish of the Society to secure and hand over to the National Trust for permanent preservation, certain areas in the British Islands which were of general, zoological and botanical interest. The speaker pointed out that Fellows of the Society could assist the movement by joining the Society (there being no entrance fee or subscription), and by making suggestions for desirable areas that should be acquired. The Fellows were urged to apply to the secretaries, W. R. Ogilvie Grant, and the Hon. Francis R. Henley, at the British Museum (Natural History), Cromwell Road, S.W.

A COLEOPTERON RESEMBLING A DIPTERON.—Mr. J. E. COLLIN, on behalf of Lt.-Col. C. G. NURSE, exhibited three specimens of a peculiar insect which Mr. G. C. Champion had identified as a species of *Myiodites*, a heteromerous Coleopteron, captured by Col. Nurse, at Quetta (India) in 1902. They were taken flying along a mud wall all at the same place though on different days. The exhibitor remarked upon their superficial resemblance to Diptera of the family *Cyrtidae* which had led Col. Nurse to submit them to him for identification, though at the time they were caught the manner of flying had suggested their being Coleoptera.

A REMARKABLE COLEOPTERON.—Mr. O. E. JANSON exhibited specimens of a curious form of staphylinid beetle from South Brazil, apparently the *Ecitomorpha arachnoides*, Wassm. (Deutsche Ent. Zeit. 1889, p. 185). He considered it much more nearly resembled the larval form of certain hemipterous insects than a spider. It was said to be associated with the ant *Eciton hetschkoi*, Mayr.

A COLLECTION OF *LARENTIA CITRATA*, L. (IMMANATA, HAW.), FROM ICELAND.—Mr. L. B. PROUT exhibited a series of *L. citrata*, L., from Iceland, and read the following explanatory notes:—

The comparative fewness of Lepidoptera and their generally extreme variability in regions where they are subjected to rigorous and unstable climatic conditions is a matter of pretty general observation, but is perhaps nowhere better exhibited than in the fauna of Iceland. The remarkable range of variation in that country of the Geometrid moth *Larentia citrata*, L.,* attracted the attention of Staudinger on the occasion of his historic voyage, and he published † an analysis of the forms met with, recognising eleven as worthy of diagnosis. Thirty-three years later the Rev. F. A. Walker ‡ discussed his own experiences, although—not being a specialist—he made some questionable and even misleading comparisons of his material with certain British forms. In 1908 § I gave a very full account of the variation of this species and its nearest allies. Just recently, through the courtesy of Prof. Poulton, I have had the opportunity of examining an exceedingly variable Iceland series of *L. citrata*, which furnish the subject of my exhibit this evening, and of the present note.

One of the most interesting facts about them is that they were all taken at the same time and place, so that there can be no question of local or seasonal variation such as enters into the study of the British forms of this species and *L. truncata*. They were collected by Mrs. Agnes W. Thomson on August 16, 1911, at Hvalfjord, Hals. (S.W. Iceland), 0–50 feet elevation, flying in hay. There are 32 examples—21 ♂, 11 ♀—varying in condition from perfect to quite worn.

One ♂ may be regarded as typical, the median area being white, rather lightly dusted over with fuscous scales—recalling English *truncata* more than the sharply white-banded *citrata* forms of Britain and Central Europe. In one other ♂ there may be said to be a pale central area, but this belongs to the group I have named ab. *insolida*—only a central band of the

* *Vide* Trans. City Lond. Ent. Soc., xviii, 39, 40, for the synonymy.

† Stett. Ent. Zeit., xviii, 252.

‡ Ent. xxiii, 66.

§ Trans. City Lond. Ent. Soc., xviii, 33–60.

median area being white, proximally and distally bounded by dark bands. It has, however, a slight ochreous-ferruginous hue, which is rather prevalent in Iceland forms. Possibly two other worn ♂s were also similar. All the rest are definitely dark-banded. My series of 18 from the F. A. Walker collection shows the same preponderance.

But amongst these dark-marked forms there is an exceedingly wide range of variation. 2 ♂, 3 ♀ have the entire forewing (excepting the almost invariable subapical pale markings) ferruginous, the basal and median areas only slightly darker than the rest (ab. *ferruginea*, Prout); another ♂ still more uniform and one a little more variegated can also be mentioned here. 9 ♂, 2 ♀ belong approximately to Staudinger's " var. k " (al. ant. fusciscentibus, margine antico extus albido-maculato), the " fusciscent " shade resulting from a strong admixture of black with the ferruginous of the preceding form. In four other ♀s the blackish has wholly supplanted the ferruginous in the broad median area, producing a form more general in Britain and Continental Europe; to one ♂ the same remarks apply, but that there is an admixture of white in the median area, giving rather a mottled appearance. Finally we have five examples with black basal and median bands but with an increase of white in the intermediate and distal areas, the extreme being a pair (♂, ♀) of the beautiful ab. *thingvallata*, Stgr. The intermediate form, which F. A. Walker named ab. *cjornensis*, scarcely needs a separate name, on account of the intergrading; one of the three before me (a ♀) agrees with his type, one ♂ has more dark markings in the distal area while the other (also ♂) has so much dark marking there as almost to lose the characteristic aspect.

It may be added that a ♂ of " ab. k " was taken *in cop.* with a fine ♀ of ab. *ferruginea*, but I have not learned of any result of the pairing.

AN ALMOND-FEEDING CHALCID.—Dr. K. JORDAN exhibited a species of Chalcid together with its live chrysalis, which he had received for identification from the Director of Agriculture on Cyprus, where the species does extensive damage in the almond plantations. He read the following notes on the subject :—

The insect has been determined as a species of *Eurytoma* by Messrs. Morice, Morley and Schmiedeknecht, to whom the exhibitor submitted specimens. According to live examples sent the larvae feed on the kernel of the almond and pupate early in the spring in the cavity made in the kernel. The fly appears to emerge in the spring, and presumably lays the eggs in the soft almonds. There was one larva in each almond sent, and neither the shell nor the kernel had any outward sign of frass. Whether the fruit thus infested falls off, is not stated.

Many species of *Eurytoma* are parasitic in other insects, for instance the larvae of weevils. This one is undoubtedly phytophagous. It appears to me to be closely allied to, if not identical with, a species which is very injurious to plums and prunes in South Russia, *Eurytoma schreineri*, Schreiner (Zeits. Wiss. Ins.-Biol. iv, p. 26 (1908)).

The exhibit touches upon some questions of Nomenclature. *Eurytoma* is one of those genera of which Entomologists fight shy on account of the slipshod work of Walker. The advance of our knowledge of the genus has decidedly been retarded by Walker's descriptions. Under such circumstances would it not now be advisable to put the stumbling-block out of the way? It could be done by a careful re-examination of Walker's types, or, if that is not possible for some reason or other, by treating the names as invalid. Science should not suffer for the sake of mere names.

Another point of Nomenclature is raised by the name Herr Schreiner, of St. Petersburg, has given to this or a closely allied insect. He says in describing the species that the insect perhaps deserves to bear the name of *schreinevi*, which name he spells with a *v*. Must we call the species *Eurytoma schreinevi*, Schreiner, or *schreineri*, Schreiner (1908)?

The Rev. F. D. MORICE inquired whether the Chalcid was possibly parasitic on something that fed on the almonds, but Dr. Jordan said that those he had certainly fed on the almond itself.

TINEA PALLESCENTEELLA BRED FROM HARE'S HAIR.—Mr. R. ADKIN exhibited specimens of *T. pallescenteella* that he had reared in January last from larvae found feeding in a bale of

hare's hair received from Brandon, Suffolk, in the previous November.

He said the hair in question was without doubt of English origin, and in the ordinary course of preparation the skins from which it was taken would go through a number of processes including washing with a solution of mercury and nitric acid, after which the hair would be cut from the skins, packed in bales and put into store. The bales in which the larvae were found had probably been in store at Brandon for a couple of years, were thence sent direct to London, and the larvae were found in them upon their being unpacked immediately on arrival. There can therefore be little doubt that the bales became infected during the time that they were stored at Brandon.

The portion of hair that he received out of one of the bales was put into a glass jar and it was thus possible to observe the behaviour of the larvae. During the time that they were feeding he could detect no larval tube or case, but on becoming full-fed they spun very tough cocoons, to which a quantity of the hair was attached and in these changed to pupae, and on the emergence of the imagines the pupa skins were left protruding about half their length from the cocoons.

Bales of rabbit hair received at the same time, also from Brandon, were found to be similarly infected with the larvae. It is also on record that the species has been reared from larvae found on a dead cat (*Ent. Mo. Mag.*, vol. viii, p. 209), all animal products, facts which appear to throw doubt upon the correctness of the granivorous habits originally assigned to the larvae.

Mr. SICH referred to Rebel's specimens obtained from a stuffed capercaillie, and Mr. ADKIN pointed out that the source of those specimens was, on Rebel's own showing, problematical.

Mr. DURRANT said that species of *Tinea* were very common in the Brandon district, the refuse of rabbit skins being used as manure. He had beaten two *T. pallescentella* out of ivy, near a fowl-house at Merton.

DISABLING AND OTHER INJURIES FOUND IN LEPIDOPTERA AND THEIR INTERPRETATION.—Prof. POULTON exhibited the male specimen of *Acraea peneleos*, Ward (*pelasgius*, Grose-

Smith), referred to by Mr. Neave in the Proceedings for 1912, p. lv. The left hind-wing was missing from the specimen, having been lost in the attack by a wagtail, which, as described by Mr. Neave, took place on Jan. 12, 1912, about seven miles North-west of Entebbe. Prof. Poulton stated that injuries of this kind might be called "disabling injuries," and they were characteristic of distasteful groups. An insect which had received such an injury was an easy prey to the enemy, and when it was nevertheless rejected the inference is that it was unpalatable. Although characteristic of distasteful groups, such injuries were sometimes seen in insects with cryptic colouring. These were probably accidental, the enemy having lost its prey after dropping it accidentally, or in consequence of having been itself attacked or frightened. The interest of Mr. Neave's observation was that it actually showed how the disabling injury was inflicted. Another example of the same kind was observed by Mr. G. A. K. Marshall at Mt. Chirinda, Gazaland, S.E. Rhodesia, on Dec. 7, 1901, when a young Drongo seized and rejected the Hyspid moth "*Callioratis*" *bellatrix*, Dalm. (Trans. Ent. Soc., 1902, pp. 358-9). Mr. Marshall picked up the moth which was found to have lost most of its head. The specimen was now in the Hope Department. Prof. Poulton showed the following six examples of specimens belonging to various distasteful groups, exhibiting injuries similar to those of the above-mentioned *A. peneleos* and *C. bellatrix*.

Acraea natalica, Boisd., male : Taveta, British East Africa : Jan. 16, 1906 : Rev. K. St. Aubyn Rogers. Left hind-wing wanting. It is possible that this abnormality may be due to malformation or to injury in emerging from the pupa.

Acraea encedon, L., form *lycia*, F., male : Oni Clearing, 70 miles E. of Lagos : Jan. 28, 1911 : W. A. Lamborn. Found on the food-plant, *Commelina*, by the lagoon. The injury was noted before capture. Both left wings were torn off.

Pitthea famula, Drury, male : in the forest 4 miles E. of Oni : 9 a.m., Apr. 2, 1911 : W. A. Lamborn. This Geometrid moth was found on the ground, and as in the last example, both left wings were torn off.

Pitthea famula, female : forest $\frac{1}{2}$ mile E. of Oni : 4 p.m.,

Apr. 19, 1912: W. A. Lamborn. The moth was found, headless and dead, upon a forest path.

Neaveia lamborni, H. H. Druce, male: forest, $1\frac{1}{2}$ miles E. of Oni: 5 p.m., Feb. 12, 1912: W. A. Lamborn. The butterfly was found, headless, but still alive, on the top of a leaf 1 ft. from the ground. This and the type, also from Oni (Lamborn), are the only specimens at present known of the species (*Lipteninae*).

Aletis helcita, Clerck, male: Oni Clearing: Jan. 7, 1912: W. A. Lamborn. Found headless in verandah. This Geometrid moth was left intact and alive in the verandah overnight, and had doubtless been attacked by a Gecko, the only enemy known to exist in the verandah. Mr. Lamborn notes that this species fans its wings just like a butterfly when walking.

Prof. Poulton also exhibited the two following Noctuid moths belonging to the *Catocalinae* and exhibiting similar injuries, probably the result of accident. The colours of both species were evidently procryptic.

Homoptera mendax, Walker, female: forest, $\frac{1}{2}$ mile E. of Oni: 4 p.m., Apr. 21, 1912: W. A. Lamborn. The moth was found on a forest path, headless, with most of the thorax gone and also one wing detached.

Anua producta, Holland, female: forest, $\frac{1}{2}$ mile E. of Oni: 4 p.m., May 29, 1912: W. A. Lamborn. Nearly the whole of the left hind-wing was gone, together with the apical part of both fore-wings. The moth was lying thus injured upon the upper surface of a leaf.

He also showed the following examples of butterflies exhibiting a very different form of injury, namely a snip out of one or both wings inflicted in the attempt to capture—an attempt which had obviously failed. These injuries were by no means disabling and would probably have little effect on the flight of the species.

Hypolimnas misippus, L., male: Petauke, East Loangwa district (2400 ft.), North-east Rhodesia: Jan. 25, 1905: S. A. Neave. The apical portion of the left fore-wing was shorn off as with scissors: the injury also includes a small notch out of the hind-wing.

Salamis anacardia nebulosa, Trim., male: Stella Bush, nr.

Durban, Natal: May 12, 1902: F. Muir. "This *salamis* was settled on the underside of a leaf when a bird made a dart at it and took the piece out of the wings." The anal portion of both hind-wings was symmetrically shorn off, only just missing the posterior extremity of the body.

Charaxes ethalion, Boisd., male: Durban: March 28, 1907: G. F. Leigh. Captured at light. Injury just like that last described.

Papilio demodocus, Esp., male: Beaconsfield Road, East London, Cape Colony: Aug. 12, 1905: F. A. Dixey. Injury as in last two examples.

THE SLUGGISHNESS OF THE AFRICAN LYCAENID BUTTERFLY MEGALOPALPUS ZYMNA, D. AND H.—Prof. POULTON exhibited a female example of *Megalopalpus zymna*, observed by Mr. W. A. Lamborn on a stem in the forest, half a mile East of Oni, May 28, 1912. The butterfly was in the same position on May 29, when the right hind-wing was clipped as a means of certainly identifying the specimen. It was seen in the same place on May 30, 31, and on June 1, when it was captured.

Mr. P. A. BUXTON asked whether, apart from *Acraea*, there was evidence of the distastefulness of the other genera, and Prof. Poulton replied that there was experimental evidence of the distastefulness of *Aletis*, and that *Pitthea* was so conspicuous and so evidently mimicked by other moths that its distastefulness was highly probable. With regard to *Neaveia lamborni* only two specimens were known. Mr. HAMILTON DRUCE observed that a second species of this genus had lately come to hand.

Wednesday, March 19th, 1913.

Rev. F. D. MORICE, M.A., Vice-President, and afterwards Mr. J. H. DURRANT, Vice-President, in the Chair.

Election of Fellows.

MESSRS. THOMAS ALFRED COWARD, F.Z.S., Brentwood, Bowdon, Cheshire; WM. H. EDWARDS, Natural History Dept., Birmingham Museum; LEWIS GOUGH, Ph.D., Entomologist

to the Govt. of Egypt, Dept. of Agriculture, Cairo; JOHN HEWITT, B.A., Director of the Albany Museum, Grahamstown, South Africa; CARLOS E. PORTER, C.M.Z.S., Professor of Zoology, Agricultural Institute, Santiago, Chile; and GILBERT STOREY, Entomological Research Commission, Natural History Museum, South Kensington, S.W., were elected Fellows of the Society.

Exhibitions.

CONIOPTERYX LARVAE.—Mr. C. B. WILLIAMS exhibited two larvae of *Coniopteryx tineiformis*, eight of which were beaten from pines at Oxshott on the 16th inst. So far as he was aware this larva had not been recorded since Curtis's "British Entomology," and there were only two continental records of larvae of this family.

Mr. C. O. WATERHOUSE remarked that he had exhibited to the Society, some few years ago, a coloured drawing of this larva, made from a specimen beaten by himself out of pine, but did not know whether it had been recorded.*

THE GENUS ECITON AND MYRMECOPHILES.—Mr. DONISTHORPE exhibited various species of ants of the genus *Eciton*, the "Wander Ants," and gave some account of their interesting habits. He remarked that a number of Myrmecophiles run with them on their wanderings, including some 30 species of *Staphylinidae*, a few bugs, etc.

Mr. G. E. BRYANT observed that he had taken four or five species of Coleoptera with these ants in Brazil.

ANTS FROM THE UNITED STATES AND FROM SWITZERLAND.—Mr. W. C. CRAWLEY exhibited a few ants collected during September 1909, in Pennsylvania and Cleveland, Ohio, including *Polyergus lucidus* and *Formica rubicunda*, two of the slave-makers, with their slaves; and some species collected with Dr. Forel in Switzerland, August 1912. Among the latter were six species and sub-species of *Leptothorax*, *Myrmica rubida*, *M. rugulosa*, and *M. schencki*, ♂♂ of *Formicoxenus nitidulus*, *Polyergus rufescens* taken during a slave-raid, *Plagiolepis pygmaea*, *Lasius myops*, *Colobopsis truncata*, 4, ♀

* The drawing was exhibited March 18th, 1908, and is recorded on p. xxii of the Proceedings for that year. Only the generic name, however, is given.—[ED.]

and ♀, *Hypoclinea 4-punctata*, *Camponotus lateralis* and *C. aethiops*. The last two species are of especial interest, as they belong to the xerothermic fauna, relics of a post-glacial period. They are southern species, and are only found in one or two sheltered spots as far north as Switzerland.

Lantern Exhibition.

The Rev. F. D. MORICE, having asked Mr. DURRANT to take the Chair in his place, made the following exhibits by means of the Epidiascope:—

1. Lantern-slides showing the pectinated antennae of the ♂ in the Sawflies *Lophyrus pini*, L., and *Monoctenus juniperi*, L., the latter new to Britain and not yet recorded. It was taken pretty freely on juniper at Nethy Bridge in June 1907, by Messrs. H. Scott and C. G. Lamb.

2. Lantern-slides showing paradoxical (secondary sexual) characters in the legs of numerous ♂ Aculeates (Bees, Wasps, and Fossors).

3. Microphotos (on printing-out paper) of the apex of the ♀ “terebra” in *Cimbex lutea*, L., and *Cimbex femorata*, L. (magnified 90 diameters).

4. Entomological Congress groups at Oxford and Tring. (Lantern-slides.)

During the course of this exhibit, Dr. CHAPMAN, at Mr. Morice's request, explained the manner in which he had seen the wings of the ♀ *Odynerus spinipes* imprisoned between the tridentate middle femora and excavated middle tibiae of the ♂.

Whilst the instrument was in use a most interesting demonstration of its powers was given by Mr. F. Bethell, a box of butterflies, several of the insects exhibited during the meeting, a photograph of one of the early Presidents, Mr. G. R. Waterhouse (which his son, Mr. C. O. Waterhouse, had brought for the Collection of portraits), illustrations of Lepidoptera and their larvae from Hübner, Freyer, etc., being thrown on the screen in turn, the colours coming out with great accuracy, and details of structure being readily appreciable.

Paper.

A paper by Mr. H. ELTRINGHAM, M.A., F.L.S., “On the Scent-apparatus of *Amauris niavius*, L.,” was read by the

Author, the black-and-white drawings by which it was illustrated being thrown on the screen.

Dr. CHAPMAN, having been asked by the Chairman whether he would comment on the paper, said :—

“ The Chairman having called on me, I can only say that I have no remarks to make on the paper except to express my admiration of the careful work that has produced such beautiful results. I have lately been examining the scent-apparatus of male *Lycaenids*, and having worked with ordinary dry material and by somewhat crude methods, I have met with no elaborate structures such as have rewarded Mr. Eltringham’s researches. I may mention that in *Curetis* I have met with a scent-apparatus previously unnoticed, that is possibly new in *Rhopalocera*, I think certainly amongst European and Asiatic *Lycaenids*, but it is easier to examine one’s specimens than to discover all the literature about them. In *Curetis* the arrangement is very similar to that in many *Sphingae* and *Noctuae*, a brush arising from the 2nd abdominal segment, and accommodated in a pocket in the following segments. It arises, however, from the dorsal plate instead of the ventral. The hair (or scale) bases in the pocket are modified (as scent-glands ?). I may give a fuller account of this later, if no one else will in the meantime elucidate it more satisfactorily in the field and in properly fresh material.”

Wednesday, April 2nd, 1913.

Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the Chair.

Election of Fellows.

MESSRS. ANDRÉ AVINOFF, Liteyny, 12, St. Petersburg; W. BOWATER, Russell Road, Moseley, Birmingham; J. S. CARTER, Warren Hill Cottage, Eastbourne; JAMES DAVIDSON, M.Sc., Imperial College of Science and Technology, South Kensington S.W.; ARTHUR H. FOSTER, M.R.C.S., L.R.C.P. (Eng.), M.B.O.U., Sussex House, Hitchin; J. A. DE GAYE, King’s College, Lagos, South Nigeria; OLIVER HAWKSHAW, 3, Hill Street, Mayfair, W., and Millard, Liphook; and ERNEST

EDWARD PLATT, 403, Essenwood Road, Durban, Natal, were elected Fellows of the Society.

A Correction.

The Rev. G. WHEELER explained that he had been mistaken in some of his observations on *Argynnis auresiana*, which he exhibited on Oct. 16th (see "Proc. Ent. Soc. Lond.," 1912, p. ci), as he had lately heard from Mr. Powell. The name *auresiana* was given by Fruhstorfer not by Oberthür, and a few specimens were already known before Mr. Powell discovered it in numbers at Lambessa as previously stated. It had also been figured by Turati.

Exhibitions.

TRANSFERS OF BUTTERFLIES.—MR. E. ERNEST GREEN exhibited cards showing the transferred wing-scales of butterflies and read the following notes :—

The larger cards show transfers executed by Mr. C. C. Gilbert, of Ceylon. The smaller cards bear transfers by the exhibitor and are designed to show how a useful representative collection may be preserved in an astonishingly small space. Mounted in this manner, a complete collection of the butterflies of Great Britain could be contained in a case measuring only $4\frac{1}{2}$ inches by $3\frac{1}{2}$ inches, by $1\frac{1}{2}$ inches deep. The transfers are firmly set, and will bear handling or transport by post without damage. They also lend themselves to close examination with a lens. The process is equally applicable to both butterflies and moths. It should be mentioned that the transfers consist of the scale pattern only. The membrane of the wing has been entirely removed. To produce the transfers, the dissected wings of the butterflies are placed between two pieces of freshly gummed paper and subjected to strong pressure until dry. If the outline of the wing is then neatly cut out with a pair of scissors, the two layers of paper can be readily separated. One of these pieces carries away the scales of one surface of the wing; the other piece bears the scales of the other surface, together with the wing membrane. The membrane is subsequently peeled off, when the scales—in their natural pattern—remain adherent to the gummed paper. These imprints are

then mounted on cards in the manner now shown. The card affords space for particulars of locality and other data. By this method, a single specimen will produce two complete transfers, one half of each transfer representing the upper and the other half the under surface of the wings of one side of the insect. It will be realised that the scales are shown only in reverse. This does not affect the pattern in any way, and—in most cases—effects little or no alteration in the colour, except in the case of iridescent butterflies, in which the colour is due to surface sculpturing of the scales. In some other butterflies the blue and green markings are apt to disappear during the process. This is found to be due to the fact that the blue (or green) colouring of such butterflies is contained in the wing-membrane itself, the coloured parts being covered by transparent colourless scales. The black and blue *Danainae* afford good examples of this phenomenon. A transfer of *Danaïs septentrionis*, for instance, results in a pattern consisting of a black ground with pure white spots; while the descaled wing shows a membrane with a colourless ground and blue spots corresponding with the white parts of the transferred pattern.

The Rev. F. D. MORICE observed that in other orders than *Lepidoptera* scaleless wings were sometimes highly coloured.

Dr. CHAPMAN (and other Fellows) pointed out that this method of scale transference had been frequently employed, and mentioned in particular an American book entirely illustrated in this way, and also the specimens prepared by Mr. R. M. Prideaux, with the bodies, legs and antennae so painted in as almost to defy detection.

A NORTHERN LOCALITY FOR TETRAMORIUM CAESPITUM.—Mr. DONISTHORPE exhibited a specimen of *Tetramorium caespitum*, L., ♂, from a colony found by Mr. Evans on the Bass Rock in Scotland, March 21, 1913. He pointed out that the most northern records known in Britain were Denbigh in Wales, and Cambridgeshire and Suffolk in England, and showed a map of the distribution in the British Isles.

ANTS FROM EGYPT.—Mr. W. C. CRAWLEY exhibited the following species, sub-species, etc., which were taken at Helonan during Dec. and Jan. last:—*Messor barbarus*, L., race *aegyptiacus*, Em., ♂, ♀, ♀; *M. barbarus*, race *striaticeps*,

And., ♀; *Tetramorium caespitum*, L., race *punicum*, Sm., ♀; *Tetramorium* sp. ♀; *Monomorium salomonis*, L., (*sens. str.*), ♀; *M. salomonis*, var. *sommieri*, Em., ♀, ♀; *M. salomonis*, var. *subopacum*, Em., ♀; *M. destructor*, Jerd., race *gracillimum*, Sm., 4, ♀; *Cardiocondyla batesi*, For., var. *nigra*, For., ♀, *Cardiocondyla* sp., ♀; *Pheidole pallidula*, Nyl., 4, ♀; *P. pallidula*, race *tristis*, For., 4, ♀; *P. teneriffana*, ♀; *Plagiolepis pygmaea*, Ltr., ♀; *Lasius nigro-emarginatus*, For., ♀; *Myrmecocystus* (*Cataglyphis*) *viatica*, F., race *bicolor*, F., ♀; *Camponotus maculatus*, F., (*sens. str.*), ♀; *C. maculatus*, race *atramentarius*, For., ♀; *C. maculatus*, race *fellah*, Em., ♀. A Lepismid was found with most species, and a small myrmecophilous cricket (? *Myrmecophila* sp.) with *M. salomonis*, var. *sommieri*. Notes were made of the habits, food, etc., of these ants.

Ninth International Congress of Zoology.

Dr. K. JORDAN gave a brief account of the Ninth International Zoological Congress which was held at Monaco from March 25th to 29th under the presidency of His Serene Highness the Prince of Monaco, and which he attended as one of the delegates of the Entomological Society of London.

The list of members and associates was well over 700, about two-thirds of which seemed to be present. Entomology was represented by a number of authors of wide repute, such as Kolbe, Horvath, Ch. Oberthür, Simon, Lord Walsingham, etc. A few Entomological papers were read, but the section suffered from scanty attendance, a fate which it shared with many other sectional meetings.

The subject which stood in the foreground at the Congress and aroused an immense interest was undoubtedly Nomenclature. The International Zoological Congress of Berlin, in 1901, had adopted the Law of strict Priority, *i. e.* priority without exception, much against the advice of the President and Secretary of the Commission on Nomenclature. Many protests against the hardships of this Law had been raised since, and there was a proposal before the Ninth Congress, brought forward by the German Zoological Society, mainly to the effect that exceptions be admissible. The proposal encountered a very strongly supported opposition. For some

time it appeared as if a split was inevitable. But after continued deliberations and long debates moderation prevailed, with the result that the Congress has given the Commission on Nomenclature power to suspend (under proper safeguards) the rules of the Code so that each individual case for which exception is claimed can be considered on its own merits.

In order to meet the wishes of Entomologists as expressed by the first and second International Congress of Entomology, as well as by the Entomological Society of London, the International Commission on Zoological Nomenclature has been enlarged from fifteen members to eighteen, four of whom are Entomologists (G. Horvath, H. J. Kolbe, H. Skinner and K. Jordan). Moreover, it has been arranged that all nomenclatorial matters relating to Entomology are submitted to the International Committee on Entomological Nomenclature (elected by the Entomological Congresses), which will consider them in co-operation with the Entomological National Committees appointed by the Entomological Societies of each country. By this means every Entomologist will be enabled to have his opinion recorded on points which affect the nomenclature of his own special branch of study.

There was a further proposal before the Commission on Nomenclature, brought forward by the First International Entomological Congress, referring to the labelling of "types." The Ninth Zoological Congress adopted the proposal in a slightly altered form, recommending that in publishing a description of a new species or sub-species only one specimen be designated and labelled as type, the other specimens examined by the author at the same time being paratypes.

The social arrangements during the Congress were on a lavish scale, and the members of the Congress had a most enjoyable time in spite of the rather inclement weather. The Tenth International Congress of Zoology will be held at Budapest in 1916, with Dr. G. Horvath as president.

Vote of Thanks.

At the suggestion of the President thanks were voted to the Society's Delegates for their work at the Congress, and to

Dr. Jordan in particular for his interesting and satisfactory account of it.

Papers.

The following papers were read :—

“ On the classification of British *Crabronidae* (*Hymenoptera*),”
by R. C. L. PERKINS, D.Sc., M.A., F.L.S.

“ Descriptions of new species of the Syrphid genus *Callicera* (*Diptera*),” by the late G. H. VERRALL, F.E.S. Edited by J. E. COLLIN, F.E.S.

“ Neue Pyrgotinen aus dem British Museum in London,”
Von FRIEDRICH HENDEL, Wien.

Wednesday, May 7th, 1913.

Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the Chair.

Election of a Fellow.

Mr. CHARLES C. BEST-GARDNER, of Rookwood, Neath, Glamorgan, was elected a Fellow of the Society.

Obituary.

The PRESIDENT announced the death of Mr. HERBERT DRUCE, F.L.S., who was elected a Fellow of the Society in 1867, and was well known for his work on the *Lepidoptera* of Messrs. Godman and Salvin's “ *Biologia Centrali-Americana* ” and other important contributions to our knowledge of Exotic *Lepidoptera*.

Library.

Donations to the Library were announced, and thanks voted to the Donors.

Letters.

The SECRETARY read a letter from Lord Walsingham, one of the delegates of the Society to the Ninth International Congress of Zoology at Monaco.

A letter was also read from the President of the Entomological Society of Ontario, extending a very cordial invitation

to the Society to send a representative to take part in the Fiftieth Annual Meeting at Guelph, Ontario, August 27-29. It was announced that the Council had decided to ask Prof. J. H. Comstock, of Cornell University, U.S.A., to act as their delegate on this occasion.

Exhibitions.

A RARE WEEVIL.—Commander J. J. WALKER exhibited a series of *Acalyptus carpini*, Fr., var. *rufispennis*, Gyll., a rare weevil which had not been met with in Britain for many years previously. These specimens were taken on and about a willow-bush at Weston-on-the-Green, Oxon, in April 1913.

AN ALBINO EXAMPLE OF TAENIOCAMPA GRACILIS.—Mr. N. CHARLES ROTHSCHILD exhibited an example of *Taeniocampa gracilis* captured in April this year at Wood Walton Fen, Hunts. The specimen in question is white all over, without any markings whatever. The exhibitor remarked that Mr. W. Holland, who had secured the example, had also captured several more of both sexes of this remarkable form, as well as some others approaching to it but not identical with it.

A NEW BRITISH ANT.—Mr. DONISTHORPE exhibited a form of *Lasius affinis*, Schenck, an ant new to Britain, of which he had found a colony at Tenby in South Wales, on the sand hills, on April 24 this year. He also exhibited specimens of *L. flavus*, *L. umbratus* and *L. mixtus* for comparison, and showed by drawings on the blackboard the difference in the scales of all these yellow ants.

SCALES OF CNETHOCAMPA PITYOCAMPA.—Mr. H. ELTRINGHAM exhibited a number of the scales composing the anal tuft of the ♀ of *Cnethocampa pityocampa*, Schiff., remarkable as being the largest scales known in any Lepidopterous insect. He also remarked on the absence of urticating spicules (such as are found in *Porthesia similis*, Fuess.) in the anal tuft of this moth. Mr. A. BACOT and Prof. POULTON took part in the discussion which ensued.

THE FEMALE FORMS OF PAPILIO POLYTES, L., IN THE HONG-KONG DISTRICT.—Prof. POULTON exhibited four males and six females of *Papilio polytes*, L., captured March 10-October 10, 1912, by Capt. R. A. Craig on Stonecutters' Island in Hongkong

Harbour about one mile from the mainland. All the females were of the male-like form *cyrus*, Hübn. (= *pammon*, L.). The collection contained many other species of *Papilio*, but the model of the chief mimetic female of *polytes*, namely *P. aristolochiae*, F., was absent. On the island of Hongkong Commander Walker had described the mimetic and the male-like form of the female *polytes* as about equal in numbers (Trans. Ent. Soc., 1895, p. 470). With regard to the model *P. aristolochiae*, the same author stated (p. 468) that individuals existed in local collections, but that he had not himself taken the species. Mr. J. C. Kershaw, F.Z.S., in his "Butterflies of Hongkong" (Hongkong and London: 1907) stated, as regards the Macao district, that *P. polytes* "is, perhaps, the commonest *Papilio* here, exceedingly numerous all through the wet season, and occurring every month, though scarce in January. The form of ♀ resembling the ♂ is the common one here, the other form of ♀ being rather scarce by comparison" (p. 110.) Of *P. aristolochiae* the author wrote (p. 107), "I have never seen this insect in the neighbourhood of Macao, and it is very scarce at Hongkong. . . . It seems to have become rarer of late years at Hongkong."

Finally, Prof. Poulton had received a letter dated May 4, 1913, from Dr. Adalbert Seitz of Darmstadt giving his experience of *P. polytes* in the Hongkong district. Dr. Seitz had collected in 1890 and from June 1891 to February 1892, in Kau-lung, a part of the mainland opposite Victoria on the island of Hongkong and about a mile distant. Dr. Seitz never saw *P. aristolochiae* nor any female of *polytes* except the male-like form *cyrus* (= *pammon*). He examined all the females captured throughout the whole year and they were all alike.* At Singapore, on the other hand, Dr. Seitz collected (chiefly in 1892) many of the mimetic females of *polytes* and none of the male-like form. In Kandy (Jan.—March, 1902), according

* Dr. Seitz had written further, on May 9, 1913:—

"I saw daily, when the weather was fine, a number of *P. pammon* [*polytes*], which is, after *P. bianor*, the commonest *Papilio* of Kau-lung and Hongkong. I remember having seen in one day over 20 specimens, and altogether I must have seen hundreds. I have collected butterflies for nearly 50 years and my eyesight is very strong, so that I can distinguish ♂s and ♀s by their flight, and of course the *pammon* [*cyrus*] ♀s from the *polytes* ♀s, for the two have no similarity at all."

to his experience, the male-like female was rare—he only took it once—while the mimetic *romulus*, F., and *polytes* females were common. Furthermore in the Nilgiri Hills (1903), where he found *P. Hector*, L., although not commonly, there was a form of the *romulus* female differing from the Ceylon *romulus* in the same manner that the Nilgiri model *hector* differs from that in Ceylon. Prof. Poulton had been informed by Dr. Jordan that the Ceylon *aristolochiae* is so variable that very large numbers of specimens would be required to establish the existence of any average difference between the species in this island and in S. India.

A FAMILY OF PAPILIO DARDANUS, BROWN, BRED FROM EGGS LAID BY A PLANEMOIDES, TRIMEN, FEMALE.—Prof. POULTON read extracts from letters received from Dr. G. D. H. Carpenter, telling of his success in obtaining, for the first time, fertile ova from a *planemoides* female of *P. dardanus*.

“ Dec. 2, 1912. *Bugalla, Sesse Archipelago.*

“ I hasten to tell you of a stroke of extraordinary luck which has fallen to me. Yesterday I was out caterpillaring (there being very few butterflies; but I took my net as I felt sure, if not, I should regret it).

“ On my way home, where the track goes through the gap in the forest belt which I have labelled locality B, I saw fluttering slowly just in front of me what I at first thought was a remarkably large *Planema*; it flew *just like a Planema* that has not been alarmed. Almost at once I realised what it was—a *Pap. dardanus* ♀ f. *planemoides*—and, to my great excitement and joy, caught it easily. It was really doing its very best to pretend it *was a Planema*; for instead of wildly fluttering in the net as Papilios do, it lay perfectly still for a minute or so like a *Planema*, and remained quiet, so that I carried it in the net straight to my breeding-box in the forest, without a single flutter, although it was in the net nearly half an hour. It was a nice fresh specimen.

“ You will hardly believe that it is the first ♀ *dardanus* I have caught myself! Save for the one *hippocoon* my boy caught (which you have received) it is also the only one I have seen on this island, and the ♂ I have only seen once or twice,

so you see it was a stroke of extraordinary good fortune, and the gods of butterfly hunters are particularly in favour at present! I provided it (or *her*) with nice green young sprays of lime (which I gather Lamborn uses as food-plant), and following his tip, put in a box of earth saturated with sugar solution. Now THEN—To-day I visited the box in the evening and found she had already laid six ova! So you may imagine how pleased I was—almost as excited as when I saw the first egg of *Pseudacraea obscura*. She will probably lay more, I expect. I know you will be awfully pleased, for (I believe) not only has *P. dardanus* never been bred from in Uganda, but no one has ever bred from the form *planemoides*. I feel I could not have had a nicer end up to my sojourn among the Sesse caterpillars, for by the time the imagines appear I shall almost have done here.

“ Tuesday, Dec. 3.

“ I visited the breeding-box this evening; there are now about 20 ova. Madam Planemoides seemed in the best of health—pulse and temperature normal and tongue clean—so there seems every reason to hope her progeny will be even more numerous!

“ Dec. 17.

“ The young larvae are thriving well; they all got through the first ecdysis without a fatality and are now undergoing the second. I *am* excited about them. I have always longed to breed this classical butterfly, but never hoped I should do it from a form not hitherto bred from. It is a splendid wind up to my breeding series.

“ Dec. 20.

“ By the way, now that the larvae have accomplished their second moult, I have been much struck by their appearance, and this does not seem to have impressed other folk in the same way—at least I have seen no reference to it in such literature as I possess. What struck me was the likeness to a *freshly extruded bird-dropping*, which, not having been dropped from a height, has kept a cylindrical shape; the anterior and posterior ends of the larva are chalky white, the middle of a curious greenish chocolate (and glistening as a fresh dropping does);

about the middle of the body this dark colour is suffused with white, which is continued downwards and forwards over the sides, thus breaking up the dark into two parts, of which the anterior section is swollen and larger than the posterior, resembling a bird-dropping of unequal diameter. Moreover, the larva sometimes adopts a position slightly bent to one side, the angle being at the white intersection of the brown areas. The filamentous processes at the anterior and posterior ends are not at all conspicuous, and I should not fancy the suggested mimetic resemblance to an *Amauris* larva is a reality: I am very struck with the bird-dropping likeness."

Prof. POULTON said that 3 *planemoides* and 7 *hippocoon* females had been bred from the eggs laid by the *Bugalla* parent, and that he hoped Dr. Carpenter would exhibit the whole family at the June meeting. He also said that Mr. W. A. Lamborn, when he had read Dr. Carpenter's description of the larvae, expressed his entire agreement with the suggestion that there is, at a certain stage, a procryptic resemblance to a bird-dropping.

PROTECTIVE RESEMBLANCE AND MIMICRY IN THE MEMBRACIDAE.—Prof. POULTON drew attention to some criticisms recently urged by Dr. Arnold Jacobi in "Mimikry und Verwandte Erscheinungen" (Braunschweig: F. Vieweg & Sohn, 1913). In this work the author had objected to the procryptic interpretation of the bark-like or thorn-like, etc., appearance of the *Membracidae*, on the ground that these insects have remarkable powers of protecting themselves by jumping. The following passage as well as that quoted somewhat later had been kindly translated for him by Mr. E. A. Elliott, F.E.S., F.Z.S. :—

"Not only is there an entire absence of all observations as to the protective value of these resemblances, often certainly very distinct from the human point of view, but the mode of life of these creatures is against it. In order to deceive effectually, protective resemblance demands that the bearer shall remain quiescent among surroundings which harmonise with its appearance, but the *Membracidae* are, for their size, mighty jumpers, and when approached, or at least when their support is shaken, they disappear after the manner of the

flea. Hence, these attempts and those of Melichar (1904) must be classed under the heading of 'Museum Mimicry' (p. 15).

Prof. POULTON contended that this was a very extraordinary criticism, and urged that it was common for more than one method of defence to be combined in the same individual. It was indeed a well-known characteristic of cryptically coloured species to be exceedingly alert when once disturbed: the cryptic *Acridiidae* were obvious examples. In order to obtain direct evidence from a keen and accurate observer in the field, he had written to Mr. W. A. Lamborn, who had carefully studied in the Lagos district the West African species of the group. Mr. Lamborn's reply, dated April 15, 1913, was as follows:—

"In answer to your letter referring to *Membracidae* I certainly think that the shapes and colours of the insects are of cryptic value, more especially when oviposition and the moult from nymph to imago are proceeding.

"I believe I am right in saying that in most cases, if not in all, the eggs are deposited on old dark cortex with which the female harmonises well. Oviposition must take hours: I remember having seen a ♀ *Leptocentrus altifrons*, Walk., on two consecutive days still adding to the same egg-mass, and the ovipositing ♀ sits tight over her eggs in an astonishing way. I have cut through stems carefully and have thus been able to examine one more conveniently without causing her to fly up, and I have found by experience that I can always pick off such females in my fingers, which it is almost impossible to do under ordinary circumstances.

"The larvae of all that I know, except *L. altifrons*, are light green and always run up from the brown stem to the softer green part directly they are hatched. The larvae of *L. altifrons* are brown, and I have never seen them on green stems. Though one frequently finds *Membracidae* in communities I am disposed to think that these are composed of one family and have all only just emerged from the nymph-case, and that when hardened up they tend to scatter. I believe that these communities are to be found in situations where concealment tends to be ensured. The grouped individuals of one species,

soon to be described by Mr. W. L. Distant, were certainly all fresh when taken, and all were on a rough brown stem. One frequently finds isolated specimens feeding on green stems, and these are so wary that if one advances a finger they soon take the alarm and spring to a tremendous distance. In the early morning they are certainly more sluggish, but I doubt if one could catch them even then with the fingers." *

Dr. Jacobi had also contended—and for similar reasons—that the resemblance of certain South American *Membracidae* to ants was without significance from the point of view of mimicry :—

“Poulton has attributed to several genera of these truly wonderful insects a mimetic significance as myrmecoids. In the genera *Heteronotus* and *Hemiconotus* the bladder-like, inflated pronotum, extending backwards almost to the apex of the wings, lends to some species a startling similarity to the body of an ant, and, seen from above, obliterates the rest of the body. Even the tubercles on the petiole of the *Myrmicidae* are reproduced. Yet this is only a case of ‘Pseudomimicry.’ Ohaus, who observed these creatures in Brazil, informs me that their behaviour bears no comparison to that of the restless activity of ants : like all Cicadas they usually sit motionless on one spot, and if disturbed, they reach safety by means of their splendid jumping powers ” (p. 106).

Here too it was quite obvious that the resemblance to an ant might be, and almost certainly was, extremely valuable even to a motionless insect which, when approached too closely, could defend itself in a manner very different from that

* I have received the following note on the Uganda *Membracidae* from Dr. G. D. H. Carpenter.—E. B. P.

“I am afraid I have hitherto paid very little attention in the field to the *Membracidae*. It has seemed to me, however, that they can jump vigorously, yet they take rather a long time to make up their mind about it. A Membracid will walk about over a finger for quite a long time, and will even allow itself to be poked before it finally leaps. Perhaps, however, it requires a suitable ‘take-off’ place from which to jump.

“A species common in Uganda has a large hook curving backwards from the shield. I have found this one in the gut of a green frog; and when dissecting the frog found it difficult to believe that it had not swallowed a thorn. It seemed almost as if the sharp hook must perforate the gut.”

Oxford, May 25, 1913.

adopted by an ant. Dr. Jacobi admitted the extraordinarily detailed resemblance to an ant wrought in the pronotal shield of the Membracids, but preferred to think that the suggestion of adaptation was entirely invalidated because under certain circumstances another and un-ant-like method of defence was resorted to. It would be interesting to know whether the author regards this extraordinary and detailed likeness to be a mere coincidence.

THE COCOONS OF THE TINEID MOTH *EPICEPHALA CHALYBACMA*, MEYRICK.—Prof. POULTON read a letter dated Feb. 13, 1913, which he had received from Mr. T. Bainbrigg Fletcher, explaining that his second assistant at Coimbatore had arrived, in June 1910, at the same conclusions concerning the production of the spheres upon the cocoons of this species as those reached by Mr. E. E. Green and published in Proc. Ent. Soc., 1912, pp. cvi-cix.

“ Many thanks for your letters of 20th and 22nd February with the copy of Green’s account of the Cocoon of *Epicephala chalybacma*. It is peculiar that he should have found the larvae descending such a height from a Rain-tree (*Pithecolobium saman*). This tree is commonly grown here but I have never seen the larvae near it, whereas the cocoons are common enough on *Caesalpinia (Poinciana) pulcherrima*.

“ On coming down here last April I was interested to find, amongst the notes accumulated in the Entomological Laboratory, an account of this little moth from observations made in June 1910 by the Second Assistant, Y. Ramachandra Rao. I transcribe his note :—

“ ‘ Eggs on buds; very small, with striae or grooves.

“ ‘ Larva bores into buds and feeds chiefly on pollen sacs and the ovary rarely. When full grown it bores its way out through a hole at the base of the bud. Full-grown larvae are beautiful light green with red cross-bands. Full-grown larvae pupate on leaflets (upper surface mostly—sometimes on lower).

“ ‘ The cocoons are remarkable, as they have on their distal [“ upper ” was written first, but crossed out and “ distal ” substituted—E. B. P.] surface a number of froth-like bubbles of a whitish colour. The bubbles are prepared at the hind end of the alimentary canal and excreted. The larva attaches

threads to them, makes a slit in the roof of the cocoon, pushes them out, and then covers up the slit. The bubbles are thus pushed out as they are excreted from the hind end of the body. Each bubble is made up of several chambers.'

"I had noted the difference in the two accounts made independently at Pusa and Coimbatore, but had not made any further observations to see which was right. It is always a drawback to have a common species to work with, as one is then inclined to put things off. Now I am glad to find that Green has made a third and again independent set of observations. But the habits vary slightly in Ceylon by the attachment of the cocoon to posts, etc. Both in Bihar and in Madras I have almost invariably found that the larva makes its cocoon on the leaves of its food-plant.

"I had seen your previous note about the parasitic-cocoon-like structures on the pupa of *Deilemera*, and it at once struck me that the cocoon of *E. chalybacma* was perhaps a parallel case, though I rather doubt whether the pupa is parasitised to any extent. Possibly the anal excretion is simply composed of waste products of metabolism thrust outside the cocoon to get rid of them. The larva itself is parasitised fairly freely."

Concerning Mr. Bainbrigge Fletcher's last suggestion Prof. POULTON said that it was to him impossible to explain the elaborate procedure of the larva as merely due to the necessity for the extrusion of waste products. The whole process was an instinct of the most complex and nicely-adjusted kind, wholly unnecessary for the mere purpose of extrusion. He thought that the hypothesis of Mr. Edward Meyrick, F.R.S., was a very probable one, namely that "the cocoon suggests the appearance of a batch of empty eggshells" ("Exotic Microlepidoptera," vol. i, 1912, p. 22). It was to be noted, however, that the suggestion of parasites might be a protection even to species that were not habitually killed in this manner, because such a method of destruction was so exceedingly common in nature. Mr. J. H. Durrant had informed him that so far the life-history of *Epicephala chalybacma* is unknown—the larvae have only been found hanging on threads—and he had suggested that they mine under the bark of twigs or the young branches

like the larvae of *Marmara*. Prof. POULTON thought that Mr. Durrant would be interested to know that the habits of larvae are very closely in accordance with his suggestions.

A HESPERID DRINKING INK AFTER FIRST MOISTENING IT.—Prof. POULTON said that the following observation—entirely new to him—had been made by his son, Dr. E. P. Poulton of Guy's Hospital, when staying at Grundl See, Salzkammergut, Austria :—

“ When at Gössl, we were writing in the open air by a lake : a skipper flew up, and tried drinking up the dried ink with his proboscis, and to make matters easier, he extruded a drop of liquid from the end of his abdomen, and produced a small smudge by moving about his proboscis. He then sucked up the ink ” (Aug. 19, 1912).

Dr. E. P. Poulton believed that the species was *Hesperia linea*, L.

WINGS OF DANAINA AND EUPLOEINE BUTTERFLIES KILLED BY BIRDS IN CEYLON.—Mr. J. C. F. FRYER exhibited a large series of the wings of Danaine and Euploeine butterflies from Ceylon, remains of these insects which had been observed by him to be eaten by birds, mainly by the so-called “ Wood-Swallow,” *Artamus fuscus*; also a few specimens of the same butterflies which had been killed by *Asilidae*, these being distinguished by the fact that the bodies were nearly or quite intact. Prof. POULTON, Mr. G. A. K. MARSHALL, and Commander J. J. WALKER, took part in the discussion which ensued.

Prof. POULTON said he was very much interested in Mr. Fryer's results, and that he was particularly glad to see such a fine body of evidence in the shape of the abandoned wings of butterflies that had been eaten. At the same time the evidence did not appear to him to be as subversive of existing hypotheses as many opponents of the theory of mimicry seemed to think. He was referring not so much to Mr. Fryer's remarks on this occasion as to the reports in the press of his paper recently read before the Zoological Society of London. Prof. Poulton had always combated the opinion of the late Erich Haase that protected species with warning colours enjoy “ absolute ” immunity from attacks. He was confident that no species in the world enjoyed absolute immunity, and those

forms with special protection and warning colours we should expect to find and did find attacked by certain special enemies able to disregard the means of defence and so gain for themselves a supply of food which was abundant, easily seen, and easily caught. We should expect to witness such attacks more readily than any others, because the prey were themselves slow flying, and locally abundant. Such facts were well known among the insects specially defended by stings, no less than in those protected by an unpleasant taste or smell. Thus bees were well known to be attacked by special birds, and a similar relationship to enemies would no doubt be found in all insects, however well defended. The same argument held with regard to procryptic colouring. It was erroneous to suppose that concealment was always efficacious; on the contrary, large numbers of insect-eating vertebrates preyed habitually on insects with procryptic colouring. Concealment was none the less an essential aid by which a species was able to keep up its average numbers because a vast number of individuals above the average were destroyed by enemies of one kind or another. The same facts held for the specially protected species with warning colours, only here we must look to the frequent attacks of a few specialised enemies as well as to a relatively enormous slaughter by parasitic insects, rather than to less frequent attacks by a very much larger number of enemies and a smaller amount of destruction by parasites, as in the procryptic species. One observation of Mr. Fryer's seemed to him particularly significant—the *Papilio agamemnon*, L., which he had seen to be attacked and mutilated by the drongo. This observation fell into line with many other records of injuries seen to be similarly caused; and the whole body of such evidence might be fairly brought forward as proof that injuries of the same kind were inflicted in the same way. If this be admitted we were at once confronted by an immense body of circumstantial evidence indirectly proving the continual persecution of butterflies by birds. Collectors had only to look out for such evidence in the specimens they would generally be inclined to reject, in order to place beyond the reach of doubt the conclusion that butterflies are constantly attacked in this manner.

Papers.

The following papers were read :—

“ On the British *Mycetophilidae*,” by F. W. Edwards, F.E.S.

“ *Culicidae* from Papua,” by Frank H. Taylor, F.E.S.,
Government Entomologist to the Australian Institute of
Tropical Medicine.

“ Pupal Coloration in *Papilio polytes*,” and “ The larval
habits of the Tineid moth *Melasina energea*, Meyr.,” by
J. C. F. Fryer, M.A., F.E.S.

Wednesday, June 4th, 1913.

Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the
chair.

Royal Patronage.

The PRESIDENT announced that HIS MAJESTY THE KING
had been graciously pleased to become Patron of the Society.

As this fact does not imply the addition of “ Royal ” to the
title of the Society, a discussion arose as to whether permission
to make this alteration should be sought, and eventually, on
the motion of Mr. H. ROWLAND-BROWN, seconded by Mr.
C. O. WATERHOUSE, it was resolved that the question should
be discussed in October.

Obituary.

The death of Lord AVEBURY, the oldest Fellow of the
Society, was announced, and also that of Mr. PHILIP DE LA
GARDE.

Election of a Fellow.

Capt. F. SITWELL, Wooler, Northumberland, was elected a
Fellow of the Society.

Exhibitions.

A SCARCE ABERRATION OF RHYNCHITES AENEOVIRENS.—
Mr. C. O. WATERHOUSE exhibited a blue variety of the female
of *Rhynchites aeneovirens* recently taken at Burnham Beeches.
Males of this blue colour are not so uncommon, but the female
is extremely rare.

TATOCHILA IMMACULATA, RÖB.—Dr. F. A. DIXEY exhibited
a male and female specimen of *Tatochila immaculata*, Röber,

with a pair of *T. stigmadice*, Stdgr., for comparison. He said: "The first-named specimens were presented to the Hope Collection by Mr. C. M. Dammers, having been captured by him in Tucuman, N.W. Argentina, in March 1912. They show points of resemblance to *T. stigmadice*, Stdgr., and *T. xanthodice*, Luc., but are clearly distinct from either. I at first thought that they represented a new species, but on further examination it appeared that they might be referred to a form described by Röber in Seitz's 'Macrolepidoptera of the World' as *T. immaculata*, though in one small respect the male does not exactly tally with Röber's description. He says that the dusky stripe in the cell on the under-side of the hind-wing is indistinctly forked at the distal end. In the present male specimen it is not forked at all.

"The genus *Tatochila* to which these species belong, is entirely confined to South America. It is undoubtedly a natural assemblage, though its generic rank may possibly be open to question. Its nearest affinities appear to be with the *Metaporias* of Central Asia, and it has also points of contact with *Synchloe*. The scent-scales of those members of the genus which possess them are unusually large and quite distinctive. It is interesting to note that I find no scent-scales in *T. immaculata*, nor *T. demodice*, Blanch., though *T. stigmadice*, which seems to be much nearer to *immaculata* than *demodice* is, possesses them in good numbers.

"The present, though not a new species, appears not to be well known. We may confidently hope that Mr. Dammers will do much to increase our knowledge of the fauna of the interesting district of the Neotropical Region to which he is devoting his attention."

ANTS AND THEIR GUESTS.—Mr. DONISTHORPE exhibited a fine series of *Claviger longicornis*, Mull (including live specimens), with its proper host *Lasius umbratus mixtus*, with which he had taken it at Box Hill on May 16 and 23. He also exhibited the common *Claviger testaceus* (to show how very distinct *C. longicornis* is) with its principal host *L. flavus*; and specimens of the Acari *Trachyropoda bostocki*, *Sphaerolaelaps holothoroides* and *Antennophorus uhlmani* taken at the same time.

He gave an account of the history of *C. longicornis* both

on the Continent and as a British insect. He pointed out that here as elsewhere in the world the normal host was *Lasius umbratus* (and *mixtus*). He mentioned that he had visited the locality in Oxfordshire both with Commander Walker and Mr. Collins where these Coleopterists had taken the beetle very sparingly with *Lasius niger*. On these occasions the beetle was not found, but he had discovered a small colony of *L. mixtus* there, showing that the normal host did occur in that locality.

BRITISH ANERGATES ATRATULUS, SCH.—MR. W. C. CRAWLEY exhibited ♂, virgin ♀, fully developed fecund queen, and a partly-developed queen of *Anergates atratulus*, Sch., taken for the first time in Britain, July 1912, in the New Forest. The original queen of the colony lived in captivity for nine months, and died owing to rough handling while moving the ants to a fresh nest. The queen, unable to walk owing to the enormous dilatation of the gaster, is pulled from place to place in the nest by means of the claws on the fore-legs of the *Tetramorium caespitum* ♀♀. The partly developed queen was fertilised in the nest, and accepted by a large colony of *T. caespitum*, and she was assiduously tended by the ♀♀ for nine months, when she died owing to an accident when changing the nest. Immediately after her adoption, the *Tetramorium* ♀♀ killed their own ♀♀ and ♂♂, thus showing how the *Anergates* is accepted and the host queens eliminated. Previous experiments by myrmecologists on the Continent had only shown that the *Anergates* may be received into the nests of *Tetramorium*, but none had ever lived more than a few days or had been treated by the *Tetramorium* ♀♀ as their queen. The solution of this problem may possibly throw some light on the question of the elimination of the host queen in the case of other parasitic ants.

A SINGLE BATCH OF CELASTRINA ARGIOLUS EMERGING IN AUTUMN AND SPRING.—THE PRESIDENT showed thirty-three specimens of *Celastrina argiolus* bred from one batch of eggs, sixteen of which emerged last autumn and seventeen in May of this year. They had all been bred by the Rev. C. R. N. Burrows on Portugal laurel. The autumn emergence (which had been shown to the Society previously) were unusually

bright in colour and large in size, the black borders of the females being very broad. Those that emerged the following spring were of the ordinary spring form, decidedly smaller in size, whilst the borders of the females were quite normal and the colour nothing unusual. He pointed out the fact that the two emergences came from one set of larvae reared to the pupa stage by Mr. Burrows; those that stayed over through the winter had no doubt used up to some extent their own tissue in their survival, hence the fact of their smaller size and quite spring-like form. From the biological point of view the exhibit was of much interest, not only in that the same set of larvae produced the two forms, but also in the matter of sexes, the autumn emergence resulting in ten females to six males, whilst the spring emergence produced ten males and seven females.

INSECTS AND ASCLEPIADACEAE.—DR. K. JORDAN showed a Swallow-tail (*Papilio thoas thoantiades*), a Hawk-moth (*Protoparce diffissa diffissa*) and a Honey-bee (*Apis mellifica*), which were found dead at Buenos Ayres on *Araujia albens*, being caught by their proboscis in the flowers of that plant. This sweet-smelling climber, a native of Southern Brazil and the Argentine, but also cultivated as an ornamental shrub in other countries, is well known as an insect-catcher, moths being particularly often found entrapped. The exhibitor explained the peculiar mechanism characteristic of the flowers of all *Asclepiadaceae*, and which ensures cross-fertilisation by means of insects.

STRIDULATING PUPA.—DR. K. JORDAN also exhibited, on behalf of Prof. SEITZ, the cocoon and chrysalis of a Noctuid from China. The pupa bears dorsally at the base of the last segment a patch of sharp longitudinal ridges, and there are corresponding ridges on the inside of the cocoon. This stridulating apparatus enables the pupa to produce a loud chirping continued sound, which Dr. Seitz at first mistook for that of an Orthopteron. Leaning on his arm against a tree, Dr. Seitz felt vibration under his hand, and found that the sound proceeded from a cocoon on which he had accidentally placed his hand. He collected several such cocoons and bred from them the Noctuid *Gadhirta inexacta*, Walk.

A USEFUL APPARATUS.—Dr. G. B. LONGSTAFF exhibited a simple apparatus which he had designed, with the assistance of Mr. H. Eltringham, to turn over several butterflies at once, so as to display alternately the upper- and under-sides. It was manufactured by W. Watson & Son, 313 High Holborn.

BEE AND PARASITE.—Dr. LONGSTAFF also exhibited a small bee (*Andrena*, sp.) with a coleopterous larva, apparently a Meloid, partly on, partly in its abdomen. Captured near Seville, Spain, April 15, 1913.

A PALE TAENIOCAMPA GRACILIS.—Mr. J. C. F. FRYER exhibited a light specimen of *Taeniocampa gracilis* for comparison with that exhibited at the last meeting by the Hon. N. C. Rothschild.

THALPOCHARES OSTRINA FROM PAIGNTON.—Comm. J. J. WALKER exhibited, on behalf of Dr. R. C. L. PERKINS, a specimen of *Thalpochares ostrina*, Hübn., var. *carthami*, H.S., apparently freshly emerged from pupa. This was taken by Dr. Perkins at Paignton on June 1, 1913.

THE RESEMBLANCE BETWEEN THE UNDER SURFACE OF MANY SPECIES OF MELITAEA AND THAT OF CERTAIN PALAEARCTIC HESPERIDAE.—Prof. POULTON said that he had called attention to the striking resemblance between the parts of the under-side exposed during rest of many species of *Melitaea* and certain *Hesperidae*—especially the large species *H. antonia*, Spey., *H. sidae*, Esp., and to a less extent *H. carthami*, Hübn. (Proc. Zool. Soc., 1911, pp. 866-7). This resemblance had very much struck him in looking through a collection of butterflies made about 1906 in the Tian-Chan Mountains in Central Asia, and belonging to the late Mr. Henley Grose-Smith. Prof. Poulton had no means of ascertaining whether the captures were effected in Russian or Chinese Turkestan. The details of the resemblance are described in the paper referred to. In order to test the hypothesis of a mimetic association, he had in 1909, with the help of Commander Walker, sent many living specimens of the English *Melitaea aurinia*, Rott., to Mr. R. I. Pocock, F.R.S. His experiments in the Zoological Gardens, as recorded in P.Z.S., 1911, pp. 825-7, left little doubt, when they were looked at as a whole, that *Melitaea* does actually possess qualities that would render it

an advantageous model. Since that date he had lost no opportunity of inquiring of those who know the *Melitaeas* and these *Hesperidae* during life to give him an account of their experiences, and he now brought forward the following evidence. A very interesting account had been given to him by M. Avinoff, whose beautiful exhibit of Central Asiatic butterflies, earlier in the present year, would be remembered by the Fellows. The following letter from M. Avinoff was written in April 1913 :—

“*Pyrgus antonia maxima* I have caught myself in the Eastern Transalai Mountains, Bordoba, under the Kisil Art Pass, 11,000 ft. It was not very numerous there and was flying with *Melitaea minerva* and *M. didyma*, which were much more abundant. Both the *Melitaea* and the *Pyrgus* have the habit of resting for the night on tall plants, such as *Artemisia* or *Carduus*. I saw them myself sitting side by side, and can affirm that the pattern of the wings is very much alike.

“Exactly the same relationship is repeated in Tian-Chan. At any rate I have received, from Sary Djas, Central Tian Chan, *P. sidae* intermixed with *M. asteroidea*, although my collector in the locality sent me no special observations on the biology of the case.

“In the South of Russia *P. sidae* is often found with *M. didyma*, but there the resemblance is not so well marked as in Tian-Chan.”

In illustration of his observations M. Avinoff had sent the following specimens which were exhibited to the Society : From the Transalai Mountains in Russian Central Asia *Melitaea minerva*, Staud., *M. didyma*, Ochs., and *H. antonia*; from the Tian Chan Mountains (from the Russian slopes close to the frontier between Russian and Chinese Turkestan), *M. minerva*, *M. asteroidea*, Staud., and *H. sidae*. Together with these Prof. Poulton exhibited a series of specimens which had been partly purchased from Mr. Grose-Smith and in part kindly given to him by Mr. J. J. Joicey, F.E.S. These included six examples of *M. minerva*, three of *M. didyma*, two being of the var. *ala*, Staud., one *M. arduinna*, Esp., one *M. asteroidea*, f. *solona*, Alph., six *H. antonia*. Accompanying these was a single example of *Brenthis hegemone*, Staud., showing

an under-side appearance probably mimetic of the Melitaeas. This last exhibit, taken in conjunction with *M. Avinoff's*, proves that both of these mimetic *Hesperidae* occur with the numerous Melitaeas in the Tian-Chan Mountains. It appeared, so far as it was possible to infer any conclusion from so small a collection, that *M. minerva* was the dominant species of the group, and that the next in importance was *M. didyma*. Nearly the whole of the exhibited specimens were pinned so as to show the under-side pattern on which alone the mimetic resemblance is to be seen.

Prof. POULTON had written to Mr. Harold Powell, F.E.S., a naturalist who had gained much experience of these species in the field.

Mr. Powell had kindly replied, Oct. 22, 1912, from Lambessa, Constantine, Algeria :—

“ The under-side of *H. sidae* is certainly suggestive of *Melitaea*. I noticed the resemblance a long time ago, but I did not pay any special attention to it.

“ When the sun is out *sidae* rests with its wings open, and in that position it does not look much like a *Melitaea*, at any rate when seen from above as we usually see it when at rest. Seen from below it is quite possible it might be mistaken for a *Melitaea* by some enemy.

“ I do not remember having seen *sidae* resting at night or in cloudy weather. It no doubt has its wings closed then, with the fore-wings dropped between the hind-wings and the antennae nearly at right angles to the body and slightly drooped, as in the case of the different *Hesperia* species I have seen resting at night. They generally settle in a prominent position such as the top of a stalk, blade of grass or end of a branch, for night rest. The following *Melitaea* species occur in the locality where *sidae* is found, in the Plan du Pont Valley at Hyères :—*M. cinxia*, *M. didyma*, *M. phoebe*, *M. athalia*. A large form of *M. cinxia* is fairly common in April. It is going over by the time *H. sidae* appears, but is still on the wing. *M. didyma* flies at the same time as *H. sidae*, but is not abundant. *M. phoebe* is scarce. *M. athalia* is sometimes very common, but it flies late in May when *H. sidae* is nearly over. It is particularly abundant on a hill-side about

a kilometre away from *sidæ*'s special locality, but it is also common enough where *sidæ* flies."

THE HABITS OF TWO ALGERIAN DIPTERA—AN ASILID AND AN ONCODID.—Prof. POULTON exhibited a female of the Asilid fly *Heligmoneura brunripes*, F. (*Asilus castanipes*, Meigen), together with the Oncodid (Cyrtid) fly *Physegaster maculatus*, Macq., both from Batna, Algeria—the Asilid dated July 2, 1909. Neither of these was present in the British Museum collection, but Mr. E. E. Austen had kindly named them from H. Lucas' "Expl. Sci. de l'Alger.," 1849. The Oncodid Mr. Austen considered to be the same species as that represented in fig. 6, plate iii of vol. iii (p. 445), the Asilid that represented in fig. 8, plate ii of the same volume (p. 440). The two specimens had been sent by Dr. Adalbert Seitz with the following interesting notes upon their habits:—

"There is to be found upon the wing from the end of May until August a horrible fly, a great danger to all day-flying insects. I found the largest butterflies killed by it, for instance: *Papilio podalirius*, *P. machaon*, *Argynnis pandora*, *Colias edusa* and *P. daphidice*. *Anthocharis eupheno* I found only once, for this species is over before the Asilid is common. I observed a common Noctuid moth, *Thalpocharis albida*, which rests on the thistles, but never flies by day, and this is exceptional, for all *Thalpocharis* are day-fliers. Once I disturbed two *T. albida* on the ground, so that they had to fly, and immediately they were caught by the Asilids. I also found plenty of *Anisoplia*, *Cicadidae*, etc., etc., caught by the Asilid, and sometimes I found the females devouring their own males.* But I did not observe the capture of a single Zygaenid moth, although they fly in numbers amongst the voracious Asilids. Nor did I observe the capture of a Myla-brid beetle. Together with the Asilid I send another fly, an Oncodid, upon which it preys. This fact astonished me; for the Oncodid hovers like a Syrphid in the holes made in the ground by spiders. The short wings enable it to hover even in narrow holes, and it hums so loudly as to attract

* Dr. Seitz once found a female *in copulâ* with one male and devouring another, all three insects being of the same species, viz. *H. brunripes*. A pen-and-ink sketch of the three accompanied the exhibit.

attention. The sound is very curious, and I have rarely detected the fly by any other means. When one attempts to catch it the fly retreats more deeply into the hole, so I find it difficult to understand how the Asilid can seize it.

“ Seeing your collection of *Asilidae* and their prey I formed the intention of obtaining a set of insects captured by this Asilid, and I hope on my return to Algeria in June to be able to send you a good series of them.”

Prof. POULTON said that the latter observation doubtless bore upon the fact that the larvae of *Oncodidae* are parasitic upon spiders. It was interesting to learn that this Algerian Asilid drew the line at the *Zygaenidae* and a Mylabrid; for certain other species are known to attack the most specially protected insects. It was clear that each species must be studied separately and that a very large body of evidence was required.

A LOCUSTID AND A REDUVIID MIMIC OF A FOSSORIAL ACULEATE IN THE S. PAULO DISTRICT OF BRAZIL.—Prof. POULTON exhibited on behalf of Dr. ADALBERT SEITZ, F.E.S., the Fossorial model *Pepsis sapphirus*, Pal. de Beauv., and two of its mimics—the Reduviid bug *Spiniger ater*, Lep. and Serv., and the Locustid (Phasgoneurid) *Scaphura nigra*, Thunb., var. *vigorsii*, Kirb. All three had been captured, together with a third mimic, a Syntomid moth of the genus *Macrocneme*, by Dr. Seitz, along not more than 200 paces of a sunny road through the high forest between Santos and the little village of São Vicente, about the year 1888, although Dr. Seitz believed that he had seen all three insects upon the wing in every month in the year. He had written, May 4, 1913, with additional details in a later letter: “ At this spot the Fossor, a species of *Pepsis*, is very common. It appears on the wing about 10 a.m., and flies slowly up and down the road. At this time of day large spiders may often be seen crossing the road, and, in a moment, they will be captured by the Fossorial wasps. The Fossor is a very powerful insect, stinging very badly, and it is the model of several different insects. Among the mimics are Syntomid moths of the genus *Macrocneme*. The Fossor, when on the wing, carries its legs hanging down like our *Psammophila*; and I observed that the *Macrocneme*

does the same, in mimicry, I believe, of the Aculeate model.

“ The *Pepsis* is also mimicked by a Reduviid bug and a Locustid of which I send specimens. The likeness is not at all striking when the insects are at rest, but both of them have the very curious habit of flying and running alternately and of running short distances with expanded wings.* The *Scaphura* when active directs its antennae forward, but these organs sweep backward in the resting position, in which the insect appears to be non-mimetic. I was somewhat surprised to see that the *Pepsis* does not attack its mimics. Many of the American Fossorial wasps hunt the Orthoptera, but not this kind.”

Prof. POULTON said that in view of Dr. Seitz's last sentence, it was interesting to find that H. W. Bates, in his epoch-making memoir (Trans. Linn. Soc., xxiii, 1862, p. 509) had spoken of these very *Locustidae* as the prey of their models:—

“ Amongst the living objects mimicked by insects are the predaceous species from which it is the interest of the mimickers to be concealed. Thus, the species of *Scaphura* (a genus of Crickets) in South America resemble in a wonderful manner different Sand Wasps of large size, which are constantly on the search for Crickets to provision their nests with. Another pretty Cricket, which I observed, was a good imitation of a Tiger Beetle, and was always found on trees frequented by the Beetles (*Odontocheilae*). There are endless instances of predaceous insects being disguised by having similar shapes and colours to those of their prey; many Spiders are thus endowed: but some hunting Spiders mimic flower-buds, and station themselves motionless in the axils of leaves and other parts of plants to wait for their victims.”

Prof. POULTON questioned the interpretation of mimetic resemblance given by Bates in the paragraph quoted above, although he did not doubt the anticryptic significance of the flower-haunting spiders. He had argued, in Trans. Ent. Soc., 1904, pp. 661-5, that the mimicry of their Hymenopterous prey by certain Asilid flies, and of *Bombus* by the Volucellas which lay eggs in their nests, is not to be explained in the

* This description was illustrated by a sketch of the two mimics, made from memory by Dr. Seitz, and fixed beside the specimens.

manner suggested by Bates or still earlier by Kirby and Spence, and followed in 1890 by the speaker himself ("Colours of Animals," p. 267). All such examples were better interpreted as a protection from enemies that feared the stinging Hymenoptera. The particular models were peculiarly advantageous because of the special association between them and their mimics. If the *Scaphuras* mimicked their Fossorial foes the resemblance was probably to be explained in the same way, and not as a means of escaping the attacks of their models. In the meantime Dr. Seitz's observations showed that these *Locustidae* may mimic Fossors which attack other prey.

The resemblance of the thickened basal segments of the Locustid's antennae to the entire organ of the model was found throughout the genus *Scaphura*, which was probably mimetic in all its species. The sudden thinning away to the diameter of the usual hair-like Locustid antenna as well as the appearance of a yellow "tip" at the end of the thick basal section—about one-third of the whole organ in length—was very striking. There was also a peculiar quality about the annulation of the basal part which strongly suggested the antennae of the Fossor. The example afforded a most instructive comparison with the mimetic likeness of certain Longicorn beetles to weevils and Phytophaga, as described by Mr. C. J. Gahan. In these cases, which he had quoted in Linn. Soc. Journ. Zool., xxvi, 1898, p. 596, the terminal part of the too-long antennae of the mimic was concealed by a hair-like fineness, while a false "tip" was indicated by a special dilatation (in *Doliops*) or by hairs (in *Estigmenida*).

The antennae of the *Pepsis* sent by Dr. Seitz were entirely yellow and not black with yellow tips like those suggested by both Reduviid and Locustid mimics. The fine series of *Pepsis sapphirus* in the British Museum, kindly shown to him by Mr. G. Meade-Waldo, included specimens from localities widely distributed over the whole Neotropical Region, and in these the antennae were very variable in colour, being more often black than yellow. Concerning the varieties in the Santos district Dr. Seitz had written: "This Fossor, so far as I remember, *always* has yellow tips to its antennae at

Santos. We have, however, in this locality different species of these Aculeates : I remember seeing a *Pepsis* with the apex of fore-wing *white*, and so on."

The specimens of the Reduviid and of the Locustid in the British Museum were labelled Brazil. As Dr. Seitz had been unable to send a specimen of the moth, Prof. Poulton had included *Macrocneme lades leucostigma* from Castro, Parana (2,900 ft.), March 16, 1910, kindly given to him for the purpose by Mr. W. J. Kaye.

Prof. POULTON also drew attention to the blue-black iridescence still distinct on the abdomen of the Locustid, and probably far more brilliant in the living insect.

SYNEPIGONIC SERIES OF *PAPILIO DARDANUS*, FROM PARENT FORM *PLANEMOIDES*.—Dr. G. D. H. CARPENTER gave the following account of a brood of *Papilio dardanus* raised by him from eggs laid by a ♀ of the *planemoides* form :—

"The parent *planemoides* was taken on a track through the forest belt (a comparatively open space) on Bugalla Island, Sesse, L. Victoria, on Dec. 1, 1912, and at once put into a breeding-box in the forest, with sprigs of lime. She laid 26 ova on the 1st or 2nd, and though left till Dec. 8, yielded no more. The ova all hatched Dec. 8-9. The dates for the successive ecdyses are those of the first larvae in each case.

"I, Dec. 13; II, Dec. 17; III, Dec. 22; IV, Dec. 28.

"When I counted them after the beginning of the third ecdysis *twenty-five* larvae were all I could see—one had apparently escaped or got lost in changing food-plants. When the majority of the larvae were nearly full grown, for some reason *three* individuals lagged behind—and of these two died—the other grew very very slowly and finally died on Feb. 9. There are therefore *twenty-two* imagines : 7 *hippocoon*, 3 *planemoides*, the rest males.

"As regards the act of pupation. I watched this through in several instances, for I had been much puzzled by the account given by Trimen. He mentions that the antennae, as well as the cephalic tubercles, are both used to 'push the loose skin between the suspensory threads.' It seemed to me very extraordinary that the newly-formed organs (which in all instances I had previously seen were mere flaccid tubes

full of fluid) should be endowed with power of movement, so I watched for this very carefully. *I saw no signs of it in any case.* The skin is withdrawn from the head and thorax in the invariable manner, and the appendages are simply drawn into their symmetrical position by the passage of the larval skin towards the abdomen—being as helpless and flaccid as usual.

“ As regards the cephalic tubercles, in all my pupae they were *far* too short to extend to the level of the silken thread (which before pupation girdles the body between the 2nd and 3rd abd. segments, but as soon as the larval skin has been withdrawn beyond it is shifted forwards by adroit movements so as to lie between thorax and abdomen of the pupa); the only movement which they underwent was rotation through half a circle being at first flexed on the ventral aspect of the head, and later on assuming a position in a line with the long axis of the body. As was the case with the much longer processes of the pupae of *Pseudacraea eurytus*, previously described, the straightening out of these processes seems to be caused by the pumping into them of fluid.

“ The pupae begin to show colour 24 hours before emergence of the imago. In the *case of the male*, a peripheral black rim surrounds the wing, and the pale apical dot soon becomes marked out.

“ In the case of the *planemoides* ♀ the first part to become dark is the future orange band on the fore-wing; this at first shows black, then becomes gradually orange, while the rest of the wing area becomes black.

“ The darkening in the case of *hippocoon* ♀ is very interesting. At the very commencement, when the dark areas are only just beginning to define themselves, the condition is very similar to that of the male. There is a dark peripheral border to the costal and hind margins, but along the course of the latter is a single large indentation. This marks the site of the future large subapical white patch. By degrees the black seems to invade the rest of the white area, cutting off the apical from the basal white areas, as indicated by the dotted lines in the diagram. I wonder if this ontogeny recapitulates, as it were, the phylogeny, showing how *hippocoon*

came to be differentiated from the male? It is a very easy process to understand.

“ I apologise for the poor condition of the males, they *will* flutter about and break their tails even before their wings are dry, and I had great difficulty in killing them without letting them escape. Indeed several I put into a large box as soon as they came out of the pupa, kept them in the dark until night, and then executed them. It was a good thing there was no one about to hear how I abused them as they broke their tails in the killing bottle!

“ As regards the *larvae*, the subjoined are rather rough notes on their appearance. Before the first moult they are blackish, a little white showing posteriorly. *After first moult* they are chocolate with the greater part of the anterior and posterior two segments white; *after second moult* some white appears in the middle of the body as a dorsal suffusion over the chocolate, running downwards and forwards dividing the chocolate area into two, the anterior part of which is somewhat more swollen than the posterior. The lowest part of the body at level of bases of legs is white all along. During this stage I was very much struck with the likeness to a large bird dropping—one which has been extruded while the bird sat on a twig, and has not fallen from a height so as to obliterate its cylindrical shape. The curious glistening line of the chocolate areas which sometimes makes them look greyish, the more swollen anterior part of body, the attitude of the larva (it often rests with this anterior part slightly deviated to one or other side), and the great sluggishness of the larva, all contribute very materially to the resemblance, which struck me very forcibly.

“ *After the third ecdysis* the larva becomes too big to gain by resemblance to a bird dropping, and the white at the anterior extremity becomes invaded dorsally by the chocolate, which becomes gradually lighter in hue, eventually turning greenish. *After the fourth ecdysis* the head changes from black to green; the filaments from segments I and II become very short and stunted—the dorsal white on the anterior two segments is wholly replaced by green, and the chocolate hue elsewhere has now become leaf green, with two or four (it

varies in different larvae) dorsal blue dots on each segment. The suffusion of white in the middle of the body in some cases disappears altogether, so that some larvae are pure leaf green, with dorsal blue dots.

“ I give below the dates of pupation, and emergence of the imago.

<i>Number on paper of Imago.</i>	<i>Pupation.</i>	<i>Date of emergence.</i>
1	Jan. 7	♂ Jan. 23 before sunrise
2	„	♂ Jan. 23 „
3	Jan. 8	♂ Jan. 24 „
4	„	♂ Jan. 24 „
5	„	♀ (<i>hipp.</i>) Jan. 23 „
6	„	♀ (<i>hipp.</i>) Jan. 24, 9 a.m.
7	„	♂ Jan. 24 at dawn
8	„	♀ (<i>plan.</i>) Jan. 23 before dawn
9	„	♂ Jan. 25 „
10	Jan. 9	♀ (<i>hipp.</i>) Jan. 25 „
11	„	♂ Jan. 25 „
12	„	♂ Jan. 25 „
13	„	♂ Jan. 24 at dawn
14	„	♀ (<i>plan.</i>) Jan. 24 before dawn
15	„	♀ (<i>hipp.</i>) Jan. 25 „
16	„	♂ Jan. 25 „
17	„	♀ (<i>plan.</i>) Jan. 25 „
18	„	♀ (<i>hipp.</i>) Jan. 25, 3 p.m.
19	„	♀ (<i>hipp.</i>) Jan. 25 before dawn
20	Jan. 10	♂ Jan. 27 at dawn
21	„	♂ Jan. 27 „
22	Jan. 12	♀ (<i>hipp.</i>) Jan. 28 before dawn.

“ Pupation usually occurred between 6–10 a.m., and the imago emerged in great majority of cases before or at day-break.”

Papers.

The following papers were read:—

“ On the relationship between certain West African Insects, especially Ants, Lepidoptera and Homoptera,” by W. A. LAMBORN, M.R.C.S., L.R.C.P., F.E.S., Entomologist to the

Agricultural Department of Southern Nigeria. With an Appendix containing descriptions of New Species by G. T. BETHUNE-BAKER, Pres. Ent. Soc.; W. L. DISTANT, J. HARTLEY DURRANT, and Prof. R. NEWSTEAD, F.R.S.

“Supplementary notes on new or little-known forms of *Acraea*,” by H. ELTRINGHAM, M.A., F.Z.S. With description of a new form of *Acraea encedon* by Prof. E. B. POULTON, D.Sc., F.R.S.

Prof. POULTON, in giving an account of Mr. W. A. Lamborn's paper, stated that it contained careful observations on the association between three species of Liptenine *Lycaenidae* and particular species of ants, and recorded facts from which such an association could be inferred in three other species. The same association was described, often in great detail, between seventeen species of *Lycaeninae* and their respective ants. Eight species of *Lycaenesthes* (*s. l.*) were included among these. The paper also contained an account of the habits of several carnivorous Lepidopterous larvae, including some of the *Lycaenidae* which fed upon ant-tended Homoptera.

Careful observations upon the life-history of the *Membracidae* and their association with ants were also put on record. An important appendix, in which the new species and genera are described, was contributed by Mr. G. T. BETHUNE-BAKER, Pres. Ent. Soc., Mr. W. L. DISTANT, Mr. J. HARTLEY DURRANT, and Prof. R. NEWSTEAD, F.R.S.

Wednesday, October 1st, 1913.

Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the Chair.

Election of a Fellow.

Herr WILHELM JUNK, 68, Sachsische-strasse, Berlin, W. 15. was elected a Fellow of the Society.

Exhibitions.

HAPLOTHORAX BURCHELLII.—Mr. H. F. BARTLETT exhibited a specimen of the Carabid beetle *Haplothorax burchellii* found under a stone on the lower part of Flagstaff Hill, St. Helena, on March 25, 1913. A party of three were looking for this insect on Deadwood Plain and Flagstaff Hill, given by Wollaston as its habitat, but though a large number of remains were found, the ♂ exhibited was the only one seen alive in a hunt of about an hour.

Prof. POULTON observed that the type specimen in the Hope Department was also in good condition—though W. J. Burchell's St. Helena collection from which it had come had perished—since Mr. Hope had (fortunately) forgotten to send it back.

LARVAL AND IMAGINAL EMBIIDAE FROM TUNISIA AND ALGERIA.—Mr. P. A. BUXTON exhibited specimens (sp. as yet undetermined) from various localities in Tunis and Algeria and from the coast to south of the Atlas Mountains. They were never common, and always found as larvae in small communities (rarely singly, and once a score together) under stones and fallen leaves of prickly pear—never under bark; all the individuals of a community faced in the same direction and retreated or advanced down their tubes with equal ease backwards or forwards. The exhibited larvae (two) came from Hammam Meskoutine, Constantine, E. Algeria (30 March, 1913). Their food was doubtful. The insects (originally six) had lived in the same tube from March to September. No cast skins were found nor dead individuals, which must therefore have been eaten. They refused to touch a fly, alive or dead, also a blade of grass. They made a large chamber in a piece of cork in their tube, with three small entrances to it, but the nutritive value of cork cannot be high. The insects spun silken tubes in all directions in their home, commencing by a straight tube three inches long, which was spun by six Embiids in ten hours. In nature the tubes branch dichotomously, and are flattened in cross section. The chamber in the cork was not silk lined. The insects were very shy and skototropic, and very sensitive to vibration. They were

taken to Norway, and probably fed unsuitably, and developed slowly in a perfectly dry tube.

The adult male exhibited was bred by Mr. C. B. Williams from a larva brought by the exhibitor from El Kantara (just S. of the Atlas range). This was kept reeking wet between two pieces of bark in a beaker, and had developed much more quickly. The food was again doubtful; it had had Psocids and mildew as well as bark in its beaker. It had been kept warm in a greenhouse.

HEMIPTERA-HETEROPTERA STILL PRESERVING CHARACTERISTIC SMELL AFTER A LAPSE OF EIGHTY-FIVE YEARS.—Mr. BUXTON also brought a drawer of mixed *Heteroptera* (Pentatomids, etc.) given to a relation of his who died in 1830. The drawer still smelt strongly of bugs, quite differently from any other drawer in the same collection.

REMARKABLE COLEOPTEROUS PALPI.—Mr. E. E. GREEN exhibited a Drilid (?) beetle, from Ambalangoda, Ceylon, with remarkable elongate spatulate mandibular and maxillary palpi.

BRACONID SILK.—Mr. W. J. LUCAS exhibited, on behalf of Mr. G. T. Lyle, some silk wound from a Braconid cocoon, together with specimens of the cocoons themselves. Mr. Lyle had written as follows:—

“Many species of *Braconidae*, or rather their larvae, are known to form silken cocoons in which a period of from eight days to eleven months is passed, according to the species and season. One of the largest of these to be found in Britain is *Meteorus albiditarsis*, Curtis, which is parasitic upon the larvae of various species of Noctuids, and whose cocoon is generally, if not always, formed underground, within that of its host.

“A certain resemblance which this cocoon possesses in shape, texture and colour to that of the silkworm of commerce, *Bombyx mori*, led me to believe that its silk might be wound off in a similar manner. This I found to be quite easy, and by employing the same methods as I did when a small boy with the silkworm cocoons, I obtained the skein of silk which is exhibited to-night. The silk would appear to be somewhat finer than that of the silkworm, but even if superior in quality,

the smallness of the yield and difficulties in breeding the maker render it more than unlikely that it will ever become of commercial importance."

CONIOPTERYGID COCOONS.—MR. C. B. WILLIAMS exhibited specimens of the cocoons of the three British *Coniopterygidae*: *Coniopteryx tineiformis* on a pine needle, *Semidalis aleurodi-formis* in a small depression in a hawthorn twig, and *Conwentzia psociformis* on the under-side of holly leaves. The cocoon of the latter species is a double structure having an outer layer some distance above the small inside case which contains the pupa.

In answer to a question by Mr. E. E. GREEN, Mr. Williams replied that the larvae had eaten ova, particularly those of spiders, and also mites, and small scale insects.

MIMICRY IN RELATION TO GEOGRAPHICAL DISTRIBUTION.—DR. F. A. DIXEY exhibited several boxes of Lepidoptera in illustration of the geographical relations of Mimicry, and remarked on them as follows:—

The theory of Mimicry, like many other theories, is by no means so simple as it looks at first sight. I propose to restrict my remarks on this occasion to one aspect only of the question, viz. its relation to the facts of geographical distribution.

It is well known to all entomologists that along with the striking resemblances between insects of different affinities which are considered to come under the head of Mimicry, there exists to a large extent a community of habitat.

Take, for instance, the group of red, black and white Neotropical butterflies, allied to our English Swallowtail, of which *Papilio nephalion*, Godt., is a good example. This particular colour-scheme has representatives in each of the three sections into which the genus naturally falls; and the same scheme is adopted by a number of butterflies, such as *Euterpe rosacea*, Butl., which have nothing to do with the Swallowtails, but are nearly allied to our common garden whites. This particular combination of colours is unknown except in Central and South America.

So also the peculiar facies of the genus *Mylothris*, with the parallel series of forms presented by the very distinct genus *Phrissura*, belongs exclusively to the African Islands and Continent south of the Sahara.

In both of these cases, and in many others that might be adduced, the dependence of resemblance on locality extends further than to the general aspect of an assemblage of species common to the whole region. It is found that where modifications of the pattern occur in different parts of the same extended region, the whole number of insects associated by participation in the common pattern undergoes the same kind of change; they all become similarly modified together. One of the most striking instances of this phenomenon is afforded by a well-known assemblage of butterflies from Central and South America which has been fully dealt with by Prof. Poulton. These butterflies are characterised by a peculiar arrangement of the colours red, yellow and black; and the assemblage contains representatives of many different subfamilies, including Ithomiines, Heliconiines, Danaines, Nymphalines and Pierines, to say nothing of certain moths. The general facies, while retaining its common elements, shows certain modifications according to the special locality; one such modification being peculiar to Central America, another to Venezuela, and others to Trinidad, Guiana, East Brazil, the Upper Amazon and Ecuador. These modifications, be it understood, are not confined to one or two of the constituent members of the combination, but are shared in by all or most of the associated species. A somewhat similar phenomenon may be observed in the parallel African genera *Mylothris* and *Phrissura* which were mentioned just now. Both of these are Pierine genera, though the affinity between them is not very close.

In considering such cases as these, the number of which might be almost indefinitely extended, we are naturally inclined to ask whether the geographical conditions may not have something to do with the resemblances noted. No doubt they have; but the question remains whether such influence is a direct or an indirect one. That the influence of a climatic condition may sometimes be direct is suggested by the temperature experiments of many investigators, including Merrifield, Standfuss and Fischer. But there are great, and, as it would seem, insurmountable difficulties in the way of adopting the hypothesis of a direct climatic or geographical

cause for such cases as those that have been mentioned. This has been shown so convincingly by Prof. Poulton, that I need not enlarge on the point further than to remark that a general lightening or darkening of pigment, as in some experimental cases, is an entirely different matter from the production of an elaborate colour-pattern like that, for example, of the female of *Perrhybris pyrria* and its Ithomiine and Heliconiine counterparts.

But, it may be asked, if the theory of a direct action of the environment be given up, what explanation remains? Well, the hypothesis of mimicry remains. This rationalises the geographical facts, without raising the difficulties involved in the theory of direct action. I will not attempt to recapitulate the arguments in favour of the mimetic explanation, but for my present purpose will assume that it is, at all events provisionally, accepted.

This being so, it will not escape the notice of those who inquire into the facts, that there are some anomalies that require further explanation. It is, for example, sometimes found to be the case that a supposed mimic is observed in regions where its model is not known to occur. This may in certain instances be due to the ascertained fact that many insects, including butterflies, do occasionally extend their range, occupying districts where they were previously unknown. In the case of a Batesian mimic, such a proceeding would presumably be hazardous in the extreme, and the species could hardly be expected to establish itself in its new home unless it succeeded in developing some fresh means of defence. In the case of a Müllerian mimic, the difficulty would be lessened.

But in seeking an explanation of such cases there is another factor to be taken into account; viz. the distribution of enemies. It is quite conceivable that a migratory bird, for instance, which had learned its lesson in one locality, might carry its experience into another region; and in this way the mimic might still retain some measure of the protection originally gained in the presence of its model. An interesting example, possibly explicable on these lines, has been adduced by Prof. Poulton. An hypothesis of this kind naturally

needs to be verified before it can take rank as a true explanation.

Some would explain all supposed cases of mimicry as being merely the result of coincidence. In the midst of so wide a range of facts it is to be expected that coincidences should be found; and as a matter of fact they do occur under circumstances which put explanation by the principle of mimicry out of the question. There is a numerous assemblage in South America characterised by a white diagonal band crossing the fore-wing, the general surface of both wings being of a dark colour. To this assemblage belong many species of diverse families of both butterflies and moths. The following are here exhibited :—

DARK GROUND-COLOUR WITH WHITE DIAGONAL BAND.

AMERICA.

NYMPHALINAE.

- Catonephele capenas*,
Hew. ♀.
Ectima rectifascia, Butl.
Ectima livia, Fabr.
Eunica eurota, Cram. ♀.
Eunica sophonisba, Cram.
♀.
Adelpha epione, Godt.
Phyciodes, sp.

SATYRINAE.

- Lasiophila prosymna*,
Hew.
Pedaliodes peucestas,
Hew.

ACRAEINAE.

- Actinote hylonome*, Doubl.
♀.

ERYCINIDAE.

- Mesosemia mevania*, Hew.
Mesosemia asa, Hew. ♀.

HESPERIIDAE.

- Bungalotis astylos*, Cram.
Nascus broteas, Cram. ♀.
Telegonus apastus, Cram.
Thymele enotrus, Cram.
Orses cynisca, Swains.
Spathilepia clannius,
Cram.
Cecropterus neis, Hübn.
♂.
Cecropterus neis, Hübn.
♀.
Cecropterus annus, Fabr.
Cecropterus itylus, Hübn.

SYNTOMIDAE.

- Ctenucha circe*, Stoll.
Ctenucha braganza, Schs.

Euagra latera, Druce. *Heterusia*, sp.
Agyrta porphyria, Stoll. and others.

GEOMETRIDAE.

Leucopsumis, sp.
Sangala, sp.

HYPSIDAE.

Eucyane pylotis, Dru.

Those who admit the theory of Mimicry at all will probably allow that between some of these forms at all events, the relation is a mimetic one. But when we turn to the Old World, we find several species, also of diverse affinities, exhibiting very much the same type of pattern, which at once suggests a warning signal, or, to use Prof. Poulton's convenient term, an aposeme. Examples are here shown from Asia, Australasia and Africa.

ASIA.

ERYCINIDAE.

Dodona ovida, Hew. ♀.
Abisara neophron, Hew.

HESPERIIDAE.

Charmion ficulnea, Hew.

LYMANTRIADAE.

Numenes silheti, Wlk. ♀.

GEOMETRIDAE.

Odezia aterrima, Butl.

CHALCOSIINAE.

Pidorus glaucopis, Dru.
♂.
Pidorus glaucopis, Dru.
♀.

HESPERIIDAE.

Casyapa dissimilis,
Swinh.
Plesioneura feisthamelii,
Boisd.

GEOMETRIDAE.

Heleona remota, Wlk.
Craspedosis norbeata,
Swinh.

NOCTUIDAE.

Leucanitis schraderi, Feld.

AFRICA.

ZYGAEINIDAE.

Pitthea perspicua, Linn.

AUSTRALASIA.

ERYCINIDAE.

Abisara gesica, Hew.

PYRALIDAE.

A specimen unidentified.

Here again it will probably be allowed by believers in the theory of Mimicry that there is a mimetic relation between some at least of these Old-World forms. But that the Eastern

aposeme should so closely resemble the Western must be put down to coincidence; and we shall perhaps not be far wrong if we suppose that a simple, but no doubt effectual, aposeme like this may originate quite independently in regions far remote from each other, and may become the common property of many diverse species.

What has been said of the white band aposeme will also apply to a second case, in which the white of the band is replaced by brown or orange, as is shown by the examples here exhibited. These are as follows:—

DARK GROUND-COLOUR WITH BROWN OR ORANGE DIAGONAL BAND.

AMERICA.

BRASSOLINAE.

Brassolis sophorae, Linn.

Opsiphanes crameri, Feld.

HELICONIINAE.

1. *Opisogymni*.

Heliconius melpomene
melpomenides, Riff.

2. *Opisorhyperi*.

Heliconius hydarus
hydarus, Hew.

NYMPHALINAE.

Chlorippe vacuna, Godt.

♀.

Adelpha sophax, Godm.
and Salv.

Adelpha melanippe,
Godm. and Salv.

Epiphile orea, Hübn.

Cyclogramma pandama,
Doubl. and Hew.

Catagramma denina,
Hew.

Catagramma pacifica,

Bates.

Catagramma brome,

Boisd.

Catagramma atacama,

Hew.

Catagramma aeries,

Godm. and Salv.

Callithea sapphira,

Hübn.

SATYRINAE.

Daedalma dinias, Hew.

ERYCINIDAE.

Erycina inca, Saund. ♂.

Erycina inca, Saund. ♀.

Emesis cypria, Feld. ♀.

Panara phereclus, Linn.

♂.

Panara phereclus, Linn.

♀.

Aricoris jansonii, Butl.

Aricoris, sp.

Isapis agyrtus, Cram.

- GEOMETRIDAE.*
Nelo uxisama, Druce.
Nelo pandia, Druce.
Nelo, sp.
Darma colorata, Wlk.
- HESPERIIDAE.*
Mahotis nurscia, Swains.
Lychnuchus celsus, Fabr.
Lychnuchoides ozias, Hew.
- ASIA.
HESPERIIDAE.
Koruthaialos, sp.
Koruthaialos rubecula,
 Plotz.
Koruthaialos xanites,
 Butl.
Kerana cameroni, Dist.
Kerana armatus, Druce.
- GEOMETRIDAE.*
Milionia pulchrinervis,
 Feld.
- CALLIDULIDAE.*
Callidula attenuata,
 Moore.
- Cleis sakuni*, Horsf.
- AUSTRALASIA.
ERYCINIDAE.
Abisara statira, Hew.
- ARCTIADAE.*
Buzara chrysomela, Wlk.
 ♀.
- AGARISTIDAE.*
Immetalia saturata,
 Wlk. ♂.
Scrobigera semperi, Feld.
- LYMANTRIADAE.*
Orgyia josiata, Wlk. ♂.
- GEOMETRIDAE.*
Milionia glauca, Cram.
Milionia cyaneifera, Wlk.
- CALLIDULIDAE.*
Cleis sobah, Pagenst.
- AFRICA.
HESPERIIDAE.
Pardaleodes fan, Holl.

In another series of forms the aposeme consists of a dark ground-colour crossed by a band of varying shades of yellow. This also is found in both hemispheres, East and West, and to it the same considerations are no doubt applicable.

DARK GROUND-COLOUR WITH YELLOW OR
 YELLOWISH WHITE DIAGONAL BAND.

- AMERICA.
PAPILIONINAE.
Papilio androgeus laodocus, Fabr. ♀.
- NYMPHALINAE.*
Catonephele esite, Feld. ♀.
Hypna clytemnestra,
 Cram.

be claimed as mimics of the Western models, or *vice versa*; and it is equally true that the facts of geographical distribution make such a claim impossible. But what we have to notice is that in all these cases the aposeme is of an extremely simple character, such as might well arise quite independently in different geographical regions. When we come to patterns of a more complicated kind, such for instance as that of the red, white and black Papilios, or the red, black and yellow Ithomiines and Heliconiines, the case is entirely altered. I cannot exhibit New and Old-World series of these, corresponding to those you have just seen of the simple white or coloured band, for the reason that such series do not exist. The conclusion is obvious: if mere coincidence can account for the coexistence of so many forms showing the same pattern in a given locality, why cannot it produce the same or a similar pattern elsewhere? This we have seen it can only do if the pattern is relatively simple. A complicated system of colouring is beyond the power of mere coincidence to reproduce. We are therefore driven back to the position that geographical conditions are at the bottom of the matter; and if, as seems indisputable, the direct influence of the geographical environment must be disallowed as a cause, we can only conclude that the influence is indirect. And of possible indirect causes the only one yet suggested which appears to be at all adequate is mimicry.

If it be true that there is no rule without an exception, I ought perhaps to be challenged to show some exceptions to the rule I laid down just now about a complicated mimetic pattern being confined to one definite region of the earth's surface. Here are a few such:—

Cybdelis mnasyllus, Doubl. and Hew., a South American Nymphaline, resembles *Hypolimnas bolina*, Lin., ♂, a Nymphaline from Asia. *Megalura marcella*, Feld. ♂, another Neotropical Nymphaline, is like a magnified *Marmessus bois-duvalii*, Moore, an Indian Lycaenid. A South American Hypsid, *Eucyane egaensis*, is strikingly resembled by *Milionia fulgida*, Voll., a Geometrid from Java. It is quite likely that if these Old-World forms occurred in company with the New-World species put beside them, they would be

accounted as belonging to the same mimetic association. But although I can bring forward a few instances of this nature, they remain few, isolated and insignificant. They may, in my judgment, be confidently reckoned as some of the exceptions which prove, or test, the rule.

Prof. POULTON and Dr. JORDAN both concurred as to the meaning to be assigned to the instances cited by Dr. DIXEY.

PAPILIO DARDANUS, BROWN, BRED IN S.E. RHODESIA BY MR. C. F. M. SWYNNERTON.—Prof. POULTON read the following extract from a letter written from Chirinda, S.E. Rhodesia, Aug. 28, 1913, by Mr. C. F. M. SWYNNERTON :—

“ You will have received my postcards of the past few mails and been interested in the consistent way in which your expectations have been fulfilled.

“ Emergences have taken place since last mail from a 2nd brood of *cenea* parentage and one of *trophonius* parentage. There are relatively few pupae left, and it may be interesting to sum up the results as they now stand :—

“ *Hippocoon* ♀ parent : many families : ♀ offspring always *hippocoon*.

“ *Cenea* ♀ parent : two families : ♀ offspring *hippocoon*, intermediate and *cenea*.

“ *Trophonius* ♀ parent : one family : ♀ offspring only 3, viz. 2 *hippocoon* and 1 *trophonius*.

“ *Niobe* ♀ parent : one family : ♀ offspring *hippocoon*, *niobe* and intermediate between *niobe* and *cenea*.

“ The families are small, the result not only of early losses but of the damage to pupae, through the muslin, by my ground hornbills. I did not realise the extent of these latter losses till I finally moved the pupae from the sleeves to boxes. The damage has resulted sometimes in non-emergence, sometimes in deformity. It is especially a pity in the families of *niobe* and *cenea*, as these were producing interesting intermediate forms. However, the main point to be tested has come out pretty clearly, and in accordance with your expectations.”

Prof. POULTON said that Mr. Swynnerton's breeding experiments showed that the *hippocoon* form at Chirinda in S.E. Rhodesia is, genetically, just as predominant as the *cenea*

form is in the Durban district. His results furthermore showed, as the speaker had anticipated, that the proportion of the ♀ forms to be observed in any locality was a safe criterion of the proportion that will be obtained by breeding. It was particularly interesting to find so marked a contrast between localities not more distant than S.E. Rhodesia is from Natal. Mr. Swynnerton would be sailing for England in October, and it was therefore to be hoped that the whole of this material would be shown by him to the Society later in the present year or early in 1914.

AN IMPORTED JAPANESE LOCUSTID.—Mr. W. J. LUCAS exhibited, on behalf of Dr. Burr, a specimen of *Dicstrammena marmorata*, Haan, a Stenopelmatid Locustid from Japan, which occurs alive in Relf's Nursery at St. Leonards; (*v. Ent. Rec.* for Sept. 1913, p. 228). The insect is carnivorous.

ARASCHNIA LEVANA IN THE FOREST OF DEAN.—Mr. H. ROWLAND-BROWN brought for exhibition an example of *Araschnia levana*, sent him by Mr. T. Butt Ekins of Penarth, who said that he had captured it at the end of May this year on the outskirts of the Forest of Dean, close to the banks of the Wye, where there is an abundance of undergrowth, including nettle. The example was a female in good condition; this was the first reported authentic capture of the species in a wild state in the United Kingdom.

AN ABERRATION OF COLIAS EDUSA.—Comm. J. J. WALKER exhibited a ♀ *Colias edusa*, F., taken by himself in the Isle of Sheppey, August 21, 1913, in which the margin of the hind-wings was almost entirely clear golden yellow, the usual black border being reduced to three or four spots; the yellow markings in the border of the fore-wings were also much extended.

AN IMPORTED AMERICAN SYNTOMID.—Comm. WALKER also exhibited a specimen of a Syntomid moth, a *Ceramidia* near *C. chloroplegia*, Druce, taken by a lady in a fruiterer's shop in North Oxford, evidently just emerged from the pupa, and brought alive to the exhibitor September 18, 1913. It had no doubt been imported with fruit, probably bananas.

SCARCE AND ABERRANT COLEOPTERA.—Comm. WALKER also exhibited the following Coleoptera :—

(1) A short series of the very rare Halticid beetle *Psylliodes cyanoptera*, Ill., taken in June 1913, at Wood Walton Fen, Hunts, on *Sisymbrium sophia*, by Mr. W. Holland.

(2) A specimen of *Coccinella 10-punctata*, L., var. *confluens*, Haw., taken in the Isle of Sheppey, June 1912, and another very curious aberration of the same beetle with golden yellow spots from Wytham Park, Berks, July 30th, 1913.

(3) The very rare ♂ of *Malthodes atomus*, Thoms., also from Wytham Park, June 14th, 1913.

(4) A monstrosity of *Haliplus confinis*, Steph., with three perfectly developed tarsi on the right-hind leg, received from Mr. W. Holland, and taken by him at Wood Walton Fen, near Ramsey, Hunts.

Mr. P. A. BUXTON observed that *Sisymbrium sophia* was supposed not to grow now in Wood Walton Fen, and the Hon. N. C. ROTHSCHILD said that this was the case in the fen itself, but that he had found it just outside.

A COLLECTION OF CATOCALIDS.—Mr. DADD exhibited an interesting collection of Catocalids, comprising most of the Continental species.

Mr. DURRANT exhibited on behalf of Mrs. W. C. Boyd a series of specimens of British Lepidoptera of great historical interest which she is presenting to the British Museum (Nat. Hist.). Mrs. Boyd desired that these specimens should be exhibited to the Society before being incorporated in the national collection.

Chariclea delphinii, L.

Chelsea, 1799, captured in his garden in the summer of 1799 by W. Jones. British record—*teste* Donovan, N.H. Br. Ins. X., 18 (1801); Haworth, Tr. Ent. Soc. Lond. I., 35 (1807); Barrett, Lp. Br. Is. VI., 145-6 (1900). From W. Jones Coll. it passed to Druitt Coll.; Druitt presented it to J. N. Winter, from whom it passed to Coll. W. C. Boyd—*vide* W. C. Boyd, Ent. Mo. Mag. XXXIX., 281 (1903).

Torula quadrifaria, Sulz.

(*Psodos alpina*, S.-D., Stph. Ill. Br. Ent. Haust. III., 144 (1831); Wd. Ind. Ent. 450; *equestrata*, F. Cr. Br. Ent. IX., 424 (1832).

A reputed British specimen, ex Coll. W. Jones, Chelsea, whence it passed to Dr. Druitt Coll.; Dr. Druitt presented it to J. N. Winter, from whom it passed to Coll. W. C. Boyd.

Diasemia ramburialis, Gn.

Probus, Cornwall, 16. VI. 1858 (*T. Boyd*). British record—T. Boyd, Ent. Wk. Int. IV., 151 (1858); Stainton, Ent. Ann. 1859, 149 Pf. 3.

Ebulea catalaunalis, Dp.

Cheshunt, Herts, 18. IX. 1867, in the garden (*W. C. Boyd*). British record—still unique, W. C. Boyd, Ent. Mo. Mag. IV., 152-3 (1867); Knaggs, Ent. Ann. 1868, 108-9 Pf. 4.

Platyptilia zetterstedtii, Z.

Lynmouth, N. Devon, VII. 1855 (*T. Boyd*). British record—Stainton, Ent. Ann. 1856, 44.

Gelechia ocellatella, Boyd.

Lizard, Cornwall, taken, and bred from *Beta maritima*, V. 1858 (*T. Boyd*). New species—T. Boyd, Ent. Wk. Int., IV., 143 (1858); Stainton, Ent. Ann. 1859, 151 (1858); Durrant, Ent. Mo. Mag. XXXI., 82-4 (1895).

Gelechia arundinetella, Boyd.

River Lea, near Hackney, larva *Carex riparia*, IV-VI. ex. 22, VI. 1857 (*T. Boyd*). New species—T. Boyd, Ent. Wk. Int. II., 139-40 (1857); Stainton, Ent. Ann. 1858, 91: N.H. Tin. X., 226.

Gelechia leucomelanella, Z.

Lizard, Cornwall, larva *Silene maritima*, 18, V. 1858 (*T. Boyd*). British record—T. Boyd, Ent. Wk. Int. IV., 143 (1858); Stainton, Ent. Ann. 1859, 150-1.

Glyphipteryx fischeriella, Z. (= *schoenicolella*, Boyd).

Lizard, Cornwall, taken, and bred from *Schoenus nigricans*, V. 1858 (*T. Boyd*). British record—(Type series of *schoenicolella*)—T. Boyd, Ent. Wk. Int. IV., 144 (1858); Stainton, Ent. Ann. 1859, 153.

Coleophora limosipennella, Hb.

Sutton, bred from Elm leaves, 1854 (*T. Boyd*). British

record—Stainton, Ent. Comp. 133 : Ent. Ann. 1855, 45 (2nd ed. 67).

Nepticula prunetorum, Stn.

Loudwater, Bucks, bred from *Prunus*, 1854 (*T. Boyd*).
New species—Stainton, Ent. Ann. 1855, 50 (2nd ed. 72).

Nepticula atricollis, Stn.

Bred from wild Apple, and Hawthorn, 1856 (*T. Boyd*).
New species—Stainton, Ent. Ann. 1857, 112.

Nepticula luteella, Stn.

Bred from Birch, 1856 (*T. Boyd*). New species—Stainton,
Ent. Ann. 1857, 110.

Nepticula minusculella, HS.

Cheshunt, Herts, bred from Pear leaves, 22. II. 1869 (*W. C. Boyd*).
British record—*W. C. Boyd*, Ent. Mo. Mag. V., 280 (1869).

ABERRATIONS OF LEPIDOPTERA FROM THE GUILDFORD DISTRICT.—*Mr. H. O. HOLFORD* exhibited a specimen of *Coenonympha pamphilus* of abnormally large size, taken at Newlands Corner, and a ♀ of *Ematurga atomaria*, almost without markings, from Milford.

BUTTERFLIES FROM THE TYROL.—*Mr. D. PEARSON* showed a drawer of butterflies taken this summer in the Tyrol, including specimens of the large Tyrolean form of *Polyommatus amandus*, and a series of *Erebia euryale* var. *ocellaris*.

A short discussion arose as to the specific identity or otherwise of *E. ligea* and *E. euryale* in which *Dr. CHAPMAN* and *Messrs. WHEELER, DADD, and ROWLAND-BROWN* took part, but no definite conclusion was reached.

Papers.

The following papers were read :—

“ Illustrations of Specific Differences in the Saws of Female Dolerids,” by *Rev. F. D. MORICE, M.A., F.E.S.*

“ Additions and Corrections to my List of the *Rhopalocera* of Trinidad (1904),” by *W. J. KAYE, F.E.S.*

“ On the Urticating Properties of *Porthesia similis*,” by *H. ELTRINGHAM, M.A., F.E.S.*

Wednesday, October 15th, 1913.

Rev. F. D. MORICE, M.A., Vice-President, in the Chair.

Election of Fellows.

The following gentlemen were elected Fellows of the Society :
—MESSRS. EDWARD O. ARMITAGE, Geelong, Victoria, Australia ;
F. W. CRAGG, M.D., Capt. I.M.S., King Institute of Preventive Medicine, Saidapet, Madras ; WALTER JAMES DOW, The Cottage, Lynwood Avenue, Epsom ; LESLIE JOHN WILLIAM NEWMAN, Dept. of Agriculture, Perth, W. Australia.

Title of the Society.

As there had been no meeting of the Council since the last reply had been received from the Privy Council Office as to the title of the Society, it was unanimously resolved to postpone any discussion which might have taken place at the present meeting to the next.

Exhibitions.

THE EVOLUTION AND DISTRIBUTION OF ASYMMETRICAL INDO-AUSTRALIAN PASSALIDAE.—Mr. F. H. GRAVELY, who was present as a visitor, exhibited lantern slides illustrating the evolution of asymmetrical from symmetrical forms of Indo-Australian *Passalidae*. He pointed out that the anterior margin of the head, the mandibles, and the labrum, all showed a tendency towards asymmetry in the groups dealt with, but not in certain other groups living under apparently the same conditions in the same place. Further, the degree of asymmetry found in the mandibles was always correlated with the degree of asymmetry found in the anterior margin of the head. The manner of evolution of this asymmetry could be traced right from the start in forms still living, and was different in different sub-groups, proving that asymmetry had originated independently in each of them, and that the degree of asymmetry found in any species of *Passalidae* might be regarded as an index of the degree of specialisation to which that species had attained.

It was therefore interesting to find that the most primitive

(symmetrical) genera of what might be termed the Australian (in a broad sense) asymmetrical group, were confined, with the exception of a single species, to Australia (in a restricted sense), and that no asymmetrical species was known from there; while the most primitive (symmetrical) genus of what might be called the Oriental asymmetrical group, was confined to Ceylon; these primitive genera being much more alike than were their more highly specialised representatives in intermediate localities.

It appeared, therefore, that we had here an example of discontinuous distribution, due to the pushing outwards of primitive forms by their more highly specialised descendants. This was especially well shown in the Oriental asymmetrical group, a group confined to the Oriental Region, and including all asymmetrical forms found there except those belonging to the genera *Gonatas*, Kaup, *Graphalocnemis*, Heller, and two small genera closely allied to the latter. The symmetrical genus *Episphenus*, Kaup, was confined to Ceylon, the dominant species in which island belonged to the slightly asymmetrical genus *Chilomazus*, Lang. In the Indian Peninsula the group was represented only by two species of the more highly asymmetrical genus *Basilianus*, Kaup. The degree of asymmetry exhibited by these two species was at least equalled by that of every asymmetrical species of the group found in the remainder of the Oriental Region, where the dominant species was *Aceraius grandis*, Burmeister, the most highly asymmetrical form known. A small symmetrical genus, allied to *Episphenus* but off the main line of evolution, had, however, succeeded in establishing itself in the hills of Assam and in the Eastern Himalayas.

A considerable discussion took place on this exhibit with regard to the occurrence and possible use of asymmetry, in which Prof. POULTON, Mr. CHAMPION, Rev. F. D. MORICE and other Fellows took part; Dr. DIXEY instancing the cases of the Narwhal and of certain Crustaceans, Mr. E. E. GREEN some species of Termites, and Mr. KAYE the male genitalia in many Sphingids; Mr. GAHAN pointed out the undoubted utility of asymmetry in the mandibles of many insects, the teeth of the one side fitting into the grooves of the other,

while Mr. BLAIR observed that it was not necessarily an indication of high specialisation, since it was found in some very primitive insects. In answer to a question from Mr. CHAMPION, who said that in his experience of Tenebrionid beetles asymmetry of the mandibles was confined to the ♂♂, Mr. GRAVELY replied that in the Passalids of which he had been speaking it was equally present in both sexes.

A NEW GENUS OF MYMARIDAE.—Mr. F. ENOCK exhibited photographs of the ♂ and ♀ of a new Mymarid, and read the following note :—

During a short holiday at Hastings, I had the good fortune in sweeping to obtain an entirely new Mymarid, at Hollington Wood, near Hastings. After a long examination under the microscope, I failed to identify it with any of the known genera. On submitting the specimens, of which I obtained a male and female, to Mr. Chas. O. Waterhouse, he confirmed my opinion that I had captured something quite new, which we determined to name *Neurotes iridescens*. It is closely allied to Haliday's genus *Limacis*, and we have placed it at the head of the British *Mymaridae*.

Mr. C. O. WATERHOUSE corroborated Mr. Enock's remarks and observed that the new genus was nearer to the Chalcids than any of the previously known Mymarids.

RARE MYRMECOPHILOUS DIPTERA.—Mr. DONISTHORPE exhibited specimens of the rare myrmecophilous Diptera :—

1. *Platyphora lubbocki*, Verrall, two specimens bred out of his observation nest of *Formica sanguinea* on July 11 and 26 last. Only two specimens have been captured (one by Dr. Wood in Herefordshire and the other by Mr. King in the New Forest) since Lord Avebury bred a specimen in an ant's nest. He expressed his opinion that his two specimens had hatched from pupae of *F. fusca* given to the *sanguinea* colony as slaves.

2. *Aenigmatias blattoides*, Meinert. A specimen of this curious little apterous Dipteron was taken in a nest of *F. fusca* at Nethy Bridge, July 21. It was originally taken by Meinert in a nest of *F. fusca* in Denmark. Subsequently Wasmann had bred a few specimens from *F. fusca* pupae in his nests, in Luxemburg.

3. *Peyrimhoffia brachyptera*, Kieff., taken in a nest of *Lasius alienus* on Lundy Island, June 9. He added that only two specimens had been taken heretofore, by Mons. Peyrimhoff under a stone, in Algeria.

SCOTCH ZYGAENIDS.—The Hon. N. CHARLES ROTHSCHILD exhibited specimens of *Zygaena filipendulae* from the Isle of Lismore, Scotland, and an example resembling them from Folkestone.

Mr. L. W. NEWMAN observed that he had exhibited to the Society some years ago a Zygaenid from Oban similar to those exhibited by the Hon. N. C. Rothschild, and that he believed it to be a separate species.

CHRYSOPHANUS DISPAR, VAR. RUTILUS.—Mr. ROTHSCHILD also exhibited specimens of *Chrysophanus dispar*, var. *rutilus* from Hungary and other localities, and made remarks on the different races. The exhibitor said that in his opinion specimens of the first brood from this Hungarian locality equalled in size all but the abnormally large examples of the British insects. He stated that if the insect is bred in England from ova deposited by a female sent to this country in the late summer, the butterflies emerge far later than they do in Hungary.

CHRYSOPHANUS DISPAR, VAR. RUTILUS, AND FORMS OF AGRIADES CORIDON.—Mr. H. ROWLAND-BROWN brought for exhibition examples of *Chrysophanus dispar*, var. *rutilus* captured by him in the marshes of the Gironde below Bordeaux on August 1st and 2nd, 1911, to compare with the much larger form taken in Hungary by Mr. N. C. Rothschild. He said that examples of the first generation, taken on the same ground in May, 1912, by Mr. F. Gilliat, were no larger than those of the second emergence, nor did they present any marked superficial differences.

He also exhibited a specimen of *Agriades coridon*, var. *tithonus*, Meig. (= *syngrapha*, Kef.), taken in the Chiltern Hills on August 9th, 1913, being the first ever recorded therefrom; with several examples of this variety taken by him at Dom-pierre-sur-Mer, Charente-Inférieure, on August 4th and 5th, 1911; and an example of the form *semisyngrapha*, Tutt, taken by Dr. J. N. Keynes at Royston, Herts; and for comparison

the form of the ♀ commonly taken in the Chilterns, having the basal area of the hind-wings rayed with blue; also, a fine ♀ of the form of *coridon* which occurred with *rutilus* in the Gironde, on the marshes themselves, and entirely away from chalk, or limestone formation.

GYNANDROMORPHOUS GONEPTERYX CLEOPATRA.—Capt. E. B. PUREFOY exhibited a short series of *G. cleopatra* which included two gynandromorphous specimens. The parents came from abroad in 1908, and the brood had been kept up in Kent ever since. He said that the ♀♀ paired before hibernation, and that this was the most important factor making for success.

Dr. LONGSTAFF inquired whether Capt. Purefoy had noticed the scent of the ♂ and ♀ of *G. cleopatra*, and observed what an exceptional opportunity he had of doing so. He had been unable to distinguish some ♀♀ of *G. cleopatra* from those of *G. rhamni*, but the scent might possibly differ. If the scent of the ♂ were connected with the orange suffusion, those specimens in which there was but very little orange should have very little scent.

The Rev. G. WHEELER pointed out that the ♀♀ of these two species might be distinguished by the underside of the fore-wings, those of *G. cleopatra* having a slight orange suffusion along the median nervure.

Mr. F. ENOCK said that he had sent several pupae of *G. rhamni* to a young collector, from one of which a ♂ had emerged with unusually large orange spots. These specimens had been attacked on the setting board by ants, which had eaten out the orange spots only.

Prof. POULTON said that ants were known previously to eat out only the scent-patches on certain African butterflies.

SMERINTHUS POPULI.—Mr. L. W. NEWMAN exhibited four gynandromorphous specimens of *Smerinthus populi*, three with the left side ♀ and right side ♂, and one *vice versa*. In three of the specimens there was no trace of variation in the wings either in size or markings, the antennae only denoting gynandromorphism. The fourth specimen showed well the two sexes, the left side being smaller and quite differently marked from the right. He also showed two extreme light,

two extreme dark, two light pink and two dark pink *Smerinthus populi*, bred from selected parents.

AGRIADES CORIDON.—Mr. NEWMAN also exhibited four curious ♀ specimens of *A. coridon*, three having the right pair of wings much smaller than the left and heavily dusted with blue scales, the left side being normal; also one specimen similar but *vice versa*. All were taken wild in Herts in 1913, where several other similar specimens were noticed.

AN IRISH PTEROSTICHUS ATERRIMUS.—Dr. G. W. NICHOLSON showed a specimen of *Pterostichus aterrimus*, Pk., from Cloverhill, Co. Cavan. The only other Irish record is from the Co. Cork, where a few were taken in the early thirties of the last century. This species used to be common in the Fens before they were drained, but has since disappeared from there. A specimen, however, was taken in Norfolk by Prof. Beare in 1911.

ABERRATION OF TELCHINIA VIOLAE.—Mr. E. E. GREEN exhibited a transfer of a remarkable aberration of *Telchinia violae*, Fab., taken by Mr. G. Halkett, in the district of Kurunegala, Ceylon. He also showed transfers of the normal form of the same butterfly which is usually regarded as a very constant species. The aberration consists of a black suffusion completely occupying the cell of the fore-wing; a considerable extension of the discal black spots; a suppression of the pale spots on the black border of the hind-wing, together with an inward extension of the black border along the course of the veins.

PARASITISED JASSIDAE.—Mr. GREEN also exhibited *Jassidae* from Ceylon, parasitised by an undetermined species of *Gonatopus*.

ACANTHOCINUS AEDILIS FROM BOW.—The Rev. G. WHEELER exhibited on behalf of Miss Macbride a number of living specimens of the Longicorn beetle *Acanthocinus aedilis*, L., taken in a timber-yard at Bow. This species is almost confined in the British Isles to Scotland, being far from uncommon in the neighbourhood of Rannoch, but has been several times brought south in timber, and has been taken in the British Museum itself. Only the ♂ has antennae of the immense length of the specimens exhibited.

BUTTERFLIES FROM THE SUDAN.—Dr. LONGSTAFF exhibited on behalf of Mrs. Waterfield a box of Sudanese Pierine Butterflies taken by her, and communicated her observations thereon, viz. :—

The following notes give a short account of some of the butterflies that I have taken during the last three winters in the neighbourhood of Port Sudan. This newly-opened port of the Anglo-Egyptian Sudan is situated, roughly speaking, half-way down the African coast of the Red Sea, and about 35 miles north of the older and better-known Port of Suakin.

Port Sudan is situated on a creek in the fringing coral reef which forms a beautiful natural harbour. Its surroundings are almost entirely devoid of vegetation except for a few thorny acacia trees and such desert plants as can subsist on the thin layer of salt earth which covers the old coral reef. Where, however, a stream finds its way to the sea, there the conditions are improved, and a variety of plants will grow on the soil brought down from the hills about 16 miles distant. It is in these watercourses—locally termed “ khors ”—which are dry except for a few days in the year, and in the public gardens, a plot of land enclosed in the middle of the town, that my entomological studies have been made.

During the winter months rain falls every few weeks, sometimes to the extent of 2" or more, and it is after rain that the butterflies emerge in numbers. I have not spent a longer time in the Sudan than from November to May, so have had no opportunity of studying insect life during the summer.

1. *Belenois mesentina*, Cr. At times this insect is very common, and I have bred it in numbers from larvae taken on a bright green-leaved shrub of which the green exactly matches the green along the caterpillar's back. The black and white chrysalis is also frequently to be met with, and I think the caterpillar must feed on various shrubs. The females seem to be particularly sluggish, and can often be caught in the fingers as they sit with folded wings on flower or leaf.

2. *Synchloë glauconome*, Klug. This butterfly I overlooked until Dr. Longstaff pointed it out to me. In 1912 it was common in the public gardens. In 1913 I saw it plentifully once only, when riding in the desert, but a few days later

a visit to the spot with a net yielded but a solitary specimen. It seems to frequent the driest and most barren places.

3. *Herpaenia lacteipennis*, Butl. This insect I have only once taken, and then the brood was obviously almost over. The four tattered specimens I took were flying in a broad and, for the time, grassy "khor," where there was a variety of vegetation.

4. *Calopieris eulimene*, Klug. I was surprised to find this considered a rare insect, as it is to me one of the most widely distributed species that I take. In fact, wherever the wild caper-bush grows there will this most beautiful little insect almost certainly occur. In a freshly caught specimen the red veins on the underside of the lower wings are heavily outlined in green, but in a worn specimen hardly a trace of green will be left. The female has no pink sheen to the yellow tips of the fore-wings.

5. *Teracolus phisadia*, Godart, I have only taken once, at Sinkat, the hill station about 72 miles from Port Sudan, where it was almost the only insect to be found; it was flying round plants of what I took to be a sort of creeping cactus (possibly *Vitis quadrangularis*, Wallich).

6. *Teracolus chrysonome*, Klug. This is common enough in some "khors" near Port Sudan, though I have never taken it in the public gardens. It seems to go on continuously, never swarming, but always to be found throughout the winter months.

7. *Teracolus protomeia*, Klug. In 1912 this was a common insect, and in spite of being very difficult to catch, I brought home a fair series. This year I never saw it, though why I never knew.

8. *Teracolus halimede*, Klug. This insect seems to be moderately common throughout the winter. When chased it has a habit of flying straight through the nearest thorn bush, so that the ragged creature which emerges on the other side has earned its own freedom. The female seems rarer than the male.

9. *Teracolus pleione*, Klug. This charming little insect was scarce in the winter of 1911, quite common in 1912, but

altogether absent in 1913. I think I know the food-plant, which seemed to be growing as strongly as ever.

10. *Teracolus eris*, Klug. In 1912 I took one in very poor condition in a garden near our house and quite away from the desert. The next specimen I saw was in my breeding-cage, where it emerged from the chrysalis of a small green larva which I had unwittingly brought home on the food-plant of *B. mesentina*. I found four more larvae, and two eggs which hatched, and the caterpillars from them were almost full grown when ants got into the cage and devoured them and other treasures. The egg was clear except for an irregular red line running round it: it was laid on the upper side of the leaf. The caterpillar was green, wood-lice shaped, and hard to see, as it generally lay along the midrib of the leaf.

11. *Teracolus eupompe*, Klug. In 1912 this very lovely insect was quite common, but in 1913 I took only a couple of males, though I was constantly on the look out for it. It is a species that varies very much as to size, and the female has a great tendency to vary in the amount of red at the tips of the wings; often this is quite absent, but the underside appears to be always characteristic.

12. *Teracolus achine*, Cram., is never abundant, but in the course of an afternoon's hunt two or three specimens will come to hand. I have taken it more commonly at Suakin than at Port Sudan.

13. *Teracolus दौरα*, Klug. This inconspicuous little butterfly, so far as I know, is only taken in one spot on the bank of a "khor" near Port Sudan, where it sits in the rough grass, seldom apparently flying much.

14. *Teracolus liagore*, Klug, is another butterfly favouring tufts of grass near "khors." It is a rare insect, and one pair in an afternoon is the largest number I have taken at a time.

15. *Teracolus evarne*, Klug, is the common butterfly of the place. Every winter I have found it abundantly. From a long series one may pick out small and pale examples known as *philippsi*, Butl. I have tried to breed this species from eggs laid in captivity, but the infant larvae refused to eat. The egg was straw-coloured at first, then vermilion, and hatched on the fourth day.

16. *Catopsilia florella*, Fabr., is another insect which was fairly common in 1912 but quite absent in 1913. Being a strong-flying butterfly it is hard to catch. The males seem decidedly more common than the females, and also easier to catch.

17. *Colias hyale*, auct., var. *marnoana*, Rogenh. This butterfly is generally to be found in grassy places, though not always abundantly. The pale variety of the female would appear to be the commoner.

AMAUERIS EGIALEA STROKING THE BRANDS OF THE HIND-WINGS WITH ITS ANAL TUFTS, AGAIN OBSERVED BY W. A. LAMBORN.—Prof. POULTON said that he had just received a letter written Sept. 19–23, 1913, from Mr. W. A. Lamborn, who was now resident, as Entomologist to the Agricultural Department of Southern Nigeria, at Moor Plantation, Ibadan. The letter contains the following interesting observation dated Sept. 20 :—

“ I saw this morning a male *Amauris egialea*, Cram., settled on a leaf in the sun, brushing its scent-patches with the anal tufts, the abdomen being anteflexed. The wings were midway between the vertical and horizontal positions, and at the end of each act of brushing they were suddenly brought almost together and then expanded to the original position.”

Mr. Lamborn's earlier observation on the same species, made Jan. 30, 1912 (Proc. Ent. Soc. 1912, p. xxxv), states that the wings were “ over-flexed,” their outer margins being in contact with the leaf and therefore below the general level of the body. The difference in attitude was an interesting one, and might perhaps be explained by the use of the scent-organ at different periods in the life of the imago or in different states of physiological activity. The sudden movement of the wings suggested that the object was to promote the passage of scent from within or between the secreting cells into the cups on the surface of the brand, as described and figured by Mr. Eltringham, on Plate XX of this year's Transactions. Again, it was possible that the motion promoted the circulation of fluids in the neighbourhood of the veins, or of air in the tracheal tubes of the wing. That the motion bore some relation to the function of the scent-brand could hardly be doubted.

Prof. POULTON said that in view of Mr. Eltringham's researches on *Amauris niavius*, L., he wished now to withdraw the suggestion that scent was conveyed from the brushes to the brands (Proc. Ent. Soc., 1911, pp. xlv, xlvii). It was obviously more probable that scent secreted in the brands was conveyed to the brushes.

Mr. Lamborn had now three times observed the brushing of the brands by male Danaines, and, as far as Prof. Poulton was aware, no other naturalist had ever seen this operation, although it was probably performed several times by all the males of many species which were among the commonest of tropical butterflies. He hoped that naturalists would now make a special point of watching male *Danaini* and *Euploeini*. It would be especially interesting to observe the insertion of the tufts into the pockets of certain *Danaini*, such as the species of *Tirumala* and *Danaida*, and in the *Euploeini* to ascertain whether the brands on the part of the hind-wing that is overlapped by the fore-, as well as those existing on the fore-wing itself, bore a similar relationship to the anal tufts. He much hoped that Oriental naturalists would settle this question for us.

MR. W. A. LAMBORN'S OBSERVATIONS ON THE COURTSHIP OF A LYCID BEETLE.—Prof. POULTON exhibited a set of four males and one female, and another of two males and one female, of *Metriorrhynchus semiflabellatus*, Thoms. Both sets were captured on *Urena lobata*, July 16, 1913, at Moor Plantation, near Ibadan, S. Nigeria. Of the first set Mr. Lamborn had written: "Two of these were *in coitu* and the other three were clinging to them"; of the second set: "Two beetles *in coitu*, the third, an unsuccessful suitor, clinging to the successful male." Prof. Poulton said that these observations might be compared with Mr. Lamborn's earlier record, in Proc. Ent. Soc., 1911, p. xc, of three males of the Acraeinae butterfly *Planema alcinoe*, Felder, clinging to a female *in coitu* with a fourth male. The *Acraeinae* and the *Lycidae* were both distasteful groups with aposematic colours, and it was reasonable to suppose that the increased conspicuousness produced by such masses of individuals was not harmful to them as it would be to palatable species. Mr. C. J. Gahan had kindly determined the species.

A LIZARD ATTACKING MEGACHILE CINCTA, F.—Prof. POULTON exhibited a female specimen of *Megachile cincta*, the subject of the following note by Mr. W. A. Lamborn: “My attention was attracted to the nest under the eaves of a building at Moor Plantation at 2 p.m., June 5, 1913, by hearing the protesting buzz of a bee, and I then discovered a female *Agama colanorum* trying to get at a *Megachile cincta*, the hinder extremity of which was just appearing at the mouth of a cell. The lizard had only managed to nibble away a few wing fragments.” The tip of the left fore-wing bore evident traces of the attack. Two males from the same nest, emerging Aug. 9–28, during Mr. Lamborn’s absence, and Sept. 2, were also exhibited. The Hymenoptera of this and the following note were kindly determined or confirmed by Mr. G. Meade-Waldo.

INSECTS BRED BY W. A. LAMBORN FROM THE NESTS OF HYMENOPTERA ACULEATA.—The material of the following observations made at Moor Plantation was exhibited by Prof. POULTON:—

1. A male *Megachile cincta* (Sept. 17), and the Cantharid beetle *Zonitis eborina*, Fahr. (Sept. 17), the latter kindly named by Mr. K. G. Blair. The following note referred to the specimens: “A nest made by *Megachile* was found in an outhouse on June 5, 1913. A *Megachile* emerged on Sept. 17, and a bright pink beetle left the same cell on the same day, one or other having, I think, bored out sideways into this cell from another adjacent one. It is perhaps well to mention that the nest was placed on June 5 in a jar which was closed with a glass lid, and that since that date the cover has not been off.”

2. *Odynerus* sp. inc. (Sept. 17): The species exists unnamed in the collection of the British Museum.—“A large mud nest, which I thought belonged to *Megachile*, was found in an outhouse July 24. A small wasp emerged on Sept. 17.”

3. A female *Mutilla floralis*, Klug.—“This female Mutillid emerged July 26, from a mud nest, probably that of *Sceliphron spirifex*, L., found July 14.”

4. *Chrysis* (*Tetrachrysis*) sp. inc. (July 26), *Chrysis* (*Tetrachrysis*) *lyncea*, F. (Aug. 3), and *Sceliphron spirifex*, L., ♀ (July 31). All three insects emerged at the recorded dates

from "mud nest of *S. spirifex*, found in my store July 20, 1913." The emergence of two species of Chrysid from the same nest was of special interest.

Wednesday, November 5th, 1913.

MR. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the chair.

Election of an Honorary Fellow.

On the recommendation of the Council, DR. A. P. SEMENOFF TIAN-SHANSKI was elected an Honorary Fellow in the place of the late Prof. O. M. REUTER.

Election of Fellows.

The following gentlemen were elected Fellows of the Society :
—MESSRS. HUGH WARREN BEDFORD, Church Felles, Horley; HAROLD S. CHEAVIN, F.R.M.S., F.N.P.S., Clematis House, Somerset Road, Huddersfield; CHARLES ALBAN WILLIAM DUFFIELD, Stowting Rectory, Hythe, and Wye College, Kent; W. EGMONT KIRBY, M.D., Hilden, 46 Sutton Court Road, Chiswick, W.; LOUIS MEADEN, Melbourne, Dyke Road, Preston, Brighton; F. V. BRUCE MILLER, Livingston, N. Rhodesia; ALEXANDER DAVID PEACOCK, 137 Wingrove Gardens, and Armstrong College, Newcastle-on-Tyne; H. ANANTHASWAMY RAO, Curator of the Govt. Museum, Bangalore, India; PERCIVAL NATHAN WHITLEY, New College, Oxford, and Brankwood, Halifax.

Title of the Society.

The question of the change of title of the Society was opened for discussion from the chair, with a view to ascertaining whether there was a sufficiently strong feeling in favour of a change to justify the Council in calling a Special Meeting, but as the preponderance of feeling appeared to be

somewhat against any change, it was announced that the Council would take no official action on the matter, it being open to any six Fellows to require a Special Meeting if they so desired.

Wicken Fen.

The PRESIDENT brought before the meeting the necessity of forming a fund for the care of that portion of Wicken Fen left by the late Mr. G. H. Verrall to the National Trust, and at his request the Hon. N. C. Rothschild and Mr. H. Rowland-Brown addressed the meeting on the subject. Mr. Rowland-Brown, at the President's desire, expressed his readiness to act as Treasurer for any subscriptions given by Fellows of the Society. It was added that the question of the possibility of the Society's contributing, as such, would be brought before the next meeting of the Council.

Exhibitions.

THAIS RUMINA AS A PROTECTED SPECIES.—Dr. G. B. LONGSTAFF exhibited a series of 17 *Thais rumina*, Linn. (including a ♀ of the var. *canteneri*, Feld.), taken in March 1913 at Ronda, in Andalusia, where the species is common. He called attention to the fact that this beautiful but familiar S. European butterfly is conspicuously coloured, with the striking pattern much alike on the two surfaces, that its flight is very slow and fearless, that it is difficult to kill by pinching, and further that it has a very persistent peculiar odour of a musty character with a suggestion of the scent of the pepper-tree. These characters taken together are highly suggestive of a distasteful butterfly.

PANORPA COGNATA, RAMB.—Mr. W. J. LUCAS exhibited three species of *Panorpa*, and communicated the following note :—“ On Oct. 1 Col. J. W. Yerbury gave me a dragon-fly and three Neuroptera which he took during the summer in Wales. One of these, which I exhibit, is a female of the scarce Scorpion-fly *Panorpa cognata*. It was captured at Llangammarch Wells on August 23. I once took a specimen, also a female, at Byfleet in Surrey. Besides these I know of but one or two other captures. There are, however, a few

British examples in older collections. For comparison I have put with it typical *Panorpa germanica*, L., and *Panorpa communis*, L.”

LEPIDOPTERA FROM DEVONSHIRE.—Mr. H. LUPTON exhibited a specimen of *Thalpochares ostrina*, taken in the middle of June 1913, about a mile from the coast and about four miles from Ilfracombe. Also two specimens of *Dianthoecia luteago*, var. *ficklini*, taken in the middle of the same month on the coast of N. Devon.

Comm. WALKER referred to Dr. Perkins' specimen of *T. ostrina*, taken on June 1 this year at Paignton, and exhibited at the meeting of the Society on June 4.

Mr. A. H. JONES said that he had always found it scarce and sporadic abroad, though he had taken it in various localities.

AN ADDITIONAL OBSERVATION ON THE COURTSHIP OF A S. NIGERIAN LYCID BEETLE BY MR. W. A. LAMBORN.—Prof. POULTON exhibited four males and one female of *Metriorrhynchus semiflabellatus*, Thoms., concerning which Mr. Lamborn had sent the following note. Prof. Poulton said that this record ought to have accompanied the observations communicated by him to the last meeting, but it had been inadvertently overlooked. “These beetles were noticed July 15, 1913, in a confused heap on the plant *Urena lobata*, L., (*Malvaceae*). On closer examination they were found to consist of a male and female *in coitû* and three unsuccessful suitors. The fortunate male was on the right side and rather beneath the female, maintaining himself in position by gripping the base of her second right tibia with his mandibles. A second male was resting on her right elytron, the edge of which he held in his jaws, and a third male sat on the second, supporting himself by gripping the base of the right antenna. The remaining male rested on the left elytron of the female holding on to its corrugations by his jaws. When there is no competition the male obtains admission to the female between her slightly separated elytra.”

THE IMPORTANCE OF PRESERVING INSECTS FOUND IN COITÛ.—Dr. G. D. H. CARPENTER read the following notes in connection with his exhibit of *Epitoxis albicincta*:—Bates, in his original

paper describing mimicry in S. America, pays particular attention to the question of the perfect matching of two insects of a pair. Thus he says (Trans. Linn. Soc., vol. xxiii, p. 501) : " The process of the creation of a new species I believe to be accelerated in the *Ithomiæ* and allied genera by the strong tendency of insects, when pairing, to select none but their exact counterparts," and again, on p. 513 he says : ". . . the one exact counterfeit, whose exactness, it must be added, is henceforward kept up to the mark by the insect pairing necessarily with its exact counterpart."

Charles Darwin (as Prof. Poulton pointed out in his Presidential address to the Ent. Soc., 1904) at once saw the importance of this, and wrote to Bates in 1862 (" Life and Letters," vol. ii, p. 392) : " I wish, however, you had enlarged a little more on the pairing of similar varieties; a rather more numerous body of facts seems here wanted." Again on November 25 (1862?) he wrote : " Could you find me some place, . . . where you could state, as fully as your materials permit, all the facts about similar varieties pairing,—at a guess how many you caught, and how many now in your collection? I look at this fact as very important." Subsequently, Charles Darwin rather severely criticised the statements of Bates above alluded to. At the close of his review of Bates' paper in the *Natural History Review* for April 1863, article 17, pp. 223, 224, he says : " We will only notice briefly one other point which has an important bearing on the production of new species and races; namely the statement repeatedly made that in certain cases the individuals of the same variety evince a strong predilection to pair together. We do not wish to dispute this statement; . . . But we are by our profession as critics bound to be sceptical, and we think that Mr. Bates ought to have given far more copious evidence." I am much obliged to Prof. Poulton for telling me of this interesting passage.

Prof. Poulton, in his address mentioned above, quotes a letter from Trimen on this subject, who says : " I have noticed the tendency of sexes of a variety to pair together rather than with other varieties in the numerous cases of captured pairs sent to me by correspondents in South Africa, and sometimes

in cases of the same kind which occurred to myself when collecting."

Prof. Poulton remarks: "It is tantalising to reflect upon the number of interesting and important questions which could be now decided if" the practice of collecting and carefully labelling all specimens captured *in coitâ* "had prevailed during the past fifty years."

I now bring forward a few facts bearing on the question of the preferential mating of varieties, not because it is considered that sufficient evidence has been produced to prove anything, but rather with a view of directing more attention to this important point. On Bugalla Island, L. Victoria, during 1912, I found that a small and extremely variable Syntomid moth, *Epitoxis albicincta*, Hmps., was very abundant; I had previously met with this species at Jinja in Usoga, on the mainland, and at Mpumu in Chagwe, but not in such abundance as on the island. The moth varies equally in either sex, from a form all black without markings to a form with large and well-defined white spots. The first specimen I took was one of the fully spotted forms, on a grass stem (for it is always found in open grassy places) on Mpumu Hill, Chagwe. It hung feet upwards from a bending stem, and, when approached, held its wings in a peculiarly twisted way, hanging perpendicularly from its back but with the ventral surface facing forwards. I have obtained altogether 58 specimens in various localities, of which 22 were actually *in coitâ*. These can be arranged under six types, but of course no one type can be quite sharply marked off from another.

Before making any remarks upon the specimens grouped as on p. xci, it must be said that they were not collected altogether as they came. It will be seen, for instance, that Type VI comes mostly from the mainland; and although my impression is that it *was* relatively more abundant on the mainland, more material is required. For when I got on to the island I remembered that I had already caught Type VI on the mainland, and devoted myself rather to getting a good series of varieties than to determining the relative frequency of each. It is also suggestive, that Type I does not seem to

In Type I the wings are entirely black.

Type VI is the fully spotted form. There is a large rectangular white mark at the base of the fore-wing; a pair in the middle of the wing one above the other, of which the upper is rectangular and the lower roughly triangular; beyond these are three elongated narrow white spots, one at the apex of the wing and a pair close together at the middle of the hind margin. On the hind-wing there is a large round white spot just beyond the middle and a broad white streak down the anal margin. In a single specimen (Type VIa, a female) the spots are all very large, and there is an additional little white spot in the outer angle between the two large ones in the middle of the wing.

In Type V all the spots can be made out, but they are small and ill defined.

Type IV differs from V by absence of apical spot on the fore-wing.

Type III has a few small spots.

Type II has only traces of spotting, sometimes there is only one, ill-marked, spot.

The 58 specimens can be grouped as follows under the six types:—

I.		II.		III.		IV.		V.		VI.	
♂	B. 11.1.'12.	♂♂	B. 14.1.'12.	♂	B. 14.1.'12.	♂	B. 14.1.'12.	♂	B. 14.1.'12.	♂	B. 14.1.'12.
♂	B. 14.1.'12.										
♂	B. 15.8.'12.	♂♂	B. 15.9.'12.	♀	B. 14.8.'10.	♀	B. 14.8.'12.	♂	Jg. 14.8.'10.	♂	Jg. 14.8.'10.
♂	B. 15.9.'12.										
♂	B. 16-30.9.'12.	♂♂	B. 14.1.'12.	♀	Jg. 14.8.'10.	♀	B. 1-15.9.'12.	♂	Jk. 16-30.9.'10.	♂	Jg. 14.8.'10.
♂	B. 20.9.'12.										
♂	B. 25.10.'12.	♂♂	B. 14.1.'12.	♀	B. 15.9.'12.	♀	B. 21.9.'12.	♂	B. 7.12.'12.	♂	B. 14.1.'12.
♂	B. 11-15.12.'12.										
♂	B. 7.12.'12.	♂♂	B. 15.9.'12.	♀	B. 15.9.'12.	♀	B. 21.9.'12.	♂	B. 7.12.'12.	♂	B. 14.1.'12.
♀	B. 15.8.'12.										
♀	B. 1-15.12.'12.										

Type VIa.

♀ M. —.7.'10.

13	+	11	+	7	+	9	+	6	+	12 = 58
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have been taken on the mainland. The localities were as follows :—

B. = Bugalla Island.

Jg. = Jinja neighbourhood, on the Uganda side of the lake inlet.

Jk. = „ „ on the Kerinya peninsula.

Js. = „ „ on the Usoga side of the lake inlet.

M. = Mpumu hill, Chagwe, about 20 miles from Kampala.

SHOWING THE MATCHING OF INDIVIDUALS OF ELEVEN PAIRS
TAKEN IN COITŪ.

Pair Data.	Type I.	Type II.	Type III.	Type IV.	Type V.	Type VI.
1. B. 14.1.'12. .		♂				♀
2. B. 7.12.'12. .	♂♂				♀	
3. B. 20.9.'12. .	♂♂♂♂					
4. B. 11.1.'12. .	♂♂♂♂			♀♀♀♀		
5. B. 16-30.9.'12. .	♂♂♂♂			♀♀♀♀		
6. M. —.7.'10. .						♂ ♀
7. B. 15.9.'12.*. .		♂♂♀				
8. B. 15.9.'12.*. .	♂♂♀	♂♂♀				
9. B. 15.8.'12. .	♂♂♀					
10. B. 15.9.'12.*. .			♂			
11. B. 1-15.9.'12. .				♂♀	♀	

The above arrangement shows that while pairs Nos. 1, 2, 3, 4, 5 are not very well matched, pairs Nos. 6, 7, 8, 9, 10, 11 are excellently well matched.

In two instances the individuals are separated by three types (1st and 2nd pairs).

In three instances the individuals are separated by two types (3rd, 4th, and 5th pairs).

In three instances the individuals are of adjacent types (8th, 10th, and 11th pairs).

In three instances the individuals are of the same type (6th, 7th, and 9th pairs).

A particularly suggestive fact is that pairs Nos. 7, 8, 10 should have matched so well, seeing that they were all taken

* The three pairs 7, 8, 10 were taken within a few yards of each other at the same time and date.

together. Instead of ♂ 10 uniting with either of the ♀♀ 7 or 8, he was *in coitû* with the one of the three which most nearly resembled himself.

It is obvious that my material is not enough to do more than suggest the interest that could be got from a large collection of hundreds of specimens made without prejudice, both of single specimens and of pairs *in coitû*. This species is an ideal one for such a collection, it is conspicuous and easily caught, it occurs in numbers in suitable open grassy places, and the pairs are easily seen *in coitû* on grass stems. Moreover, it is small, and yet well marked. Had we such a collection we could estimate mathematically the chances of one type pairing with its own rather than with another, according to the relative abundance of the different types; and then we should soon see whether the pairing was according to mathematical chances, or by selection.

In this connection it is interesting to note that on Bugalla Island on Jan. 14, 1912, specimens of every type were taken, and a single pair taken on that day was the worst matched of all my pairs!

This just shows how much we want a large amount of material from one locality. It may be said How can one moth select another of a pattern like itself? Even if it can see the pattern of its mate it does not know what its own pattern is like. It must be, if there is anything in the sexual selection amongst varieties, a problem of the same nature as Why does one individual know that another of the same species is its proper mate? It seems probable that the answer is, in the case of the little Syntomid we are discussing, that *scent* has much to do with it, and that variation in pattern is correlated with variation in scent. A lucky observation which I made on Bugalla Island, Oct. 25, 1912, has some bearing on this matter. A male moth, of the species we are discussing (*Epitoxis albicincta*), was sitting on a grass stem perfectly quiet and unconcerned, but a male *Acraea terpsichore*, L., form *ventura*, Hew., in a state of great sexual excitement, was endeavouring by every means in its power to effect coitus, frantically passing the tip of its abdomen round about the abdomen of the moth in every direction, and obviously trying to pair. Both these specimens

are exhibited in the box, the *Acraea* next to the Syntomid, in Type I. The obvious explanation is that the ♂ Syntomid, by chance, had a scent corresponding to that of the ♀ *Acraea*, and that the ♂ *Acraea* had made a bad mistake!

Dr. CHAPMAN observed that in view of nine of the eleven pairs exhibited it would seem that the darker ♂ ♂ selected the lighter ♀ ♀.

VARIOUS INSECTS MOSTLY FROM AFRICA.—Dr. CARPENTER also exhibited a case of miscellaneous insects and communicated the following notes upon them:—

Variety of *Acraea acerata*, Hew. (*vinidia*, Hew.).—At Jinja, in Usoga, I caught on the Kerinya peninsula, in Feb. 1911, a male of this species which very closely resembles the male of *Acraea viviana*, Staud. The dark tawny orange of the typical *acerata* is replaced by a shade of yellow almost identical with the colour of the male *viviana*.

Acraea mairessei, Auriv., very resistant to cyanide fumes.—The typically aposematic insects seem to have extraordinary powers of resistance, not only to damage inflicted by enemies, but to other harmful influences. A specimen of *Acraea mairessei* surprised me by being even more resistant than other Acraeines to the fumes of a cyanide bottle which knocked over other butterflies in a minute or two; this specimen, caught in Chagwe, Uganda, near Mpumu Hill, July 13, 1910, was very little the worse after half an hour in the bottle.

At a later date, on the Sesse Islands, I wanted to preserve a couple of pupae of *Planema consanguinea arenaria*, E. M. Sharpe. I put them in a cyanide bottle one night, and next morning they were still active. I repeated this the next night with the same result.

Amauris albimaculata, Butl.; scent-brand eaten out (by ants?).—A male specimen which had been caught at Jinja, Usoga, in the second half of August, 1910, was found by Prof. Poulton when it arrived at the Hope Dept. to have been damaged, probably by ants, in a very interesting way. The strongly odoriferous brand in the (left) wing had been neatly eaten out, and nothing else had been touched. Similar instances of this have been given in Proc. Ent. Soc., 1907, p. x, where Prof. Poulton describes a specimen of *Amauris*

egialea, Cram., sent by Mr. H. S. Gladstone from near Lagos, in which both scent-brands had been eaten out cleanly and neatly; and again in the Proceedings for 1912, p. xxxv, a specimen of *Am. niavius*, L., received from Mr. Lamborn, near Lagos, in which the same thing was shown. In a note to the first case was quoted a passage from Prof. Meldola (Ann. Mag. Nat. Hist., Dec. 1882, p. 425) in which he pointed out that the scent patches are *sexual* characters and have nothing to do with producing the general distastefulness.

Notes on three species of *Hesperidae* :—1. *Eretis perpaupera*, Holl.—A very small specimen of this was found at Jinja shortly after sunrise one morning on a leaf amongst grass. It was covered with dew drops, and in a curious attitude which one never sees when the species is alert. The fore-wings were held out at right-angles to the body, but the hind-wings were quite disconnected from them, and near to the body, so that there was a distinct gap left between the anterior margin of the hind-wing and the inner margin of the fore-wing.

2. *Baoris niveicornis*, Plötz.—Several *Hesperidae*, believed to be of this species, were caught at Jinja. The ♂ only is remarkable for having the upper surface of the antennae of a brilliant shining white, and so conspicuous are these in the field that on one occasion at least my attention was drawn to the butterfly by the gleaming white antennae.

Prof. Poulton suggests that this is an epigamic colour, since the brilliant white is only on the *upper* surface of the *male* antennae. It is interesting to compare with this the shining white fore-legs of the ♂ *Eretis perpaupera*, which are quite conspicuous when the butterfly settles.

3. *Leptalina lepeletieri*, Latr.—This dark-brown skipper is without markings save for two very conspicuous (in the cabinet) pearly white and sharply marked, narrow stripes, on the under surface of the hind-wing, running from base to hind-margin. The most conspicuous one passes through the centre of the wing, the other nearer the anal margin, along which is a little of the same colour. This species I found at Jinja amongst long grass; its resting attitude was vertically on a stem, head upwards, so that the silvery

lines not only broke up the uniform ground-colour, but themselves harmonised with the dry silvery stems of the grass.

The Lymantriid *Laelia niobe*, Weym. (*thompsoni*, Druce).—This fine species I reared for the first time from larvae found on Damba Island and later on Bugalla Island. At the close of my stay on Bugalla I found alarva like those previously found, but it pupated while still quite small, and to my astonishment the moth was totally different from the former imagines. I put the case down, at the time, as one of synaposematic resemblance between larvae; but, when I examined the specimens at Oxford this summer, I found that all the large specimens which I bred first were *females*, and the little, very different, form from the same type of larva was a *male*. So that it seems that *Laelia niobe* is very markedly sexually dimorphic. I suggest that perhaps the female has been influenced by the extraordinarily abundant and conspicuous Syntomid moth *Meganaelia sippia*, Plötz, and that it is perhaps synaposematic with it. Descriptions of this, and many other new larvae, are in course of preparation.

Resting attitude of *Antheua spurcata*, Walk. (*Notodontidae*).—A specimen was found resting on a leaf in full glare of the sun at Jinja on Jan. 2, 1911. The glistening yellow fore-wings were brought together over the back with their inner margins contiguous, but at the posterior end the darker yellow anal tuft of the body projected upwards between the hind-margins of the wings. The moth was very conspicuous and absolutely motionless.

Zygaenid moth mimicking *Acraea quirina*, F.—I show a specimen of a Zygaenid, *Staphylinochrous tenellula*, Holland, which with its thinly-scaled black-bordered red wings is an excellent mimic of *Acraea quirina*, F., with which it may be found in the forest, though I have sometimes seen the moth outside the forest flying over open grass land. The general appearance of the *Acraea* is particularly well brought out on the wing; the flight of the moth is the steady straight, rather laboured flight of many conspicuous moths.

The following cases illustrative of aposematic and procryptic coloration have been recorded in the October number of

“ Bedrock ” for this year, but I venture to bring them forward again as they are of some interest. First, aposemes.

Rhodogastria leucoptera, Hmps. (*Arctiidae*), found resting in an exposed position at Jinja, 1910. Its wings were of a pure, hard, shining white colour, but not very thickly scaled, so that, when they were brought together over the body of the moth, the abdomen, which was of a bright rose-pink, was distinctly visible. The thorax was pure white, spotted with black; the legs, which were freely displayed, were of the same bright rose as the abdomen. When the moth was disturbed, it separated its wings and spread out the legs so as to display the bright pink (a typical aposeme), and emitted from the thorax just behind the head a copious yellow froth, till a mass of yellow bubbles with a very strong acrid odour (and, I may add, taste) projected on each side. Such frothing is a very common method of defence by aposematic insects. The abundant and very conspicuous Hypsid moth, *pactolicus*, gives out the same kind of froth when handled, and I have proved by offering it to moth-eating monkeys, that it is markedly distasteful, for they would never eat it.

A very beautiful example was again afforded by a large grasshopper of the family *Acridiidae* (*Dictyophorus* (*Petasia*) *laticincta*, Walker). It was a very heavy-bodied, slowly moving species of dull leaden-black colour, with very small tegmina and small incompletely covered wings of reddish colour; its large and fat abdomen had red marks on the sides.

One constantly sees this insect crawling slowly and heavily over grassland, and it is extremely conspicuous. It makes no attempt to get out of the way, and only feebly hops an inch or so if much interfered with. In short, it has all the characteristics of a typically protected insect.

In order to test whether it was really distasteful, I put one down in front of three young pet monkeys, who were constantly fed on grasshoppers, so that they would expect it to be good to eat, as they were accustomed to being given only edible grasshoppers and always got greatly excited when the box was produced. In this case, however, instead of at once snatching it, biting its head off, and then devouring it piecemeal, one of the monkeys caught hold of it and looked at it

with great interest; it was obviously something which it would be better to examine first. The monkey was a young one who had been in captivity from babyhood, so that it was highly probable that he had never seen anything like this before. While he held the grasshopper (which was of good size, being two inches long), it began to emit yellow, strongly smelling, acrid froth from the sides of the thorax, forcing it out by first distending the abdomen with air so as to show off the red markings on the sides, and then contracting the abdomen so strongly that the bubbles emerged from the thorax with a hissing sound audible several yards away. At the same time the red wings were prominently displayed.

The monkey was obviously very greatly interested in this very curious phenomenon, and tasted the froth. He clearly did not like it, but, as he could not believe that an insect given him by his master was not good to eat, he persisted in pulling it to pieces and tasting: eventually the dismembered insect lay on the ground. It was hardly possible to doubt from the monkey's behaviour that this conspicuous insect was highly distasteful, and that if he had been a wild monkey, able to select what food he would eat from out of a great abundance and had already met one of these markedly aposematic grasshoppers, he would not think it worth while to try another. The other two monkeys tasted and smelt at the remains, but would not eat them.

I now quote two examples of Procrystis. The first was a species of *Cirphis*, a Noctuid allied to our English *Leucania*, which adopted an unusual attitude when at rest. It was found at Jinja, in 1910, amongst tall dry grass. On the upper side the wings are light brown; below, however, they are of a beautiful light silvery grey. The meaning of this is at once obvious when the moth is seen in its natural environment, where it adopts an attitude quite foreign to that of the majority of Noctuids. It hangs from a dry flower-spike of tall grass, with the wings brought together face to face over its back so that they hang down showing only the silvery underside, and the effect agrees extraordinarily well with the silvery grass-head. I repeatedly saw it take up this attitude when it had

been disturbed and had flown away to one grass-head after another.

This brings out well the importance of seeing insects in their natural surroundings, for in this case a peculiarity in colouring is at once seen to be correlated with a marked departure from the attitude usually adopted by that particular group of moths.

A very wonderful example of procryptic resemblance brought out by attitude was afforded by a Notodontid moth which I found on a leaf on one of the islands in L. Victoria (*Scalimicauda niveiplaga*, Hmps. n.). Only a single specimen of this species has been recorded hitherto, namely the type in the British Museum. It had such a perfect resemblance to a dead and rolled-up leaf that I had to look again and again, and almost to touch it, before I could satisfy myself that it was really a moth.

The fore-wings, of a light brown colour, were closely brought together along the back, hiding the hind-wings, so that the two inner margins, of a slightly darker hue than the rest of the wing, came together along the middle line and represented the midrib of a leaf. The continuation of this into the petiole was represented by a large, upstanding, slightly curved tuft of long hairs projecting from the top of the head.

The front of the head was very dark brown and represented exactly the dark shadow of the interior of a tube of rolled-up leaf. Strange though it may seem, this was the most realistic factor in the whole resemblance, and that which made it most difficult to realise that one was looking at a moth and not at a dead leaf.

The fore-wings were light brown with several lines on them of a darker hue running out from the apparent midrib to represent veins on the leaf, and there were three doubly ringed markings resembling the marks made by the growth of minute fungi on dead leaves. Near the tip was an absolutely pure white small round spot which quite well represented a gap at the edge of a dead leaf with high light shining through.

The antennae and legs were so carefully packed away that they were quite invisible.

I think I have never been so completely puzzled by an

insect resembling a dead leaf as by this moth, and yet when it had been set, and was in the Hope Museum, Prof. Poulton was surprised to hear how much like a leaf it had been when alive.

Carabus violaceus, L., attacked and forsaken by an enemy.—This case was noted in "The Countryside" for June 24, 1905, but the date of the observation was previous to that, probably by several years.

I picked up, in the University Parks, at Oxford, a specimen of this beetle which had been badly mauled. The head had been removed at the junction with the thorax, and all the legs, except the right posterior one, had been removed at the base. The exception still had the femur attached to the body. The stumps of the legs were being vigorously moved. I took the specimen home, and it lived for three weeks and three days from the date on which I found it, being able to move the leg stumps up to the end of that time.

If this injury was due to an enemy, and not to mischief by some child, it illustrates remarkably the distastefulness of this beetle, which had been forsaken after many repeated tastings, and also the vitality which is such a characteristic feature of protected insects.

Sphegidae and *Pompilidae*, a remarkable difference in the methods adopted for filling up their burrows.—The very first Fossors which I observed were a Sphegid, *Ammophila hirsuta* (*viatica*, Sm.), Scop., and a Pompilid, *Pompilus viaticus*, L., at Bordighera on the Italian Riviera, in the early spring of 1899. The point I wish to emphasise is this: after the burrow has been stocked it has to be filled up. When it was necessary to ram the loose earth down, the Sphegid used its head; holding on to the sides of the burrow with all its legs it launched itself down against the loose earth, using the broad flat anterior surface of the head as a battering ram. The Pompilid, on the other hand, sat quietly over the hole, and rammed the loose earth down with the end of its abdomen. Since this remarkable difference was only seen in a single specimen of each, I was much interested when out in Uganda to be able to confirm it by observations on other species. *Sphex marginatus*, Smith, uses its head as does the other species

alluded to. *Pompilus bretoni*, Gués., however, employs its abdomen like *Pompilus viaticus*, and a species of *Salius* did the same. The *Salius*, however, showed another difference. All the other fossors which I have seen at work filled up the burrow by standing an inch or so away and scratching a shower of sand backwards in a continuous stream beneath the body; varying this by carrying small stones, etc., in their mandibles and ramming them in. *Salius*, however, adopted a much lazier method. It stood with its abdomen inside the burrow, and head and fore-legs projecting outwards, and simply reached to it armfuls of the loose earth with its front limbs, which was then rammed down with the end of the abdomen as indicated.

It would be extremely interesting to know if other observers have noted this striking difference between Pompilids and Sphegids in methods of doing the same thing.

On one occasion, when watching *Ammophila hirsuta* (Scop.) at work at Bordighera in 1899, I by chance observed a very remarkable fact which is I believe unique. This species stores up a single caterpillar of species of *Noctuidae*, which it finds among the bases of grass stems in March when it hunts. I repeatedly saw it bringing to, and burying in its hole, these caterpillars. On one occasion when the egg had been laid as usual upon the 6th segment and the wasp was filling up the hole I frightened it away and brought out the larva, leaving it at the mouth of the hole. When the wasp came back and found the larva lying there it examined it and seemed puzzled, and then deliberately sucked the contents of the egg dry (I watched it shrivel!) and deposited another in its place.

This is a curious fact and suggests that the wasp's instinct led it to destroy the egg, which might well have been that of a species of indirect parasite whose larva would devour the food stored up for the wasp larva. I do not for one moment suggest that the wasp recognised the egg as such, otherwise it might equally well have known that it was its *own* egg!

A VERY RARE ANT.—Mr. DONISTHORPE exhibited ♂♂, winged ♀♀ and a deãlated ♀ and ♂♂ of *Solenopsis fugax*, Latr., taken at Blackgang, Isle of Wight, on Aug. 26, 1913. He mentioned that the colony was a very large one, and was not in connection with a nest of any other ant. The late Mr. Dale

appeared to be the only other person who had found the winged forms in this country. The ♂♂ and ♀♀ are much larger than the ♀♀, the latter being our smallest British ant. It is very rare and local in Britain, having only occurred at Deal, Southend, the Isle of Wight, and Portland.

ABERRATION OF PYRAMEIS INDICA.—MR. E. E. GREEN exhibited an aberrant example of *Pyrameis (Vanessa) indica*, Herbst, from Ceylon. He remarked that the aberration was apparently caused by a sudden change of temperature at the critical period of pupation. A few full-fed larvae had been sent from Nuera Eliya (alt. 6,500 ft.) to Peradeniya (alt. 1,500 ft.), where they immediately pupated; of three specimens that emerged successfully, one was normal, while the other two had assumed the coloration of the example now exhibited. Though *P. indica* occurs in the plains, on the Indian continent, it is found only in the hills, in Ceylon. Its food-plant—the giant Nilgiri nettle—is more or less confined to the mountain region of Ceylon, though Trimen has recorded its occurrence at considerably lower elevations. This particular aberration of the butterfly has been figured in a recent number of “*Spolia Zeylanica*.”

CORYDALIS ORIENTALIS, McLACH.—COMM. J. J. WALKER exhibited a ♀ specimen of the gigantic Neuropteran, *Corydalis orientalis*, McLach., taken by a native collector at Chuchow, Chekiang Province, S.E. China, May 1913, and forwarded to the exhibitor by C. T. Bowring, Esq., F.E.S., of Wenchow. The species was described in *Trans. Ent. Soc.*, 1899, pp. 281–3, plate ix, from a single mutilated specimen taken at Chia-tung-fu, W. China, by one of the late Mr. Leech’s collectors. Species of *Corydalis* are numerous in North America, but only three (*C. asiatica*, Wood-Mason, from the Naga Hills, *C. orientalis*, McLach., and a doubtful species from Assam) have been recorded from the Old World.

ABERRANT AND HYBRID HETEROCERA.—MR. L. W. NEWMAN exhibited the following Heterocera:—

(1) *Calymnia (Cosmia) trapezina*. A melanic ♀, the whole of the fore-wings very dark brown, with white transverse lines; a worn specimen taken at sugar in Bexley Woods.

(2) *Zonosoma (Ephyra) annulata* and *pendularia*; a long

and very varied series of both species, being picked forms from several thousands bred from ova. The specimens showed extreme light, dark, and intermediate forms and there was one very pink *Z. pendularia*.

(3) A series of Hybrid *Z. pendularia* ♀ and *annulata* ♂; specimens showing the markings of *pendularia* most pronounced and the coloration of *annulata* prominent.

Papers.

The following papers were read :—

“New or little-known *Heterocera* from Madagascar,” by Sir G. H. KENRICK, Bart., F.E.S.

“The *Culicidae* of Australia,” by FRANK H. TAYLOR, F.E.S.

“Descriptions of New Species of *Staphylinidae* from India,” by MALCOLM CAMERON, M.B., R.N., F.E.S.

“*Pseudacraea eurytus hobleyi*, Neave, and its models on Bugalla Island, Lake Victoria, with other members of the same combination,” by G. D. H. CARPENTER, B.A., M.D., F.E.S.

“*Pseudacraea boisduvali*, Doubl., and its models, with special reference to Bugalla Island,” by the same.

“The inheritance of small variations in the pattern of *Papilio dardanus*, Brown,” by the same.

The following is an abstract of these three papers on the bionomics of butterflies on Bugalla Island, L. Victoria.

The materials on which these papers are based was collected during 1912 and Jan.–Feb. 1913, on Bugalla Island, in the Sesse Archipelago in the N.W. corner of the great L. Victoria, about 25 miles S.W. of Entebbe, and a few miles S. of the equator, where I was working for the Royal Society’s Sleeping Sickness commission. The specimens have all been presented to the Hope Department of the Oxford University Museum. The work has been done during the summer of this year while I was home on leave.

The first paper deals with the great *Planema-Pseudacraea* combination, and with other members of the same mimetic association, and a full description is given, for the first time, of all the varieties of *Pseudacraea eurytus*, Linn., so abundant on the island. The material on which it is based was collected,

as it came, without prejudice, and gives a fair idea of the relative abundance of the various forms.

The second paper was written with the idea of pointing out the great interest of the forms of *Pseudacraea boisduvali* on the island. This involved a careful study of all the specimens in the Hope Department, and, through the kindness of Mr. Roland Trimen, I was able to see his fine series. The Island forms are of the very greatest interest.

The third paper is to be considered somewhat as a reply to a recent statement by Prof. Punnett that in no case has it been clearly shown that small and unimportant variations are inherited. It is based on the *hippocoon* form of female of *P. dardanus*, and it is shown, by measurement of a particular spot (not one of the most important details in the mimetic likeness) that the pattern of a parent can influence a particular part of a different pattern in the offspring. A very large number of specimens was examined—all that exist in the Hope Department, together with a few of Mr. Roland Trimen's from a locality poorly represented at Oxford.

Wednesday, November 19th, 1913.

Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the chair.

Wicken Fen.

Arising out of the Minutes, it was announced that the Council had decided to make an annual grant of two guineas towards the maintenance of Wicken Fen.

Election of Fellows.

The following gentlemen were elected Fellows of the Society :—Messrs. B. G. ADAMS, 15 Fernshaw Road, Chelsea; BARNARD ORMISTON DICKINSON, B.A., 57 Castelnau, Barnes, S.W.; ALFRED OLIVER ROWDEN, 3 Archibald Road, Exeter; OSCAR WHITTAKER, Ormidale, Ashlands, Ashton-upon-Mersey, Cheshire.

Nomination of Officers and Council.

The following Fellows were nominated by the Council as Officers and Council for next year:—*President*, Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S.; *Treasurer*, Mr. A. H. JONES; *Secretaries*, Commander J. J. WALKER, M.A., R.N., F.L.S., and Rev. G. WHEELER, M.A., F.Z.S.; *Librarian*, Mr. G. C. CHAMPION, A.L.S., F.Z.S.; *Other Members of the Council*, Messrs. E. A. BUTLER, B.A., B.Sc., J. E. COLLIN, S. EDWARDS, Dr. H. ELTRINGHAM, M.A., D.Sc., F.L.S., Messrs. C. J. GAHAN, M.A., A. E. GIBBS, F.L.S., F.Z.S., E. E. GREEN, G. MEADE-WALDO, M.A., Dr. G. W. NICHOLSON, M.A., M.D., Hon. N. C. ROTHSCHILD, M.A., F.L.S., F.Z.S., Messrs. H. ROWLAND-BROWN, M.A., and C. J. WAINWRIGHT.

Exhibitions.

SPANISH RHOPALOCERA.—Mr. A. H. JONES, in exhibiting specimens of both sexes of *Plebeius zephyrus*, var. *hesperica*, taken by him in June last at Albarracin, in Spain, remarked that this variety is hardly known in British collections. The butterfly is extremely local, and although specimens may be taken sporadically, it occurs chiefly among its food-plant, *Astragalus aragonensis*, or in its immediate vicinity. The size of the butterfly is smaller than *P. zephyrus*, var. *lycidas*, and the colour more resembles the blue, but perhaps not so bright, of *Polyommatus hylas*. The underside differs very little from that of *lycidas*. *P. zephyrus*, type, and var. *lycidas* were also exhibited for comparison. The larvae of the latter, as is well known, feeds on *Astragalus exocarpus*. Mr. Jones exhibited, also from Albarracin, in Spain, *Melitaea desfontainii*, var. *boetica*, Rbr., the Spanish form of *M. desfontainii*, Godt. (an Algerian butterfly): both sexes were exhibited. The butterfly is locally abundant, frequenting the hot dried-up watercourses, but probably the larvae feed on some plant on the hills beyond. Fresh specimens are extremely beautiful. The species is quite distinct from *M. aurinia*, but forms of that species and its var. *iberica* were also shown for comparison.

AN ABNORMAL PAIRING.—Mr. E. E. GREEN exhibited two Pierid butterflies, of distinct genera, taken *in coitâ* at Aripu,

Ceylon. Copulation had been so complete that the two insects remained in the same position after death. It was possible that the structural differences in the sexual organs, while permitting the act of copulation, might have hindered the separation of the parts. The abnormal pair consists of *Appias libythea*, Fab., ♂, and *Teracolus limbatus*, Butl., ♀.

Dr. DIXEY, the Rev. G. WHEELER, and Dr. M. CAMERON commented on this exhibit, giving further instances of abnormal pairing.

VARIATION IN *HELICONIUS DORIS*, L.—Mr. W. J. KAYE exhibited a large and very variable series of *Heliconius doris*, L. He said that the species had always been an interesting one by reason of its curious phase of variation, which was usually one of dimorphism in both sexes. Both ♂ and ♀ were either blue or red-streaked in the hind-wing. In some localities, however, the red area was reduced or enlarged, but the blue form not only underwent this variation, but also became pale blue, bluish-green and green, such as was found in the region of Chiriqui in Panama. In the Cauca Valley in Colombia a very special phase of variation was found rarely, with both blue and red forms devoid of the large central yellow blotch, but occurring with normally blotched forms. In the San Esteban Valley in North Venezuela there occurred one of the rarest forms, that with the central blotch white. This phase occurred in both red and blue forms, but the former was considerably rarer, although both were very scarce. Occurring rarely in a number of localities, such as Venezuela, Colombia, Ecuador, Guiana, C. Brazil, was a form known as *amathusia*, where the blue and red streaking was mixed in varying degrees. The red form known as *delila*, which exhibited a large amount of red at the base of the fore-wing extending into the cell, was only found when other species of *Heliconius* had this characteristic such as in the Guianas, where *H. xanthocles*, *H. aede astydamia* and *H. burneyi catharinae* all occurred together. The specimens exhibited were divided into the localities from whence they came, and included from British Guiana typical *doris* and *delila*; from Trinidad *doris* and *eratonia*; from Cauca Valley, Colombia, *eratonia*, *obscura*, *tecta*, *metharmina*, *aristomache*;

from C. Brazil a form of *amathusia* which was shortly blue-streaked with a few narrow red streaks through it; from Chiriqui the forms *viridis*, *luminosa*, *transiens*, and from the San Esteban Valley, N.W. Venezuela, a white blotched form of *eratonia* for which he proposed the name *suavior*, and a white blotched form of *metharmina* for which he proposed the name *fascinator*. Many other examples were exhibited from different localities. Mr. Kaye considered it was only confusing to say, as Riffarth and Stichel had done, that many of these forms split up into subspecies; while in several cases the statements could not be accepted as true. The form *tecta* was considered by them a form of the subspecies *H. doris viridis*, while *obscura* was treated as a form of the subspecies *H. doris doris*, yet both of these forms occurred together at Jimenez in W. Colombia at an elevation of 1,600 ft. Again, the form *aristomache* could not be regarded as a subspecies as it graded into typical *doris* in the localities where it was found, and similarly *transiens* graded into *eratonia*, and the forms were not geographically separated, although tending to become so.

MIMICRY (?) IN EREBIAS.—DR. CHAPMAN exhibited some *Erebias*, on which he made the following observations :—

At Le Lautaret in Dauphiny last July I captured some *Erebias*, and Mr. H. J. Turner has handed me some taken by him at Karer See in Tyrol. These specimens have reminded me of a communication to this Society by Mr. Tutt on November 4, 1896, and one by myself to the E. M. M. of May 1901. These various observations seem worth bringing together, as they show that at Lautaret *Erebia melampus* and *E. ceto* assume forms very closely resembling *Erebia pharte* as it occurs there, and that at Guarda (Lower Engadine) and at Karer See the same species is closely copied by *Erebia manto*. *E. pharte* is involved in each instance, being closely approached at Le Lautaret by both *E. melampus* and *E. ceto* and in the two other localities by *E. manto*.

I have no facts to enable me to say that this is a case of mimicry of any sort, though it looks very like it, or whether it may be due to some influence climatic or other that produces a resemblance between all the species that may be

called " Grass " *Erebias* (a definition we owe, I think, to Mrs. Nicholl) when they occur at a high level.

The specimens exhibited are such that they will no doubt be recognised by Fellows who have done any collecting in Switzerland at over 5,000 ft. as very usual, and I believe there are sundry varietal names to which they are entitled. It is not the actual forms, but their association that claims attention.

When the resemblance between *melampus* and *pharte* at Le Lautaret attracted Mr. Tutt's attention in 1896, he thought that it signified that the two species were there connected by intermediate links that showed they were one species. On examining these species for my communication to the Society in 1898, I found nothing in Mr. Tutt's collection to substantiate this view, but merely that specimens of each species closely approached the other in appearance. I have not unfortunately any of Mr. Tutt's most illustrative specimens, and I did not pay enough attention to these species last summer to meet with such intermediate forms, but those I exhibit show a considerable approach between the two forms, and I must refer to Mr. Tutt's observations in proof that these do not show so much in this direction as they might.

It will be noticed, however, that the general appearance of the two species is very close, and that the two rows (one of each) that I exhibit have a very close general aspect, that differs considerably from the equally close general aspect of the two rows (of *pharte* and *manto*) from Guarda. I have placed between the two rows of *pharte*, a row of the species from Carinthia, much brighter and more richly marked than the species usually presents in Switzerland, but the ordinary *pharte* of Switzerland does differ from the special forms exhibited, somewhat in this direction. It is perhaps apposite to add that this form of *pharte* was accompanied by an equally bright form of *eriphyle* on the Koralp. This summer at Le Lautaret I also found specimens of *ceto* of a size and colouring that made them indistinguishable from *pharte* and *melampus* until caught; I exhibit five of these specimens in contrast with *ceto* from a lower level.

I may add that I think *epiphron* ought to be added to this group (as also to the Guarda set) as another member,

though I do not happen to have enough specimens to feel sure of this; it certainly flew with the others, and was not usually recognised until captured.

On turning to the Guarda group (really Val Tuoi, 6,000 ft. and upwards) the general coloration here has a distinctly sooty-black tone, such as culminates in the nearly black var. of *manto*, named *caecilia*, which contrasts with the redder brown-black of the Le Lautaret series. I have added several lower level *manto* for comparison. Mr. Turner's *manto* from Karer Pass are, again, of a more ruddy form.

The change from what I regard as a normal form in all these races, is in smaller size, darker colour and diminution of the rusty spots and bands. Assuming this to be for some reason an effect of high level, it will hardly account for the change having the same amount and direction in the several species at each locality, but not identical with the change at another station. There is obviously a tendency for each species, whilst undergoing this change, to approach its neighbours that are undergoing a similar alteration.

What I have said perhaps implies that *pharte* is constant and that the other species approach it, but the movement by *pharte* is really quite as great as by *manto*, *melampus* or *ceto*. *E. melampus* occurred at Guarda more or less with the *pharte* and *manto*, but preserved its own facies there, differing altogether from the *pharte-manto* combination, but varying to a form without any black spots in the rusty band. This band, however, remained quite bright and clear, wholly unlike its greater or less obsolescence in *pharte* and *manto*. I might perhaps add that these two species were fairly common and always together in about equal proportions.

It seems very desirable that considerable series of these species should be taken at localities where they occur together. I anticipate that such concomitant variation as my exhibit shows, would be found to be not uncommon.

Prof. POULTON observed that he saw no other solution so probable as that of mimicry, and that though the bird population was now small it may have been greatly reduced by man, birds on the Continent not enjoying the protection now extended to them in England.

Mr. H. ROWLAND-BROWN said that in Cantal the resemblance between *E. melampus* and *E. epiphron* was so close that they were difficult to separate.

Mr. H. J. TURNER remarked on the close resemblance at Mürren between the *Erebias manto*, *stygne*, *oeme* and *medusa*, and at Cortina between *E. pronoe* and *E. euryale*, var. *ocellaris*.

The Rev. G. WHEELER also spoke of the close resemblance at Mürren between *E. manto* and *E. oeme*, the nearly black forms *caecilia* of the former and *lugens* of the latter being predominant. He observed that this was the more remarkable in that these were generally high mountain forms, whilst at Mürren, and even above in the Blumenthal, *Lycaena arion* showed no tendency towards *obscura* nor *Chrysophanus hippothoë* towards *eurybia*. He could only state the facts, not account for them.

The PRESIDENT observed that in the Sefinenthal, near Mürren, but not in the direction of the Blumenthal, *L. arion* does tend to the *obscura* form.

Prof. POULTON suggested that perhaps in such associations as those of the *Erebias* exhibited, those specimens which did not conform to the general pattern might be more conspicuous, and consequently more apt to be weeded out.

PIERIDS AND THEIR SCENT-SCALES.—Dr. F. A. DIXEY exhibited a drawer containing specimens of the genus *Pieris*, with drawings of their scent-scales, and remarked on them as follows :—

Dr. A. G. Butler, writing in the Annals and Magazine of Natural History, 7th series, vol. ii, 1898, p. 17, divides the genus *Pieris*, Boisd., into four groups or sections, the first three of which are represented by *P. demophile*, Clerck, *P. viardi*, Boisd., and *P. phileta*, Fabr., respectively. With these three sections I do not propose to deal, further than to say that they are no doubt closely allied to each other, and to certain other American species such as *P. pyrrha*, Fabr., *P. malenka*, Hew., *P. lorena*, Hew., and *P. lypera*, Koll., which have sometimes, I think erroneously, been included in the genus *Mylothris*. The fourth of Dr. Butler's groups, which may be called the *P. buniae* section, stands well apart from the others. All the males, as Butler observes, exhibit well-

developed patches and streaks of thickened scaling on the wings. When a scraping from these streaks is examined microscopically, it is seen to consist almost entirely of peculiarly-shaped scent-scales, somewhat resembling those of the genera *Huphina* and *Delias*, and quite distinct from the scent-scales of the other three groups of *Pieris*. There are specific differences between these scent-scales which are often of service in the determination of specimens. I propose to offer a few remarks on some members of this *buniae* group, and especially on some captures lately made in Venezuela by Dr. G. B. Longstaff.

About *P. buniae*, Hübn., there is little doubt or difficulty. It is a large form from Brazil, white with a black apex and posterior margin, more or less indented internally, on the fore-wing; a dark spot, sometimes double, at the end of the cell on the under surface of the hind-wing; and a black discoidal spot, larger in the female, on both surfaces of the fore-wing. The hind-wing in the female usually bears dark marginal spots. The scent-scales are long, narrow and tapering, with rounded base and small accessory disc. They vary slightly in size and shape. Those from the hind-wing are shorter and broader than those from the fore-wing. The species is well represented in the Burchell Collection at Oxford, and both sexes are adequately figured in Seitz's "Macrolepidoptera."

P. ausia was described by Boisduval from specimens captured in the environs of Pernambuco, *i. e.* the coast region of the extreme east of the South American Continent. The male and female from the Hope Collection agree well with Boisduval's description. The extent of the apical dark area of the fore-wing is in both sexes less than in *P. buniae*, and the female has a dark curved band passing from the costa over the distal end of the discoidal cell. Seitz's account of *P. ausia* differs in some respects from the above and from Boisduval's description. He does not figure the species. The scent-scales closely resemble those of *P. buniae*, but are on an average slightly narrower.

P. phaloe, Godt., is widely distributed in the north-east of S. America, including the island of Trinidad. Its locality

is given by Godart simply as "Brazil." It is nearly allied to the two preceding species, but easily distinguishable from them by the parallel dark markings on the underside of the hind-wing, which are specially interesting as affording material for an incipient mimetic pattern. The posterior of the two bands is clearly homologous with the dark spots at the end of the cell in *P. buniae* and *P. ausia*. The scent-scales of *P. phaloe* are very much like those of *P. buniae* and *P. ausia* in size and shape, but can usually be distinguished by the attenuated distal portion, of which the sides are parallel instead of tapering. As in *P. ausia* the scent-scales tend to be somewhat narrower than in *P. buniae*.

The three preceding species are, I think, all very closely related. The next species to be mentioned, though certainly belonging to the same section of *Pieris*, stands a little apart from the first three. This is the form described by Felder from the Bogota district as *P. diana*. It is not unlike *P. buniae* in general appearance, but has the dark apex of the fore-wing generally narrower. It also differs in shape from that insect, the apex being more pointed, the hind border of the fore-wing being slightly concave, and the anal angle of the hind-wing somewhat prolonged. The scent-scales, though of the same elongated kite-like character as those of the three preceding species, are considerably shorter.

Closely allied to *P. diana* is *P. sevata*, described by Felder from Venezuela. As to this form there is some degree of doubt. There is a specimen (♂) in the Collection of the British Museum which is presumably a co-type. It came through Messrs. Godman and Salvin from the Kaden Collection, and bears on a manuscript label "*sevata*, Mz." (*i. e.* Moritz) and the locality note "Venez." (Venezuela). No female specimen is assigned to *P. sevata* in the British Museum Collection, but there is another Kaden *Pieris* from the Godman-Salvin series which, though unplaced as such, must I think be a female *sevata*. It corresponds well with the description of the female given by Felder. Under the subspecific heading *P. sincera*, Weym., are two males and a female from Venezuela which bear on pin labels "*P. sevata*, Felder." These I am inclined to refer, not to *P. sevata*, but to another species to be mentioned shortly.

On Jan. 11, 1913, Dr. G. B. Longstaff captured at a height of about 1,000 ft., between Curatici and Zigzag, Venezuela, five individuals, two males and three females, all of which belong to this section of the genus *Pieris*. I have no doubt that the two males are Felder's *P. sevata*. They answer perfectly to the description, and correspond closely with the Kaden ♂ in the British Museum. With regard to the females I do not feel so certain, but I think that at least one of them, that numbered by Dr. Longstaff 451, is the female of *P. sevata*. The female numbered 433 is more problematical. It corresponds well in size and shape with *P. sevata*, but is strikingly deficient in the dark markings of the upper surface. The scent-scales of Dr. Longstaff's two males are like those of *P. diana*, being of about the same length, but slightly narrower.

On March 29, 1907, Dr. Longstaff took in the same locality as the preceding a male *Pieris*, which is well figured on Plate III, figs. 1, 2, of his book entitled "Butterfly Hunting in Many Lands." On page 320 of the same work he mentions the circumstances of its capture, and cites my opinion that it is "near *P. sevata*, Feld., and appears to be identical with three specimens from Venezuela placed in the National Collection under *P. sincera*, Weymer, but which might well be considered as a distinct species, or at any rate local race." These three specimens are those referred to above, p. cxii. I have no doubt whatever that Dr. Longstaff's specimen (numbered 1927) is quite distinct from *P. sevata* as represented by the two males captured on Jan. 11, 1913. It is smaller, differs somewhat in shape, and has a well-marked dark spot at the end of the cell on the underside of the hind-wing, the males referred to *P. sevata* being immaculate beneath. All these points are such as might characterise seasonal phases of the same species, but what really differentiates the present form from the authentic *P. sevata* is the distribution and character of the scent-scales. In *P. sevata* ♂, the mealy streaks formed by the scent-scales on the upper surface of the fore-wing fuse along the inner or posterior side of the median vein between the internal vein and the first median branch; in the present species there is no such fusion, and the clear area of the

interno-median interspace reaches right up to the trunk of the median vein itself. This condition is accurately reproduced in Dr. Longstaff's figure. Besides this distinction, there is a well-marked difference in the scent-scales themselves. Those of *P. sevata* are, as already noticed, comparatively short. Those of the present form are more than half as long again as those of *P. sevata*, and considerably longer than those of *P. buniae*, *P. ausia* and *P. phaloe*. They are, moreover, of a different shape from those of the rest, the tapering from base to apex being much more gradual.

A female captured by Dr. Longstaff at the same time and place as the four *P. sevata* already mentioned (Jan. 11, 1913) must, I think, be referred to the present form and not to *P. sevata*. It corresponds with the male in size and shape, and has, like that sex, a well-marked dark spot at the end of the cell on the underside of the hind-wing, just anterior to the third median branch. The present form may be a subspecies of *P. sincera*, described by Weymer from a male specimen captured on the sea-level at Guayaquil, Ecuador. It differs, however, from Weymer's figure and description in some particulars.

Another species of this section of *Pieris*, at present undescribed, is represented in the Hope Collection by a male and two females from Lower California. This species is much smaller than the other members of the *buniae* section, and differs considerably from them in aspect, especially by the greyish-brown shading of the underside. Its scent-scales are very nearly the longest known to me. They are of like character with those of the last species (from Venezuela), but are appreciably longer.

The nearest relatives of this Lower Californian species appear to be *P. amaryllis*, Fabr., from Jamaica, and *P. josepha*, Godm. and Salv., from Central America. *P. josepha*, though a much larger insect, resembles it in general appearance and in the character of its scent-scales. The latter are actually the longest known to me in this genus, being more than half a millimetre in length, and easily visible to the naked eye. They are only exceeded in length, so far as I am aware, by those of two or three species of the genus *Huphina*.

There are other members of the present section of *Pieris*, but those that I have mentioned are the only ones that I have been able to submit to microscopic examination. *Pieris limona*, recently described by Schaus from Costa Rica (Proc. Zool. Soc. Lond., 1913, p. 356, Plate LII, fig. 5) appears to be a Central American representative of *P. buniae* or *P. diana*.

THE METHOD BY WHICH FLEAS INFECT WITH PLAGUE.—Mr. A. BACOT exhibited slides showing the development of Plague bacilli in the alimentary canal of the Flea, and the method of infection through the mouth, and read the following paper:—

The conclusion that fleas are the responsible agents in the transmission of Bubonic Plague from animal to animal, first arrived at on epidemiological grounds by Ogata (1897), Simond (1898), Ashburton Thompson (1900), and Liston (1905), has received abundant proof at the hands of later workers, among whom may be named Gauthier and Raybaud (1902-3), Verbitzki (1904), and the Commission for the Investigation of Plague in India (1906-7). Simond's initiatory experiments in flea infection have been confirmed by an overwhelming weight of testimony.

It was found that the bacilli multiplied freely in the stomach of the flea, but the exact method of infection was left in some doubt. In the absence of any definite proof of transmission through the mouth, the general consensus of opinion tended to the view that plague bacilli, voided by the flea with its faeces, came in contact with punctures made by fleas, or found entrance through abrasions in the skin caused by the animal scratching itself.

Experiments undertaken by Dr. Martin and myself, with a view to testing the possibility of mouth infection, were performed with specimens of *Ceratophyllus fasciatus* and *Xenopsylla cheopis* under conditions that precluded the possibility of infection by the fleas' dejecta. The results satisfactorily establish the fact that mouth infection does occur, and suggest the conclusion that it is not only a possible, but perhaps the general, method by which the disease is spread.

It is not necessary for me to describe our experiments and methods in detail, as an account will shortly be available in

the Journal of Hygiene, but I wish to bring to your notice how the development of *Bacillus pestis* in the alimentary system of the flea causes it to convey infection through its mouth. The alimentary system of the flea includes a long sharp tubular pricker formed by the opposition of the mandibles and epipharynx, through this tube the blood is drawn, owing to the action of a powerful pump in the head of the flea. From the pump the blood passes along the oesophagus, a narrow but *elastic* tube, to the proventriculus or gizzard on its way to the stomach. The proventriculus when at rest is shaped very much like a tangerine orange; internally it is armed with a series of rings of slender curved chitinous spines; externally it has a series of hoops or belts of muscles. Normally this organ forms an efficient valve, owing to the constriction of the muscular bands narrowing and elongating the organ, and causing the spines to meet in the centre.

After a meal of infected blood, the ingested bacilli become the starting-points of colonies which increase in size until they cause the stomach contents to be of a lumpy nature, and finally the stomach may be completely filled with a solid mass of plague culture, which can be removed on dissection like jelly from a mould. At the same time the bacteria also multiply among the spines of the proventriculus, clogging its action and blocking the passage to the stomach. The pumping apparatus is, however, still efficient, and further feeding not only tends to distend the proventriculus, but the oesophagus as well, the blood in the latter being under pressure in an *elastic* tube. The bacteria develop in this fresh blood where it comes into contact with the obstructing mass of plague culture, and the possibility of the flea regurgitating a blood culture of *Bacillus pestis* into the next wound it makes is brought about.

In some instances continued efforts on the part of the flea enable it to get some blood past the stoppage, but in many instances the mass of bacteria develops forward into the oesophagus, forming a solid cone in front of the entrance to the proventriculus; in this case the flea's efforts are in vain. Meanwhile the jelly-like mass in the stomach gradually disintegrates and passes out of the flea, as the supply of nutriment for the bacteria becomes exhausted.

Fleas in this condition, unable to satisfy the cravings of an empty stomach, are most persistent in their efforts to obtain food, and lose much of their accustomed shyness. In two instances fleas in this blocked condition were fed on a shaved area on eight rats in succession, and in one instance on twelve. Two minutes was the time allowed on each rat, and in some instances so eager were the fleas that they would make a second attempt before they could be removed. In one experiment three out of nine rats on which two blocked specimens of *X. cheopis* had been fed in succession died of pest, and in a similar experiment with *C. fasciatus* the two fleas were responsible for the death of three rats out of nine.

This stoppage of the alimentary canal does not apparently necessitate the death of the flea if the block is only in the proventriculus. We have among our sections some which show the process of the clearance of an old block and the formation of a new one in its several stages. It seems questionable, however, if the flea can survive long enough without food for the plug to disintegrate if it forms a solid cone in the distended oesophagus, such as is exhibited in some of the specimens I have to show.

Blocked fleas have been observed by us to emit a minute droplet of blood from the base of the pricker while feeding, and from its tip at the moment of removal from the skin, and our sections show that blood remaining in the oesophagus and pharynx is heavily infected.

Dr. JORDAN, commenting on this very important paper, observed that it proved conclusively that infection was through the mouth of the flea, and not, as he had previously thought, through the faeces.

A CURIOUS LARVAL HABIT.—Dr. K. JORDAN exhibited some specimens of a lepidopterous larva which is most remarkable for its adaptation in habits and colour. The specimens were discovered by the Rev. A. Miles Moss, F.E.S., who is chaplain of the English Church at Pará and a most ardent observer of Lepidoptera, having bred and painted, both at Pará and in Peru, many hitherto unknown larvae of butterflies and moths, particularly *Papilionidae*, *Sphingidae* and *Saturniidae*. When collecting near Pará a Saturniid caterpillar with black

intersegmental bands and long branched spines, a species of *Automeris*, he noticed that some of the black bands appeared to be swollen. To his amazement these swellings, when touched, quickly slid over the back of the caterpillar to the other side with the hurried motion of a Pyralid larva, and indeed turned out to be small lepidopterous larvae as black and glossy as the bands of the *Automeris* caterpillar. Mr. Moss found it very difficult to catch these larvae with the forceps on account of the swiftness with which they rushed from one side of the host to the other. They are well protected by their colour as well as the long spines of the *Automeris*. It is to be hoped that Mr. Moss will succeed in obtaining more explicit information about this curious larva and in breeding the moth.

Instructions for exhibiting specimens in the Epidiascope.

The Rev. G. WHEELER explained to Fellows that the Epidiascope, by means of which the last two exhibits had been made, would not throw on to the screen anything of greater size than an ellipse of 11 ins. by 8 ins., and further, that, in consequence of the construction of the instrument, any specimens exhibited in a box of larger dimensions must be placed at the right-hand side of the box. It is also necessary to remember that the edges of a box throw a shadow, and that it is therefore important that specimens for exhibition should not be placed too close to the edge.

Papers.

The following papers were read :—

“ Revision of the Mexican and Central American *Malachiidae* and *Melyridae*, with descriptions of new species,” by GEORGE CHARLES CHAMPION, F.Z.S.

“ Four new genera and species of *Hymenoptera* from Australia,” and “ Three new species of Australian *Hymenoptera*,” by A. A. GIRAULT, communicated by A. M. LEA, F.E.S., Govt. Entomologist, South Australia.

Wednesday, December 3rd, 1913.

MR. G. T. BETHUNE-BAKER, F.L.S., F.Z.S., President, in the chair.

Election of a Fellow.

MR. WALTER ORMISTON, of Kalupahani, Haldumille, Ceylon, was elected a Fellow of the Society.

Presentation to the Library.

DR. G. B. LONGSTAFF presented to the Society, on behalf of a number of subscribers, a copy of Hübner's "Exotische Schmetterlinge," original edition, being the copy selected by the late Mr. W. F. Kirby for Mr. Roland Trimen; the names of all the subscribers will be placed in the first volume. Dr. Longstaff had collected £84 6s., and the Society had subscribed £10.

Nomination of Auditors.

THE PRESIDENT announced that he had nominated the following Fellows as Auditors:—On the Council, Messrs. R. ADKIN, J. E. COLLIN and A. E. GIBBS; other Fellows, Messrs. H. ST. J. K. DONISTHORPE, R. W. LLOYD and C. O. WATERHOUSE.

Exhibitions.

ABERRATIONS OF ABRAXAS GROSSULARIATA.—MR. G. T. PORRITT exhibited two curious specimens of *Abraxas grossulariata*. In the first the fore-wings were asymmetrical in marking, and the left lower wing was wanting, there being absolutely no trace of it. In the other the right lower wing was also wanting, but in its case there was a rudiment of it visible. He had bred both specimens this year, he believed from about a couple of hundred larvae from the same garden.

MIMICRY AMONG SWALLOWTAILS AND OTHER NOTES ON BUTTERFLIES AT SÃO PAULO, BRAZIL.—MISS DIANA R. WILSON, who was present as a visitor, read the following communication:—

“ These butterflies were caught in Brazil this year, during the last week of January and the first week of February, but as I was there on other business time was very limited for collecting. Also I am a novice in the art and am indebted to Prof. Poulton for the following facts.

“ The larger swallowtail, which is the model, is *Papilio chamissonia* f. *chamissonia*, Eschsch., belonging to Section I of the great *Papilio* group, called ‘*Aristolochia Swallowtails*,’ Roths. and Jord., or ‘*Pharmacophagus Swallowtails*,’ Haase.

“ The smaller one, mimicking the larger in almost every detail, is *Papilio* (*Cosmodesmus*) *lysithous*, f. *lysithous*, Hübn., and belongs to Section III, known as ‘*Kite Swallowtails*,’ Roths. and Jord., or ‘*Cosmodesmus Swallowtails*,’ Haase.

“ The city of São Paulo lies about 2,500 ft. above the sea in a country of hill and forest. The immediate surroundings of the town are cleared, and large areas are partially mapped out for future building. It was on this at present waste and undeveloped land that I caught the swallowtails and other butterflies. The gardens and houses of the finished streets were on the upper side of a large open space sloping downwards into the country, and the trees were mostly in the gardens. One tree particularly, *Vochysia tucanorum*, M. and G., with its mass of golden blossom, was most attractive to butterflies, and it was in that neighbourhood that I did most of my catching. These particular swallowtails were by far the commonest things on the wing. They would hover high up round the yellow blossoms and then fly down and out into the more open ground. They seldom settled, but fluttered slowly and rather sleepily so that they were easy to catch. Unfortunately at the time I did not know I had a case of mimicry under my eyes or I should have taken more trouble to make exact observations.

“ On January 31, I caught two specimens of *P. lysithous*, on February 2, three of *P. chamissonia*, and on February 4, two of each species. My impression is that the numbers flying were usually about equal. I should say the mimics were quicker and more alert flyers, but both kinds were easy to catch, and *very* common. They often annoyed me, too, by ‘resurrecting.’ I always pinched the thorax and then put

them into a killing-bottle, but when folding them into their papers afterwards I was often startled by sudden movements which made me hastily return them to their bottle. Nothing else seemed to die so hard. As I was not specially on the lookout for a difference in the vitality of the two species, I cannot be certain that there was *no* difference, but I am fairly sure that *all* the swallowtails required an extra dose of killing-bottle.

“ The open ground was more or less bushy and in places covered with a wiry white-flowering plant—*Sida rhombifolia*, L., about a foot high. This harboured all sorts of smaller butterflies and the swallowtails were constantly fluttering among them. Except round the tree they hardly ever flew more than shoulder-high and did not often go far out into the open. In the heat of the day there would be dozens on or near their favourite yellow tree. They were always very conspicuous on the wing, but so alike that I often did not know whether I was catching model or mimic till I had them dead in my hand. Seeing them now, set side by side, there is a much bigger difference in size than I should have expected.

“ There are a few other species to which I should like to draw attention, all but two caught on the same open waste.

“ i. Two specimens of *Papilio polydamas polydamas*, L. (Section I), caught on January 31 and February 6. One specimen of their mimic, *Papilio scamander grayi*, Boisd. (Section II, viz. ‘Fluted Swallowtails,’ Roths. and Jord., or ‘Papilio Swallowtails,’ Haase), caught on February 7. Two specimens of another mimetic swallowtail, belonging to the same Section II, *Papilio anchisiades capys*, Hübn., the male on February 8, in the hotel garden, the female on February 4, on the waste. I only caught one specimen of each of the latter, but I saw more, chiefly frequenting the yellow tree, *Vochysia tucanorum*. They usually flew high and were not nearly so numerous as *P. chamissonia* and *P. lysithous*.

“ ii. One specimen only of the Brassoline butterfly, *Penetes pamphanis*, Doubl. and Hew., which I caught on February 8, in the hotel garden. It was sitting on a tree-trunk with wings folded, and was very inconspicuous, the underside of the wings harmonising so well with the bark. I saw other specimens of this species sitting thus on trees, motionless for hours, but

always high out of reach of the net. I only saw them on the wing in the evening.

“ iii. Three specimens of *Peridromia epinome*, Boisd., and two of *Ageronia ferentina*, Godt., all except one *Peridromia* (which was caught on February 4) taken on February 7. They made a peculiar clicking noise as they flew and were aggravatingly clever at dodging the net. They settled on grey tree-trunks, their wings spread flat, exactly like bits of lichen. They were particularly numerous in an old shady garden which I visited but did not collect in.

“ iv. Two ♀ specimens of *Callidryas philea*, L., caught on February 2 and 7. They were fairly common on the waste, but they flew very fast and high and were extremely difficult to catch.

“ There is one other small point of general interest. I noticed that as a rule, orange or bright-brown butterflies settled on orange flowers, yellow butterflies on yellow flowers (particularly the little *Terias deva*, Dbl., on *Pavonia sepium*, St. Hil.), and grey butterflies, or those with brownish undersides on tree-trunks.

“ My thanks for this paper are due to Prof. Poulton for his interest and help, without which the collection would never have come into existence.”

Prof. POULTON congratulated Miss Wilson on the interesting results which were the outcome of so small a collection made in so short time. He showed an example of the Pyralid moth *Myelobia smerintha*, Hübn. (*Gallerianae*), in Miss Wilson's collection, and said that the species, although very common, was well worth attention on account of its enormous size. It appeared to have great powers of flight, two specimens in the British Museum having been taken at sea over 100 miles from the S. American coast. He also said that, when informed by Dr. Karl Jordan that nothing had been published on the habits in life of these “*Aristolochia Swallowtails*” and their mimics, he realised that Miss Wilson's observations were of great interest and ought at once to be put on record.

MR. C. O. FARQUHARSON'S RECORD OF EROTYLID BEETLES FOUND IN CLAY CELLS.—Prof. POULTON exhibited eight examples of *Episcaphula interrupta*, Lac., found in one clay

cell, and eleven examples found in another, by Mr. C. O. Farquharson, B.Sc., at Moor Plantation, near Ibadan, S. Nigeria. The history of the discovery was given in the following extract from a letter written, Sept. 23, 1913, by Mr. C. O. Farquharson to Mr. Lamborn. The beetles had been kindly named by Mr. K. G. Blair, F.E.S.

“The two small clay cells which I brought you the other night were found (Sept. 19, 1913) on an old stump by the side of one of the streams in the plantation. On collecting the first one, the base was somewhat damaged and I was surprised to find the interior nicely filled with a collection of small beetles. The second cell I collected unbroken, and as I found the opening loosely blocked I thought perhaps it might contain a Hymenopteron of some sort. As you know it also contained small beetles, similar to the other.”

[Prof. Poulton, in exhibiting the specimens, suggested that the beetles had been stored by an Aculeate; but a later letter from Mr. Lamborn, dated Dec. 3, 1913, stated that the beetles “had obviously congregated of their own accord, for both the clay cells were open and the beetles in one were so lively that Mr. Farquharson had to plug the hole to keep them in during the walk home.”]

MR. W. A. LAMBORN'S OBSERVATIONS ON THE DRIVER ANTS (*DORYLUS*) OF SOUTHERN NIGERIA.—Prof. POULTON read the following notes received from Mr. Lamborn and exhibited the material referred to. The ants had been kindly determined by Mr. G. Meade-Waldo and the Diptera by Mr. E. E. Austen.

1. *Dorylus helvolus*, L. (*Typhlopone punctata*, Sm.).—A series of workers of various sizes. “These reddish ants appeared to be engaged, some in bolting earthworms from their burrows, others in killing the smaller ones, cutting them into sections, and carrying them off.” Aug. 10, 1913: Agege, about 12 miles N. of Lagos.

2. *Dorylus nigricans*, Illig.—Two long series of workers of various sizes, one accompanied by the note: “These ants were marching in column at Agege after rain on August 20,” the other captured, Oct. 12, at Moor Plantation, near Ibadan. The following notes refer to this species of *Dorylus*, and record observations made at Moor Plantation in 1913.

3. *The predaceous habits of D. nigricans.*—An extract from Mr. Lamborn's letter, dated Nov. 1, speaks of "disaster from a totally unconsidered source which swept away in a night 15 or 20 pupae of the *P. cardui* family, about 10 pupae from wild *cardui* larvae and 7 or 8 of the Satyrid pupae. I awoke one morning to find these all gone without leaving any traces. Ultimately I found two major and one minor driver ants in a test-tube of water left in one of the boxes; so the ants had raided my dining-room during the night and evacuated the position by morning while I was comfortably asleep, as usual, in my camp-bed out on the verandah. I don't think I mentioned that they came in one day last week at 7 a.m. and cleared the house of all other insects, including *Pheidole* and the small red ant *Monomorium pharaonis*, L., and they even caught two unfortunate bats in the eaves, one of which was killed, but I managed to free and let loose the second. On this occasion I repulsed the drivers with very heavy losses, but this does not seem to have been a lesson to them. Much to the disgust of my boy I always put most of my boxes on the table for the night so that, as the ants did not get up the rounded polished legs, my loss is not so bad as it might have been, and the *dardanus* family did not suffer."

4. *Camponotus sericeus attacking Dorylus nigricans on the march.*—The following note referred to the specimens exhibited to the meeting, viz. two workers of *Camponotus sericeus*, F., one of them with a worker minor of *Dorylus nigricans*, Illig., fixed to its leg.

"I send two ants, one with a 'driver,' soldier minor, gripping its 2nd right tibia. The history of the specimens is as follows:—On June 12, 1913, at 2 p.m., after heavy rain, a column of drivers was observed on the march along a channel between two earthworks which they had thrown up across the path. On the top of the earthwork were the two ants, evidently bent on mischief of some kind. They leaned over, narrowly examining the column of drivers and every now and again seized a minor which was released after a short scuffle. When a major came with open jaws to reinforce the minors, these ants did not retire but anteflexed the abdomen so that its point was presented between the fore-legs. The major then

retired precipitately, doubtless owing to the discharge of an offensive odour or noxious fluid. Occasionally the ants fell down from the earthwork on to the top of the drivers and then beat a most hurried retreat over their backs, though the drivers did not seem to attempt to attack them.

“ These manœuvres went on for a quarter of an hour, and I then dropped a slightly maimed minor driver near one of the two ants. The ant seized it at once and anteflexed its abdomen; a tremendous scuffle ensued, the combatants rolling over and over in a confused heap. The driver then seemed to gain the upper hand, for the other ant started to run away with its opponent firmly fixed on to its leg, and no efforts on the part of the ant were successful in dislodging it.

“ I think the ants were on the look-out to steal pupae or prey from the drivers, but it is a matter I will look into.”

Prof. Poulton suggested that the senses of the wounded *Dorylus* might have been blunted so that it was not susceptible to the defensive secretion of the *Camponotus*.

5. *The fly Bengalia depressa*, Walk. (*Calliphorinae*), robbing *Dorylus nigricans* on the march.—The following notes were illustrated by a specimen of *Bengalia depressa* and the second series of *Dorylus nigricans* referred to on p. cxxiii. Both were dated Oct. 12. The specimens illustrating the notes of later dates were not yet available.

“ I spent most of this Sunday morning, Oct. 12, in watching a column of driver ants, many carrying immature forms, on the march, endeavouring to find out the business of the other ants [*Camponotus sericeus*] with them. I found that some Diptera, insects as large as a *Sarcophaga*, were also concerned with the drivers, but I did not succeed in elucidating their object any better than I did the purpose of the ants. About eight of these Diptera were to be seen settling here and there, usually on an elevated object, *e. g.* a stone close beside the drivers, which, in a column about two inches broad, were crossing the road. Every now and again one flew up and poised itself on the wing immediately over the column, whereupon the larger soldiers assumed a threatening attitude and the fly retired. Sometimes a fly ran over the ant column

with abdomen slightly anteflexed as if it might be ovipositing, but of course the difficulty of deciding if an ovum was dropped would be well-nigh insuperable.

“ I succeeded in catching one fly only, for they were so very alert, and it was not easy to scoop them up from off the ground. I took the opportunity of securing some drivers for the Hope Collection and discovered a very easy way of getting them. By irritating them with a straw a number of the larger soldiers were induced to fasten on to it; then immediately other ants fastened on to them and in a few seconds hundreds of the ants, massed into a ball, were hanging to the straw. It was surprising though how soon the minors got to the centre of the mass and the majors concentrated on the outside.

“ I then amused myself by carrying balls of ants to varying distances and in seeing how the ants managed to get into communication with the main column and how long it took them.”

The following note is dated Nov. 1 :—“ I believe these large Diptera which I see constantly waiting on ‘ Drivers ’ on the march must manage to oviposit on the immature forms. It seems so wonderful that the flies should have any business at all with these ants that are so formidable as to make even *Homo sapiens* give way before them at times.”

The problem was finally solved in a letter dated Nov. 8, and received only last Monday, Dec. 1 :—“ I succeeded to-day in solving the problem as to the relationship between the *Muscidae* mentioned in my letter of Oct. 12, and the black driver ants. A column of drivers was crossing a conduit over a stream, following precisely the same ant-path that I have seen them traverse several times before, and I was able to sit down on the parapet comfortably in the shade and watch them. I soon saw three or four of the Muscids flying about the moving column and occasionally settling near it, sometimes on the ground quite close to the ants, sometimes on a blade of grass, stone or other raised object. Such as settled on the ground were extremely alert, and being able to run rapidly, never allowed any ants to approach any nearer to them than about a quarter of an inch. When, as frequently happened, any ant made a little circuit away from the main body, a fly would

generally pursue it at a distance of about half an inch, but backing away directly the ant turned towards it.

“ Other flies, having rested motionless a few minutes, flew up and poised themselves on the wing over the ants, but, immediately the drivers realised their presence and stretched out towards them with widely opened mandibles, flew again to a place of rest. Eventually I saw a Muscid stalking a minor ant which had strayed from the main body carrying a pupa in its jaws. Suddenly the fly rushed forward, and it must have driven its proboscis, which seems to me armed with strong bristles, into the pupa, for the ant was brought to a standstill with a sharp jerk.

“ Then ensued a tug-of-war between ant and fly fastened on at opposite ends of the pupa, but neither had the advantage till, as it seemed to me, the ant must have got annoyed and loosening its hold rushed towards the fly, which of course instantly flew off with the pupa, and this it proceeded to suck on the ground about a foot away from the ants. It allowed me to get quite close before taking to the wing with its prey, and it settled again two or three feet further off and became so preoccupied with its meal that it fell an easy victim to my net.

“ I then carefully watched a fly hovering over the ant-column. It suddenly swooped down and rose instantly with an ant pupa, with the driver that had been carrying it still hanging on, fixed to its proboscis. The fly carried this burden for about a foot then dropped it and alighted on the ground near by. The ant started to run away with the pupa, but the fly pursued it, again impaled the pupa and started a tug-of-war with the ant. Neither side had any advantage, and then the fly rose again about three feet into the air with the pupa and ant and after a flight of about eighteen inches let them fall. The ant being discomposed by this procedure let go of the pupa, and no sooner had it done so than the fly seized it and, flying off with it triumphantly, settled near by and proceeded as in the previous case to suck the prey. This one again fell easily to my net, so that the flies are evidently keenly alert only when in the immediate vicinity of the ants. I subsequently noticed that the Diptera seemed to have certain

preferences in regard to their prey, for I repeatedly noticed one poised over the ant-column make an unsuccessful swoop and then fly, keeping level with the ant carrying the particular object which it had missed, making occasional rushes in an endeavour to secure it. Those I took had obtained ant-pupae, but I am sure they take other things from the drivers, probably portions of dead insects, but I shall look into the question further.

“ The flies were not always successful even when they had separated an ant with its burden from the main army, for a large ant carrying a small burden often got away owing to the difficulty the fly experienced in getting hold of the load without falling into the jaws of the ant.

“ I subsequently witnessed these manœuvres many times and, as you will see, secured a little series, each fly with its particular prey and the ant concerned.”

Prof. Poulton said that Dr. G. D. H. Carpenter, to whom he had communicated the substance of Mr. Lamborn's observations, had stated that, according to his experience, the Driver ants, when on the march, carried pupae and never larvae, and that, when hunting, they did not even carry pupae. Dr. Carpenter's observations were made upon *Dorylus nigricans* in Damba and Bugalla Islands, in the N.W. of the Victoria Nyanza.

Mr. E. E. Austen had called his attention to a note by Dr. Gaillard on *Bengalia gaillardi*, Surcouf, preying on Termites in a rotten tree-stump which had just been dug up at Konlouba, French Sudan, Aug. 13, 1908; recorded by Surcouf in Bull. Mus. Nat. D'Hist. Nat., 1912, No. 7 (published Apr. 1913), p. 427.

Prof. Poulton also referred to Mr. E. E. Green's and Capt. K. E. Nangle's notes on the attacks of an allied species, *Ochromyia obscurepennis*, Bigot, and *jejuna*, F., on winged Termites in Ceylon and Secunderabad, to Col. J. W. Yerbury's observation in Ceylon that *Ochromyia* steals sugar grains from large ants (Trans. Ent. Soc., 1906, pp. 394-6), and to Mr. E. E. Green's confirmatory observations in Ceylon, together with his description of the strongly toothed tongue of the fly (Proc. Ent. Soc., 1908, pp. xxvi-xxvii). The Ceylon species

was not *Ochromyia jejuna*, as stated in the publications referred to above, but *O. obscurepennis*, Bigot. The following note by Col. Yerbury accompanied the series of this species in the British Museum:—"Very common in shady places. I have more than once seen this fly trying to take her burden from a large ant (*Lobopelta* sp.)—regular 'pulley-hauley' game." Col. Yerbury believed that the hold of the fly's tongue was given by suction and not by piercing—a conclusion probably supported by Mr. Lamborn's observation that the fly could drop the pupae at any time. It was clear, however, that the tongue was used as a piercing organ when the fly was feeding on the Termites and ant-pupae. The following note by Col. F. W. Thomson, I.M.S. (Dehra Dun, U.P., India, Nov. 1907), was borne by a specimen of the Indian species *Ochromyia jejuna* in the British Museum:—

"I always noticed specimens of this species on the ground, or on a stone or leaf near an ant's nest. On watching, I saw them swoop down on any ant carrying an 'egg' or larva, take it from the ant, carry it away a short distance, and proceed to suck it."

Col. Thomson's record pointed to habits similar to those here described by Mr. W. A. Lamborn. It was to be noted also that the Ponerine ant *Lobopelta*, robbed by *Ochromyia*, was allied to the Driver ants and itself hunted in companies somewhat after the manner of a driver.

Mr. E. E. GREEN observed that *Dorylus orientalis* was a garden pest, eating potatoes, dahlia roots, etc. Unlike the African forms it was largely or wholly a vegetable feeder. Col. YERBURY said that in Ceylon *Ochromyia* was predaceous, and took sugar and other things away from *Camponotus* ants. Mr. E. E. GREEN also remarked on the structure and habits of *Ochromyia*.

SOUTH AMERICAN PAPILIOS.—Dr. K. JORDAN exhibited a series of species of the two groups of Papilios called by Haase *Cosmodesmus* and *Pharmacophagus* respectively, and said:—The American mimetic forms of *Cosmodesmus*, which contrast so strongly with their more normally coloured relatives, are undoubtedly modifications derived from a more generalised type, such as is represented by *Papilio asius*.

This species connects the American mimetic species of *Cosmodesmus* with the non-mimetic ones, and would be an interesting object for the study of the wing in the pupa inasmuch as the imaginal wing in the pupa might show traces of the cell-bars which are so common in *Cosmodesmus*, but entirely lost in the imago of *P. asius*.

All the mimetic American *Cosmodesmus* resemble "Aristolochia Papilios" of the same country, with the exception of *P. pausanias*, which imitates a *Heliconius*. In the Oriental Region, where "Aristolochia Papilios" also abound, the mimetic *Cosmodesmus* on the contrary all bear the garb of *Danainae*. Such mimetic resemblances are often ascribed to the common ancestral pattern being preserved both in the model and the mimic. This explanation may be true in some instances, but it does not apply to the mimetic *Cosmodesmus* as a whole, as the Eastern Danaine pattern and the very different colouring of the American species cannot both be ancestral in *Cosmodesmus*.

Like many other mimetic Lepidoptera, the American mimetic *Cosmodesmus* present some interesting cases of polymorphism. We consider the tailed *Cosmodesmus* of South-Eastern Brazil allied to *P. lysithous* as forms of one single species (*lysithous*, *aedipus*, *rurik*, *pomponius*, etc.), and also believe that *Papilio protodamas* is the same species as *choridamas*. These conclusions are mainly based on a study of the structure. But morphological evidence, though it may afford guidance, cannot be accepted as sufficient. The final court of appeal in such questions is breeding, and we hope that some day some entomologist resident in South-Eastern Brazil will give up mere collecting in order to devote himself to the elucidation of the life-histories and habits of the Lepidoptera.

THE ASSOCIATION OF THORICTUS AND MYRMECOCYSTUS.—Mr. CHAMPION exhibited a specimen of *Thorictus pauciseta*, Wasm., attached to the scape of the left antenna of a worker of an ant, *Myrmecocystus viaticus*, F., found by Dr. Santschi and himself at Kairouan, Tunisia, last May. The beetle possesses a tuft of golden hairs at each hind angle of the prothorax, the secretion from which is said by Wasmann to be appreciated by the ants. Numerous examples of the beetle

were found in the nests, and occasionally one of them was found attached by the mandibles to the antennae of the ants, the ants themselves being extremely active.

Mr. DONISTHORPE observed that *Thorictus* was always associated with ants, and carried about by them in this manner.

THREE INCIPIENT COLONIES OF ANTS BROUGHT UP BY UNAIDED ♀♀.—Mr. W. C. CRAWLEY exhibited :

1. Three deälated ♀♀ of *L. niger*, L., taken Isle of Wight, July 1911. These, after rearing ♂♂s, fought until only one survived. During 1912 the ♂♂ reached the number of 200, and the ♀ had long ceased to function as a ♀. All the ♂♂ died in March 1913 owing to drought, but the ♀ revived her colony founding instincts, and had brought up two new ♂♂ by the beginning of Sept. 1913. She has taken no food since Feb. 1913, though her supply of body-fat and degenerating wing-muscles must have been exhausted during the founding of her first colony in 1911 and 1912.

2. A ♀ of *Aphaenogaster subterranea*, Latr., taken Aug. 1912 at Yvorne with Prof. Forel, after marriage-flight, brought up two ♂♂ by Sept. 1913. Has taken no food.

3. Six ♀♀ of *L. flavus*, Fabr., taken after marriage-flight at Seaton, July 14, 1912. They built a cell together and brought up ♂♂ by June 23, 1913. The ♂♂ now number 50-60, and there has been no hostility among the ♀♀. No food was taken till Aug. 14, 1913.

A large-eyed variety of *Lasius umbratus*, Nyl., taken at Wellington College in 1910. The ♀ considerably smaller, darker, and less yellow than either *L. umbratus* or *mixtus*; the head longer and narrower, the antennae less clubbed, and the eyes twice as large.

STALK-EYED FLIES.—Mr. O. E. JANSON exhibited specimens of *Laglasia caloptera*, Bigot, one of the curious forms of Diptera with stalked eyes, from the Arfak Mountains, Dutch New Guinea.

GONEPTERYX CLEOPATRA.—Capt. E. B. PUREFOY exhibited two more specimens of *Gonepteryx cleopatra* with gynandromorphous colouring, being ♀♀ in general appearance but with patches of ♂ colouring. He observed that the larvae were

now feeding and were doing so at the end of November in Kent.

NORTH AMERICAN BUTTERFLIES.—Mr. E. B. ASHBY exhibited a number of Nearctic Butterflies, including several belonging to genera widely distributed in the Palaearctic Region.

HELICONIUS ANDERIDA.—Mr. W. J. KAYE exhibited a very large series of specimens of *Heliconius anderida* ranging into a number of forms which tended to become fairly definite subspecies in different geographical regions. In Panama in the canal zone the following named forms occurred and were so intergraded that they could only be looked on as aberrations of one variable species; such were, *clara*, Fab., *melicerta*, Bates, *albucilla*, Bates, *albipunctata*, Riff., *zuleika*, Hew. In Costa Rica the *zuleika* form occurred almost exclusively, and only very rarely did forms occur that were referable to *albipunctata*, Riff., but specimens transitional to this latter form were less rare. In N.W. Venezuela, near Porto Cabello, a further development occurred out of the *anderida* and *clara* forms, in which a submarginal row of paired yellow spots appeared on the hind-wing, the fore-wing being normal *clara*. This form had apparently no name and it was proposed to call it *estebana*.* A further set of specimens was from Colombia from the so-called Bogota district, but which really referred to a much lower elevation. These specimens were the usual *clara* form and were more or less constant. A single specimen from the Rio Dagua in W. Colombia was shown of the *holcophora* form. It was thus shown that in Panama the species was altogether unstable, but both northwards, eastwards and still further eastwards definite races were developed. The series was

* *HELICONIUS ANDERIDA ESTEBANA*, n. sub-sp.

♂. Fore-wing like *H. anderida clara*, but with less yellow within the cell and the large black blotch extended towards the base as a wedge. The black spot on the yellow patch between veins 2, 3 large and nearly touching the edge of the cell. Hind-wing with broad black marginal band containing four pairs of elongate yellow spots. ♀. Fore-wing as in ♂, but with a great extension of black beneath vein 2. Hind-wing with the black marginal band becoming broken at vein 4, and with the innermost pair of yellow spots barely visible. A single elongate yellow mark above vein 7.

Habitat. San Esteban Valley, N.W. Venezuela.

divided geographically into sections from Costa Rica, Panama, N.W. Venezuela and Colombia.

SCENT APPARATUS OF AMAURIS EGIALEA.—Dr. H. ELTRINGHAM gave a preliminary account of the scent apparatus in *Amauris egialea* comparing the same with that of *A. niavius*, illustrated by drawings, and microphotographs of sections of the brush. He remarked on the complicated structure of the brush, showing the existence of black and brown hairs together with three other kinds of structures, of irregular section and presumably varied function.

Paper.

The following paper was read :—

“ New Species of South American Butterflies,” by W. F. H. ROSENBERG, F.E.S., and G. TALBOT, F.E.S.

Mr. TALBOT made the following exhibits in connection with this paper :—

1. Sixteen new species of S. American Butterflies.

2. A black and brown mimetic combination from Yahuar-mayo, S.E. Peru, October and November, 9 species, viz :—

Athyrtis salvini, Stgr., *Napeogenes seminigra*, sp. nov., *N. deucalion*, Hnsch., *Ceratinia callanga*, Hnsch., *Melinaea orestes*, Salv., *M. clara*, sp. nov., *Hirsutis melanina*. Hnsch., *Heliconius sisypheus*, Salv., *Eresia*, sp. ?

NOTE.—See p. lxxvi.

ON A NEW GENUS OF MYMARIDAE.

By FRED ENOCK, F.L.S., F.E.S., F.R.M.S.

NEUROTES, n. gen.

The tarsi 5-jointed. The abdomen sub-sessile. The antennae of the male 13-jointed, those of the female 8-jointed. The wings broad and elliptical $\cdot 75$ mm. long \times $\cdot 208$ mm. broad. The costal nerve very long. The ovipositor level with the tip of the abdomen.

NEUROTES IRIDESCENS, n. sp. (Plate A, figs 1 and 2.)

The general colour dark brown; the head broader than the thorax. The antennae of the male 13-jointed, dark brown, 1 mm. in length, the scape twice as long as the funicular joint, the third to the twelfth joints of equal length; the thirteenth a little short.

The antennae of the female 8-jointed $\cdot 57$ mm. long. The scape and pedicel testaceous, the latter a little longer than the first funicular joint, the others gradually diminishing in length to the club, which is the longest joint and rounded at the tip. The ovipositor level with the tip of the abdomen. The wings narrower and shorter than those of the male. The costal nerve very long, reaching to beyond the middle of the wing, the tip slightly enlarged. The cilia long. The surface hairs most numerous at the base and margins of the wing, leaving an almost clear oval area in the centre. The cilia long on the lower wings. The legs lighter brown than the body, and darkest in the centre.

Length 1 mm.

Hab. Hollington Wood, Hastings. August 1913. Male and female captured.



♂



♀

Photo. F. Enock.

C. Hentschel.

Neurotes iridescens, Enock, x 40.

ANNUAL MEETING.

Wednesday, January 21st, 1914.

Mr. G. T. BETHUNE-BAKER, F.Z.S., F.L.S., President, in the Chair.

No other names having been received in addition to those proposed by the Council as Officers and Council for the ensuing year, the following were declared by the President to be elected :—

President, Mr. G. T. BETHUNE-BAKER, F.L.S., F.Z.S.; *Treasurer*, Mr. A. H. JONES; *Secretaries*, Commander J. J. WALKER, M.A., R.N., F.L.S., and Rev. G. WHEELER, M.A., F.Z.S.; *Librarian*, Mr. G. C. CHAMPION, A.L.S., F.Z.S.; *Other Members of the Council*, Messrs. E. A. BUTLER, B.A., B.Sc., J. E. COLLIN, F.Z.S., S. EDWARDS, F.L.S., F.Z.S., Dr. H. ELTRINGHAM, M.A., D.Sc., F.L.S., C. J. GAHAN, M.A., A. E. GIBBS, F.L.S., F.Z.S., E. E. GREEN, G. MEADE-WALDO, M.A., Dr. G. W. NICHOLSON, M.A., M.D., Hon. N. C. ROTHSCHILD, M.A., F.L.S., F.Z.S., H. ROWLAND-BROWN, M.A., C. J. WAINWRIGHT.

Mr. R. W. LLOYD, one of the Auditors, read the Auditors' Report, which was adopted on the motion of Mr. H. E. PAGE, seconded by Mr. J. PLATT BARRETT.

The Rev. G. WHEELER, one of the Secretaries, then read the following

Report of the Council.

Since our last Annual Meeting we have lost one Honorary Fellow, the Poet-Scientist, Prof. O. M. REUTER. To the vacancy thus created Mr. A. P. SEMENOFF TIAN-SHANSKI has been elected.

Amongst the nine ordinary Fellows whom we have lost by death during the year are both the oldest and the eldest Fellows of the Society, viz. Lord AVEBURY and Dr. ALFRED RUSSEL WALLACE, both former Presidents, who enjoyed those distinctions respectively; the other seven being Messrs. LIONEL ARMSTRONG, HERBERT DRUCE, at one time a member

of the Council, Lieut. C. A. FOSTER, PHILIP DE LA GARDE, THIEN CHENG KUNG, A. G. LETHBRIDGE and G. MEYER-PACINI. We have also received notice of the death of Mr. P. W. MACKINNON, which took place in 1911. Only three Fellows have been removed from the list, but the number of resignations is unusually large, being twelve; some of these, however, are only intended to be temporary. Our total losses from all causes thus amount to twenty-six, whilst thirty-nine ordinary Fellows have been elected, bringing our total up to 618, composed of 12 honorary and 606 ordinary Fellows.

The most important event we have to chronicle is that HIS MOST GRACIOUS MAJESTY, KING GEORGE, has consented to become our Patron. As this gratifying fact does not carry with it the title of Royal, the Council, after causing inquiries to be made, informally consulted the Society as to whether steps should be taken to make any alteration in our title; the response, however, was not such as to justify them in calling a Special Meeting to consider the question.

The Society was represented at the International Congress of Zoology at Monaco by Lord WALSINGHAM, the Hon. WALTER ROTHSCHILD and Dr. KARL JORDAN. At this Congress the vexed subject of Nomenclature was much discussed, and a beginning made towards an adequate recognition of the claims of Entomology in this matter, by the inclusion of as many Entomologists as the regulations with regard to retirement would permit, in the International Zoological Committee of Nomenclature.

Following on the Resolution placed by our Society before the International Congress of Entomology, held at Oxford in 1912, an International Entomological Committee of Nomenclature has been formed, on which one of our Fellows, Mr. C. J. GAHAN, sits as the British Representative. At the same time the National Committees have been set on foot, and our Society has elected as its representatives on the English Committee Messrs. J. H. DURRANT, L. B. PROUT and C. O. WATERHOUSE. It has also appointed a permanent Committee of its own, consisting of the British member of the International Committee, its three representatives on the National Com-

mittee, the Secretary of the Society and two elected members, who at the present time are the PRESIDENT and Dr. K. JORDAN.

The Royal Horticultural Society having asked for the names of Entomologists competent and willing to act as members of their Parliamentary Committee, the names of Prof. THEOBALD, Mr. MAXWELL-LEFROY, Prof. NEWSTEAD and Mr. GUY MARSHALL were submitted to them; they took, for the moment, the first-named of these gentlemen, but hope eventually to include them all.

A very cordial invitation having been received by the Council to be represented at the Jubilee of the Entomological Society of Ontario, our Honorary Fellow, Prof. COMSTOCK, was deputed to act as our representative.

Two important matters bearing more or less directly on our Science have been before us this year—Nature Reserves and the upkeep of Wicken Fen. Towards the latter object an annual subscription of two guineas has been voted by the Council.

Our Transactions for this year form a Volume of 693 pages, containing 30 papers by the following Authors:—The PRESIDENT, (2), MESSRS. H. BOILEAU, F.E.S., A. E. CAMERON, M.B., B.Sc., F.E.S., MALCOLM CAMERON, M.B., R.N., F.E.S., (2), G. D. H. CARPENTER, B.A., B.Sc., F.E.S., (3), G. C. CHAMPION, A.L.S., F.Z.S., F.E.S., (2), J. E. COLLIN, F.Z.S., F.E.S., F. W. EDWARDS, B.A., F.E.S., H. ELTRINGHAM, M.A., D.Sc., F.L.S., F.E.S., (3), J. C. F. FRYER, M.A., F.E.S., (2), W. J. KAYE, F.E.S., (2), Sir G. H. KENRICK, F.E.S., W. A. LAMBORN, M.R.C.S., L.R.C.P., F.E.S., G. B. LONGSTAFF, M.A., M.D., F.E.S., E. MEYRICK, B.A., F.R.S., F.E.S., Rev. F. D. MORICE, M.A., F.E.S., J. C. MOULTON, F.L.S., F.E.S., R. C. L. PERKINS, M.A., D.Sc., F.E.S., (2), W. F. H. ROSENBERG, F.E.S., jointly with G. TALBOT, F.E.S., and F. H. TAYLOR, F.E.S. Of these 16 refer to Lepidoptera, 5 to Coleoptera, 4 to Diptera, 3 to Hymenoptera, and 2 are of general Entomological interest.

These papers are illustrated by 44 plates, consisting of 6 chromo-lithographs, 2 three-colour plates, 3 black lithographs, 23 half-tone plates and 10 line blocks. Of these Mr. F. D. GODMAN gives the entire cost of two chromos (Plates III and IV), Dr. G. B. LONGSTAFF the entire cost of one chromo

(Plate II) and the accompanying map; Mr. J. C. MOULTON gives the drawing for one chromo (Plate X) and also contributes half the cost of reproduction, and Mr. W. J. KAYE gives the drawings for the other two chromos (Plates I and XXX). Dr. H. ELTRINGHAM gives the drawings for the three black lithographs (Plates XX, XXII and XXVII); Sir GEORGE KENRICK contributes the entire cost of the two three-colour plates (Plates XXXI and XXXII), and the Rev. F. D. MORICE the entire cost of three of the half-tones (Plates XXXIII, XXXIV, XXXV). The drawings and photographs for all the other plates have been supplied by the Authors, and Prof. POULTON also contributes towards the reproduction of Plates XXXIV–XL, illustrating Dr. Carpenter's Papers.

The Proceedings amount to 134 pages, and contain one half-tone plate illustrating the new *Mymar* exhibited by Mr. F. ENOCK, who supplied the photograph for the plate.

The TREASURER reports as follows :—

Although the total receipts in 1913 were about £34 less than in 1912, the balance sheet is of a far more satisfactory character. Several factors are instrumental in bringing about this result: *Firstly*: The Grant from the Royal Society which belonged to 1912 was paid in the beginning of 1913. *Secondly*: The cost for Plates has been small, £69 8s. 4d. against £254 1s. 6d. in 1912. *Thirdly*: The cost for Printing is £368 9s. 11d. against £409 13s. 1d. in 1912.

The surplus arising from these differences has enabled us, after paying all bills rendered, to invest all life compositions, amounting to £110 5s., in Consols (including the £47 5s. uninvested in 1912), and to carry forward a balance to 1914 of £134 5s. 10d., nearly sufficient to meet the cost of Parts III, IV, and V.

The LIBRARIAN reports that forty-nine volumes, the usual periodicals and publications of Societies, and a large number of separata have been added to the Library during the past year, a list of which will be included in Part V of the Transactions. Notably among the donations to the Library may be mentioned *Fauna Hawaïensis* (3 vols.), which was presented by Dr. SHARP; the continuation of Wytzman, *Genera Insectorum*, given by Mr. E. A. ELLIOT; *Études de Lépidoptérologie Com-*

parée, by Charles Oberthür, presented by the Author, and Hübner's *Sammlung Exotischer Schmetterlinge* (3 vols.), which was subscribed for by Fellows of the Society and others. Five hundred and ten volumes have been issued for home use, as against a total of four hundred and seventy-eight volumes the previous year. As usual, the Library has been well used for the purpose of reference.

The Report was adopted on the motion of Mr. R. S. STANDEN, seconded by Mr. R. W. LLOYD.

The PRESIDENT then delivered an Address, after which Prof. POULTON moved a Vote of Thanks to him, coupled with the request that he would allow the Address to be printed as a part of the Society's Proceedings; this was seconded by Mr. W. J. LUCAS and carried by acclamation.

The PRESIDENT returned thanks and Mr. O. E. JANSON then proposed a Vote of Thanks to the other Officers for their services during the past year; this was seconded by Mr. T. F. P. HOAR and carried, the TREASURER and the two SECRETARIES returning thanks in a few words.

ENTOMOLOGICAL SOCIETY OF LONDON.

Balance Sheet for the Year 1913.

RECEIPTS.		PAYMENTS.	
	£ s. d.		£ s. d.
Balance in hand, 1st Jan., 1913	16 18 9	Printing Transactions, etc.	368 9 11
Subscriptions for 1913	490 7 0	Plates, etc.	69 8 4
Arrears	21 0 0	Rent and Office Expenses	159 3 6
Admission Fees	42 0 0	Books and Binding	61 7 4
Donations (including £60 received from the Royal Society)	80 10 5	Investment in Consols as per contra, including the £47 5s. carried over from 1912	110 5 0
Sales of Transactions	153 15 1	Subscriptions in Advance as per contra carried to 1914	18 18 0
Interest on Investments— Consols	£28 13 4		
Birmingham 3 per cents.	6 15 4		
	35 8 8		787 12 1
Subscriptions in Advance	18 18 0	Balance in hand	134 5 10
4 Life Compositions	63 0 0		
	£921 17 11		£921 17 11

ASSETS.		LIABILITIES.	
	£ s. d.		
Subscriptions in arrear considered good	30 0 0	Cost of printing Parts 3, 4 and 5.	
Cost of £1,292 1s. 2d. Consols. Present value at the price of 71 $\frac{3}{4}$ on 31st December, 1913, £927 1s.	1,185 18 0		
Cost of £239 12s. 4d. Birmingham 3 per cents. Present value at the price of 77 on 31st December, 1913, £184 10s. 1d.	250 0 0	Audited, compared with vouchers and found correct, 13th Jan., 1914—	
Balance in hand	134 5 10	R. W. LLOYD.	
	£1,600 3 10	HORACE DONISTHORPE.	

Additional Assets:—

Contents of Library, including Recent acquisition of Hübner "Sammlung Exotischer Schmetterlinge" and unsold Stock.

Less total depreciation of £324 6s. 11d. in the value of Securities.

A. HUGH JONES, *Treasurer*.
5th January, 1914.

THE PRESIDENT'S ADDRESS.

GENTLEMEN,

HIS MAJESTY THE KING has been pleased to confer on the Society his Royal Patronage during the present year, whilst in other ways also it has been one of continued prosperity.

If the Transactions do not reach to the large number of pages that they have occasionally done, they certainly have neither lacked in the interest of their matter nor yet in the variety of subjects treated on. Our meetings have been as largely attended as ever, whilst the number of exhibits has been so great that our hours of closing have been frequently rather late. All I think betokens continued prosperity.

The obituary record this year contains I regret to say the names of several eminent men. One honorary Fellow representing the Russian Empire has passed away—Odo Morannel Reuter of Helsingfors—Professor, poet and scientist, we can ill afford to lose him.

Lord Avebury, our oldest Fellow has gone from our ranks, and in him the world loses a large-hearted philanthropist and politician as well as a man of science.

Then Herbert Druce has gone also, in whom many of us lose a personal friend ever ready to help with his long experience and large collections.

Alfred Russell Wallace, the gifted co-discoverer with Darwin of the theory of evolution by Natural Selection, has joined his friend in the great beyond. A man whose magnanimity and modesty are evidenced in the fact that he christened their joint discoveries with the name of Darwinism, and spoke with rare felicity in exaltation of his friend's greater part therein at the Darwin-Wallace celebration on July 1st, 1908.

Five others have likewise passed to the great majority—Thomas Boyd, Philip de la Garde, Thien Cheng Kung, Lionel Armstrong and A. G. Lethbridge. It would be well if the courage and indomitable patience of a Reuter and the large-hearted highmindedness of an Avebury and the modesty of a Wallace could inspire each one of us to attempt greater things.

I will now pass to the subject of my address.

THE SCALES OF THE RURALIDAE, WITH SOME OBSERVATIONS
ON THEIR COLOUR PROBLEMS.

It is manifestly impossible to deal adequately with so wide a matter in the course of a single address, but it has occupied my attention intermittently for many years and I thought it might be well to lay before you some of my observations, inasmuch as the scales of this group are very varied, many are very beautiful, whilst some have a peculiar interest of their own.

It is no doubt well known to all that the different areas of the wings have scales of different patterns, for instance the costa of the fore-wing, which needs to be strengthened as the cutting edge during the process of flight, generally has long scales different from the others; these are formed into a sort of cable, so to speak; the subcostal area differs in its scales from those covering the cell and these differ from those in the postmedian area, whilst the fringe scales (most beautiful objects under the microscope) are totally diverse in shape from all the others. In addition to these there are the various sexual brands of very varied structure and design, whilst there are also the extraordinary protective scales covering the entire surface of that peculiarly specialised insect *Liphyra brassolis*.

Before describing the scales themselves it might be well to explain one term that I have used; in the details of the "blasenschuppen" I have used the word "reticulations;" a reticulated surface in its strict sense should show a network, formed by lines crossing each other at different angles, and under a low power these peculiar scales have a reticulated appearance; to be accurate however they are crossed longitudinally only by rows of minute dots, and the fact that the rows are exceedingly close to one another gives them the appearance mentioned, I have therefore used the words "rows of reticulations" or "reticulated rows" as it expresses the general appearance, though technically it is not correct.

I ought also to add that in my preparations of butterflies with these structural colours all the Ruralidae have a second under layer of brown scales whose office might well be to absorb all the unused rays of light, and thus perfect the production of the colours of this group.

Plebeius argus, L. (*aegon* Auct.).

The costa is composed of a gradually tapering cable of long flattish scales that slowly taper distally and terminate generally in a sharply bifid extremity, though there are many with a trifid extremity among them, these scales are arranged in a heavy continuous bundle near the base, becoming gradually narrower and fewer up to the apex, the scales are without doubt a modification of those that form the fringe on the termen with which they eventually merge at the apex, they are at the base brownish but soon become white on the outer edge of the costa; between this and the costal vein the area is filled with blue scales not half the length of those just mentioned; they appear to be flat, but of course are not so, and are broad, tapering very slightly to the extremity, their bases are indented, a short fine stalk issuing from the indentation, whilst their apices have three equidistant incisions giving them a quadrifoliate (if I may use the term) termination, with these, nearer the termen, we find a few of another bluish scale like the costal ones but shorter and wider (though much longer than the ordinary scale just described) with a deeply and sharply quadrifid apex. The veins are all clothed with a combination of two or three different scales, and are always I believe brown, this being the case with the great majority of species examined. One other pattern is like that mentioned, but not so long and broader, another is similar but broader still and with four or five deepish serrations at the apex, whilst the third is a short very broad scale with a bluntly quinque-dentate apex. Between the costal vein and the cell, as also in the subcostal area above vein 7, the same pattern scales prevail as are found in the costal area, but those in the cell itself are different, they are much broader with no serrated extremities (though the basal attachment remains practically the same in all) but instead a quinque-foliate apex in many, though the majority of the scales in this area, for there are two sorts, have an even, very slightly undulated apex; the pattern on the fold is a still further modification, for whilst retaining the same size and shape as the scales in the cell, they have mostly assumed a perfectly even, slightly convex apex, though a certain number with an inclination to a slight foliation appear among them; in the

radial area below vein 7, including the upper and lower sections, the same pattern prevails as on the fold, whilst below vein 1 in the basal portion the scales are similar to those in the cell, but as they near the tornus they become like those on the radial area. The inner margin itself is fringed with fine, very long, bluish hair-like scales, quite cylindrical, that become whiter as they merge into the fringes proper, these scales are also found in some numbers over all the basal area. What we usually call the fringes, *i. e.* those scales which are found on the termen are always very beautiful objects, they are of two patterns both having the same shape and structure but with different lengths and apices, the shorter fringe scales are brown with very deeply and sharply quadriserrate apices with a few triserrate amongst them, both sorts are of an inverted lanceolate shape, on a fine, very long stalk, spreading out rapidly for the terminal third in a fan-like structure with very deeply serrated apices, the long terminal fringe scales are white, and have five and six exceedingly deep fine serrations at the apices—both these scales are very finely ribbed, so finely indeed that under a moderately high power we do not obtain a really adequate idea of the structure, the subterminal area is composed of brown scales similar to those clothing the veins, but the longest pattern with the quadrid apex very largely predominates. All the wing scales are finely ribbed. We now come to the last type of scale that is found on the fore wing, one whose office is not yet known; usually it is devoid of colour, though not always, and it has attracted more attention than any of the others. I refer of course to the battledore scales, though personally I think the German appellation is much more to the point, viz. Blasenschuppen “bladder scales.” These are present under each row of ordinary scales in considerable numbers, they are in this species subovate with a long fine stem and have eleven rows of reticulations; they may be recognised at a glance nearly always on account of being devoid of colour (with a few exceptions) and always strongly shagreened, they are more or less rotund and are I believe, as has been stated by previous authors, only found in the male sex; it is however incorrect to state that they are only

found in blue species, I have found them in entirely brown species and they are present in all the wings upper and lower. In the secondaries the costa and also the inner margin are fringed with whitish long hair-like scales quite similar to those on the inner margin of the primaries, the costal and subcostal areas are clothed with brown scales similar to those on the veins of the primaries but with an admixture of an oblong scale having an evenly rounded apex, between the costal vein and the cell the space is occupied by an upper layer of short very broad scales of even width, except at the base which is rapidly rounded off, they have the same method and pattern of attachment as in the primaries but the apices are quinque- and sexa-dentate with a very irregular dentature, among these will be found some of the same pattern but a quarter longer, the lower layer are longish scales of moderately even width or very slightly tapering with quadri- and quinque-dentate apices, among them however a few with an even apex having no dentature at all obtain. In the cell some of the brown scales just described are present, but the blue ones begin to predominate and are different, being of a bell-like shape, of moderate length, very broad, slowly tapering to the apex which is uneven but not dentate; the rest of the wing is clothed with similar scales some of which have a quite even apex, and with an admixture of the brown scales also. At the inner margin the longish brown scales again predominate as also in the terminal area, the fringes are quite similar to those in the primaries but with modified apices being only bi- or tri-serrate, with only a few quadriserrate; the serrations are however of the same deeply cleft and fine pattern as in the fore wings, the "blasenschuppen" are less abundant in the secondaries than in the primaries but of the same shape and structure.

In *Plebieus sieversii* from the Caspian region the abundant blue scales in the subcostal area are of moderate length and width, tapering slightly distally, the apex being deeply dentate; in the other areas they are roughly spatulate, but the apices are mixed, either scalloped or quite evenly arched, and occasionally waved, these all appear to be mixed indiscriminately. The thick hair-like scale is finely ribbed and very

prominent in this species and is distinctly blue in colour, it is very long, tapering, slightly wider at the centre, whence it tapers down slightly to the apex which terminates in a blunt point—it is the widest scale of this type that I am acquainted with and is very plentiful all over the basal half of the wing, getting less so towards the termen. The “blasenschuppen” are large, almost oblong in shape, with a comparatively short attachment peduncle; they have usually ten rows of reticulations but go up to twelve.

In *Polyommatus icarus* the costal cable of fringe-like scales is not nearly so heavy and prominent as in *argus* (Linné) and at the basal area is largely mixed with the long hairs found in that area though these become brown on the costa whilst they are whitish elsewhere, the other scales differ in very minute particulars, showing the near relationship of the two species; they are however simpler in pattern and have more or less evenly terminated apices; the “blasenschuppen” exhibit a marked divergence, for in this species they are elliptical in shape tapering at the base slowly into the stem-like attachment, and have but six rows of dotted reticulations instead of eleven. In addition to the basal hair-like scales is another somewhat similar one, but much thicker, it is better developed in *thetis* and will be described under that species.

Polyommatus semiargus has scales throughout entirely of the *icarus* type, differing only in size more than actual shape, the thick hair-like pattern being very close to that species. The “blasenschuppen” follow closely the *icarus* pattern, being a long oval, slightly wider than in that species, and with seven rows of reticulations, though in one scale I counted eight.

In *Polyommatus thetis* the scales show some advance in development, in the basal area some of the blue ones have scalloped, whilst a few have waved apices, but the large majority of the blue scales are approaching the simpler pattern found so largely, as I shall show hereafter, in the brilliantly blue exotic species; this I am inclined to regard as a later development than the highly serrated scales of the brown and non-metallic blue species, in this case they have not the absolutely evenly arched apices but a very close approximation to that character, the distal end, though

sometimes evenly rounded, is more frequently slightly uneven. The special scale I would draw attention to however is a tubular hair-like one that is blue in colour, it is very long, though the length is not uniform, with the base quite as wide as the apex; the base is colourless, apparently quite empty, for the proximal eighth the tube tapers down more narrowly, and in the second narrow eighth the first vestiges of colour appear, it then assumes its usual width and terminates in a very bluntly rounded apex, it is really a hair-like scale though coloured, being perhaps three times the width of the very fine and longer basal hair-like pattern obtaining almost throughout the group. The "blasenschuppen" are ovate, broader than in *icarus* with seven rows of reticulations usually, though I have counted as few as six and as many as ten.

P. eros shows a yet further advance in the simplification of the blue scales—omitting those composing the costal cable, which in all cases is composed of special ones more or less similar, it being obviously necessary for the costa of the primaries to be particularly strong; they are of slightly varying sizes and widths in the different areas but are all more or less of the same pattern, being of moderate length, narrower at the base and tapering somewhat broadly up to the apex which is evenly terminated in a slight arch. The thick hair-like scales as described in *thetis* are present in some numbers, whilst the "blasenschuppen" are very numerous and of the typical *icarus* pattern; they are a long narrow oval shape with a long attachment peduncle and have four or five rows of reticulations; they are colourless, the reticulations appearing greyish, but under a condensed direct light they are brownish; they are then however so very obscure that an inexperienced eye would probably fail to see them.

Plebeius anteros possesses "blasenschuppen" of unusual size and interest whilst the ordinary blue scales are quite simple and for the size of the insect large; they are oblong, longish, rather broad, tapering very slightly indeed up to near the apex, from whence they reduce equally slightly to the apex which is very weakly curved, without any wave or serration; they are finely ribbed. The "blasenschuppen"

are about half as large as the ordinary blue pattern, rather more if anything; they are goblet-shaped, with a longish strong attachment peduncle tapering into the scale exactly as in a goblet; in sculpture they are ribbed, not reticulated as is usual with these scales, and are blue in colour; there can however be no doubt as to their being "blasenschuppen" from their shape, their stem, and the position they occupy.

Polyommatus galathea would appear from its general scaling to be very closely allied to *icarus*, but the "blasenschuppen" are more nearly related to the *Lycaena (arion)* group, the scales in each part of the wing are very similar to *icarus*; the thick hair-like scales are also present in fair numbers. The "blasenschuppen" are however different, they are largish and balloon-shaped, with eleven rows of large reticulations.

In *Lycaena arion* whilst the cable of costal scales remains similar, this being no doubt necessary for the strengthening and protection of the wing, there is a considerable admixture of bluish scales, on its internal side, of quite a different shape, that are long for a wing scale, in contradistinction to a marginal fringe scale, slightly tapering, of but moderate width, and with a deeply serrated apex having four sharp points; the neural scales are of medium length, generally brown, narrowish of almost even width, with serrated apices consisting of either a single or double serration, the costal and subcostal inter-nural scales are mostly brownish, of medium length and width, tapering slightly, wider distally, with the apex sharply tri-serrate, *i. e.* with four points; mixed with these however are a number of more or less blue scales similar to those obtaining on the internal edge of the costal cable. The cell and other blue areas are covered with two patterns of scales, brown ones and blue, both have minor deviations, both are broad, of moderate length, nearly even in width, in the case of the blue scales the apices are trifid or quadrifid, not having the sharply serrate pattern but rather scalloped, the apices of the brown scales being evenly dentated with two or three dentations; the brown scales in the marginal area are similar to those on the veins, whilst at the base are to be found a large number of broad bell-shaped scales with irregularly dentated or scalloped apices, the terminal fringes are shorter

in pattern than in the case of the two species I have already described, and have more modified serrations, which are less deep and not more than four in number. The "blasenschuppen" are heavier in build than those described, being subovate with the apex rather flattened, they have eleven rows of broad deep reticulations, the attachment peduncle is of only moderate length. In the secondaries the base of the wing has a large number of brown bell-shaped scales with the excised attachment cleft very narrow and nearly perpendicular, the stalk itself being short and stout; the apex is dentated but the dentations are irregular both in number and pattern, these extend along the veins and slightly over the cell and the fold, as also into the costal area to about the end of the cell, whereabouts they appear to cease. The costal cable is composed of scales of three sizes and patterns, the largest being quite twice the length of the shortest, it is long and very broad, slightly curved, with the apex scalloped, the second is straighter, similar to the previous one but a third less in width, whilst the third is about half the length of the first, very broad, slightly tapering to the apex which is sometimes evenly hollowed and sometimes trifid, the subcostal areas are clothed with scales similar to these two latter. In the cell and on the fold the brown scales are present in some numbers and are superimposed over the blue, the latter being broad, moderately even in width, with quadridentate apices, though this last point is by no means universal, though general; the brown ones, in addition to a few of the bell-shaped pattern, are smaller than the blue, of moderate width, shortish, with the apex generally quadridentate but of irregular dentation. Those in the radial and postmedian areas are also of two patterns, viz. a subhyaline and a brown scale, both seem to be of the same shape and pattern, smaller than the blue scale in the cell; they are of moderate width and length, not tapering, with irregularly dentate apices, the "blasenschuppen" are well distributed over the whole wing even almost up to the termen.

In *Scolitantides baton* the ordinary blue scales are almost the same throughout all the areas of the wing, approaching somewhat nearly the brown species of the Plebeid group.

I therefore regard this as an early type; they (the scales) are longish, of moderate width, tapering rather wider to the apex which is scalloped more or less deeply. There is a large admixture of brown scales of quite different pattern throughout the wing. The "Blasenschuppen" are very difficult to estimate, some are almost spherical, some are ovate with broadly rounded ends, other are very similar to the *arion* group; they have seventeen rows of fine reticulations.

Aurivillius has already pointed out that *S. orion* has no "blasenschuppen," and my own observations confirm this.

In *iolas* the blue scales are somewhat specialised, in the subcostal area they are longish, of varying widths, many having scalloped apices but in very varying degrees, and some have almost even or very slightly arched apices; it will be remembered that *iolas*, without being lustrous at all, is yet a very blue species, and the great majority of the blue scales are short and very broad, almost as broad as long, evenly terminated in a decided arch and very finely ribbed; they differ however in length in different parts of the wing; near the base they are longer and occasionally one will be seen distinctly scalloped, in the terminal area they are narrower and evenly oblong, the species has also the thick hair-like scales found so plentifully in the genus *Polyommatus*; they are of even length and terminated in a blunt point. The "blasenschuppen" are somewhat pyriform with eleven and twelve rows of coarse reticulations. In the subcostal area are several scales quite like the "blasenschuppen" in structure and sculpture, but about three times the size, and might be described as narrowly fan-shaped (an enlarged pyriform would be approximately fan-shaped), they take the place of the "blasenschuppen" and are mixed with them. I found them in each of the specimens examined, but in some there are only one or two whilst in others there are more of them; they are however of interest in that they show that mutation in this special form of scale is in operation.

Melanops is a species rather strongly blue to the naked eye; there is however a very large admixture of ordinary brown scales in both wings which are superposed on the blue ones; these latter approach closely to the patterns obtaining

in the last insect, those in the subcostal area being practically similar whilst the majority in the other areas are close also, being very simple and broadly spatulate rather than oblong. The thick hair-like scales are present in some numbers and do not differ from the usual structure and form, whilst the "blasenschuppen" are decidedly of the *Lycaena* type but are more spherical than those of *arion* (*arion* however has the longest of the genus); they have nine rows of distinct reticulations and occasionally ten, this may however be occasioned by the position of the scale.

In both the above cases the ordinary blue scales are very different from the *Lycaena* type.

In *Celastrina argiolus* the costal cable of the primaries is quite fine, as might be expected with a weakly flighted species, and is made up of the costal fringe scales; the subcostal and presubterminal areas are clothed with two kinds, a broad almost even (in width) long scale, that is irregularly dentated at its apex, and has a rounded base with a minute incision for the attachment stalk; with this pattern are mixed a few of a much longer shape, almost fan-like, *i. e.* narrow at the base and widening considerably to the apex, which is tricrenate, the central excision being less deep than the outer ones; the scales occupying the cell and the fold are decidedly shorter in length, tapering slightly from the rounded base to the apex which is irregularly dentate or crenate, the postmedian scales are of a similar pattern to those in the subcostal area, whilst those on the margin are narrower in width, the long fringe scales are very narrow proximally and for at least half their length, when they rapidly expand, and then, immediately in front of the serrated tip, slightly decrease in width; the apex is deeply quinqueserrate, the three middle serrations being the longest, but not uniform, sometimes one point being the longest and sometimes another point. The "blasenschuppen" are extraordinarily numerous and large, they are cup-shaped, deeply reticulated, with fifteen rows on one side. In the secondaries the basal brownish scales are somewhat squarely formed, having a subtriangular base whose apex is the incised attachment stalk; they are very broad and short and of even width, the apices being slightly rounded,

generally crenate, but sometimes quite even; with them are to be found a few blue scales of two patterns, the smaller one very similar to the brown one but rather longer and rounded at the base, the other is twice the length, slightly narrower, even in width with a tricrenate apex; the costa consists of entirely brown scales, those near the base are similar to the basal brown ones but rapidly change to a pattern having a somewhat cone-shaped even apex, these again give place to an uneven or lopsided scale, the outer half of which is more or less evenly pear-shaped, whilst the inner half has the base slightly excised as also the apex, but this latter is excised below the apex so as to form a squarish shoulder laterally, these continue up to the postmedian area where they are replaced by a longer narrower scale of even width with dentate apices; the costa itself has an edging of a single line of very smooth longish scales, slightly wider in the middle, but evenly terminated both fore and aft, and with them are mixed not only the hair-like fringe but also a scale that may be a modification of the fan-like fringe, viz. a long, narrow, even tube, bluntly terminated but very irregular in width, being very narrow with an almost pointed extremity; in the subcostal area the basal and the postmedian patterns are mixed together, and with them there is a large admixture of the blue cell scales which predominate as that area is approached; these blue cell scales are oblong with truncate apices that are decidedly crenate, all the blue scales being of this pattern, those on the abdominal fold are long, broad, of even width, very slightly reduced at the evenly truncate apex; the terminal wing scales call for no special remark.

In *Everes argiades* again certain differences are noticeable; the costal cable is composed entirely of long, thickish, hair-like scales (thickish in comparison with the somewhat colourless hair-like scales that are found in the basal and antemedian areas of most *Plebeinac*); they are brown, and mixed with them are a certain number of simple fringe scales, these becoming predominant towards the apex. The blue scales throughout the wing are of three patterns, a very broad shortish one that tapers slightly from the base and has a very irregular serrated apex; this is the predominant one and

obtains up to the postmedian area, where a longer narrower pattern begins to obtain with similar irregular apices; an occasional very blue and somewhat different scale is also present, having a very smooth surface, similar in shape, but tapering out more widely to the apex which is crenate not serrate. In direct light on a dark background these are all very blue, whilst the ordinary scale has a paler and a mauve tint. I have been quite unable to trace any difference in structure between these and the ordinary predominant pattern, the ribbing is similar yet it looks smoother and is decidedly different in colour. The brown neural scales are of two patterns, a somewhat bell-shaped one expanding rather rapidly and with an irregular much serrated apex, and a narrower and longer one also serrated but less irregularly; this latter is less abundant. The "blasenschuppen" are very numerous and are not unlike those obtaining in *Celastrina argiolus*, but not quite so large, and the apex is not truncate; it is therefore nearly globular but a little too long to be quite so, they have as a rule fourteen rows of reticulations on one side, but in certain cases I have counted fifteen, though fourteen appears to be the normal number. In the secondaries the scales above the costal vein are brownish, of unusual width and of moderate length, tapering to the apex which is rounded off unevenly, the outer apex being generally the longer and descending irregularly to the inner edge, the base of these scales is deeply cleft at the attachment stalk and very deeply and heavily lobed on the costal side, this lobing which obtains in certain species in this particular area is very interesting and is evidently an accommodation to the shape of the wing, I am not aware of its occurring where the scales have an entirely free course; the basal brown scales are short, broad, of even width, with a regularly rounded base with but little incision for the stalk, and with an unevenly dentate apex, the blue median and postmedian scales being a modification of this pattern, as might be expected in this case where they freely intermingle; they are rather longer, tapering slightly towards the tri-scalloped apex, the central division of which is the widest; those on the abdominal fold are long and narrower, even in width with a truncate apex, these are brownish at the

base, becoming blue when free from the overlap. The "blasenschuppen" are very numerous in the secondary as in the primary. It is interesting to record that the Indian *Everes parrhasius* has no "blasenschuppen" at all, thus proving conclusively to my mind the distinctness of the species.

Tarucus theophrastus is Plebeiid in its scaling; dealing with the blue ones only, the subcostal ones are longish, for so small an insect I should say long, tapering somewhat more widely to the apex which is scalloped; in the cell and median area they are broad, of moderate length, with the apex well arched and scalloped to a more or less degree; the same pattern obtains on the fold also. The "blasenschuppen" are very large and flask-shaped (*i. e.* the shape of a pocket flask) somewhat tapered at the base to meet the attachment peduncle; they have fourteen to sixteen rows of reticulations and extend practically to the termen of the wing, this being a very unusual character. They are Plebeiid in sculpture rather than of the *Polyommatus icarus* type.

Lampides boeticus presents some very remarkable features, more especially in its plumules, if I may depart from my adopted appellation "blasenschuppen" in this special species, the fact being that in this insect these scales are not bladder-like, though generally speaking they are so. In *boeticus* however we find these scales with a certain amount of colour, they are brownish, occasionally with a slight lustre, and very long, in shape like an Indian club, and they are extraordinarily abundant, being so plentiful as to completely cover the ordinary scales in some parts of the wing. I will however refer to them after the ordinary scaling has been described. The basal area above the cell is clothed with beautifully waved, fine, very long, greyish-white hair scales, under which are a layer of similar brown ones, the former extending also into both the cell and the fold; these cover entirely the ordinary wing scales among which are a few brown ones with very long and sharply dentated apices, the indentations between the teeth being very deep; the ordinary wing scaling calls for no very special remark but probably all lepidopterists will remember the somewhat rough and occasionally almost greasy look that *boeticus* has; this arises

I believe from the admixture with the "blasenschuppen" of (so far as I am yet aware) a unique scale, imitating almost exactly the plumule but inserted into the wing membrane at the other end of the scale and being entirely beautifully pale blue; these are the apparently hair-like blue scales all over most of the wing that give it the well known rough texture, they are, however, not hair scales but of the shape of an Indian club, with the club part longer in its tapering than in the plumule, and the thin end also longer and thinner than is the case with the other scale, the result being that this blue scale is a much longer and more elegant one than is the plumule, its apex is also more elegantly shaped, being rapidly tapered down to a rather blunt point; again, it is evenly ribbed, the ribs being practically parallel and disappearing as they approach the narrower part, whereas the "blasenschuppen" are irregularly striated from a central line. I was much perplexed in my early examinations of this insect at finding a large number of blue plumules, as I at first thought, mixed up with the brown ones, the former all with their club apices towards the termen, whilst the latter had their club apices towards the base of the wings, and frequently deeply embedded among the ordinary wing scales; it was some time before I realised that I had before me a pseudo-plumule in the blue one; such however is without doubt the case. The plumule itself is a much coarser and rougher object; generally, though not always, decidedly shorter than its mimic, with its narrow apical end less narrow than the blue one, the tapering being much more rapid, and the broad end broader, the attachment stalk being a short one emitted from the broad base which is more triangular than the apex of the pseudo-plumule; the striations of the plumule proper differ in number, they are striations, not reticulations, as is generally the case; I have counted from 15 to 18 or 19; they are deep and irregular and branch from each other, finally converging to a common termination at the apex. The essential difference in the two scales is that the broad club is the base and attachment end in the plumule whereas the club end in the mimic is the apex, the attachment to the membrane being at the thin basal end. Both the scales obtain in both the wings though the

pseudo-plumule is less abundant in the secondaries than in the primaries.

It has been said that *Lampides aratus* has "plumules" of a similar shape to *boeticus*; this however is an error, the plumules of all the species of the genus *Lampides* (*i. e.* of the *aelianus* group) that I have examined having short "blasenschuppen" of the *Celastrina* type, in fact I am at present unaware of any "blasenschuppen" similar to *boeticus* with one exception and that in a genus not nearly related to it; the species in question is *Uranotauma falckensteini*, the scale being an almost exact replica of the one found in *boeticus* only probably less than half its size; it is the same shape, has similar striations, with the attachment peduncle at the thick end, but the scale is finer in texture as also are the striations. The most interesting feature of these "blasenschuppen" however is that they are not distributed generally over the greater part of the wing as is usually the case, but are restricted to certain defined interneural lines and are of a purplish-blackish colour; mixed with them is another mimic "blasenschuppe" of the common "battledore" shape with four parallel ribs; these are numerous and do not occur apart from the long ones just described. These are perhaps with the large sex patch obtaining in the other species of this genus the simplest form of sex mark in the *Lycaeninae*, with the exception of the *Strymonidae*; it is also worthy of note that the ordinary wing scales are among the simplest of the group being plain oblong scales evenly terminated, the same scale being distributed over nearly five-sixths of the wing, those on the fold and in the costal area being only a narrower and longer modification of this pattern. The usual deeply serrated or scalloped apices are almost, though not absolutely, absent in this species.

Polyommatus menalcas presents several peculiar and interesting features, this being a species in which the median area of the primaries is largely covered with soft hair-like scales, and it was with considerable interest that I examined it. The base and costal cable are amply covered with the long, fine, hair-like, bluish-white scales common to most of the genera *Plebeius* and *Polyommatus*, but the soft brown hair-

like scales of the median area are quite different in several respects. They are many times as thick, very long, and waved, attached to the wing not by a short peduncle or stalk, but by a slight spreading of the base directly on to the membrane, the basal part of the scale is colourless, slightly swollen, soon becoming shortly constricted, at which part the brown pigment develops and the very fine ribbing begins; beyond this it very rapidly thickens slightly and remains of even width until near the apex, when it shortly tapers to a blunt point. With these scales, especially on the veins is found another from which it may be possible the former were evolved; it is unusually long and narrow, but not hair-like, it very gradually tapers wider to about a fifth from the apex, when it rapidly reduces to the tip which is abruptly and almost squarely terminated; the attachment stalk is also specialised, being between the ordinary method and that obtaining in the hair-like brown scales; it is thicker, and gradually tapers for a short distance to its juncture with the scale, whose base is simple, not ribbed, but again tapering up shortly to its juncture with the part where the usual ribbing arises, and from whence the rest of the scale is finely ribbed; these two joints (if I may use the term) are the nearest approach to hair structure that I have yet found, and the interesting part is that they do not occur in the hair-scales, but in a scale proper. The question that naturally arose was, will there be a modification of the usual wing scales that obtain under the brown hair-like scales? At the extreme base where the ordinary whitish hair scales still persist there was no modification, the scales presenting nothing worthy of note and having sharply serrated apices, but in the median area this was not so, the blue scales being of the simplest pattern; they are of a long oval shape, the apices being of two patterns, one quite evenly rounded, the other with a slight shoulder on each side, the apical edge itself however being quite evenly rounded off; these latter are very few in number. In the postmedian area the blue scales are much shorter but with similarly modified apices, so that one is led to wonder whether the brown hair-like scales were not at one time more largely spread over the wing. The "blasen-

schuppen," which are very numerous, are ovate, not always regular in size or shape, sometimes being evenly ovate, sometimes tapering slightly towards the apex; the attachment stalk is long, tapering, slightly wider at its juncture with the scale, which is coarsely ribbed, several that I have examined having nine ribs, others however had fewer. The scales of the secondaries show no such modifications as do the primaries. From this unusual example I went for confirmation to *Polyommatus dolus* var. *vittata*, a species that has somewhat similar hair-like scales over the same area, only they are less copious and not quite so noticeable; in this case I found the long fine basal hair scales (bluish-white) more extensive, whilst the brownish ones (so prominent in *menalcas*) are perhaps less abundant but still very plentiful; they are similar in structure to those just described but rather finer; an extraordinary character however obtains in the ordinary blue wing scales, the whole of which are curled round so as to form more or less short tubes, the process appears to be that each side of the scales turns over, and occasionally they meet thus in the centre, but more generally one side will overlap the other and so form a more or less perfect tube, by this I mean of course that the basal and apical ends remain open—a tube that is sealed at each end naturally ceases to be a tube, becoming a cylinder. This peculiar and interesting development obtains with nearly all the upper layer of blue scales with the exception of those in the terminal area, the lower layer in this case are not brown but are more or less transparent brownish-grey, and they (not being as numerous as is generally the case) retain their normal shape and position. The "blasenschuppen" are plentiful, a long oval in shape, much the shape of a narrow specimen of the egg of the red-necked Grebe, with a longish attachment stalk as in *menalcas*, and having 7 or 8 rows of coarse reticulations, though in one large scale I counted 9, but the former seem to be the normal numbers. In the secondaries also the normal bluish scales are developed in exactly the same way into the more or less semitubular ones as in the primaries. Is it possible that we have here the early evolution of the long hair-like scales peculiar to this section of the genus *Polyommatus*?

P. admetus is more abundantly covered with these peculiar long soft scales than any other European species. What shall we find in this species? The scale is of the same structure and form as in the two last-mentioned only it is more robust, whilst those underlying, and in fact all over the wing in the median and post-median areas, are simply developed, with evenly rounded terminations. Again however we find an interesting character. It has been said, and I do not find that it has been pointed out to the contrary as yet, that no brown *Lycaenidae* have "blasenschuppen"; *admetus* however has them fairly plentifully in both wings; they are similar in shape to its congeners, but smaller, and with finer reticulations. I found in one specimen two quite abnormal examples of this scale, one being more than double the usual size and a second very much larger.

Polyommatus meleager is another species that is densely covered with long hair-like scales, as in those we have been just considering; the basal ones are of the usual type only very long and very fine, but they are succeeded by some of another pattern that cover the greater part of the wing surface, only the terminal area and a small part of the post-median subcostal area being free from them. They are ribbed exceedingly finely, in colour they are whitish, blue, bluish-grey and brown; in size they are very long and narrow, being twice to three times the width of the usual basal hair-like scales, and in length would exceed ten to fourteen of the ordinary wing scales in their usual overlap; in parts they are thickly packed together so that it is not easy to see the underlying scales, in which, as would be expected, we find some modification; they are finely ribbed, simple in pattern but very large in size—apart from those on the veins which are very broadly tulip-shaped with waved apices—being unusually broad; in shape they are very broadly ovate, the corners being rounded off rather too much to be able to call them oblong; they are slightly narrower at the base than the apex which is evenly arched somewhat; along the inner margin the pattern is elongated with a crinkled apex; the terminal scales are broadly tulip-shaped with slightly scalloped apices.

The "blasenschuppen" are of the usual *Polyommatus*

type, they are of a fair size, a longish oval with a strong attachment peduncle, and have five rows of reticulations usually, though in certain cases I have counted six; they are colourless. In the secondaries the same hair-like scales also prevail considerably though they appear to be slightly finer than those in the primaries, whilst it should also be noted that they are entirely confined to the male sex, not being found in any of the female forms of the species.

I do not find that the scales of the *Plebeinae* (in its broadest sense) that are brown in both sexes present structural differences from those that are blue in one or both sexes; they appear to be essentially of the same type, they are ribbed similarly and are similar in pattern, allowing of course for specific divergence.

The genus *Heodes* is very nearly allied to the *Plebeinae* and there is nothing specially to draw attention to in the structure and type of their scales. They have assumed patterns very similar to those we have been considering both as to shapes and apical terminations whilst their attachment peduncles are almost precisely the same, there are however two points in which they differ; they have no "blasenschuppen," and though their copper hue is classed among structural colours, yet viewed under transmitted light the colour remains quite apparent; this is not the case with our European blues, they are always, so far as I have examined them, transparent under transmitted light and are somewhat yellowish; it must be remembered however that this is not so with many of the tropical species, but I propose to put before you a few observations on this difficult subject a little later on.

Knowing that certain exotic genera that were magnificently blue in most of their species, and whose affinities I put rather nearer the *Ruralinae* than the *Plebeinae*, were devoid of "blasenschuppen" it was with much interest that I turned to the blue species of the genus *Ruralis* to see whether or not they would be found in them, naturally the first one to be examined was *Ruralis quercûs*.

The scales generally speaking are simple, the only ones that have serrated apices being those that largely compose the

costal cable which are longish and narrow, the terminations having three short serrations, *i. e.* with four teeth; a smaller and slightly modified pattern also obtains in the terminal area; in the costal, cellular and other areas the scales are simple, broader and shorter in the median and postmedian regions, narrower and longer in the costal and subcostal areas and also on the fold, but all have more or less even apices, generally quite even and slightly rounded, but occasionally irregular with an indication of dentation, and among the brown neural scales many are definitely dentated. Of "blasenschuppen" however I could find no trace, and this applies to all the species of the genus that I have examined both Palaearctic and Exotic.

In *Laeosopis roboris* the "blasenschuppen" are likewise absent, the blue scales are small, oval, without any trace of serration or dentation of the apices, whilst the brown scales are of the normal type with serrated ends.

In the genus *Strymon*, in which with a few exceptions the coloration is entirely brown, the scales are similar in general shape and pattern to those obtaining in other *Ruralidae*. *Strymon titus* and *w-album* are typical of all the species, and in the latter the costal cable is composed of long narrow scales tapering very slightly indeed and having one, two and three moderately deep dentations, those with the single dentation being mostly on the outer costal edge and largely confined to the basal two-thirds; as the apex is approached the scales have generally two dentations, whilst those with three are found more in the body of the cable; the subcostal area is composed of longish broad scales with three and four deep dentations among which are a few short broad ones, these latter scales also obtain in the cell and on the fold, but with the admixture of a certain number of very short broad scales, almost round, with a mere indication of slight dentation; in the postmedian area the scales are longish and narrower, with three and four sharp dentations at their apices. In general pattern those of *S. titus* scarcely differ from *w-album*, but in the detail of apices and relative width of scales there are slight differences. We find in this genus perhaps the simplest form of sex patch in the whole group; it consists

of a very small oval patch of androconia situated at the upper end of the cell and generally slightly diverting veins 6 and 7. In *titus* the colour is pale neutral grey to the naked eye, but under the microscope in a good white direct light it is warm brown, quite as brown as the usual scales but of a different tint, the androconia are decidedly shorter than the ordinary wing scale and not half their width, being very narrow, of almost equal width, but tapering slightly narrower just before the apex which is quite even and nearly straight; they are placed at a slightly different angle to the surrounding scales and are attached to the wing membrane at a wholly different angle; whilst the former might be described as almost flat with the wing surface, these are inserted at a considerable angle, as nearly as I could measure it would be from 40° to 45° , with a very considerable overlap, so that not more than the terminal third to a quarter is visible. The difference of the angle and the fact that only the ends of the androconia are seen no doubt accounts for the difference of colour, and certainly accounts for the prominence of the patch.

In *w-album* I was fortunate in being able to transfer the entire sex mark on to my slide, leaving only a few isolated scales attached to the membrane of the wing, and I found that the apices of the ordinary surrounding wing scales rise up slightly on to the edges of the brand, except at the front edge where the androconia overlie the other scales; it is also seen that the veins intercept the brand, running through it and causing a modification in the angle and colour of the scales; the true androconia are a sort of neutral grey, very closely and thickly set at angles different from the ordinary scales; those on the veins crossing the patch differ in colour from the rest, being rich dark brown, and appear to be attached to the membrane at a somewhat lower angle than the others, the androconia are fully as long as the surrounding scales, being set in a deep pit (as are all these brands more or less); they are narrowly elliptical in shape, tapering from the middle to a blunt point, and form a strong contrast to their surroundings.

In *Strymon saepium*, the brand is larger than in the European species and of a blackish colour, showing a very

marked contrast to the bright tawny colour of the species; in this instance there is a diminution of the ordinary wing scales immediately around the sex patch, there being only one layer, the bottom one, instead of two, with the result that the androconia overlie them entirely on their edges; they (the androconia) are set at different angles as usual, and are closely packed with the usual deep overlap; they are considerably shorter and very considerably narrower than the surrounding scales, being only about a third as wide, they are oblong, with base and termination of almost the same curve. The ordinary scales in this species are large, and are of quite unusual width considering the size of the species.

In *Callophrys rubi* the brand is very similar to those of *Strymon*. The androconia are a sort of dull neutral grey when seen in a good white light, and they are at a different angle from the ordinary scales; they are not however inset at nearly so high an angle as in *Strymon*, neither is there the same overlap; they are of moderate length (the ordinary surrounding scales in *rubi* are unusually long) narrow, of almost equal width, but have a slight taper just before the apex which is slightly excised, thus making the extremity shortly bifid. The scales of the underside of the secondaries of this species call for special comment. They are finely ribbed, long, somewhat narrow, with deeply serrated apices, having two and three deep narrow incisions, this pattern scale prevails practically over all the wing; the basal third of the scale is uniform in colour, being a warm brown gradually changing into the green tint; under transmitted light the colour is grey gradually altering to a brownish-red.

The shape and disposition of the scales in the Indian species I have examined are different from those we have considered before, and it will therefore be well to describe them. In *Lampides aelianus* the thick costal cable is composed of very long, narrow scales, tapering but slightly with bifid extremities, these scales are both very pale brownish, and bluish-white; those in the subcostal area are also long but broadish, tapering wider to the apices which have four deepish crenulations, the two central points being the longest; these obtain to beyond the cell, whilst in the postmedian area they become

longer and narrower and continue so up to the termen; underneath these is a layer of short broad scales, almost the shape of a Swiss cowbell, which have four deep longitudinal ribs, the apices being very slightly hollowed between them and the whole surface finely shagreened. These scales are by no means flattened but are corrugated, as they appear to rise and fall alternately with the ribs; together with these are also similarly shaped scales which are very finely ribbed; these however seen under transmitted light are yellowish-tawny and not quite clear and transparent as are some of the former ones. The cell and median area are covered with bluish scales, similar to those in the subcostal area but slightly shorter, and tapering rather more widely to the apices which are less deeply scalloped; many of these scales appear to be "fluted" and to be finely shagreened; the basal area below the cell and on the fold is clothed with the two kinds of shorter scales already referred to, but these are succeeded by the longer and broader pattern just described, whilst the post-median and terminal areas are covered with a scale of moderate length, of even width, rather broad, with more or less even apices, underneath which is a layer of the bell-shaped scales previously mentioned. The "blasenschuppen" are entirely different from those in *boeticus* and are very Celastrinid in shape and quite so in sculpture; whilst that genus has somewhat of a bell-shaped pattern, this is more scallop-shaped, but with straightish sides, tapering wider to the evenly convex apex, it has ten and eleven rows of reticulations, and the scales do not appear to be uniform in size, some being smaller than others; all are somewhat longer than broad, but very many are decidedly longer than they are wide. The scales of *aratus* are very closely similar to those of *aelianus* as also are the "blasenschuppen"; these however have twelve rows of reticulations as a rule, and the base is squarer than in the other species. Whilst the ordinary scales of *clpis* are quite similar to the others, the "blasenschuppen" are recognisable at a glance, for they are double the length of the others though similar in sculpture and general shape; there are however only ten rows of reticulations.

The genus *Thysonotis* is also furnished with "blasen-

schuppen" more or less of the Celastrinid type whilst in *apollonius* it is further provided with another scale peculiar to the male sex, viz. one that is of quite unusual length; it is Indian club shaped, having a very long and fine stem with an elongated finely tapered club, the apical end tapering to a point much more rapidly; the term plumule suits this elegant scale admirably, it covers very largely all the wing below the upper margin of the cell, extending up to vein 7, and is especially abundant in the cell and on the fold; it is almost white, being just tinged with milky bluish, and is probably accountable for much, though not quite all, the whiteness of the special areas of the primaries of the male; it is very finely ribbed. The "blasenschuppen" proper are very closely similar to those obtaining in *Lampides elpis*, scallop-shaped with straight sides and a squarish base, the apex being evenly but highly convex, and having ordinarily ten rows of prominent reticulations, though I have in one or two cases counted as many as twelve on the one side. Very many of these scales are bright blue, others are less blue and some have no colouring at all; but when viewed under transmitted light there is absolutely no colour at all visible in some, others are yellowish shading distally into pink, or becoming colourless and transparent, others again are wholly straw yellow. As might be expected there follows some modification of the ordinary wing scales in the parts affected. The costal cable is large and composed of long narrowish scales of almost equal width, with apices very deeply bifid; mixed with these are many similar scales but deeply trifid, underneath which is a layer of broadish oblong ones with scalloped apices; all these are brown. In the subcostal area similar scales occur with others that are deeply trifid and quadrifid in their apices, and are of a deep indigo blue tint in part, generally for the apical half; mixed with these are some of the brilliant blue scales of the same pattern that obtains on the median and other areas covered by the plumules; they are longish, rather broad, tapering slightly wider to the apex which is highly and evenly rounded, the whole surface being finely ribbed; this pattern is constant for the blue scales which are sparingly present under the

plumules, the size varies slightly, some being narrower than the majority. With these is also found another scale, of the same size and shape but slightly shagreened, that is quite colourless, both under direct and transmitted light; it is to these scales with the plumules that I attribute the whiteness (already referred to) of the central portion of the primaries; in the terminal area the pattern becomes shorter and narrower, and assumes the brown hue of that region, many being however only coloured for the apical half; mixed with them also are a certain number of both the blue and the hyaline scales. On the inner margin are found some long hair-like scales (which are also found in the female in more abundance and over an extended area); the plumules are also present, and together with them is a scale, apparently peculiar to the male, which is again of the shape of an Indian club, tapering immediately from the base so that it has no thread-like stem; it is long—about two-thirds the length of the plumule, rather broad and tapering more broadly up to the apex which is highly rounded; some few of these scales are not more than half the length of a plumule, and they are found all along the inner margin and extending up the termen in the tornal area; in colour they are mostly greyish brown, all being finely ribbed, minute particles (probably of pigment) appear to be present in the brown scales, but mixed with them are some of a narrower, though similar shape, which are milky-blue, almost the colour of skimmed milk. The brown basal scales are short and broad, somewhat tulip-shaped with serrated apices, these are of irregular length and size, whilst with them are two others both quite double their length, one broad, of almost even width, with serrated apex, the other broadish but slightly wider at the apex which is evenly terminated and more or less waved. Similar scales are found in the secondaries as in the primaries, the plumules and the “blasenschuppen” being in about the same proportion, both are very abundant. The same type of “blasenschuppen” is found throughout the genus *Thysonotis*, *i. e.* so far as I have examined it, and I have studied a good many of the species; the plumules are by no means generally present, however in *hengis* and several others they obtain, but in many they do not obtain, and in

consequence we find decided modification in the ordinary blue scales: in *hengis*, a species with only the least trace of a white area, they are present very sparingly, but the blue scales remain of the same type as in *apollonius* and approximately of the same pattern; in *hengis* however this pattern scale covers almost entirely the whole wing, except in the costal and terminal areas, the plumules (being so few in number) not having affected the general distribution of these scales, they merely lie on the surface, and are similar in design to those obtaining in *apollonius*, but are shorter and they are also decidedly bluer in colour: the "blasenschuppen" are slightly broader and shorter than in that species and have thirteen rows of reticulations, these scales are almost as blue as are the ordinary ones, but viewed under transmitted white light they are quite colourless, whilst the ordinary scales are yellowish.

In the species of the genus *Thysonotis* that have no plumules there is a decided change in both the pattern of the ordinary scales and of the "blasenschuppen." *Caelius* is a good example, in it the latter are short and very broad and have as many as fourteen rows of reticulations, though thirteen is the usual number; they have a broad squarish base and expand somewhat to their apex which is evenly and slightly arched, the scale being broader than long and having a strong attachment peduncle; under direct light they are almost colourless, and placed as they are (and as is usually the case) in alternate layers between the ordinary blue scales, they form a marked contrast to the deepish blue of this species; under transmitted light they are very slightly yellowish, whereas the ordinary blue scale of this insect is deepish lemon colour. The ordinary blue scales are likewise different, they differ slightly in length and width in the different areas of the wing, but follow in general shape those of the genus, being longish, moderately broad, tapering slightly wider to the apex, which however is not evenly arched but is slightly scalloped, the scalloping being very irregular, some being distinctly so, others scarcely scalloped at all.

The deep rich lustrous blue of *Hypochrysois rex* attracted attention, and in this species I found the simplest general

plan of scaling that I know as yet among the group; the whole of the blue scales are of one pattern and shape in all areas of the wing, the only modification being a very slight one in the subcostal region, where a slight narrowing takes place. The scales are longish, of moderate width, tapering but slightly wider to the apex which is highly and evenly arched; they are finely ribbed longitudinally and striated reversely rather irregularly: in the plan of these scales they are very simple also, there being scarcely any overlap at all transversely, the longitudinal overlap being likewise small; under these is a solid layer of short, broadish, dull brown scales, with even apices scarcely arched at all. The blue scales themselves are highly developed, being reticulated in the technical sense, but their arrangement is unusually simple, and there is a paucity of the upper layer of scales, though the paucity is not observable inasmuch as the blue surface appears to the unaided eye absolutely solid and even. The same arrangement obtains in both wings.

There are no "blasenschuppen" in this species, this no doubt is accounted for by the fact of there not being sufficient overlap to render them of any service.

Another group of brilliant colours called for some investigation, viz. those of a lustrous metallic nature as is represented by such species as the gorgeous green *Arhopala*, also by the similarly green species of the genus *Ruralis* and again by *Heliophorus brahma* with its wonderful metallic golden lustre, species that de Nicéville stated to be the most brilliant gems in the insect world, beside which the brightest and most lustrous of the blues were quite dull in comparison. Taking first *Ruralis duma*, a common Indian species, of a brilliant metallic green colour, I found that the costal cable was very narrow and of a light structure, being composed of the type of scales common to the genus, a long rather narrow scale with sharply serrated apices; these are all warm brown, those on the veins are also brown, square in shape with the corners rounded off, the apices being waved or very slightly arched in many cases; these are bronzy brown and both under direct and transmitted light they retain much of their bronzy hue; this is however quite different to the metallic colour of the

bulk of the wing scales; these are broadish and comparatively short, being about twice as long as the width; they are all decidedly curved, the highest part of the curve being in the centre, they are shovel-shaped, deeply ribbed, with the apices cut off quite square. There are no "blasenschuppen" in this species, nor in any of these metallic species that I am yet acquainted with. Another equally lustrous metallic green insect is *Arhopala eumolphus*, but the green is more delicate though quite as refulgent. Here again the costal cable is composed of long brown narrow scales with serrated apices, whilst the veins are also clothed with brown scales of moderate length, rather broad, with very deeply serrated apices, leaving exceedingly fine sharp points between; the metallic scales are all of one pattern, being a long oval, much longer than in *R. duma*, decidedly broader in the centre, and abruptly and evenly truncate at the apex; they are deeply ribbed and curved, but the curve is not quite so marked as in the previous species. *Heliophorus brahma* is of a wonderful metallic lustrous reddish-golden colour, probably the most brilliant insect in the world; it is allied to the genus *Heodes*, though all the other species in the genus are bluish in the males. The brown scales in this butterfly call for no special comment, but the metallic golden ones are of two sizes; those in the cell are long, broad, slightly wider in the centre, with the apices very slightly arched, not abruptly cut short as in *A. eumolphus*, those on the fold are shorter and broader, tapering somewhat wider to near the apex which is moderately rounded off, both are deeply ribbed. In the secondaries the metallic scales are shortish and broad, tapering more widely to the apex which is scalloped, the ribbing and the colour are precisely as in the primaries. There are no "blasenschuppen" in this genus. To return to the genus *Arhopala* in which nearly all the species are blue, perhaps one of the most beautiful and brilliant is *helius*, which is brilliantly deep blue in its costal and terminal area, and equally brilliantly almost Cambridge blue in the median area and on the fold; the scale in each of these cases appears to be of the same structure; the pattern is quite similar, a long broadish scale, evenly rounded at the apex and rather narrow at the

base, the scale is broader on the fold to some extent but not uniformly so, and the ribbing is the same, yet there is something as yet unknown that quite alters the shade of blue. I shall refer to this again in dealing with colours later on. *Arhopala hercules*, the largest species of the genus, is entirely very metallic deep purplish blue, one of the quite aniline colours to the naked eye and very lustrous; the ordinary blue scales over the greater portion of the wing are of one pattern, a longish, rather broad one, suddenly rounded at the basal corners and almost square at the apical corners, the apex being generally but not always quite abruptly truncated; it is of even width throughout, there being but the least and shortest possible tapering off at the apex; the ribbing is somewhat coarse; on the fold the scales are narrower; there is also a peculiar scale on the costa, more or less on the inner edge of the costal cable, it is a long scale quite tubular, narrower at the base with the normal attachment peduncle, and at the apex tapering to a blunt point; this is by no means a hair-like scale, but in this species the evolution of the costal cable scales might be said to be present; this simple one is in some numbers, there is also a second, quite similar but somewhat wider at the apex and slightly bifid, others that are wider still but tubular and distinctly bifid, whilst there are others, trifold and quadrifold, that are approaching the usual flattened scale, though quite evidently derived from the original tubular design; they are distinctly hollow tubes and are filled with minute granules of a greyish substance; they are finely shagreened with very minute lines not ribbed as the usual cable scale is; the cable itself is composed largely of the usual longish apparently flat scales with bifid, trifold and quadrifold serrated apices, the special tubular scales being more on the inner edge of the cable, though not entirely confined thereto.

Turning now to the white species of the group, I find in *Larinopoda lagyra* that the scaling is very diverse from the brown and blue sections. The fringe scales are Indian club shaped with the club very heavy, and they are very coarsely ribbed, the costal cable is composed of the same type of scale with varied apices, some as the terminal fringes others bifid

and some trifold, but the type of scale remains the same; the scales that cover the greater part of the wing are long and broadish, generally almost straight, but occasionally slightly wider at the apices which are waved and even, not dentate; with them in much smaller numbers is a lyre-shaped scale, but shorter than the one just described. These obtain in both wings.

In *Larinopoda soyauxii* we have similar types but varying in details; the fringe scales have the club much heavier; the ordinary pattern is of moderate length, narrow, of equal width, with the apex very slightly indented in the middle, just sufficiently for it to be seen; but with them in very large numbers is a most remarkable scale; it is shaped just like a trident, very broad with a heavy base, the attachment peduncle shaped up to it as in a trident, not hollowed out and with the stalk in the centre as in all the usual pattern scales; the prongs are long, and generally it is only two-pronged, though in one specimen before me there are some with a short central prong; these apparently lie in alternate rows with the ordinary pattern, and there is not sufficient overlap for the latter to reach to the solid basal portion of the trident scale, which no doubt accounts for the somewhat hyaline appearance of this species. The scales on the underside of the wing are similar in pattern but very slightly modified, being smaller, whilst in addition on the basal portion of the inner margin there are a large number of triangular scales (roughly triangular) that are not ribbed, but are reticulated (*in sens. strict.*) the reticulations being rather transverse and very definite. The secondaries both upper and under side have the same two patterns but have no reticulated ones. The scale ribs of these species are very finely lined transversely. In addition to these the veins are clothed with a small narrowly oval scale, ribbed, that is like the "blasenschuppen," in *icarus* but about twice as long. The very hyaline species generally called *Pentila muhata* (it is not a *Pentila* however, and as I shall shortly have to bring that species under review I may as well name it here, especially as its new generic name is derived from its extraordinary scales. I propose the name *Ornipholidotos* for it, as the scales look as if they were horny

whilst they are exactly like a pictorial representation of a far-away bird) has scales—all that are left to it or perhaps all it has yet attained—of a most remarkable pattern, they are all alike and yet they vary extraordinarily. A fairly accurate description of the shape is that already given of a far-away bird in the air, some scales are however the shape of the merrythought of a bird, a few are like a merrythought but with an additional outside bone on each side, at the base an occasional scale may have a broader lamination at the proximal end, one being quite a good scale very deeply trifold whilst another is quadrifid; the vast majority however have scarcely any lamina, consisting mainly of three (occasionally four) lines, a thin trident, with the prongs straight or slightly curved, sometimes wide apart, sometimes closer together. In the dark marginal parts of the wing the scales are brown, not white, and they all have more lamina than the white ones, not however that they are much more numerous. On the underside most of the scales are of the same pattern but they are almost linear. There are however at the base a number of a different pattern, being almost the shape of an oat, they are not flat, but as a grain (say an oat), coarsely ribbed, but with a covering superposed so that under direct light the ribbing shows but faintly through, though it is distinctly visible with transmitted light; the secondaries have the same pattern as the primaries. *Pentila undularis* (the type of the genus) has scales that do not call for special remark, those in the subcostal and inner marginal areas are very typical of the whole order, but the pattern of those occupying the median and postmedian areas of the wing are different; they are short broad scales, quite as broad as long generally, and tulip-shaped, the surface appears to be deeply indented up the central line, so that it has an unusual waved appearance.

In *libyssa* the scales differ only in detail but on each vein there is a row of small narrow elliptical scales with the apices truncated and slightly excised in the centre.

In *Megalopalpus* and *Oberonia*, both genera with only white species, the scales call for no special remark. They are all somewhat typical in the main of the ordinary *Plebeiid* genera,

except that in the median area there is a predominance, more or less, of the short broad tulip-shaped pattern.

Turning now to the tawny *Lipteninae* we find scales of quite a peculiar character in *Liptena parva*, a small dark brown species with a tawny red patch on the primaries and a large red basal area in the secondaries; practically the whole of the scales on the upper side are more or less pyriform, it might be more accurate to describe them as foliate or leaf shaped, and with slight modifications the whole of the scales, except the extreme marginal fringes, are of this pattern, some are longish like a laurel leaf with a rounded apex, and some are shorter and so look broader, and they obtain indiscriminately together over both brown and red areas in both the wings.

In *petreia* the same principle holds good throughout, but along the veins are found a number of lanceolate shaped scales, that do not depart from the character mentioned; there are however some very long and narrow scales present which have very deeply cleft apices. On the underside there is a continuance of the same character up to a point, many of the scales having truncated and irregular apices, but mixed with them are also a large number of scales something similar to those obtaining in *muhata*; in this case however they are just like a pair of slightly opened compasses, and would appear to be a development of the long deeply cleft scale of the upperside; a few are occasionally trifid instead of bifid.

Multipunctata is very typical of this genus, and in it we find precisely the same character of scale as already described; most of the upper side are foliate, some broadly, others less broad; there are the lanceolate pattern and the deeply cleft ones; on the underside the same general pattern obtains, but the scales that in *petreia* are like a pair of compasses, in this species are more like the deeply cleft pattern of the upperside, but the cleft is decidedly deeper.

I cannot close this section of African *Lipteninae* without mention of the genus *Citrinophila*, a little group of yellow species; in *marginalis* the scales are very little specialised indeed and do not need description; whilst the large black species of *Pseuderesia* from the Cameroons called *tripunctata* does

not call for special notice either; it is however more Liptenine than is *Citrinophila*.

Turning again specially to the male sex marks which are all caused so far as I have examined them at present by peculiar scales placed differently in the wing (a subject on which a whole treatise could be written easily), I have but time to take a few examples from the three great tropical Continents. Beginning with Africa, we find in *Deudorix cameroni* that there is a tuft of blackish hairs in both wings on the underside of the primaries and the upperside of the secondaries, and that in the latter there is also a peculiar patch in a reciprocal position to the tuft on the primaries, that is to say that the one lies over the other. The long tuft of blackish-brown hairs in the primaries rises from the inner margin, which is turned over to form a narrow groove for this purpose, the hair-like scales rise from it transversely across the wing reaching half up the fold, the upturned margin is clothed with longish scales of moderate width with an even ovate apex, the tuft itself being superposed over a large patch of whitish scales placed transversely and inclined basewards—all ordinary scales being placed horizontally with their apices towards the termen. This patch extends well over each side of the tuft, above which is another patch of transversely placed scales which are blackish brown and subovate in shape. The “brand” appears to affect all the scales near it, for all are of the ordinary pattern in the cell—and none of the modified pattern described extend into that area—but they are inclined transversely at an angle of about 45° instead of being placed horizontally; underneath all the special scales referred to there is the usual layer of brown scales next the membrane, but they seem to have very little pigment, being rather transparent. In the secondaries is a large patch of dark differently placed scales occupying the basal angle of veins 6 and 7 and extending into the cell over the branches of these veins; this patch has an oval iris of small white scales, and it is pupilled with an almond shaped hollowed centre of very narrow and minute darkish grey androconia; all these are placed transversely in relation to the ordinary pattern; the dark brown, very similar to those on the primaries, are the largest and occupy the same level

as the ordinary scales, the white ones are smaller, again similar to those in the primaries, but they are depressed and below the usual level, whilst the grey androconia are in a small pit, and I imagine that the main part of the tuft of hair-like scales in the primaries lies in this androconial pit. There is in addition to this the long tuft of hairs rising in the fold between veins *1a* and the cell, its base is covered by ordinary scales, but on the denuded membrane is seen a short ridge which is no doubt the source of this tuft, the scales underneath this seem to be but little displaced by its presence. The membrane itself is only changed in the androconial area and to some extent in the surrounding area occupied by the white scales; it is a hollowed pit, and from the points of attachment shows the enormous number of minute scales that must be crowded in so small a space.

In *Dioptes catalla* we find the tuft in the primaries to be so similar to that in *Deudorix cameroni* as not to need further mention, but the androconial patch on the secondaries is quite different; it is interesting to find that all the scales immediately surrounding the brand sweep round from the horizontal position with apices facing up to it: the brand itself is composed of probably thousands of minute erect scales, very long in proportion to their breadth, of almost equal width throughout, and having rounded apices, and packed together as tightly as possible, not flat but vertically from the membrane; this alters the whole wing below it, even the under-surface, for there is apparently a bare patch in that spot on the underside; when carefully examined however it is found to be covered with neutral grey scales which are quite transparent, and when viewed under transmitted light are quite colourless; the patch is quite peculiar, having much the outline of a full blown rose. The brands of the Indian species of the genus *Rapala* are very closely allied to *Dioptes* so far as the patch in the secondaries is concerned, though they differ somewhat in the primaries; in *petosoris* there is so to speak a double tuft of hairs the larger of which has its origin on vein *1a*, emitting a small and short little fringe upwards just over the vein, but sending all the long hair-like scales downwards to the inner margin (whilst another less copious one ascends

so that they cross each other, but the margin is not upturned as in *Dioptes*); these are long stout hairs; next to these nearer the base is a patch of broad short white androconia erect from the membrane. In the secondaries there is also a large brand of cream-coloured androconia composed of minute, closely packed, narrow, elliptical, short, erect scales. The number of these must be very large, for they are not more than a quarter the size of those in *Dioptes catalla* and the patch is larger; the surrounding scales do not appear to sweep round and face these androconia, as in some species, and they do not seem to affect the scaling of the undersurface in any serious degree.

Drupadia boisduvalii, another Indian species in the Ruralid section, has a brand on the underside of the primaries, in some respects not unlike that on the secondaries in the previous species; the inner margin has been prominently excurved, no doubt on account of this large sex mark; it is somewhat shining deep cream colour, of an ovate shape, being surrounded on its three lower sides by a large area of irregular milk-white sub-transparent scales, whilst above is a narrow area of somewhat similar more regular dark brown scales, which are also transparent under transmitted light. The brand is composed of very broad scales, rather irregular at their apices, these are erect from the membrane and on the outer areas form an almost perfect honeycomb; instead of being packed closely together as in the previous cases, in the more central part of the brand the cells (so to speak) are pressed more closely and irregularly together; under the microscope the colour is almost orange with a direct light, and this is but little modified under transmitted light; this patch examined from the reverse side is quite solid showing that the formation of the cells is real and complete; the upper side of the secondaries has a reciprocal brand which is very delicate so far as the combination of its colours go, it also is surrounded by an area of small milky white sub-transparent scales, again not diverted from their usual position; the sex mark is composed of two kinds of scales, the one is of moderate length and broad and is milky white, the other is decidedly narrower, rather longer and tawny in colour, except its apex which is

bright darkish chestnut red; this has its apex slightly scalloped, whilst the broad whitish one is evenly arched; these scales are not erect though they are placed at a high angle. On the underside of the wing we find a very slight diversion of the scales under this brand, they are practically not altered in shape but the position is diverted, and instead of being horizontally placed as usual, these have their apices turned towards the costa in an irregular manner. Before leaving the Indian subregion I would draw attention to another beautiful species with an entirely different brand. I refer to *Arrhenothryx penicilligera*, a lovely brilliant pale blue species with a brand (a tuft of hair scales and patch) on the upperside of the primaries as well as on the underside, and also with another brand on the secondaries. The ordinary scales are of typical Ruralid patterns, in this instance all longish and rather narrow with dentate apices. The brands on the upperside consist of a very long tuft of white hair scales that sweep over and terminate on a brown sex mark; the former rises below the angle of vein 2, about the middle of the fold, from a patch of long broadish erect scales of a neutral tint colour that are densely packed together, which show distinctly on the microscopic slide the holes from which the hair-scales have been removed on to another slide; these scales are like thick white hairs, very long and coming from the membrane in a bold curve (necessitated by the fact that they rise in a sex brand of long erect scales); they then sweep downwards over the wing, terminating in another curve on a second sex mark consisting of long pale brownish scales with scalloped apices, which are not erect but are placed at an angle of about 45° and in a circular position all more or less facing a point about direct with the tornus; this sex mark follows the position of the tuft at first, but expands somewhat to a circular shape above vein 1. The tuft on the underside of the primaries is equally long and of quite similar white hairs that rise on the inner margin rather nearer the base than is the brand on the upperside, but the tuft sweeps forwards in a bold curve and terminates on a patch of ordinary white scales; those on the marginal area immediately below the hairs appear to be the ordinary brownish basal scales, only more transparent

than usual. The brand on the secondaries seems to me to be in process of formation; it is marked on the wing by a small, raised, almost circular area; when examined it is seen that the scales are not erect but that they are at a different angle to the others; it is composed of brown longish scales, and mixed with them are a large number of long blue scales that only differ from the other blue ones in that they are narrower, paler and longer; except for the angle at which they are inserted there are little differences in these and the ordinary ones, and this makes me think the brand is to-day in a state of development and that it has by no means reached the final stage as we know it at the present time.

In the Neotropical region the *Ruralinae*, in its strict sense, attain their highest development, the species being of the utmost beauty with marvellous development of blues and greens, at the same time the sex brands likewise have developed greatly; though various genera have been raised they are at present generally classed under the old omnibus name of *Thecla* and in the absence of any revision of the group I will use that generic name here.

In *Thecla orgia* the sex mark is fairly simple, being round and composed of closely packed longish greyish androconia of moderate width, they are almost erect and have strongly arched apices. *Thecla triquetra* has a different brand; it is composed of two sections, that nearer the base is irregularly a narrow oblong and composed of very pale ochreous brown androconia by no means erect but placed at an angle of less than 45° ; they are long and narrow with apices evenly but slightly arched; the second section is large and roughly quadrangular, but with the front side slightly curved; the androconia are at rather a greater angle than the others, they are shorter and much broader, having strongly curved apices; the two sections are separated from each other by a narrow band of blue scales; at the top it consists of three or four layers of scales but tapers down to one blue one; these double section brands are not uncommon in South America, and as we shall see are developed into two large sex marks. Before however dealing with one or two typical specimens of these, I would refer to one rather beautiful one found in *Thecla*

ocrisia; it is roughly circular and might almost be described as like a greenish rose with the brand forming the stamens, &c.; all the surrounding bluish green wing scales are set up around it forming a raised ridge, the scales themselves looking just like the petals of a flower, the androconia being sunk in the middle (as are the stamens); moreover, to add to the simile, they are yellowish scales overlaid with chestnut red; they are not however erect, the androconia are narrow, longish, with somewhat truncated apices. The general scales over the wing in this species are excessively small and finely serrate, and are totally different in size and shape from the largish petal-like surrounding pattern and from the brand itself.

In *Thecla polybetes*, a very brilliant blue species, we find a brand with an extension, and that in a different place from the usual one. Any addition to the sex mark is usually in the costal area, but in *polybetes* it is in the lower radial area, extending from the definite brand itself (which is easily discerned) a third along vein 4, and reaching straight down to vein 2; the ordinary scales on the basal side are set up to the androconial patch, much as in the previous species, but are not so on the costal margin; the patch itself is large, consisting of closely packed nearly erect scales, pyriform in shape, with the thick end at the base and the apex gently curved; in colour they are dark brown, but there is a small patch of pale brown ones of a broader pattern and equal width; those covering the extension are different, being very broad and short, the breadth almost equalling the length, and they are not erect, but are set at nearly the same plane as the blue scales, only they have a much greater overlap. The brilliant blue scales in this insect are set at a higher angle than usual, being by no means so flat, and they are curved, as is not infrequently the case with the very metallic blue and green colours. In *Thecla phaleros*, another metallic blue species, the brand is set in a deep pit, the sides of which are set with the ordinary brilliant blue scales (set petal-ways); from the base of the pit it rises up like a minute crater, up whose sides very large broad scales of a pale brownish colour rise, and they appear to be of an unusual length, though it is extremely

difficult to judge this accurately owing to their peculiar position and arrangement; inside this miniature crater the true androconia are placed, those at the circumference being at a much lower angle than the others, which become more vertical towards the centre, the centre itself being also at a perceptibly lower level than the rest, and we must suppose therefore that the androconia are shorter in the middle; these scales in their vertical position are very deep coffee brown, though those on the circumference, where more of the scale is visible, become paler. This brand (a very beautiful object) is quite complete in itself, but at the upper posterior corner (not that there can be a real corner to an almost circular object) there is an extension, which has the appearance of a gradual development into a second brand; it is very pale coffee brown in colour (the other to the naked eye is black), and extends over the bases of the subcostal veins across the cell to vein 5; the scales are minute in comparison with the blue ones around, and are set at quite a different angle; this extended sex mark is not set in a pit as the other, but is more on the usual plane of the membrane though it is evident at the base of the subcostal veins that some alteration is in process of development. *Thecla polybe* shows this process of development in a more advanced condition, the two black brands being very marked, but the second one has not yet created the pit in the membrane as has the first; this species has not by any means the crater-like arrangement of *phaleros*, though it is in a pit, the difference being that there is no outer ridge around it, but the blue scales are set petal-ways up to the depressed area in which is the brand; the androconia within are deep black even under the microscope, the surrounding scales are very broad and square, broader than long, and with an arched apex; whilst the inner layers of the surrounding scales are of different sizes, all are very broad with broadly scalloped apices, some assuming almost a truncated "fleur de lis" shape: the blackish androconia are of moderate length, rather narrow, equal in width, with strongly arched apices, these being set, if not erect, at a very high angle; this brand is finely separated from the outer one, which is also blackish and of almost equal size, not being set at quite so low a level; the androconia are nearly

the same shape but taper slightly, the distal end being the smaller; the ordinary scales around are not set up to this brand, but are rather overlaid by the androconia whilst the " mark " is crossed by two veins which modify both the colour (brown instead of black) and the size of the scales clothing them. Though the apices of the androconia are black this colour is only at the apices, the lower parts being pale brown; this however is by no means of infrequent occurrence.

A discussion on the scales of the *Ruralidae* could not be closed without some reference to the unique and primitive though extraordinarily specialised genus *Liphya*, with the delicate white fugitive scales attached to its wings on emergence from the pupa, and with the yet more peculiar body scales all of which probably disappear after the first flight or two; both are quite evidently protective developments. The long white scales of the wings are much the shape of a lily of the valley leaf with its end truncated and scalloped; in size they vary considerably, whilst the scalloping of the apex varies yet more; some have two scallops, others go up to four or five; the point of attachment is also peculiar, there being a twin attachment excavated between the two points which are almost at right angles to the stem, this being no doubt necessary to allow it to be easily freed from the ordinary scales; this is the usual method, but occasional scales are present with but one; they are all ribbed, the ribbing not being particularly fine. Under direct light the colour is pure white, but under transmitted light grey, more or less transparent. The body scales are however much more unique than these just described; the abdomen of the imago looks to be densely covered with silky fluff, the word fluff is the only word that adequately describes it, this however under the microscope is found to consist of scales of extraordinary size and structure; they are exactly like the egg case of the skate, but instead of having a long filament at each corner, they have one from each end in the centre, that at the one end being very long indeed, frequently much longer than the rest of the scale, whilst that at the other end, probably the end of attachment, is by no means as long and not infrequently has two points of adherence (*i. e.* Y shaped), the stem of

each being of moderate length; these scales also vary much in size and in the length of the filaments; in the smaller ones the likeness to the "mermaid's purse" diminishes, they are rather coarsely striated, the striations being by no means sufficiently uniform to be called ribbing. In colour they are golden brown under direct light, and are much the same hue by transmitted light. When it is remembered that the whole abdomen is covered with these scales, their number must run into very many thousands; their size and arrangement must make them almost perfect for their purpose, so that when ants attack the newly emerged butterfly the long filaments at each end must be most admirably adapted for curling round and adhering tenaciously to their antennae, and thus ensuring a hasty retreat.

Inasmuch as all the metallic greens of the *Ruralidae*, when seen under transmitted light, showed that they had no green pigment but that their basis was mauve or pink to red, it became necessary to investigate the allied colours in other genera. I therefore first looked to the great family *Papilio* and made several preparations, among others, of *Papilio blumei*. This is a very brilliant bluish-green species. I found the general pattern of the scales to be very diverse from those of the *Ruralidae*; the shape is pyriform, the scales being very coarsely reticulated, there being only ten rows of reticulations on these large scales (in a few very broad scales I counted as many as thirteen rows); the ribbing and the transverse ribbing are very deep and very irregular, being roughly quadrangular, but the quadrangles are of very varied sizes and they appear to contain one globule of (I suppose) pigment of a magenta colour (under transmitted bright light); in examining this, I reflected a very intense white light through the scales, the result being that the lines of the reticulations were finely buff colour whilst the contents were pinkish magenta; absolute sunlight, reflected through, left the same colours only intensely clarified; an ordinary but clear light produced dull ochreous lines and dull magenta colouring inside the lines; it will thus be seen that the general colouring was the same in all lights, it being simply a question of degree of brilliancy. Here again there was no bright bluish green

visible at all under transmitted light, just as it was with the *Ruralidae*.

I ought perhaps to emphasise the fact that it is necessary to examine isolated scales if the real colour is to be ascertained; if scales, overlapping each other or lying on the top of one another are considered, quite a different effect may be produced upon the eye owing to both diffraction and refraction.

In *Papilio ulysses*, a brilliant azure blue species, the scale is very close in structure to *blumei*; the shape is not pyriform however, being broadish at the base and only increasing slightly in width to the weakly arched apex. The reticulation is less coarse, there being twelve and thirteen rows, as compared with ten; the transverse lines also are finer and the reticulations more regular, the colour of the lines is deep straw, the interior area being brownish mauve under transmitted light (it is a hue almost impossible to describe). Under condensed direct light it is seen that the general surface of the scale is blue, but the great brilliancy of the species is caused by points of brilliant blue placed at the bottom of the ribs, not on the top; they are at the four corners of the reticulations, and would therefore be accounted for by the fact that more light was available at those points, as the chitine would be thinnest at those cross points and more light would come through. All reticulations have the appearance of being minute bright blue plates overlapping each other slightly. The green points in the primaries of *paris* are caused by isolated scales very similar in shape to *blumei*, but narrower; these points are very green under direct light, and the structure of the scale is similar, being reticulated, and only differing in degree; by transmitted light the colour is red, something of the tint known as Indian red, these isolated scales are in the midst of black scales of quite a different pattern and structure; the brilliant greenish patch in the secondaries has scales of a different shape and slightly different in the pattern of the structure, they are pyriform, but taper down somewhat from near the middle, which is the widest point, to the apex, this being slightly hollowed in the centre. The reticulation is exceedingly coarse, there are but eight rows of very deep reticulations; by transmitted light the scales are very solid,

the basal area being pale golden brown becoming rapidly reddish, almost the colour of a pale garnet stone; in many cases they are entirely reddish.

Ornithoptera brookeana is the only one of the Rhopalocera I have examined that forms an exception to the rule that greens in butterflies have for a basis pinks to reds including pinkish violet; the beautiful sheen that this species has in its metallic green transverse bands is well known. The scales are very different from those of the genus *Papilio*, being almost paddle-shaped with a broadish base, and the apex slightly truncated; the deep lines and reticulations of that genus are quite lacking, the surface being lined, but so exceedingly fine is this lining that the lines are on the average but $\frac{1}{1200}$ m.m. wide as against $\frac{1}{700}$ m.m. in *Polyommatus galathea*, in which species the ribbing is rather fine than coarse for the *Ruralidae*. The brilliant glossy green of the *brookeana* scales retain their colour under transmitted light, becoming lighter and losing much of the metallic sheen. Now at last I thought I shall find some green pigment: such however was not to be the case. The scale itself behind the green looked and proved to be very solid, they look to be filled with dense black pigment as they lie over each other, the metallic gloss being partial; on removing the upperside of the scale, I found there was left nothing but a dull greyish brown colour on the lower part of the scale sack; on removing the lower surface of the sack, the upper finely lined chitinous side retained all its lustre, this upper side I discovered to be very hard and brittle; it can be split and is easily broken, but in all cases the colour is retained, and I have come to the conclusion that in this case the chitine itself must be coloured. I am aware that the colour can be dissolved to a considerable extent, and I am now testing this but it is not completed; I believe however that in this instance the real colouring matter is not in the scale sack but, contrary to the *Ruralidae* at least, the chitine itself is coloured, *i. e.* the colour is subcutaneous.

Ornithoptera priamus is quite different. Whilst the structure and pattern of the scale is almost precisely similar to *brookeana* (the shape is somewhat different however), the colouring matter is quite diverse; its brilliant and almost pure

green is well known, but under transmitted light it is fiery red to reddish orange, according to the intensity of light and the angle of the scale; when examined under a moderately high power under the microscope it is found that the surface appears to be closely dusted over with exceedingly fine and minute points of green, these points are I have little doubt determined by the width of the lines or ribs wherewith the chitine is covered, and it is only where the light falls that the green colour is visible; [under a quarter objective it is scarcely possible to get the whole scale under direct light, as the scale is strongly curved, this of course would not happen with the full play of light upon the scale or wing]; this however entirely disappears if transmitted light is turned on. With the lower surface of the sack removed, it is found to be filled with a finely granulated substance of a pinkish colour, and in certain places, where the lower surface had taken with it some of the pink material, the finely lined upperside was visible and was deep yellow in colour. The consideration of the colour problem made it necessary to examine other colours as well. Yellow being a close ally of green in some ways, I turned to the beautiful lustrous yellows so well known in many of the genus we are considering. In *chimaera* the yellow is very golden and metallic, I found the scales closely allied to *priamus* in shape and general appearance; the contour differed, and the lineation of the scale differed slightly, not being so fine. Under transmitted light the colour remains clear bright yellow; all it loses is the metallic lustre; this is without doubt caused by the lineation. Removing one surface of the scale the same clear bright yellow still remains, showing that the colour is due to pigment in some form and not to diffraction. *Ornithoptera miranda* shows precisely the same thing, only in this species it appears as if there was an outer sack containing the inner one; if this is the case, it being very finely ribbed as is the inner one, it might well be the cause of the beautiful golden lustre.

In the Erycinid *Rhetus periander*, a species as bright in its blue colouration as the majority of the *Ruralinae*, the blue scales and the location of the colour is different. They (the blue scales) are diverse from the other scales which are very

broad, indeed almost as broad as long, somewhat squarely oblong with bluntly dentated apices, having as many as seven to nine dentations. The blue scales are, however long, of but moderate width, suddenly expanding at about a fifth from the apex where it is arched in its contour, and it is only this more or less curled tip that is blue, all the rest is sienna brown; in some cases the blue apex is decidedly and evenly hollowed out, but in the greater number of the scales this is not so, the apex being more generally slightly uneven. The interesting part is that all the blue colour is entirely confined to the apical half and to a large extent to the apical fifth of the scale, the brightest part being the apical curved fifth. The difference in the method of scaling may be seen even with a tenth hand lens, when it can be observed that the scales are not wholly blue, they are very irregularly and unevenly striated, the striations being very fine; they are densely filled with pigment that under transmitted light is golden brown, though under a direct light the blue colour is very bright.

In *Morpho aurora*, a species more brilliant in its blue than most of the *Ruralidae* and as brilliant as any, the case is different. Here we have a colour more susceptible to light than any that I have yet examined, for its colour changes somewhat according to the intensity and whiteness of the light. Under direct light, in bright sun with the light condensed intensely, the blue colour is at its highest point; as the light is reduced the colour is likewise reduced until it becomes blue grey. In the *Ruralidae* there is no real change of colour, even though the hue may be intensified. Under transmitted light, with the sunlight transmitted through the scales, the colour becomes slightly lilac grey, but scales with the upper ribbed chitine removed are absolutely transparent and colourless; under very clear white light (as obtainable on a brilliant day with white fleecy clouds) the colour is yellowish opalescent. If placed under very white artificial light (transmitted) the scales are opalescent, showing slightly the colours so well known in Australian opals, but not the fiery hues of the Mexican stones. In this case, as in all others, these remarks apply to isolated scales, directly they begin to overlap each other a different effect is produced; the blue asserts itself

more owing to double diffraction and also to refraction, so that it is necessary to be most particular for all observations to be made on isolated scales so far as they relate to these structural colours, *i. e.* to colours that differ from the pigment found within the scale.

In closing I must refer to my investigations on the colours of the scales we have been considering. I can of course only refer to a few more or less typical species, or to those that differ from the usual rule. It will no doubt be understood after my previous remarks that in all cases I am dealing with isolated scales only; in many instances I have removed the upper ribbed chitinous surface of the scale sack, and frequently the lower surface, my object being to find the contents of the sack.

Plebeius argus under transmitted light has scales (blue under direct light) that are quite colourless, some being the very palest straw colour. On removing the ribbed upper wall of the sack a very fine granulated surface is disclosed that is absolutely colourless and transparent.

P. sieversii, a decidedly blue species, is under transmitted light straw colour, as also are the thick hair-like scales; with the ribbed chitine removed the sack is granulated, the pale yellowish granules lying in fine lines so as to coincide with the ribbing, the hair-like scale was likewise granulated but with the chitine removed appeared to be quite colourless.

P. eversmanni has its blue scales reddish buff under transmitted light; with the ribbed wall removed, the sack is roughly granulated, the pinkish granules not being confined to the lines of the ribbing.

Polyommatus icarus is pale lemon yellow under transmitted light; with the upper wall removed a very finely granulated surface is disclosed, which under a moderately high power is found to consist of minute yellow granules that follow precisely the lines of the ribbing.

P. thetis, with its clear and beautiful blue, becomes under

transmitted light transparent clear deep lemon colour; the ribbed wall of the sack having been removed reveals a slightly granulated deposit that is very pale pinkish. The tubular hair-like scales are paler yellow than the others.

P. eros is pinkish buff with some intermingling of yellowish buff under transmitted light, and these colours were scarcely changed by condensing direct light upon them; though usually blue reflections show themselves if this be done whilst under transmitted light.

P. anteros is pale silvery blue, but under transmitted light is pinkish. The colour of the "blasenschuppen" is not discernibly different from the ordinary blue scale under direct light, but is pale yellowish under transmitted light.

P. damon becomes semitransparent dirty straw colour proximally, shading into mauve distally; in this species I removed the lower wall of the sack with the result that the upper ribbed wall appeared to be transparent and clear and was quite colourless; no granules could be found, so that probably pigment when present is in the lower portion of the scale sack.

P. meleager, with its bright clear blue, becomes under transmitted light deepish straw colour, the blue hair-like scales being also of this colour.

P. semiargus is a strong darkish blue, but under transmitted light the scales become unusually clear pale straw colour; with the upper ribbed wall removed a finely granulated surface is revealed whose colour is almost imperceptible.

P. galathea is lemon yellow under transmitted light; with the upper wall removed, a coarsely granulated surface is disclosed, the granules being exceedingly pale yellowish.

Celastrina argiolus under transmitted light is of the palest possible yellowish, practically the colour of the chitine itself.

Lycaena arion becomes straw colour under transmitted

light, but with the ribbed upper wall removed, the scales are absolutely colourless.

L. iolas is lemon colour, as also are the thick hair-like scales; in the latter however a considerable number of grey granules are present.

Lampides aelianus is almost more white than blue under direct light but the scales become quite transparent and colourless under transmitted light; this applies both to the ordinary scales and to the "blasenschuppen." As an opaque object under very white condensed light, a single scale has a slightly milky appearance, but if placed over other scales the very pale whitish blue is at once apparent; the "blasenschuppen" are dirty cream colour, but over other scales they are exactly the same colour as the ordinary ones.

Thysonotis apollonius has the ordinary scales pale very bright blue, the two sex scales are also blue, the plumules being pale whitish blue under direct light, but transmitted light shows that there are two kinds of these plumules, one of which becomes quite transparent and colourless, whilst the other is finely shagreened all over and is dark neutral grey. The "blasenschuppen" are sometimes clear and colourless, but generally have a yellowish tinge: the ordinary scales become tawny yellow.

T. hengis again has the "blasenschuppen" blue, but under transmitted light they are clear and colourless. The ordinary scales are of a strong mauve blue, but under transmitted light they become pale yellowish, showing thus a marked contrast in inverse degree from that obtaining in *apollonius*.

Thysonotis caeleus is quite deep blue in colour, but under transmitted light it is deepish lemon, the "blasenschuppen" being very slightly yellowish, though under direct light they are practically colourless.

Hypochryrops rex, with its intense ultramarine blue, becomes deep bronze under transmitted light.

Arhopala helius is deep rich purplish blue, becoming pale

silvery lustrous blue in the median and lower radial areas; under transmitted light the deep blue becomes deep lemon, the graduated shades become orange, whilst the pale silvery blue becomes pinkish buff, several quite pinkish scales being present. The upper ribbed surface having been removed left a closely granulated pink surface, the colour being the same both with the orange and pinkish buff scales. On to this pink granulated interior I condensed a very white light, but it merely intensified the pink hue, whilst the same result was produced by condensing sunlight on to them. I therefore removed from other scales the lower surface of the sack, leaving behind only the ribbed upper chitine, no granules at all were present, the ribs being almost transparent very slightly yellowish.

Arhopala hercules is a rich, metallic, deep purplish blue, entirely uniform in colour all over the wing. Under transmitted light it is clear lemon yellow. With the upper ribbed chitine removed the same clear yellow is maintained, the surface being granulated exceedingly finely. The base of the scale was almost colourless but became rapidly coloured beyond the proximal end.

Arrhenothryx penicilligera is a beautiful pale blue, becoming clear transparent lemon under transmitted light; with the upper wall removed the interior is densely and finely granulated with minute lemon-coloured granules, whilst the white hair-like sexual tufts are greyish with transmitted light.

Thecla orgia, with its lustrous sky blue, becomes deep straw colour.

T. polybetes is brilliant metallic blue, but becomes under transmitted light deep bronzy straw colour.

T. phaleros is bright metallic blue and also becomes bronzy straw colour.

Most of the South American metallic blues are under transmitted light of a bronzy hue so far as my observations go.

Ruralis duma is lustrous metallic green inclining to yellow

green, the wing scales are deeply ribbed, and instead of being roughly flat are curved; when examined under transmitted light the colour becomes a delicate pinkish heliotrope.

Arhopala eumolphus is also lustrous metallic green but inclining to bluish-green; the scales are deeply ribbed and curved; under transmitted light they become pinkish mauve, different in hue from *R. duma*.

Heliophorus brahma is fiery metallic reddish golden colour, and becomes under transmitted light uniformly green, with no tinge of yellow but rather of the bluish hue if anything.

Callophrys rubi, with the well-known green colour of its underside, is quite different from the metallic greens obtaining in the exotic species. To the naked eye the colour looks uniform but the scales are really brilliantly mottled, the mottling under a good direct white light being very conspicuous and very brilliant. Under transmitted light the scale is found to be packed with reddish globules which lie in the sack quite regardless of the ribbing; they are very irregular in size and shape, and whilst not entirely confined to the apical portion are much less plentiful proximally, with the result that that portion is pale greyish, but rapidly becomes reddish distally.

Pithecopus dionysius is very white on its underside, but under transmitted light there is a faint brownish reflection; with the upper ribbed wall removed it is densely but finely granulated with granules of a greyish tinge.

Larinopoda lagyra is quite white to the naked eye and remains rather transparent whitish with transmitted light. When the ribbed upper wall had been removed the scale was not found to be empty but was heavily granulated with grey; the granules however were quite invisible as an opaque object.

Larinopoda soyauxii is slightly creamy white but becomes yellowish under transmitted light; the upper chitine being removed discloses a coarsely granulated surface,

quite irrespective of the ribbing the granules being greyish.

Pentila muhata is brown under direct or transmitted lights in its brown areas, and with the upper chitine removed reveals a dense granulation of darker brown. The whitish areas are the same in both lights, but on removing the upper wall the surface is finely granulated with almost transparent globules.

Pentila undularis is quite white but becomes yellowish transparent white under transmitted light; with the ribbed upper wall removed the scale is coarsely granulated, the granules being transparent, except on their circumference which is greyish. Under direct light the scale is quite invisible as an opaque object, when the ribbed surface is gone.

Oberonia ornatus is pure white, but under transmitted light becomes hyaline dirty straw colour; with the upper ribbed wall removed the interior is seen to be very finely granulated with transparent greyish granules.

The tawny red species of the genus *Liptena* are almost the same colour under both lights.

These investigations lead me to believe that blue pigment does not exist, but that though in some cases the scales appear to be quite colourless, yet in the great majority of cases blue colour seems to require a basis of yellow for its production by diffraction. In all the species that I have examined there is an under layer of brownish scales below the blue ones, which doubtless absorb unneeded light and in the case of the colourless scales probably assist the colour in some method.

The case of the metallic greens is less conclusive inasmuch as *Ornithoptera brookeana* may prove to have a subcutaneous colouring matter; but apart from that there appears to be no evidence so far as the Rhopalocera are concerned that there is green pigment present, nearly all the greens requiring a basis of pink to red whilst the strongly metallic and refulgent greens appear to require a basis of violet or lilac for their production. The whites have also very rarely white pigment, and are

very rarely empty scales; grey or brownish seeming to be the pigment necessary to produce the effect of white to the unaided eye, this is confirmed by a reference to the genus *Delias* whose species are very solid in their whiteness, whereas under transmitted light I find the scales are decidedly brown in the one or two species I have examined. In making these final remarks I have no wish to dogmatise and I only state what my own investigations have shown me. I might further add that in all my many hundreds of microscopic preparations I have trusted to no one but myself, for I have made them all with my own hands, it being a subject that has occupied my attention for a good many years.

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ERRATA.

TRANSACTIONS.

- Page 220, line 21 from top, for *parallelipipedus* read *paralleloppedus*.
 Page 252, line 7 from top, for *parallelipipedus* read *paralleloppedus*.
 Page 270, line 20 from bottom, for *Hemisodorius* read *Hemisodorcus*.
 Page 546, line 1, for *eubaea* read *euboea*.
 Page 556, line 7 from bottom, for *eubaea* read *euboea*.
 Page 556, line 6 from bottom, for *eubara* read *euboea*.
 Page 556, line 6 from bottom, for *Heterchroa* read *Heterochroa*.

PROCEEDINGS.

- Page cxxx, line 23 from top, for *aedipus* read *oedipus*.

CORRIGENDA.

THE BUTTERFLIES OF THE WHITE NILE, by G. B. LONGSTAFF.

Page 29, line 15 from bottom, *delete* "Yerbury records *H. iterata*, Butler, for Aden." The paragraph should read—

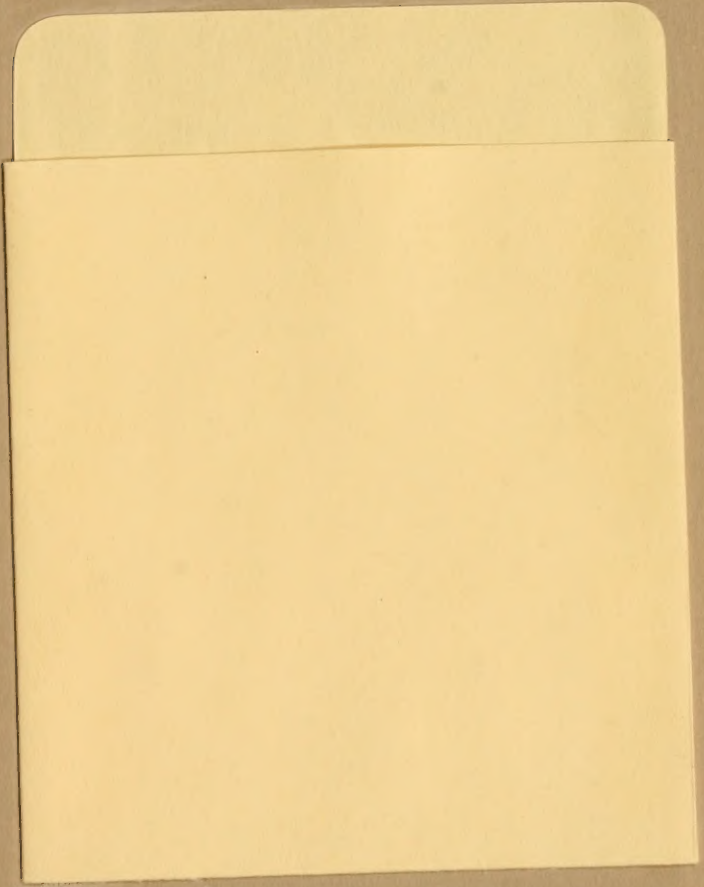
"The form, *H. iterata*, Butler, is recorded for Somaliland (Lieut. Sparrow), as well as for German East Africa, and British East Africa. Aurivillius 3. p. 389) doubts whether it is specifically distinct."

Page 51, line 17 from bottom, *delete* "with the notable exception of the total absence of the great genus *Acraea*."

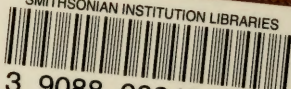
Though it is true that no *Acraea* has been recorded from the Aden district, *A. doubledayi arabica*, Eltringham, has been taken in the Azraki Ravine in Southern Arabia [Eltringham, 14, p. 174], also *A. neobule arabica*, Rebel, has been taken near Makálla, as well as at Râs Furtak, both in S. Arabia, c. Lat. 14° N. and 16° N. respectively, (*Lepidopteren aus Südarabien u. v. d. Insel Sokotra*, Prof. Dr. H. Rebel, LXXI. B. (II. H.), p. 28. K. Akad. d. Wiss., Wien.).

Consequently the table on page 50 should read—

<i>Acraeinae</i>	5	2	0
<i>Pierinae</i>	33	18	15
	—	—	—
Total	75	51	37



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