PROCEEDINGS

OF THE

Hawaiian Entomological Society

Vol. III, No. 3. MAY TO DECEMBER 1915. SEPTEMBER 1916.

MAY 6TH, 1915.

The one hundred-seventeenth meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Back, Bryan, Fullaway, Illingworth, Mant, Muir, Osborn, Pemberton, and Swezey. Three students of Professor Illingworth's from the College of Hawaii were present as visitors: A. H. Case, Y. Kutsunai, and H. E. Starratt.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM

Mr. Muir gave a short summary of a paper he was preparing for publication on "A Review of the Native Genera of Hawaiian Delphacidae," which contained quite a number of new species.

Mr. Swezey stated that this was one of the groups in which he had collected for several years, and that he considered that other groups would yield new species similarly if more thoroly collected.

Mr. Fullaway remarked on the very large number of undescribed species which he had found in looking over material of the genus *Sierola,* collected by Mr. Swezey, Mr. Giffard, and himself.

In consideration of some of the subjects touched on by Mr. Muir above, Mr. Bryan mentioned some evidences of depression and elevation which he had recently been making observations on in the Waianae region. Well drillings in one of the valleys show silt to 1500 feet below sea level, from which it is estimated that there has been a subsidence of at least 3000 feet since the valley was eroded. Some elevated coral reefs

of the Eocene age show an elevation of 60 to 80 feet since that time.

Bruchid in palm seeds.—Mr. Ehrhorn exhibited a Bruchid found in a shipment of palm seeds from Cuba. A Chalcid had emerged in numbers from the shipment and observations by Mr. Fullaway indicated it to be a parasite attacking the Bruchid eggs but emerging from the pupae. If satisfied of its parasitic habit on Bruchids, the parasite will be released here.

Chrysidid.—Mr. Mant exhibited several specimens of a Chrysidid captured at his residence in Manoa. It was an undetermined species which has only lately made its appearance here, the first specimen having been collected in June, 1914, by Mr. Potter.

Chrysomyza aenea.—Mr. Fullaway reported finding a mass or the larvae of this Ortalid breeding in horse and cow manure at Waialae, about 50% of which proved to be parasitized by *Spalangia.*

Telespiza ultima.—Professor Bryan reported this as a new species of bird from Nihoe or Bird Island, taken by Captain Brown of the "Thetis." The description will be in a forthcoming number of the "Auk."

Chinese thrush.—Professor Bryan reported that he was trying some feeding experiments on the Chinese thrush. A nest had been upturned, the three nestlings found were placed in a rat trap in which the mother bird was captured later. In this connection, Mr. Ehrhorn mentioned that dried water boatmen was the favorite bird-food used by the Chinese bird men on vessels.

Coconut leaf-roller [Omoides blackburni (Butl.)] destroyed by ants.—Professor Illingworth reported that these moths began depositing eggs on his coconut trees in Palolo Valley, March 16, 1915, and continued to the present (May 6, 1915), but none of the caterpillars had been able to resist the attacks of the ants *(Pheidole megacephala)* long enough to pupate. A few of the larvae reached almost full size, but they had to finally succumb. The ants were first observed, actually at work, destroying a young colony, on April 14th last. They first cut away the under-part of the web, that protects the caterpillars, and then pulled them out. In a number of cases they were seen eating the egg-masses, and

several times they were found attacking the almost full-grown larvae.

Sitodrepa panicea in curry.—Professor Illingworth exhibited a bottle of curry very much infested by the common drug store or bread beetle.

JUNE 3RD, 1915.

The one hundred-eighteenth meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Back, Kuhns, Pemberton, Swezey, and Wilder; and Mr. August Busck of the U. S. National Museum, visitor.

In the absence of the Secretary, Mr. Swezey was appointed Secretary pro tem.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Mango weevil.—Mr. Ehrhorn mentioned that Captain Kidwell had sent mangoes from his place in Manoa Valley, having specks on them which had turned out to be where the mango weevil had laid eggs. Mr. Wilder stated that on account of infestation by the mango weevil the past year, only about 18% of the mango seeds germinated in his propagation work. He further stated that he had never found the Chinese chutney and the No. 9 mango to be attackd by the Mediterranean fruitfly.

Pseudococcus nipae.—Dr. Back exhibited some samples of a kind of sugary honey-dew produced abundantly on guava leaves by this mealybug. The specimens were collected in Kona, Hawaii. He also exhibited excellent photographs of some of the leaves.

Hypocala andremona.—Mr. Wilder reported that his *Diospyros* (or *Ebenaster)* tree had never again been infested with caterpillars since the time in 1908 when it was so badly eaten by the numerous caterpillars of this moth.

Cremastus hymeniae.—Mr. Swezey exhibited a specimen of this Ophionid and called attention to the fact that it has a large number of hosts, being parasitic on the caterpillars of a good many species of Pyralids and Tortricids. It first began to be noticed about Honolulu in 1910, and has now spread all

over the Island, even into the mountains, where it attacks many native species of moths. It is not yet known where this parasite came from. It was described from specimens collected here—bred from *Hymenia recurvalis.*

Mr. Busck made some remarks on first impressions in Hawaii, and commented on the scarcity of the native insect fauna here as compared with other places he had visited in the Tropics.

JULY 1ST, 1915.

The one hundred-nineteenth meeting was held in the usual place. No quorum being present, only informal entomological discussions took place. Those present were Messrs. Ehrhorn, Fullaway, Illingworth, Osborn, and Mr. Busck, visitor.

SEPTEMBER 2ND, 1915.

The one hundred-twentieth meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Kuhns, Illingworth, Mant, Osborn, Potter, and Swezey; and Mr. August Busck, visitor.

NOTES AND EXHIBITIONS.

Nyctalemon patroclus.—Mr. Mant exhibited a fine male specimen of this large moth, which was captured by one of the officers of the British steamer "City of Bristol," about 300 miles from the Nicobar Islands.

Azya lutiepes.—Mr. Ehrhorn reported finding this Coccinellid abundant at Moanalua. It was introduced from Mexico by Mr. Koebele in 1908, and first recovered in 1910, but was rarely seen till a few years later.

Paralaptomastix abnormis.—Mr. Ehrhorn reported having brought a colony of this mealybug parasite from the California State Insectary, where it is being reared in large numbers on *Pseudococcus citri* and distributed in the State. It had been introduced from Sicily the previous year. Mr. Ehrhorn tried it on five of the local mealybugs and found it to attack three of them: *Pseudococcus citri, P. virgatus,* and *P. bromeliae.*

Rhyparobia maderae.—Professor Illingworth stated that young of this roach which he had under observation had completed their life cycle in 9 months and 15 days.

Eleutheroda dytiscoides.—The habits of this roach were discussed. Mr. Osborn reported having been shown a grove of algaroba trees at Makaweli, Kauai, in which a large number of the trees within an area of about 25 acres had had the bark scraped off from the upper limbs and portions of the larger branches so that there was considerable dead timber. The appearance of the scraped limbs was very similar to the cypress twigs that have been killed by this roach having eaten off the bark, and it may be that it has also been injuring the algaroba in the same way. Mr. Kuhns reported having observed similar injury to algaroba trees at Waianae. Mr. Illingworth statetd that he had often seen this roach very abundant about the base of algaroba trees.

Mr. Swezey and Mr. Ehrhorn reported briefly on the meetings of the Entomological Society of America and American Association of Economic Entomologists, which they had attended at Berkeley, Cal., early in August.

OCTOBER 7TH, 1915.

The one hundred-twenty-first meeting was held in the usual place, Vice-President Illingworth in the chair. Other members present: Messrs. Giffard, Osborn, Pemberton, Swezey; and Mr. August Busck, visitor.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Agrotis ypsilon.—Mr. Giffard exhibited a specimen of this cosmopolitan moth which he had captured flying about in his cabin on board the steamer "Sonoma," when three days out of San Francisco. The incident illustrates how readily such insects may effect their introduction to Hawaii.

Catorama mexicana.—Professor Illingworth called attention to the ease with which this beetle is distributed thru commerce. He had recently found specimens in a tightly sealed tin of chocolate from New York.

Crater Lake insects.—Mr. Swezey exhibited a collection

of about 160 species of insects which he had taken during a two days' stay at Crater Lake, Oregon, in July.

"Gonatocerus mexicanus," a Mymarid parasitic in the eggs of "Draeculacephala mollipes" in Hawaii.

BY OTTO H. SWEZEY.

Two specimens of this Mymarid were caught on sedges at Kapiolani Park, Honolulu, August 26, 1915. In examining the eggs of *D. mollipes* in sedges, some were found containing different parasites than had been previously reared from these eggs here. Rearing some of these parasites they proved to be a Mymarid species, which, on comparison with Dr. Perkins' type of *Gonatocerus mexicanus,* apparently agrees with it. This species was described from specimens bred by Mr. Koebele from Jassid eggs in grass, Chapultepec, Mexico, in 1907. (Ent. Bul., Exp. Station, H. S. P. A., 10, p. 21, 1912.)

At that time Koebele was studying egg-parasites of leaf-hoppers, and attempted the introduction of several species from America. This one must have been amongst them, tho there was no record of it. My finding it at this time is the first record of its having become established here.

Ootetrastichus beatus was also bred from eggs of *D. mollipes* collected the same day at Kapiolani Park as the above. This now makes four different species of parasites breeding in the eggs of this Jassid in Honolulu. Two Trichogrammids: *Jassidophthora lutea* and *Westwoodella caerulocephala,* described by Fullaway on pages 22 and 23 of Proc. Haw. Ent. Soc. III, 1914. A Eulopid: *Ootetrastichus beatus,* which parasitizes the sugar cane leaf-hopper and was purposely introduced from Fiji in 1905. A Mymarid: *Gonatocerus mexicanus.*

The *Anagrus* sp. reported on page 9, Proc. Haw. Ent. Soc., III, 1914, as having been bred from eggs of *D. mollipes,* proved later to be from the eggs of *Kelisia paludum,* whose eggs were in the same sedges as those of *D. mollipes* and were overlooked at the time.

A Note on "Tineola uterella" in Hawaii.

BY OTTO H. SWEZEY.

Mr. August Busck has called my attention to this species of moth among the specimens labelled *Oecia maculata* in the cabinet of the Experiment Station, H. S. P. A. In fact, nearly all so-labelled proved to be *Tineola uterella.* This species has not been previously recorded in the Hawaiian Islands. Walsingham, in the Fauna Hawaiiensis, records a single specimen of *O. maculata,* without locality, collected by Blackburn in the Hawaiian Islands. This no doubt was collected in Honolulu. Walsingham remarks that *O. maculata* is "extremely similar in appearance to *Tineola uterella.*" This and the fact that only the former had been recorded here, led to my confusion of the two species, which I am now able to separate readily, since having their distinctions pointed out by Mr. Busck. They both occur in the West Indies and Brazil, from where they were described. Their larvae are said to have similar habits, in that they live in flattened cases and are found about the walls of houses.

In Honolulu, *T. uterella* is much more common than *O. maculata,* for I have collected but one specimen of the latter in 11 years of collecting; whereas, the former I have collected frequently from many localities in the Islands, and also reared it from the larval cases so commonly seen about buildings.

A Braconid, *Protapanteles hawaiiensis,* is often bred from these cases. It will be necessary to make a correction in a statement about this parasite on page 108 of Proceedings of the Hawaiian Entomological Society, Vol. III, 1915. *Tineola uterella* should be substituted for *Oecia maculata* as the host of this Braconid.

Notes on the Orthopteroid Insects of the Fiji Islands.

BY LAWRENCE BRUNER.

(Presented by O. H. Swezey.)

INTRODUCTION.

During the latter part of 1913 the compiler of these notes had the pleasure of visiting the entomologists of Hawaii in Honolulu. While there the subject of orthopteroid insects naturally came up for discussion along with other matters entomological. Among the specimens examined were a number of Orthoptera from the Fiji Islands. Most of these were brought along to the University of Nebraska to be studied. Later a second collection of these insects taken in the same islands was receivd from Professor J. F. Illingworth of the College of Hawaii.

In studying this material a list of these insects for the group of islands was prepared as a basis for the determinations of the forms in hand. Several new forms were found among the collections studied and their descriptions are given herewith. In this paper the Isoptera or termites are not included.

BLATTOIDEA.

Allacta spuria (Brunner).

Phyllodromia spuria Brunn., Nouv. Syst. Blatt. p. 96 (1865); Kirby Syn. Cat. Orth., I, p. 93 (1904).

Allacta spuria Shelford, Genera Ins. Fasc. 73, p. 18, pl. 2, fig. 7 (1908). For additional synonomy see Shelford, l. c.

Not found in the collections seen, but originally described from the Fiji Islands.

Phyllodromia vitrea Brunner.

Phyllodromia vitrea Brunn., Nouv. Syst. Blatt. p. 109, No. 28 (1865); Kirby, Syn. Cat. Orth. I, p. 95 (1904); Shelford, Genera Ins. Fasc. 73, p. 15 (1908).

Blatta vitrea Sauss., Miss. Mex., Orth. p. 30, pl. I, fig. 18 (1870).

Blatta dilatata ♂, Sauss., Rev. Zool. (2) XX, p. 98 (1868).

A specimen in the collection of the College of Hawaii comes from Nadi, where it was taken in August, 1913.

Phyllodromia germanica (Linnaeus).

Blatta germanica Linn., Syst. Nat. (ed. XII) I, (2) p. 668, No. 7 (1767).

Blatta obliquata Daldorf, Skriv. Nat. Selsk. Vol. 2 (2), p. 164 (1793).

Ectobius germanica Steph., Ill. Brit. Ent., Mand. VI, p. 46 (1835).

For additional synonomy see Shelford, Genera Ins. Fasc. 73, p. 11, and Kirby, Syn. Cat. Orth. I, p. 87.

This insect is cosmopolitan and occurs in all temperate and tropical seaports, as well as in most inland cities and towns, where it has been carried by commerce. Possibly too common to have been taken.

Phyllodromia bivittata (Serville).

Blatta bivittata Serv., Hist. Ins. Orth. p. 108 (1839).

Phyllodromia bivittata Sauss., Miss. Mex. Orth. p. 28 (1870); Kirby, Syn. Cat. Orth. I, p. 87 (1904); Shelford, Genera Ins. Fasc. 73, p. 11 (1908).

The two-lined cockroach, like the preceding, is very widely distributed over the warmer portions of the earth, where it has been carried by commerce. The same remarks might be made of this as of the preceding species.

Phyllodromia suppellectilum (Serville).

Blatta suppellectilum Serv., Hist. Ins. Orth. p. 108 (1839).

For a rather full synonomy of this species see Shelford, Genera Ins. Fasc. 73, p. 11 (1908).

This is still another of the cosmopolitan species that occurs in all seaports of tropical and subtropical countries. See remarks regarding *germanica* and *bivittata*.

Phyllodromia rufescens (Beauvois).

Blatta rufescens Beauv., Ins. Afr. Amer. p. 183, Orth. pl. 1b, f. 7 (1805).

For synonomy see Kirby, Syn. Cat. Orth. I, p. 82, and Shelford, Genera Ins. Fasc. 73, p. 11.

Still a fourth cosmopolitan species of the genus *Phyllodromia* is to be met with in these islands. While not represented in the collection studied, it certainly occurs in the Fijis.

Phyllodromia notulata (Stål).

Blatta notulata Stål, Freg. Eugen. Resa, Ent. p. 308 (1858).

Allacta notulata Kirby, Syn. Cat. Orth. I, p. 100 (1904).

Phyllodromia notulata Shelford, Genera Ins. Fasc. 73, p. 13 (1908).

Phyllodromia hieroglyphica Brunn., Nouv. Syst. Blatt. p. 105 (1865).

There are specimens in the collection of the College of Hawaii taken at Nadi during the month of June, 1913.

Temnopteryx ferruginea sp. nov.

Rather small, ferrugineo-piceous with a testaceous border on the sides of the pronotum and abdomen, legs also testaceous with prominent piceous maculae on coxae, femora and tibiae. Tegmina and wings abbreviated, the former obliquely truncated internally at apex, their inner margins touching; wings narrow, sublinear, as long as the tegmina. Dorsum and venter becoming piceous at outer margins and adjoining the narrow testaceous border. Spines of legs piceous at their base. Head ferruginous, paler on the vertex, the clypeus testaceous; maxillae testaceous, the apical joint infuscated; antennae also somewhat infuscated.

Length of body, ♀, 10 mm.; of pronotum, 2.85 mm.; width of pronotum, 4 mm.; length of tegmina, 3 mm.

Habitat.—A single female, the type, comes from Rewa, Fiji (Muir, 1906).

Cutilia nitida (Brunner).

Platyzosteria nitida Brunner, Nouv. Syst. Blatt. p. 214 (1865).

Cutilia nitida Shelford, Genera Ins. Fasc. 109, p. 8 (1910).

For synonomy see Shelford, l. c.

Habitat.—Malay Archipel. etc.; Suva, Fiji, Aug. 25, 1913 (College of Hawaii). These specimens were collected from cocoanut leaf sheaths.

Cutilia feejeeana sp. nov.

A single ♀ specimen of a second and rather closely related species of "Cutilia" is at hand. The color of this insect is a deep piceo-ferruginous and in form it is somewhat broader than the preceding. Its length is 23 mm., its greatest width 16 mm., length of pronotum 7.5 mm., width of hind margin of pronotum 15 mm., length of hind tibiae 10.75 mm.

Habitat.—Rewa, Fiji (Muir, 1906). Type in the collection of L. Bruner.

Stylopyga rhombifolia (Stoll).

Blatta rhombifolia Stoll, Spectres, Blatt. p. 5, pl. 3d, fig. 13 (1813).

For synonomy see Shelford, Genera Ins. Fasc. 109, p. 14, and Kirby, Syn. Cat. Orth. I, p. 135 (1904).

This is a cosmopolitan insect that is very widely disseminated thruout the Oriental region. It is especially common in the islands of the Pacific. It should be found in the principal seaports of the Fijis.

Blatta orientalis Linnaeus.

Blatta orientalis Linn., Syst. Nat. (ed. X) I, p. 424, No. 7 (1758).

For synonomy see Kirby, Syn. Cat. Orth. I, p. 137 (1904).

Found about the wharves, in dwelling houses, hotels, business blocks, etc., thruout the civilized world; also to some extent out-of-doors in the tropical forests. No specimens are at hand, possibly because of its being too common and well known.

Blatta rotundata (Brunner).

Periplaneta rotundata Brunn., Nouv. Syst. Blatt. p. 230 (1865).

This moderately large insect appears to be confined entirely to the Fiji Islands. No specimens are at hand. Hence it would seem either to be rare or else confined to the jungles or some special haunts away from human habitations.

Periplaneta americana (Linnaeus).

Blatta americana Linn., Syst. Nat. (ed. X) I, p. 424, No. 4 (1758).

For synonomy see Kirby, Syn. Cat. Orth. I, p. 140, and Shelford, Genera Ins. Fasc. 109, p. 18.

A cosmopolitan cockroach that occurs both about buildings and in the forests. A single specimen taken at Nadi during the month of July is classed here. It is contained in the College of Hawaii collection.

Periplaneta australasia (Fabricius).

Blatta australasia Fabr., Syst. Ent. p. 271, No. 5 (1775).

For synonomy see Kirby and Shelford, l. c.

A cosmopolitan species of the forests rather than of the cities, but by no means absent from the latter locality. Reported from the Fijis, but not present in the collections examined.

Diploptera dytiscoides (Serville).

Blatta dytiscoides Serv., Hist. Ins. Orth. p. 102 (1839).

For synonomy see Kirby, Syn. Cat. Orth. I, p. 176 (1904).

Habitat.—Quite general over the Oriental region. Muir collected it at Rewa, Fiji, in 1906.

Several other cosmopolitan roaches undoubtedly are to be met with in these islands, as for example *Leucophoea surinamensis* (Linn.), *Rhyparobia maderae* (Fabr.) and *Nauphoeta cinerea* (Oliv.), all of which are common in adjoining islands.

PHASMOIDEA.

Pterobrimus depressus Redtenbacher.

Pterobrimus depressus Redt., Ins. Fam. Phasm. p. 43 (1906).

Habitat.—Fidji-Inseln (Coll. Redt. and Mus. Hamburg). Not in the collection studied.

Chitoniscus lobipes Redtenbacher.

Chitoniscus lobipes Redt., Ins. Fam. Phasm. p. 178, pl. VI, fig. 15 (1906).

Habitat.—Viti, Fidschi-Inseln (Coll. Redt.). This insect is likewise absent from the various collections examined by me.

Chitoniscus lobiventris (Blanchard).

Phyllium lobiventre Blanch., Voy. Pole Sud. Zool. IV, p. 359, Orth. pl. I, fig. 9 ♂ (1853); Westw. Cat. Phasm. p. 174, pl. 39, fig. 5 ♀ (1859).

Chitoniscus lobiventris Stål, Recens. Orth. III, p. 105 (1875); Redt., Ins. Fam. Phasm. p. 179 (1906).

Habitat.—Fiji Isls. (Mus. Hamburg, Mus. Paris, etc.). Not among the specimens now studied.

Chitoniscus feejeeanus (Westwood).

Phyllium feejeeanum West., Proc. Ent. Soc. Lond. (3) II, p. 17 (1864).

Chitoniscus feejeeanus Kirby, Syn. Cat. Orth. I, p. 420 (1904).

Habitat.—A single ♀ specimen of this Fijian insect is at hand. It was taken at Suva in August, 1913, (College of Hawaii).

Nisyrus spinulosus Stål.

Nisyrus spinulosus Stål, C. R. Soc. Ent. Belg. XX, p. lxvi (1877); Brunn., Fam. Phasm. pp. 359, 360, pl. XVI, fig. 13 (1908).

Habitat.—Viti-Inseln (Coll. Brunner, Mus. Hamburg, Mus. Berlin, Mus. Stuttgart). Absent from the Fiji material at hand.

Nisyrus dipneusticus (Wood-Mason).

Cotylosoma dipneusticum Wood-Mason, Ann. Mag. Nat. Hist. (5) I, p. 101 (1878); Waterhouse, Ann. Nat. Hist. XV, p. 498 (1895).

Habitat.—The only reference to this insect's habitat is Taviuni, Viti-Inseln (Mus. Hamburg).

Nisyrus amphibius Stål.

Nisyrus amphibius Stål, C. R. Soc. Ent. Belg. XX, p. lxvii (1877); Brunn., Fam. Phasm. p. 360 (1908). Habitat.—Viti-Inseln (Mus. Hamburg).

Nisyrus carlottae (MacGillivray).

Prisopus carlottae MacGill., Zoologist, XVIII, p. 714 (1860); Brunn., Fam. Phasm. p. 361 (1908). Habitat.—Viti-Inseln (Mus. Hamburg).

Megacrania phelaus (Westwood).

Platycrania phelaus Westw., Cat. Phasm. p. 113, pl. 27, fig. 5 ♀ (1859); Kirby, Trans. Linn. Soc. Lond. (2) vi, p. 470 (1896).

Megacrania phelaus Kaup., Berl. Ent. Zeitschr. XV, p. 38 (1871); Brunn., Fam. Phasm. p. 370 (1908). Habitat.—Fidschi-Inseln (Westw.).

Graeffea coccophagus (Newport).

Alophus coccophagus Newp., Phil. Trans. 1844, p. 288, pl. 14, fig. 4.

Lopaphus coccophagus Westw., Cat. Phasm. p. 99 (1859).

Graeffea purpuripennis Brunn., Dr. Graeffes Reisen in Viti-Levu, figs. 1 ♂, 2 ♀ (1868).

Anophelepis fulvescens Sauss., Rev. et Mag. d. Zool. 1869, p. 4; Ib. Mel. Orth. III, p. 117, pl. 2, figs. 3, 4 (1869).

Habitat.—Australasia. There are 2 female specimens at hand from Rewa (Muir in April); also a couple from Suva taken in August, 1913 (Coll. College of Hawaii).

Graeffea lifuensis Sharp.

Graeffea lifuensis Sharp, Acc. of Phasm. in Willey Zool. Results, p. 80, pl. 9, fig. 21 (1898); Redt., Ins. Fam. Phasm. p. 371 (1908).

Habitat.—Two females and a male of what is apparently this insect are at hand from Suva, where they were collected in August, 1913 (College of Hawaii).

Graeffea minor Brunner.

Graeffea minor Brunn., Dr. Graeffes Reisen in Viti Levu. p. 47 (1868); Kirby, Syn. Cat. Orth. p. 386 (1904).

Habitat.—Fiji Islands (Coll. Brunner, Mus. Hamburg).

Podacanthus typhon Gray.

Podacanthus typhon Gray, Ent. Austr. I, pl. 2, fig. 1 (1833); Serv., Hist. Ins. Orth. p. 230 (1839); Burm., Handb. Ent. II, p. 581 (1838); Westw., Cat. Phasm. p. 117 (1859).

Habitat.—Fidschi-Inseln (Coll. Brunner).

Hermarchus differens Redtenbacher.

Hermarchus differens Redt., Fam. Phasm. p. 445 (1908). Habitat.—Viti (Mus. Paris).

Hermarchus appolonius (Westwood).

Phibalosoma appolonius Westw., Cat. Phasm. p. 181, pl. 40, fig. 4 ♀ (1859).

Phibalosoma pythonius Westw., Cat. Phasm. p. 73, pl. 35, fig. 3 ♂.

Hermarchus pythonius Stål, Recens. Orth. III, p. 89.

Habitat.—Fiji Islands. A single ♂ from Suva, taken in August, 1913, is referred here (College of Hawaii).

Hermarchus pythonius (Westwood).

Phybalosoma pythonius Westw., Cat. Phasm. p. 73, pl. 12, fig. 1 ♀ (1859).

Hermarchus pythonius Stål, Recens. Orth. III, p. 89 (1875); Brunn., Fam. Phasm. p. 446.

Habitat.—Fidschi-Inseln (Coll. Brunner, Mus. Paris, Mus. Hamburg, Hofmus Wien).

Hermarchus virga Redtenbacher.

Hermarchus virga Redt., Fam. Phasm. p. 446 (1908).

Phybalosoma pythonius var. Westw., Cat. Phasm. p. 73 (1859).

Habitat.—Fidschi-Inseln (Coll. Brunner, Mus. Paris).

Hermarchus novae-britanniae (Wood-Mason).

Phyllium novae-britanniae Wood-Mason, Ann. Mag. Nat. Hist. (4) XX, p. 76 ♀ (1877).

Hermarchus novae-britanniae Brunn., Fam. Phasm. p. 447, pl. XXI, fig. 6 (1908).

Habitat.—Fidschi-Inseln (Coll. Brunner, Mus. Genf, Mus. Hamburg, Mus. Paris, Mus. Berlin).

Hermarchus inermis Redtenbacher.

Hermarchus inermis Redt., Fam. Phasm. p. 448, pl. XXI, fig. 5 (1908).

Habitat.—Fidschi-Inseln (Coll. Brunner, Mus. Hamburg, Mus. Stuttgart).

Acrophylla chronus (Gray).

Diura chronus Gray, Ent. Australia, pp. 20, 26, pl. 5, fig. 2 (1833).

For synonomy see Brunner and Redt., Fam. Phasm. p. 457.

Habitat.—Fidschi-Inseln (Coll. Brunner).

MANTOIDEA.

Hierodula fuscescens (Blanchard).

Mantis fuscescens Blanch., Voy. Pole Sud. Zool. IV, p. 354, pl. i, fig. 5 (1853).

Habitat.—Although recorded as belonging to these islands, it is not contained in the material examined.

Undoubtedly several other mantids will be found to occur in these islands.

LOCUSTOIDEA.

Thyrsus tiaratus Bolivar.

Thyrsus tiaratus Bolivar, Ann. Soc. Ent. Belg. XXXI, pp. 187, 254, pl. 5, fig. 21 (1887); Hancock, Genera Ins. Orth. Acrid. Tetr. Fasc. 48, p. 50, fig. 19 (1906).

Habitat.—Although confined to the Fiji Islands, this species is not represented among the forms studied.

Paratettix pullus Bolivar.

Paratettix pullus Bolivar, Ann. Soc. Ent. Belg. XXXI, pp. 188, 272, 281 (1887).

Habitat.—Two specimens are at hand from Rewa (Muir, 1906).

Paratettix feejeeanus sp. nov.

Decidedly smaller that *P. pullus*, from which it differs in having the pronotum and wings much abbreviated and scarcely reaching the apex of the hind femora and tip of the valves of the ovipositor in the females; in the males only about as long as the abdomen. Color variable, mostly testaceous, more or less varied with fuscous.

Length of body, ♂, 5.5 mm., ♀, 7.5 mm.; of pronotum, ♂, 5.75 mm., ♀, 6 mm.; of hind femora, ♂ and ♀, 4.25 mm.

Habitat.—This insect was taken at Rewa in April, 1906, by Muir; and at Nausori during June and July, 1913 (Coll. College of Hawaii). Types in the collection of L. Bruner.

Aeolopus tamulus (Fabricius).

Gryllus tamulus Fabr., Ent. Syst., Suppl. p. 195 (1798).

For synonomy see Kirby, Syn. Cat. Orth. III, p. 192.

Habitat.—This insect is widely distributed in the Oriental region. Specimens of both sexes are at hand from Nadi, where they were taken in June, 1913 (College of Hawaii).

Locusta australis (Saussure).

Pachytylus australis Sauss., Mem. Soc. Geneve, XXVIII, pp. 51, 118 (1884).

Locusta australis Frogg., Agric. Gaz. N. S. Wales, XIV, p. 1106 (1903); Kirby, Syn. Cat. Orth. III, p. 229 (1910).

Habitat.—Three males and 2 females were taken at Rewa by Muir in April 1906, and 2 pairs are labelled Nadi, June, 1913 (College of Hawaii).

Oedipoda (?) liturata Le Guill.

Aedipoda liturata Le Guill, Rev. Zool. 1841, p. 295.

See Kirby, Syn. Cat. Orth. III, p. 242.

Habitat.—An insect under the above name is referred to in Fiji. It is not contained in the collections investigated.

Cyrtacanthacris vittaticollis (Stål)?

Acridium vittaticolle Stål, OEfv., Vet. Akad. Forh. XXXIV (10), p. 53 (1877); Finot, Sur. Genre Acridium, p. 73 (1907).

Habitat.—The above named insect is native in the Philippines. A pair of specimens referred here with some doubt bear the locality label "Nadi," where they were taken in June, 1913 (Coll. College of Hawaii).

Cyrtacanthacris sp.

A second and considerably larger species of this genus coming from the same locality, is also at hand. It is a female, and was also taken during the month of June and is contained in the College of Hawaii collections. This latter insect may be new. It resembles quite closely the large *Schistocera americana* and allies. It might bear the name temporarily of *Cyrt. feejeeana.* Its dimensions are as follows: Length of body, ♀, 56 mm.; of pronotum, 11 mm.; of tegmina, 57 mm.; of hind femora, 34 mm.

Undoubtedly still other species of locusts or short-horned grasshoppers occur in these islands.

TETTIGONOIDEA.

Gryllacris dubia Le Guill.

Gryllacris dubia Le Guill, Rev. Zool. 1841, p. 293; Kirby, Syn. Cat. Orth. II, p. 145 (1906).

Habitat.—This insect, while reported from Fiji, is not among the material examined by me.

Gryllacris ferruginea Brunner.

Gryllacris ferruginea Brunn., Verh. Zool.-bot. Ges. Wien, XXXVIII, pp. 316, 317 (1888); Kirby Syn. Cat. Orth. II, p. 146 (1906).

Habitat.—Nausori, Aug. 29, 1913 (College of Hawaii), and Rewa (Muir, 1906).

Euconocephalus australis (Bolivar).

Conocephalus australis Bol., Viaje al Pacif., Ins. p. 90 note (1884).

Habitat.—Specimens of this insect are present from Rewa (Muir) and Nadi (College of Hawaii). Kirby claims that it is the same as the *Conocephalus extensor* of Walker (see Syn. Cat. Orth. II, p. 250).

Euconocephalus lineatipes (Bolivar).

Conocephalus lineatipes Bol., Ortopt. Afr. Mus. Lisboa, p. 225 (1890); Redt., Mon. Conocephal. p. 95.

Habitat.—Fidji-Inseln (Redt.). Specimens from Rewa collected by Muir in 1906 are also referred here.

Salomona antennata Redtenbacher.

Agroecia rugifrons Redt., Mon. Conocephal. pp. 156, 157 (1891); Karny, Revis. Conocephal. p. 73 (1907).

Habitat.—Viti Levu, Fidji-Inseln (Walker, Brunner, Mus. Hamburg). Not contained among the material at hand.

Salomona antennata Redtenbacher.

Salomona antennata Redt., Monog. Conocephal. pp. 156, 158 (1891); Kirby, Syn. Cat. Orth. II, p. 265 (1906); Karny, Revis. Conocephal. p. 73 (1907).

Habitat.—Viti-Levu, Fidji-Inseln (Coll. Brunner). Not among the material at hand.

Salomona brongniarti Brunner.

Salomona brongniarti Brunn., Abhandl. Senekenb. Ges. XXIV, p. 270 (1898); Kirby, Syn. Cat. Orth. II, p. 265 (1906).

Habitat.—Fiji Islands. Not present in the collections studied.

Xiphidion modestum (Redtenbacher).

Xiphidium modestum Redt., Mon. Conocephal. pp. 182, 196 (1891).

Anisoptera modestum Kirby, Syn. Cat. Orth. II, p. 277 (1906).

Xiphidion modestum Karny, Revis. Conocephal. p. 91 (1907).

Habitat.—Quite generally distributed in the Oceanic islands. Fidji-Inseln (Coll. Brunner, Mus. Geneva). Not in the material at hand.

Xiphidion affine (Redtenbacher).

Xiphidium affine Redt., Monog. Conocephal. pp. 183, 199 (1891).

Anisoptera affine Kirby, l. c. p. 278 (1906).

Habitat.—Fiji Islands. Specimens are at hand from Rewa (Muir, Mch. and April, 1906), and Nadi (June, 1913, Coll. College of Hawaii).

Phisis echinata (Redtenbacher).

Teuthras echinatus Redt., Monog. Conocephal. p. 226, fig. 96 (1891).

Phisis echinata Kirby, Syn. Cat. Orth. II, p. 286 (1906); Karny, Revis. Conocephal. p. 104 (1907).

Habitat.—Fidji-Inseln (Coll. Brunner). Missing from the collections before me.

Phisis rapax (Redtenbacher).

Teuthras rapax Redt., Monog. Conocephal. pp. 226, 227 (1891).

Phisis rapax Kirby, l. c. p. 104 (1907).

Habitat.—Fidji-Inseln (Coll. Brunner). Not in the collections at hand.

Hexacentris australis Redtenbacher.

Hexacentris australis Redt., Monog. Conocephal. pp. 234, 236 (1891); Kirby, l. c. p. 287 (1906); Karny, l. c. p. 107 (1907).

Habitat.—Specimens of this insect were taken at Rewa in March, 1906, by Muir.

Morisimus oceanicus (Pictet et Saussure).

Tympanoptera oceanica Pict. et Sauss., Icon. Saut. Vertes, p. 20, pl. 2, fig. 12 (1892).

Aprion oceanicus Brunn., Mon. Pseudophyll. pp. 74, 78, pl. 3 fig. 31 (1895).

Morisimus oceanicus Kirby, Syn. Cat. Orth. II, p. 305 (1906).

Habitat.—Fiji. Not in any of the collections studied.

Ocica lutescens Walker.

Ocica lutescens Walker, Cat. Derm. Salt. B. M. II, p. 246 (1869); Kirby, Syn. Cat. Orth. II, p. 357 (1906).

Habitat.—This insect is recorded only from the Fiji Islands. None are in the collections studied.

Diaphlebus bivittatus Redtenbacher.

Diaphlebus bivittatus Redt., Verh. Zool.-bot. Ges. Wien. XLII, p. 193 (1892).

Habitat.—This and the following three species of the genus are all described from the Fiji Islands. None of them are represented.

Diaphlebus marmoratus Redtenbacher.

Diaphlebus marmoratus Redt., l. c. pp. 193, 194, pl. 3, fig. 2 (1892); Kirby, Syn. Cat. Orth. II, p. 357 (1906).

Habitat.—Fiji (Coll. Brunner).

Diaphlebus brevivaginatus Karsch.

Diaphlebus brevivaginatus Karsch, Berl. Ent. Zeitschr. XXXVI, p. 343 note (1892).

Habitat.—Fiji Islands.

Diaphlebus (?) uniformis Brunner.

Diaphlebus (?) uniformis Brunn., Abhandl. Senckenb. Ges. XXIV, p. 257 (1898); Kirby, Syn. Cat. Orth. II, p. 357 (1906).

Habitat.—Fiji Islands.

Elaeoptera nitida Redtenbacher.

Elaeoptera nitida Redt., Verh. Zool.-bot. Ges. Wien, XLII, p. 196 (1892); Kirby, l. c. II, p. 358 (1906).

Habitat.—Fiji Islands. Not represented.

Elaeoptera lineata Redtenbacher.

Elaeoptera lineata Redt., l. c. p. 196, pl. 3, fig. 3 (1892); Kirby, l. c. p. 358 (1906).

Habitat.—Fiji. Likewise absent from these collections examined.

Ityocephala nigrostrigata (Walker).

Pseudophyllus nigrostrigatus Walker, Cat. Derm. Salt. B. M. V. Suppl. p. 44 (1871).

Ityocephala nigrostrigata Redt., Verh. Zool.-bot. Ges. Wien, XLII, p. 22, pl. 3, fig. 11 a, b (1892).

Habitat.—Fiji (Coll. Brunner). Not in the material studied.

Furnia insularis Stål.

Furnia insularis Stål, Bihang. Svenska Akad. IV, p. 57 (1876); Kirby, Syn. Cat. Orth. II, p. 468 (1906).

Anaulacomera insularis Brunn., Mon. Phaneropt. pp. 280, 295 (1878).

Habitat.—Two ♀ ♀ and a nymph are referred here (Muir, Mch. 1906).

Furnia incerta (Brunner).

Anaulacomera incerta Brunn., Mon. Phaneropt. pp. 280, 295, pl. 6, fig. 85 a-e (1878).

Furnia incerta Kirby, Syn. Cat. Orth. II, p. 468 (1906).

Habitat.—Fiji (Brunner, Kirby).

Furnia malaya Stål (?)

Furnia malaya Stål, Bihang Svenska Akad. IV (5), p. 57 (1876).

Anaulacomera malaya Brunn., l. c. pp. 280, 295 (1878).

Habitat.—Two specimens, ♂ and ♀, taken at Rewa in March, 1906, by Muir are referred here.

GRYLLOTALPOIDEA.

Curtilla africana (Beauvois).

Gryllotalpa africana Beauv., Ins. Afr. Amer. p. 229, pl. 2 c, fig. 6 (1805).

Gryllotalpa orientalis Burm., Handb. Ent. II, p. 739 (1838).

Curtilla africana Kirby, Syn. Cat. Orth II, p. 6 (1906).

This insect seems to be generally distributetd throughout Australasia. Although no specimens are at hand, it most certainly will be found to occur in the Fiji Islands.

GRYLLOIDEA.

Nemobius luzonicus Bolivar.

Nemobius luzonicus Bol., Ann. Soc. Esp. XVIII, p. 418 1889); Kirby Syn. Cat. Orth. II, p. 16 (1906).

Habitat.—Two ♀ specimens of *Nemobius* are referred to Bolivar's *N. luzonicus,* although they do not agree in all respects with his description. They come from Nausori, where they were taken in June and July, 1913 (College of Hawaiai).

Apiotarsus gryllacroides Saussure.

Apiotarsus gryllacroides Sauss., Mem. Soc. Geneve, XX, p. 105, pl. 14 (XXIII), figs. 1-7 (1877); Kirby, Syn. Cat. Orth. II, p. 20 (1906).

Habitat.—Fiji Islands. Not in the material now examined.

Gryllus oceanicus Le Guill.

Gryllus oceanicus Le Guill, Rev. Zool. 1841, p. 293; Kirby, Syn. Cat. Orth. II, p. 33 (1906).

Gryllus innotabilis Walker, Cat. Derm. Salt. B. M. I, p. 47 (1869); Sauss., Mem. Soc. Geneve, XXV, p. 158 (1877).

Habitat.—Fiji Islands: Rewa (Muir); Suva, Aug. 1913 (Mus. College of Hawaii). This insect also is quite widely distributed in the various islands of the Pacific.

Ornebius novarae (Sassure)?

Liphoplus novariae Sauss., Mem. Soc. Geneve, XXV, p 315 (1877).

Ornebius novarae Kirby, Syn. Cat. Orth. II, p. 58 (1906).

Habitat.—A ♂ specimen collected by Muir at Rewa during April, 1906, is referred here with some doubt.

Ornebius sp.

Habitat.—A ♂ specimen of a second species of the genius not yet determined was also taken at Lautoka in June, 1913 (College of Hawaii).

Arachnocephalus maritimus Saussure.

Arachnocephalus maritimus Sauss., Mem. Soc. Geneve, XX, p. 313 (1877); Kirby, Syn. Cat. Orth. II, p 60 (1905).

Habitat.—Oceanica; Fiji Islands. Not at hand now.

Oecanthus rufescens Serville.

Oecanthus rufescens Serv., Hist. Ins. Orth. p. 361 (1839); Sauss., Mem. Soc. Geneve, XXV, p. 456 (1878).

Gryllus (Oecanthus) gracilis Haan, Teminck, Verhandel., Orth. p. 236, pl. 20, fig. 8 (1842).

Habitat.—Oriental region, including Fiji, but not represented in the material studied.

Oecanthus lineatus Walker.

Oecanthus lineatus Walker, Cat. Derm. Salt. B. M. I, p. 96 (1869); Sauss., Mem. Soc. Geneve, XXV, p. 455 (1877); Kirby, Syn. Cat. Orth. II, p. 74 (1906).

Habitat.—Specimens of this species are at hand from Nadi, Lautoka and Rewa.

Trigonidium flavipes Saussure.

Trigonidium flavipes Sauss., Mem. Soc. Geneve, XXV, p. 465, pl. 16 (XLVII), fig. 2i, e, pl. 19 (LXXX), fig. 1 (1878); Kirby l. c. p. 78 (1906).

Habitat.—Muir collected this insect at Rewa in 1906.

Metioche insularis (Saussure).

Homoeoxiphus insularis Sauss., Mem. Soc. Geneve, XXV, p. 470 (1878).

Metioche insularis Kirby, Syn. Cat. Orth, II, p. 79 (1906).

Habitat.—Specimens of this small cricket are present from Nadi and Nausori, taken in June, 1913 (College of Hawaii), and from Rewa, 1906 (Muir).

Cyrtoxipha maritima (Saussure).

Cyrtoxiphus maritimus Sauss., Mem. Soc. Geneve, XXV, p. 478, pl. 17 (XLIX), fig. 3, pl. 19 (LXXIX), fig. 3 (1878).

Habitat.—Fiji is among the islands listed as the habitat of this insect.

Cyrtoxipha fulva (Saussure).

Cyrtoxiphus fulvus Sauss., Mem. Soc. Geneve, XXV, p. 481, pl. 17 (XLIX), fig. 5 (1878).

Cyrtoxipha fulva Kirby, Syn. Cat. Orth II, p. 82 (1906).

Habitat.—Fiji. Not in the material being studied.

Cyrtoxipha straminea (Saussure).

Cyrtoxiphus stramineus Sauss., Mem. Soc. Geneve, XXV, p. 482 (1878).

Habitat.—Credited to Fiji, but not among the specimens at hand now.

Hydropedeticus vitiensis Miall and Gils.

Hydropedeticus vitiensis Mial and Gils., Trans. Ent. Soc. Lond. 1902, p. 284, pls. 7, 8 (1902).

Habitat.—The present species is confined to the Fiji Islands. It is aquatic in its habits, as are some of the neotropical representatives of *Nemobius*.

Cardiodactylus novae-guineae (de Haan).

Gryllus (Platydactylus) novae-guineae Haan, Temminck, Verhandl. Orth. p. 233 (1842).

Cardiodactylus novae-guineae Sauss., Mem. Soc. Geneve, XXV, p. 519, pl. 17 (LV), f. 1 (1878); Kirby, Syn. Cat. Orth. II, p. 88 (1906).

Habitat.—Quite generally distributed over Australasia. A single ♂ was collected at Rewa, Fiji, in 1906 by Muir.

Heterotrypus tripartitus Saussure.

Heterotrypus tripartitus Sauss., Mem. Soc. Geneve, XXV, p. 548 (1878); Kirby, Syn. Cat. Orth. II, p. 91 (1906).

Habitat.—This is another small gryllid that seems to be confined to the Fiji group of islands. It is not in the collections now being reported upon.

Mnesibulus bicolor (De Haan)?

Gryllus (Phalangopsis) bicolor De Haan, Temminck, Verhandel, Orth. p. 235 (1842).

Calyptotrypus bicolor Sauss., Mem. Soc. Geneve, XXV, p. 587 (1878).

Mnesibulus bicolor Bolivar, An. Soc. Esp. Hist. Nat., XVIII, p. 427 (1889); Kirby, Syn. Cat. Orth. II, p. 95 (1906).

Habitat.—A single ♀ cricket collected in 1906 by Muir is referred here with considerable doubt. Its ovipositor is fully as long as the hind femora, a character that does not agree with Saussure's measurement for *bicolor*. It may be new, but if so is quite nearly related to *bicolor*.

Mnesibulus (?) sp.

A second but much smaller species of this or a closely related genus is contained in material collected by Muir at Rewa in 1906. It is rather mutilated, hence not readily determinable nor describable.

Madasumma (?) sp.

The collection made by Muir at Rewa in 1906 contains still another cricket that seems difficult to determine even as to its generic affinities. It is apparently a female, but has the subgenital plate enormously developed into an elongate scoop-like arrangement that is deeply and rather widely longitudinally canaliculate below. Above, and partly hidden by the upturned sides of the apparatus just described, seems to be a dark-colored ovipositor of about the same length as the plate. Its apex is blunt and quite robust.

No attempt will be made at this time to name or describe this insect.

Hemiphonus vittatus Saussure.

Hemiphonus vittatus Sauss., Mem. Soc. Geneve, XXV, p. 621, pl. 18 (LXVII), figs. 1-6 (1878); Kirby, Syn. Cat. Orth. II, p. 101 (1906).

Habitat.—Northern Australia and the Fiji Islands. Not now before me.

Anisotrypus furcatus Saussure.

Anisotrypus furcatus Sauss., Mem. Soc. Geneve, XXV, p. 632, pl. 17 (LVIII), figs. 1-4 (1878); Kirby, Syn. Cat. Orth. II, p. 102 (1906).

Habitat.—This is another species of gryllid that is confined to Fiji and not represented in the collections at hand.

Podoscritus insularis Saussure.

Podoscritus insularis Sauss., Mem. Soc. Geneve, XXV, p. 639 (1878); Kirby l. c. p. 104 (1906).

Habitat.—It would appear that some one in the past collected the gryllids of Fiji quite carefully. This species is also absent from the collections now studied.

Aphonomorphus vitiensis (Saussure).

Aphonus vitiensis Sauss., Mem. Soc. Geneve, XXV, p. 661, pl. 19 (LXXI), figs. 2, 2a (1878).

Aphonomorphus vitiensis Kirby, Syn. Cat. Orth. II, p. 105 (1906).

Habitat.—Fiji. Not contained in the material now being reported upon.

Aphonomorphus depressiusculus (Saussure)?

Aphonus depressiusculus Sauss., Mem. Soc. Geneve, XXV, p. 662, pl. 19 (LXXI), figs. 1, 1a (1878).

Habitat.—A single female specimen in the collection of the College of Hawaii is referred to this species with some doubt. It is rather smaller than the measurements given by Saussure. It comes from Nadi, where it was taken during Aug. 1913.

DERMAPTERA.

Anisolabis maritima (Gene).

Forficula maritima Gene, Ann. Sci. Nat. Regn. Lomb. Venet. II, p. 224 (1832).

For the chief references to this insect see Kirby, Syn. Cat. Orth. I, p. 17 (1904).

Although a cosmopolitan insect, no Fiji specimens are contained in the material studied. A little collecting along the beach of any of the islands would certainly disclose it.

Anisolabis annulipes (Lucas).

Forficula annulipes Lucas, Bull. Soc. Ent. France (2) V, p. lxxxiv (1847).

For synonomy see Burr, Genera Ins. Fasc. 122, p. 19 (1911).

There are no Fiji specimens of this cosmopolitan species in the collections examined, but there can be little doubt but that it occurs in the islands.

Labidura riparia (Pallas).

Forficula riparia Pallas, Reise Russ. Reichs. II, Anh. p. 727 (1773).

For the very extensive synonomy see Burr, Genera Ins. Fasc. 122, pp. 36-37.

This cosmopolitan earwig most assuredly occurs in the Fiji Islands, although no specimens are at hand from there.

Chelisoches morio (Fabricius).

Forficula morio Fabr., Syst. Ent. p. 270, No. 6 (1775).

For synonomy see Burr, Genera Ins. Fasc. 122, p. 65 (1911).

Habitat.—The present species occurs throughout the Oriental region. Specimens are at hand from Nadi. They were taken during the months June, July and August, 1913.

A careful search for Dermaptera over the various islands of the group will undoubtedly result not only in the discovery of the four here listed, but also of several additional forms.

Review of the Autochthonous Genera of Hawaiian Delphacidae.

BY F. MUIR.

"A flood of light may be thrown on the theoretical problem of the origin of species by the study of the probable actual origin of species with which we may be familiar or of which the actual history or the actual ramifications may in some degree be traced."—*David S. Jordan.*

INTRODUCTORY.

During the latter half of January, 1915, I accepted an invitation to spend a couple of weeks with Mr. W. M. Gif-

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fard at his house at Kilauea Hawaii; during my stay we spent considerable time collecting in the neighborhood and made a hurried trip to the lava flows of South Kau. Most of my collecting was confined to Homoptera, but Mr. Giffard gave more attention to Hymenoptera; between us we collected nineteen species of Delphacids, four of which I describe as new species and one as a new sub-species. Upon naming up this material I soon became interested in several problems and found it necessary to revise the genera. Unfortunately my time was very limited, as field work in the Orient compelled my early departure from Honolulu, and this paper has had to be finished in the Orient, away from collections and libraries.

The material I had at my disposal, besides that collected at Kilauea, mentioned above, was cotypes of certain species belonging to the Bishop Museum, collections made by Messrs. Swezey, Giffard and Fullaway during the last several years and a few odd specimens left over by the late Mr. Kirkaldy from material collected by Dr. R. C. L. Perkins. It was unfortunate that I was not able to examine the types of Kirkaldy's species, now in the British Museum, as there is some doubt as to certain of them.*

PART I.

SYSTEMATIC.

The first Hawaiian Delphacid to be described was *Delphax pulchra* by Stål in 1854; it is now known as *Nesosydne ipomocicola* Kirkaldy (*pulchra* being preoccupied in *Delphax*). In 1904 Kirkaldy described *Aloha ipomoeae* as a new genus and species, and also *Megamelus leahi,* which he afterward placed in *Nesosydne.* In 1907, 1908 and 1910 a number of new species and genera were described by the same author in the Proceedings of this Society and in the Fauna Hawaiiensis. In 1907 Swezey described the extraordinary genus

*Subsequently I have examined long series collected by Mr. W. M. Giffard at Kilauea, Hawaii, and Tantalus, Oahu. These were collected very carefully to verify the reported food plants; they have enabled me to correct certain errors and prevented some synonymies. I hope Mr. Giffard will present the Society with full notes on these collections.

Dictyophorodelphax. Dr. R. C. L. Perkins revised the family in his interesting Introduction to the Fauna Hawaiiensis in 1913. Notes on captures and life histories have appeared in the Proceedings of this Society at various times (1905 to date). These references, along with this present paper, constitute the whole of the literature of the autochthonous genera of the Hawaiian Delphacidae.

In dividing the species into genera Kirkaldy used characters already in use in continental areas and gave them the same values. An examination of the male genitalia discloses the fact that this system brings together heterogenous forms and separates several allied forms. By using the size of the first joint of the antennae, instead of the condition of the frontal carinae, for primary divisions these forms are brought together. *Leialoha* and *Nesodryas* have the first joint of antennae very short and wide, and are composed of very closely allied forms, whereas the rest of the *Alohini* have the first joint longer than wide and form a larger group of allied forms containing several well-defined smaller groups, the exact relationship of which it is difficult to decide. In the table of genera *Proterosydne* is included, as it is the only foreign genus of the tribe, with one American and one Australian species. For specific characters the ultimate appeal is made to the external male genitalia. Owing to the variability of color in many species and the tendency of the females to immaculacy, the females of many species are difficult to separate. For this reason I have refrained from erecting new species on females, although there are several in the collections that are undescribed. One specimen collected by Swezey at Nahiku, Maui, has a single frontal carina, but otherwise it is identical with *Nesorestias;* thus it constitutes another genus.

Kirkaldy's sub-genus *Leialoha* I have separated, as a genus, from *Aloha,* leaving the latter with *ipomoeae* and *myoporicola* and placing with them *Nesopleias artemisiae, N. dubautiae* and several new species. *Nesopleias nimbata* I have placed under *Nesorestias,* as they only differ in the greater reticulation of tegmina, a character I do not consider as of generic value. The difference between *Nesodryas* and *Nesothoe* is, at most, only of sub-generic value; the type of the former *(N. freycinetiae)* is not typical of the other species, but is an extreme form, either divergent or convergent.

While working on material from the Hawaiian Islands

one finds that in many instances "species" have not the same value as among continental faunas, and one hesitates to give many forms that status, but it is necessary for both systematic and biological studies that such forms be separated and named; whether as species, sub-species or varieties must be left to the idiosyncracies of the describer.

In the Fauna Hawaiiensis Kirkaldy enumerates forty-six species (omitting two, *Nesopleias artemisiae* and *Nesosydne leahi)* under six genera. The present paper adds twenty-seven species and three sub-species to the list, thus bringing it up to seventy-eight; these are still under six genera, but somewhat differently arranged.

Genera of Alohini.

1. (4) First joint of antennae very short, broader than long, second joint short and thick, often ovaliform or sub-ovaliform. (All macropterous.)
2. (3) Two median frontal carinae, approximating at base or apex, or both, or even meeting together, but not forming a stalk. *Leialoha*
3. (2) A single median frontal carina, forked at extreme base if at all. *Nesodryas*

   (A.) Slender, elongate forms. Subgen. *Nesodryas*

   (B.) Broader, more robust forms. Subgen. *Nesothoe*
4. (1) First joint of antennae distinctly longer than broad, second joint cylindrical or only slightly enlarged in middle. (Mostly brachypterous, few macropterous).
5. (8) Two median frontal carinae.
6. (7) Tegmina reaching well beyond middle of abdomen. *Aloha*
7. (6) Tegmina very short, not reaching to middle of abdomen. *Nesorestias*
8. (5) One median frontal carina, forked or simple.
9. (10) Head enormously elongate, longer than thorax and abdomen combined. *Dictyophorodelphax*
10. (9) Head not elongate.

11. (12) Mesonotum with rounded disk, a depression dividing the disk from the posterior angle *Proterosydne*

12. (11) Mesonotum with flattened disk, no distinct depression dividing the disk from posterior angle. *Nesosydne*

LEIALOHA Kirkaldy.

Leialoha. Subgenus of *Aloha* Kirkaldy, 1910, Fauna Hawaiiensis II, 6, p. 579; type *naniicola* Kirk.

1. *L. naniicola* (Kirk.).

This species holds the same relationship to the typical *lehuae* as do the sub-species of *lehuae;* it will have to be included, along with *ohiae,* in a revision of the species when more material can be brought together.

The pygophor is typical of the genus and the styles are all on the same pattern, sickle-shape. The aedeagus is long, cylindrical, slightly curved and recurved; the crook at apex small, placed about 45 degrees to the stem, slightly widened at the apex, with three small spines; a small spine on right side near apex.

Figures from a specimen from Kalihi Oahu.

Pl. 2, fig. 1; Pl. 4, fig. 75.

2. *L. lehuae* (Kirk.).

This is one of the most interesting species of the genus and it appears to be the most polymorphic. At first I divided the specimens according to coloration, and then noticed that this grouping coincided with locality; an investigation of the aedeagus showed distinct structural differences, and I then decided to make them into species. There appears to be more than one species among the Oahu specimens, but a lack of time and material prevents me from making a thorough investigation, so for the present I leave the species divided into four sub-species, with the remark that *lehuae* is polymorphic and difficult to separate from *ohiae* except by the aedeagus.

(a) *lehuae* typical.

The aedeagus is small the crook at apex very small, a fair sized spine on right side near apex. This is dark brownish in color, the apical half of the hind tibiae and the hind tarsi yellowish; tegmen with infuscation over the greater portion leaving lighter hyaline spots at end of subcostal and first apical cells, in cubital and claval cells; granulations on veins fine.

Hab. Oahu; the typical specimen is from Popouwela, Oahu (Swezey, March); Kaala Mts. (Swezey, September). Female specimens from Lanai come near to this sub-species.

Pl. 2, fig. 2.

(b) *oahuensis* subsp. n.

This has the aedeagus with a long crook at apex with a small spine on right side near apex. Face, clypeus and vertex light brown, mesonotum and sides of pronotum darker reddish brown. Tegmina yellowish with fuscous markings from base to apex of clavus and then to apex of second and third apical cells; granulations on veins coarser than in *lehuae* typical.

Hab. Kalihi, Oahu (Swezey, May), typical; Niu, Oahu (Swezey, December).

Pl. 2, fig. 3.

(c) *hawaiiensis* subsp. n.

The crook at the apex of aedeagus is nearly at right angle to the body and bluntly pointed, a small blunt spine on right side near apex. Dark brown or nearly black, carinae of head and thorax lighter; tegmina hyaline with fuscous brown or black markings, these markings irregular over base, apex of clavus, middle of costal cell and over greater portion of 3–7 apical cells; veins dark with dark granules bearing black hairs.

Hab. Hawaii, Kilauea (Giffard and Muir, January); Waimea (Swezey, October).

Pl. 2, fig. 4.

(d) *kauaiensis* subsp. n.

Aedeagus with crook at apex thin and cruved, tapering to pointed apex and bearing very minute spines, a large spine on right side near apex. Dark brown; tegmina hyaline, whitish, heavily marked with fuscous brown, irregular over base to apex of clavus, in middle of costal cell and over radia, and over the greater portion of apical cells.

Hab. Waimea, Kauai (Swezey, February). A distinct variety of this from Lihue, Kauai (Swezey, March) is much lighter in color and has the markings on tegmina forming an irregular V-shape mark over middle, and a large area dark at apex. The brown of this variety is tinged with red; the aedeagus is near to *kauaiensis,* the crook not so curved and without the little spines; the granulations on tegmina hardly perceptible.

Pl. 2, fig. 5.

I regret that lack of time and material prevents me from making a more detailed study of this very interesting group, for here, I feel sure, we have species in formation. I refrain for the present from making these into species because it is highly probable that intermediate forms will turn up.

3. *L. ohiae* (Kirk.).

This is a light form of *lehuae,* the females being almost immaculate and tinged with red; the male I associate with them is slightly fuscous on tegmina over base, middle and apex of clavus and median portion of apical area. The aedeagus has the crook at apex at 45 degrees to main body and with its apex swollen; a small spine at right side before apex and a small blunt spine at apex. This latter character is found in some species of *Nesodryas.* Specimens under this name are from Oahu, Hawaii and Kauai.

Pl. 2, fig. 6.

4. *L. oceanides* (Kirk.).

I have seen only one female specimen of this species; it is distinguished by the white granulations on the veins of tegmina.

5. *L. pacifica* (Kirk.).

I have seen no specimens of this species.

NESODRYAS Kirkaldy.

Nesodryas Kirkaldy 1908 Pro. Haw. Ent. Soc. I (5), p. 201.

Nesothoe Kirkaldy, 1908, Op. C. p. 202.

The distinction of slender and robust forms is not suffi-

cient to hold these two genera apart; at the most they can only be regarded as sub-genera.

1. *N. freycinetiae* Kirk.

Unfortunately Kirkaldy chose this extreme form as the type of the genus; both in general build and in genitalia it departs from the other species very considerably.

No spines on anal segment, anal segment long, smaller at base than apex; a large spine on each lateral edge of pygophor and two small curved ones, with bases contiguous, on medioventral edge; styles small with rounded apices slightly curved inward, broadest at base, outer edge nearly straight, inner edge slightly emarginate on apical half; aedeagus tubular, curved, with several large spines on apical half and one on right near base.

Pl. 2, fig. 16.

2. *N. giffardi* Kirk.

This is a development of the *Leialoha* group, somewhat near to *L. lehuae;* the styles are less sickle-shape, the basal portion being straighter, the aedeagus long, slender, tubular, slightly curved in middle, the crook at apex large, curved and bearing minute spines, the spine on right side below apex large; the apex is produced into a rounded knob; anal spines short, stout, laterally flattened, curved inward.

Pl. 2, fig. 7; Pl. 3, fig. 59.

3. *N. elaeocarpi* Kirk.

Styles near to those of *giffardi*, but slightly more curved, aedeagus stouter, especially toward base, crook slightly flattened and broadened at apex, spine on right large, another spine at apex curved downward.

Pl. 2, fig. 8; Pl. 3, fig. 57.

4. *N. eugeniae* Kirk.

Styles more curved than in *elaecocarpi*, especially at apex; aedeagus slender, crook large with small spines, spine on right large, a small, stout spine at apex; anal spines stout, convergingly curved but not greatly flattened laterally; pygophor somewhat diamond shape, the anal segment closely inclosed by pygophor.

Pl. 2, fig. 9; Pl. 3, fig. 60.

5. *N. dodonaeae* sp. n.

♂ Macropterous. Vertex, face, clypeus, genae, antennae and legs fuscous yellow or light brown, pro and mesonotum darker brown. Tegmina hyaline, whitish, fuscous over the posterior half from base to apex, a darker mark on hind margin near end of clavus, very fine granules on veins; wings hyaline, slightly fuscous, veins brown.

Spines on anal segment short, stout, convergingly curved; styles very near to *fletus*, but with tips slightly recurved; aedeagus with crook at an acute angle to body of aedeagus, its apex bilobed, a small spine at apex of aedeagus but none on side below apex.

Length 2.3 mm.; tegmen 3.3 mm.

♀ Similar to male.

Length 2.8 mm.; tegmen 3.6 mm.

Hab. Waimea, Kauai, feeding on *Dodonaea.* (Swezey, February.)

In general appearance this is somewhat like *dryope,* and by its more slender form would come into the *Nesodryas* subgenus.

Pl. 2, fig. 10.

6. *N. dryope* Kirk.

One male from Oahu with aedeagus missing, one from Glenwood, Hawaii (Giffard and Muir, January), which agrees in coloration, etc., with the Oahu specimen. The aedeagus of latter is figured. Anal spines short, surved; styles with nearly straight basal portion, the apex being nearly at right angles to it; aedeagus tubular, slender, curved and recurved, with two spines at apex forming a crescent. This should be compared with the aedeagus of an Oahuan specimen when possible.

Pl. 2, fig. 11; Pl. 3, fig. 62.

7. *N. fletus* (Kirk.).

Aedeagus thin, tubular, curved, making a long spiral, apex produced into a spine, a small spine on right side near apex; styles sickle-shape; anal spines short, stout, convergingly curved.

Pl. 2, fig. 12; Pl. 3, fig. 58.

8. *N. gulicki* sp. n.

Macropterous; stout form and comes into the *Nesothoe* sub-genus. ♂ Head brown, vertex, face and genae spotted with lighter brown or yellow, in middle of face three pair of spots coalesce making three small bands, clypeus darker brown; pronotum slightly darker than head with few light spots, mesonotum still darker with apex yellow, legs brown with incomplete yellowish bands, abdomen brown slightly marked with yellow. Tegmina opaquely white, an irregular fuscous band from near base of costa to near apex of clavus, and another from near the middle of this band to middle of costa, together forming an irregular V, third to last apical cells fuscous with the veins white, veins in rest of tegmina concolorous as membrane, veins bearing dark granules with black hairs; wings light fuscous with brown veins.

Genital styles near to that of *bobeae*, anal spines short, stout, broad, convergingly curved; aedeagus thin, tubular, slightly curved and recurved, crook straight, at about 45 degrees to body of aedeagus, with four small spines at apex, a small spine on right side below crook, apex forming a short, strong spine.

Length 2.6 mm.; tegmen 3.4 mm.

Hab. On *Metrosideros,* Kahuku lava flows, Kau, Hawaii, about 1800 feet elevation (Giffard and Muir, January). I honor this little insect by naming it after the Rev. J. T. Gulick, whose work on the Hawaiian land shells, and the evidence they lend to the theory of segregation in species formation, is a landmark in evolutionary literature.

Pl. 2, fig. 13.

9. *N. bobeae* (Kirk.).

Styles with apex about at right angles to basal three-fourths; aedeagus thin, tubular, a spine near apex on right side, apex forming a small knob.

Pl. 2, fig. 14; Pl. 3, fig. 61.

10. *N. maculata* sp. n.

♂ Macropterous; stout form as in sub-genus *Nesothoe.* Dark brown, the face with four small light bands, a few small light spots on lateral carinae, extreme apex also light, some light dots on outer carinae of pronotum; tibiae and tarsi banded. Tegmina hyaline, slightly whitish, posterior half of apical cells mostly fuscous, an irregular spotting with fuscous over the rest of the tegmina, a dark mark on hind margin near end of clavus, veins with large fuscous granules; wings light fuscous with darker veins.

Pygophor near to *bobeae* but the aedeagus somewhat flattened at apex, the spine on right side near apex large, curved and slightly flattened; styles very much as in *bobeae*.

Length 2.2 mm.; tegmen 2.8 mm.

♀ Similar to male.

Length 2.7 mm.; tegmen 3.0 mm.

Hab. On *Metrosideros* (?), Kahuku lava flows, Kau, Hawaii, elevation 1800 feet. (Giffard and Muir, January.)

Pl. 2, fig. 15.

11–12.

I have only seen females of *N. frigidula* and *N. perkinsi*.

13–18.

The following six species of the subgenus *Nesothoë* I have seen no specimens of: *hula, laka, pulani, terryi, pluvialis, silvestris*.

ALOHA Kirkaldy.

Aloha Kirkaldy, 1904, Entomologist, XXXVII, p. 177.
Nesopleias (in part) Kirkaldy, 1910, Fauna Hawaiiensis, II, 6, p. 582.

1. *A. ipomoeae* Kirk.

In size and coloration there is a fair amount of variation, specimens from Kahului, Maui, being very small, yellow and almost immaculate. The aedeagus of specimens from Hawaii, Oahu and Maui are practically identical and there is very little variation in the genital styles. All the macropterous specimens I have seen are females. The genital styles of this species are typical of a large group and are here seen in a simple condition. In flat view they look like a pair of short, thick legs with the heels turned inward. One of the chief modifications on this is for an elevation to arise near the inner edge a little below the apex, about where the ankle bone should be. For the sake of brevity and clearness I shall call this elevation

the "ankle knob," the inner apical corner the "heel" and the outer apical corner the "toe."

The aedeagus is tubular, slightly flattened laterally, a row of spines at apex on dorsal side continuing a short distance on to right side, a short row on ventral side at apex.

Lanai, Maunalei (Giffard, February); Maui, Kahului (Swezey, August, on *Scaevola coriacea).*

Pl. 2, fig. 17.

2. *A. myoporicola* Kirk.

The genital styles in this species have a distinct ankle; the toe is short and pointed and the heel is pointed. The aedeagus is shorter and flatter than in *ipomoeae* and the spines different. Spines on anal segment medium size, straight. A series of female specimens from Lanai (Giffard, October) have the granulations on tegmina larger.*

Pl. 2, fig. 18.

3. *A. plectranthi* sp. n.

♂ Tegmina not reaching quite to the apex of abdomen. Head brown; vertex, apical portion of face and the clypeus darker between carinae; antennae yellowish; pro and mesonotum dark brown to nearly black; legs light yellow; coxae fuscous; abdomen brown, lighter at base and on hind margin of each segment. Tegmina light yellow, veins concolorous without granules or hairs, a dark mark at end of clavus and end of costal cell spreading inwards; apical margin and apical veins lighter.

Pygophor very similar to *ipomoeae;* anal spines short, broad at base, laterally compressed; styles near to *ipomoeae* but with toe shorter and blunter; aedeagus distinct.

Length 2 mm.; tegmen 1.3 mm.

♀ Lighter than male; in immature specimens all light yellow

Length 2.6 mm.; tegmen 1.9 mm.

Hab. Koko Crater, Oahu, on *Plectranthus* (Swezey, March; Osborn, April).

At the time Mr. Swezey was at Koko Crater he could find no signs of Delphacids on this plant, but from some specimens of *Plectranthus* which he brought back with him nymphs hatched out in Honolulu. Some two weeks later Mr. Osborn

*NOTE:—There is a second type of genitalia in which the anal spines are longer and nearer together and the aedeagus longer, more slender and the spines somewhat differently arranged. At present I cannot consider it a distinct species.

visited the same spot and searched in vain for these insects, but from plants he brought back numbers of nymphs hatched. No parasites hatched from these eggs. The absence of nymphs or adults from these plants while the eggs were present in such numbers is curious, and would indicate that some enemy made away with them upon their hatching. Ants *(Pheidole megacephala)* were abundant all over the food plant and are the only enemy we can attribute the absence of nymphs and adults to. A large series of adults was obtained by rearing the nymphs which hatched from eggs in the plants collected.

Pl. 2, fig. 19.

4. *A. kirkaldyi* sp. n.

♂ Tegmina reaching just to the end of abdomen. Near to *A. ipomoeae* but with face broader, with carinae and lateral edges more arcuate. Pronotum, vertex, face and clypeus yellowish, fuscous on pronotum between carinae and on outer edges; mesonotum dark brown; legs yellowish, with indistinct fuscous longitudinal mark on femora, abdomen yellow with brown spots, mostly on sides. Tegmina hyaline, with indistinct fuscous mark across middle, darker and narrower on hind margin at apex of clavus, wider but more indistinct on costa; three or four small brown dots on apical margin; veins whitish on basal and apical portions.

The genitalia differ considerably from *A. ipomoeae*, the spines on anal segment being longer and thinner, the styles flattish and curving to a point at apex; the aedeagus also differs.

Length 2.2 mm.; tegmen 1.6 mm.

♀ The female I associate with this is light brown with slight infuscation on abdomen; the infuscation on tegmina much more indistinct.

Length 2.7 mm.; tegmen 2.0 mm.

Hab. Punaluu, Oahu (Swezey, June).

I name this species after Mr. G. W. Kirkaldy, to whom we are indebted for so much of our knowledge of Hawaiian Delphacidae.

Pl. 2, fig. 20; Pl. 3, fig. 63.

5. *A. swezeyi* sp. n.

♂ In structure this agrees with *artemisiae* except in genitalia. Vertex, face and clypeus brown, darker along outer edges of carinae, surface slightly granulated, antennae yellowish; pro and mesonotum brown, latter darker than former, legs lighter brown, abdomen brown

with yellowish pleura, anal segment yellowish. Tegmina reaching nearly to end of abdomen, all apical cells present; hyaline, yellowish, veins yellowish, a fuscous spot at apex of costal cell, another at apex of clavus, spreading out along cubitus. Pygophor deeper than broad, no spine on ventral edge, emargination on dorsal margin only half surrounding anal segment, a pair of large, inwardly pointing spines on anal segment in a medio-lateral position; styles longer than broad, apex broad and slightly excavate, inner angles slightly drawn out, outer edge curved inwards toward base, inner edge slightly excavate along apical two-thirds, where it is slightly elevated along border; apical portion of aedeagus laterally flattened and pointed.

Length 2 mm.; tegmen 1.5 mm.
Hab. Palolo, Oahu (Swezey, December).
I can place no female with this species at present.

Pl. 2, fig. 21.

6. *A. wailupensis* sp. n.

♂ The median carinae of face converging apically, where they are obscure. Vertex, face, clypeus and antennae light brown, darker between carinae; pro and mesonotum light brown, carinae and posterior edge of pronotum darker, legs lighter brown, posterior femora darker, abdomen dark brown, base light. Tegmina reaching to end of abdomen, semi-opaque, yellowish, slightly fuscous at base, fuscous at end of costal cell and at apex of clavus, veins fuscous except at apex where they are yellowish, a few hair-bearing black granules along veins.

Pygophor oval, no spines on ventral margin, emargination of dorsal edge deep, more than half surrounding the anal segment; no spines on anal segment; styles long, narrow, widest at base and at apex where the angles are produced; aedeagus tubular, curved, with a few small spines at apex on dorsal side, behind which it is slightly excavate.

Length 2.5 mm.; tegmen 1.8 mm.

♀ In the female I associate with this species the abdomen is lighter and the femora darker, the tegmina are less fuscous and the veins have no granules; the median carinae of face are more distinct.

Length 3.2 mm.; tegmen 2.2 mm.
Hab. Wailupe, Oahu. (Swezey, January.)

Pl. 2, fig. 22.

7. *A. flavocollaris* sp. n.

♂ Tegmen reaching to end of abdomen. Vertex dark brown, lighter at base; face dark brown, lighter at apex; clypeus dark brown, lighter at base and a little on median carina; antennae yellow, pro-

notum yellow, mesonotum dark brown, legs yellow with brown femora; abdomen yellow with fuscous markings. Tegmen fuscous yellow, darkest toward apex of clavus.

Pygophor but little deeper than wide, anal segment sunk well into pygophor, spines on anal segment large, simple, inwardly turned and diverging; styles very much like those of *artemisiae* but narrower at apex and not so twisted; the aedeagus different.

Length 2.5 mm.; tegmen 1.8 mm.

Hab. Kaala Mountains, Oahu. (Swezey, September.)

In this species we have the aedeagus flattened laterally, a condition found in the following four species.

Pl. 2, fig. 23.

8. *A. dubautiae* (Kirk.).

Nesopleias dubautiae Kirkaldy, 1910, Fauna Hawaiiensis, II, (6) p. 583.

This is described by Kirkaldy as being a very variable species, but in the long series I have examined this is not very evident. In the male the dark band across the tegmen is narrow on the hind margin and broad on the anterior margin, the costa being yellow; this leaves a subquadrate yellow mark over the basal portion of the clavus when tegmina are at rest; the female almost immaculate or with a fuscous spot near end of clavus on hind margin. The spines on the anal segment strong, wide apart, curved inward; the aedeagus differs from that of *artemisiae*, but the genital styles are difficult to separate.

Hab. Lanihula, Oahu (Swezey, October); Pacific Heights, Oahu (Swezey, May); Palolo, Oahu (Swezey, December); Olympus, Oahu (Swezey, January).

Pl. 2, fig. 26.

9. *A. artemisiae* (Kirk.).

Nesopleias artemisiae Kirkaldy, 1910, Proc. Haw. Ent. Soc., II, (3) p. 118.

The male of this species can be recognized from *dubautiae* by the dark marking on the tegmina extending to the apex and the subquadrate light mark at apex of clavus not noticeable. The spines on the anal segment are near together and the aedeagus recognizable. One male specimen from Kaala Mountains has the tegmina uniformly dark fuscous brown.

Pl. 2, fig. 27.

10. *A. campylothecae* sp. n.

♂ Tegmen reaching to near end of abdomen. Light yellow; tegmina yellow with median third occupied with black band, indistinct on costal margin, the edges of the band uneven; last joint of tarsi fuscous.

Pygophor deeper than broad, ventral edge produced into minute lip, dorsal edge subangularly excavate with anal segment well enveloped; spines on anal segment curved inward; styles intermediate between *artemisiae* and *swezeyi;* the aedeagus with a distinct barb at apex and an angular projection on ventral edge about middle.

Length 2.2 mm.; tegmen 1.4 mm.

♀ Yellow; tips of tarsi fuscous; tegmina immaculate or with slight fuscous mark on hind margin about middle.

Length 2.8 mm.; tegmen 1.8 mm.

Hab. Wailupe, Oahu, on *Campylotheca.* (Swezey, January.)

Pl. 2, fig. 25; Pl. 4, fig. 64.

11. *A. kaalensis* sp. n.

♂ Tegmina reaching nearly to end of abdomen. Yellow, abdomen slightly fuscous, tip of last tarsal joint black; tegmina yellowish with black band, the band extending from a little before the middle to near the apex. One specimen much darker all over and the dark band more extensive.

Pygophor little deeper than wide, dorsal edge subangularly emarginate, anal segment sunk below edges of emargination, spines on anal segment pointing inward, short, stout, with a distinct tooth; styles near to *campylothecae* but little narrower on basal half, the outer apical corner more pointed, the knob on inner edge little more prominent; aedeagus near that of *campylothecae* but without the barb at apex and with a small spine near orifice of ejaculatory duct.

Length 2.2 mm.; tegmen 1.7 mm.

♀ The females I associate with the above are uniformly light brown or fuscous yellow, the abdomen slightly fuscous.

Length 2.9 mm.; tegmen 1.8 mm.

Hab. Kaala Mountains, Oahu. (Swezey, September.)

Pl. 2, fig. 24.

NESORESTIAS Kirkaldy.

Nesorestias Kirkaldy, 1908, Proc. Haw. Ent. Soc., I, (5) p. 201.

Nesopleias (in part) Kirkaldy, 1910, Fauna Haw., II, (6) p. 582.

1. *N. filicicola* Kirk.

This differs from the species of *Aloha* by the very short tegmina of a coriaceous texture and with reticulated surface. Anal spines short, thick, straight, bases contiguous, diverging; styles on the plan of *A. ipomoeae;* aedeagus flattened laterally, a cock's comb of three spines on dorso-apical area and a single one on ventral area near apex, a large one on left side near apex. I should consider this as a development of the *ipomoeae* group.

Pl. 2, fig. 28; Pl. 4, fig. 76.

2. *N. nimbata* (Kirk.).

Nesopleias nimbata Kirkaldy, 1910, l. c.

This has the same short tegmina as *filicicola* but not so coriaceous or with such distinctly reticulated surface. Anal spines very long and thin, slightly diverging towards apices; styles somewhat like those of *A. kirkaldyi* but shallowly emarginate on outer edge; aedeagus laterally flattened, three small spines on dorso-apical area, a large blunt one on dorso-apical area, four or five on ventro-apical area and a large one on ventro-basal area, a large spine on right side toward apex.*

Whilst these two species are congeneric, the question arises whether they are homophyletic, or if one has branched from the *ipomoeae* group and the other from the *kirkaldyi* group.

Pl. 2, fig. 29; Pl. 4, fig. 77.

DICTYOPHORODELPHAX Swezey.

Dictyophorodelphax Swezey, 1907, Proc. Haw. Ent. Soc., I, (3) p. 104.

1. *D. mirabilis* (Swezey).

By the single frontal carina this species should come near one of the *Nesosydne* group, but the aedeagus has greater affinity to *Nesorestias filicicola,* so that there is the possibility of the single carina being of independent origin.

Anal segment sunk well into pygophor, anal spines very minute; pygophor very shallow; styles broad at base, curved, with long spine at apex nearly at right angle to broad basal portion; aedeagus flattened laterally, deep for basal two-thirds, a "cock's comb" of five spines on dorso-apical area and some five or six small spines on left side near apex.

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*In specimens taken by Mr. Timberlake off *Phegopteris* the spine on right side of aedeagus is not so large and the ventral spine thinner.

NESOSYDNE Kirkaldy.

Nesosydne Kirkaldy, 1907, Proc. Haw. Ent. Soc., I, (4) p. 161.

Type *koae.*

1. *N. koae* Kirk.

This species is at present known from Oahu and Hawaii; female specimens from Waimea, Kauai (Swezey, February) may be the same, but the fact that the species attached to the phyllodia of koa in that island is distinct from that on Oahu or Hawaii makes it probable that the green species is also distinct.

Both the nymphs and adults are of the same bright green as the young leaves of *Acacia koa* on which they feed; a few stray specimens are occasionally taken from the phyllodia.

The type locality of this species is Tantalus. . In specimens from this locality the anal spines are fairly long and slender, the aedeagus slightly compressed, slightly curved in profile especially along the ventral edge and towards the base, being broadest in the middle; a row of strong spines curves from an apical-dorsal point across the right side to a ventro-basal point, on the left side a less well defined row of spines runs from apex to near base near to the ventral edge.

Specimens from Kilauea, Hawaii, are characterized by being darker, especially on the mesonotum; the aedeagus is not so greatly curved on the ventral edge and the anal spines are shorter and thicker.

Fig. 32. This figure is not so broad in the middle or so strongly curved on ventral edge as it should be.

2. *N. rubescens* Kirk.

Nesosydne koae var. *rubescens* Kirkaldy, 1907, Proc. Haw. Ent. Soc., I, p. 161; 1908, t. c., p. 202; 1910, Fauna Haw., II, (6) p. 584.

This I consider to be a distinct species from *koae* and treat it accordingly. It is attached to the phyllodia of *Acacia koa* and is colored in accordance with its habitat both in the nymphal and adult stages; a few stray specimens are occasionally found on the young leaves.

The type locality is Tantalus, Oahu, where the average color is a light reddish brown with lighter carinae. The anal spines long and thin; aedeagus straight to near base, the apical opening on the right side, a dorsal row of strong spines runs from apex to near

base, a small irregular group of spines occupy a medio-ventral position on right side and a few spines near apex on the left side extending in an imperfect line to near middle; the number of spines on the sides are variable. Figure 30.

pulla var. n. The Kilauea, Hawaii, specimens are darker in color, especially the mesonotum of the males, which is sometimes nearly black, the anal spines stouter and shorter, the dorsal row of spines on the aedeagus is represented by a few irregular spines, the spines on the left side form a more complete row along the ventral surface. It is distinct and constant enough for a varietal name.

3. *N. pseudorubescens* sp. n.

♂ Macropterous. Light brown, lighter over frons and on carinae, abdomen dark brown or nearly black. Tegmina hyaline, veins dark brown with small granules of same color bearing black hairs, yellowish over basal portion of costal, radial and median basal cells and over clavus, apical portion of clavus and over hind margin to apex fuscous. Anal spines long and straight; styles short and broad, of the same type as *Aloha ipomoeae;* aedeagus very similar to that of *N. anceps*, but the line of spines on dorsum not turning on to right side and the spines on ventral side not so distinct and forming two or three uneven rows or a cluster (not shown in figure).

Length 2.8 mm.; tegmen 3.2 mm.

♀ Lighter in color, especially on the abdomen, and inclining to greenish.

Length 3 mm.; tegmen 3.5 mm.

Hab. On the phyllodia of *Acacia koa;* at present only known from the small koa reservation at "29 Miles," Olaa, Hawaii. (Giffard and Muir, January, 1915; Giffard, 1916, January.)

In coloration this species is very similar to *rubescens,* but the fuscous hind margin from clavus to apex is very distinctive and the short, broad styles make the male easy to recognize; the genitalia come nearer to *anceps,* which is very differently colored, is brachypterous and is only known from Glenwood where there is no koa.

Pl. 2, fig. 34.

4. *N. koae-phyllodii* sp. n.

♂ Macropterous. Brown, a few light dots on face, abdomen with fuscous markings. Tegmina hyaline, yellowish, veins concolorous with membrane with distinct brown granulations.

Pygophor and styles as in *koae;* anal spines long, thin, touching at base and a little beyond, then diverging and pointing basally; aedeagus with a row of spines on ventral side, another on dorsal near apex, continuing across right side to a ventral point beyond

middle, on the left side a row of spines from near apex to near base along a ventro-median line.

Length 2.2 mm.; tegmen 3 mm.

♀ Macropterous. Infuscation on abdomen less extensive, ovipositor darker than body.

Length 3.3 mm.; tegmen 3.5 mm.

Hab. On the phyllodia of *A. koa,* Waimea, Kauai. (Swezey, February.)

A specimen from Waianae, Oahu (Fullaway), I place here provisionally; in it the anal spines are long, straight and wider apart at base, the aedeagus stands between *koae* and *koae-phyllodii.*

Pl. 2, fig. 31.

5. *N. swezeyi* sp. n.

♂ Antennae reaching to apex of clypeus, first joint more than half the length of second; furcation of frontal carina at extreme base. Tegmina not reaching quite to end of abdomen. Head light brown or yellow, slightly fuscous between carinae; pro and mesonotum dark chocolate brown, the same color extending on to the coxae of first and second legs, rest of legs light brown, hind legs slightly fuscous; abdomen brown with base, middle line on dorsum and slight specks on pleura lighter. Tegmina hyaline, very pale brown, a dark brown mark on hind margin at end of clavus, fading off into the surrounding membrane, base of tegmina slightly darker, veins concolorous as membrane, with very minute granules.

External genitalia figured. Aedeagus with a row of spines from a dorso-apical point across the right side to a ventro-median point; a small bunch of spines in a ventro-apical position extending in a row along a ventro-lateral line to past middle on left side.

Length 2.5 mm.; tegmen 1.9 mm.

Hab. Mount Olympus, Oahu (Swezey, November).

Described from a single male specimen.

Pl. 2, fig. 33; Pl. 4, fig. 68.

6. *N. anceps* sp. n.

♂ Brachypterous, tegmina reaching almost to end of abdomen. Frontal carina simple; antennae reaching beyond base of clypeus, first joint distinctly more than half the length of second.

Head light yellow, dark brown between carinae on face and on genae, and slightly on clypeus; pro and mesonotum shiny dark brown, pleura and first and second coxae brown; legs yellowish, hind femora fuscous; abdomen brown, yellowish at base and on pleura. Tegmina hyaline, slightly yellowish, a fuscous mark from base of costa across to apex of cubitus, darkening and spreading out more

at latter point, a dark mark at apex of costal cell, basal edge of clavus dark, veins concolorous as membrane, very fine granules bearing black hairs.

The genital styles are between the type of *koae* and *blackburni*, —the "ankle" forming a ridge running from inner apical corner to near base; anal spines large, curved; aedeagus slightly flattened, widest on apical half, a row of spines along dorsum to past middle where it turns across the right side, another row along ventral side.

Length 2.5 mm.; tegmen 1.9 mm.

Hab. Glenwood, Hawaii. (Giffard and Muir, January.)

Pl. 2, fig. 34.

7. *N. pele* Kirk.

One specimen from Kilauea, Hawaii (Giffard and Muir, January), which I refer to this species and figure external genitalia. The aedeagus on the type of *koae,* a few spines along the ventro-apical area and a few on dorsal continuing on right side. The styles are shorter and broader with the apices squarer than in *koae,* and the "ankle knob" forming a small pyramid.

Antennae only reaching a little beyond base of clypeus, first joint slightly less than half the length of second. Macropterous.

Pl. 2, fig. 36; Pl. 4, fig. 78.

8. *N. oahuensis* sp. n.

♂ Frontal carina simple; antennae reaching beyond base of clypeus, first segment more than half the length of second; brachypterous, tegmina reaching about one-fourth from apex. Head and antennae yellowish, blackish between carinae of face and clypeus and on genae in front of antennae; pro and mesonotum brownish, carinae yellowish, extending more or less into disk; abdomen dark brown, yellowish at base and down middle of dorsum and on pleura; tegmina yellowish with brown mark at end of costal cell, and a plainer one at end of clavus, veins concolorous as membrane with small black hairs.

Shape of pygophor very much like *nephrolepidis;* anal spines long, curved back upon themselves about middle; styles and aedeagus figured.

Length 3.1 mm.; tegmen 1.7 mm.

Hab. Tantalus, Oahu (Giffard, January).

Pl. 2, fig. 37.

9. *N. cyrtandrae* sp. n.

Frontal carina simple; antennae reaching beyond middle of clypeus, first joint considerably more than half the length of second; brachypterous, tegmina reaching to base of pygophor.

Stramineous; head, especially between carinae, fuscous. Tegmina hyaline, stramineous, veins fuscous with minute granules with small black hairs, a small dark mark at end of costal cell and a larger one at apex of clavus.

Genital styles more complex, but aedeagus on same plan as *koae*.

Length 2.1 mm.; tegmen 1.4 mm.

Hab. Nahiku, Maui, off *Cyrtandra* (Swezey, September).

Pl. 3, fig. 38; Pl. 4, figs. 67, 69.

10. *N. gouldiae* Kirk.

Antennae reaching to apex of clypeus, first segment more than half the length of second. No spines on anal segment, ventral apical edge lipped and turned down; styles widest at base, apical half narrow, inner apical corner slightly produced; aedeagus on the type of *koae*, but membranous on ventro-apical area.

Pl. 3, fig. 39; Pl. 4, fig. 72.

11. *N. nephrolepidis* Kirk.

The only male I have seen, and from which my figures are made, is a specimen from Ookala, Hawaii, and may prove to be a different species from the typical Oahu specimens. Kirkaldy's figure shows the styles foreshortened and therefore difficult to recognize.

Anal spines large, laterally flattened, tapering to a fine point, parallel to near tip where they slightly diverge; aedeagus with circle of spines near apex. Antennae reaching to near apex of clypeus, first segment more than half the length of second.

Pl. 3, fig. 40; Pl. 4, fig. 79.

12. *N. blackburni* sp. n.

♂ Brachypterous, tegmina reaching about to apex of abdomen. Antennae reaching nearly to apex of clypeus, first segment more than half the length of second; frontal carinae simple. Carinae of head, antennae, sides of genae below antennae and sides of clypeus yellowish brown, between carinae of vertex, frons and clypeus and genae in front of antennae dark brown; pro and mesonotum and coxae of front and middle legs dark chocolate brown, rest of thorax yellowish, legs light brown with faint longitudinal fuscous mark

along femora and a faint band toward apex of tibiae, tarsal joints fuscous; abdomen dark brown, yellowish at base. Tegmina hyaline, yellowish, a dark brown mark at end of clavus and another at end of costal cell spreading across disk and forming a band, lightest in middle, veins concolorous as membrane with very minute granules or with none, base of claval margin dark.

The "ankle knob" of styles developed to a slightly curved blunt point; spines on anal segment medium size, flattened laterally, sharply pointed; aedeagus sharply bent near apex, a semicircle of spines running from dorsal point near apex, across right side to a ventro-apical point.

Length 2.8 mm.; tegmen 2 mm.

♀ Brachypterous, tegmina not reaching apex of abdomen. In general color lighter than male.

Length 2.9 mm.; tegmen 2.3 mm.

Hab. Hawaii on Mamaki *(Pipturus albidus*)*; Olaa (Perkins, November, No. 635); Kilauea (Giffard, July; Giffard and Muir, January); Waimea (Swezey, October).

This is the most common Delphacid around Kilauea in January; it does not agree with any published description. It varies in color to very light forms in which the carinae of pro and mesonotum are light, and even all the head and thorax without dark markings; the markings on tegmina are sometimes reduced to a small spot at end of clavus and another at end of costal cell, but the dark color on veins does not always fade with that in cells; in some cases the infuscation extends to near base and apex along veins. It is possible that this is *umbratica* Kirkaldy, but the description is useless for identification.

Pl. 2, fig. 41; Pl. 4, figs. 70, a–b.

13. *N. perkinsi* sp. n.

♂ Brachypterous, tegmina reaching to near apex of abdomen; antennae reaching beyond middle of clypeus, first segment more than half the length of second; furcation of frontal carina about middle of frons.

Head dark brown, antennae and carinae light brown; pronotum dark between carinae, which are light, the lateral portions lighter than middle; mesonotum dark brown; abdomen dark brown, lighter at base, on pleura and a mark down middle of dorsum; pleura of thorax and front and middle coxae dark, rest of legs light brown or

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*Mr. Giffard has taken this off of *Stenogyne* and *Clermontia*. There is also a long-winged form which is somewhat darker than the short-winged ones, the tegmina light brownish with darker veins.

yellow. Tegmina hyaline, faintly brown, a dark brown mark at apex of clavus and a very faint one at end of costal cell; margins of tegmina, except at end of clavus, light yellow, veins concolorous as membrane, apical veins slightly lighter, no granulations.

The aedeagus is bent much more than in the preceding species, a ring of spines toward apex, formed of some eight or nine spines on right side and four on left side.

Length 2.6 mm.; tegmen 1.8 mm.

Hab. Haleakala, Maui, 5000 feet elevation.

From one male specimen (No. 636) of Dr. R. C. L. Perkins, October, 1896.

Pl. 2, fig. 42; Pl. 4, fig. 73.

14. *N. wailupensis* sp. n.

♂ Brachypterous, tegmina not reaching quite to end of abdomen. Antennae reaching to near apex of clypeus, first joint considerably more than half the length of second, furcation of frontal carina about a third from base. Head fuscous or black between carinae, antennae and carinae light brown or yellowish, thorax brown or fuscous brown with light carinae, legs fuscous brown, front tibiae with darker band at apex; abdomen dark brown, light at base and a small line down dorsum. Tegmina light brown, margins whitish, except at apex of costal cell and apex of clavus where it is brown, this brown extending into membrane; veins fuscous except apical veins which are light, no granules, a few black hairs along apical margin and a few on nerves.

Pygophor very distinct, lateral edges angular, anal segment with large stout spines, wide apart and slightly diverging, ventro-apical edge lipped; styles long and narrow; aedeagus tubular, slightly curved, a small group of spines on ventro-apical point and a few on left side near apex, four or five along middle on dorsal side, four or five in a corresponding ventral position and a few along the right side.

Length 3.3 mm.; tegmen 2.3 mm.

♀ Brachypterous, tegmina not quite reaching apex of abdomen.

Length 3.7 mm.; tegmen 2.5 mm.

Hab. Wailupe, Oahu (Swezey, January). Some specimens (immature?) are nearly all yellowish, the tegmina with only the dark mark at apex of clavus and apex of costal cell.

Pl. 3, fig. 43; Pl. 4, fig. 66.

15. *N. pipturi* Kirk.

Anal spines long, thin, pointed, nearly straight, slightly diverging apically; aedeagus small, tubular, slightly curved and pointed apically. There appears to be some variation in the spines on aedeagus; in some they are absent, in others irregular around middle or arranged in more or less of a line. These variations appear to follow

localities, but want of time and material prevent me from following up the question.

Pl. 3, fig. 45.

16. *N. chambersi* Kirk.

Antennae not reaching to middle of clypeus, first segment less than half the length of second. Aedeagus long, cylindrical, slightly curved and recurved, with a short, broad spine at apex on dorsal side and a few on ventral side on apical half. Feeding on *Raillardia*, Kilauea, Hawaii (Giffard and Muir, January).

Pl. 3, fig. 44.

17. *N. osborni* sp. n.

This is a light colored form, very near *chambersi*. The genital styles are narrower and the apical corners more produced and sharper, especially the outer one; aedeagus is very different. In the figured specimen, the only male I possess, it is possible that the apical portion is broken, but the base is so different from *chambersi* that I have no hesitation in giving it a specific status.

Hab. Crater of Haleakala, Maui; taken from among dead leaves round the roots of *Raillardia*, on which it probably feeds. (Osborn, January.)

Pl. 3, fig. 46.

18. *N. cyathodis* Kirk.

Antennae very short, first segment less than half the length of second. Very minute spines on anal segment; styles near to *chambersi* but narrower at apex and rounder on outer, basal edge; aedeagus small, tubular, curved, without spines.

Pl. 3, fig. 48.

19. *N. fullawayi* sp. n.

♂ Brachypterous, tegmina reaching about one-third from apex of abdomen. Antennae not reaching beyond base of clypeus, first joint less than half the length of second; frontal carina simple. Light brown; carinae of head lighter, with a few lighter spots between carinae of face; thorax slightly darker than head; legs light, longitudinally marked with fuscous; abdomen marked with darker spots. Tegmina uniformly light brown. Genital organs practically the same as *cyathodis*.

Length 1.7 mm.; tegmen 1 mm.

♀ Similar to male, but abdomen not mottled with darker spots.

Length 2 mm.; tegmen 1 mm.

Hab. Kamoku, Molokai (Fullaway, July). Also specimens of females from Iao Valley, Maui (Swezey, August), which I cannot separate from the Molokai, and two female specimens from Haleakala Crater, Maui (Osborn, January; Fullaway, July), which only differ in being darker.

20. *N. incommoda* sp. n.

♂ Frontal carina simple; antennae reaching a little beyond the base of clypeus, first segment slightly less than half the length of second; tegmina reaching nearly to end of abdomen. Light brown or yellowish, slightly darker between carinae, abdomen slightly darker. Tegmina yellowish, veins slightly darker with minute granules. Anal spines short, stout, wide apart; styles approaching *cyathodis*, but "heel" pointed and "toe" rounded, "ankle knob" slight; aedeagus long, tubular, swollen at base, curved downward, four spines along right side and a few on left, a few minute spines near apex.

Length 2.5 mm.; tegmen 1.6 mm.

♀ The female I place with this male was taken at the same time. The abdomen is not quite so dark and the infuscation between carinae not so plain. In one specimen there is a slight fuscous spot at end of clavus.

Length 3.2 mm.; tegmen 2 mm.

Hab. Kaumuohona, Oahu. (Muir.)

Pl. 3, fig. 47.

21. *N. leahi* (Kirk.).

Megamelus leahi Kirkaldy, 1904, Entomologist, 176.

Nesosydne leahi Kirkaldy, 1908, Proc. Haw. Ent. Soc., 202.

The shape of pygophor and styles as in *raillardiae*, anal spines stout, medium length, slightly converging; aedeagus with row of spines on right side from a dorso-apical point to a point a little beyond middle near ventral side, a short row along the ventro-apical line and three small spines near apex on left side.

This description is taken from specimens from Waimea, Kauai (Swezey, February) feeding on *Lipochaeta*. I have seen no males from Oahu, so this may be a distinct species.

Pl. 3, fig. 49.

22. *N. raillardiae* Kirk.

Antennae very short, first segment less than half the length of second; aedeagus very short, flattened, deep at base, a small row of spines on ventral side near apex, another on dorsal slightly on right side, none on left side.

Pl. 3, fig. 50.

23. *N. ipomoeicola* Kirk.

Antennae reaching beyond middle of clypeus, first segment more than half the length of second. Aedeagus tubular, flattened on dorsal surface at apex, a stout spine on each side of the flattened area; anal spines short, stout, wide apart and pointing backward.

Kirkaldy's figure of the styles in this species is not very clear. This species is widely distributed in the archipelago and appears to have several distinct subspecies or varieties which only more material will fully elucidate. In one form there are three spines around the apex on the ventral side (Kilauea, Hawaii, Giffard and Muir, January); in another very distinct form the flattened surface is practically absent and the two large spines are quite close to the apex (Kilauea, Hawaii, Giffard and Muir, January). This last variety is distinct enough to be given a specific name.

Pl. 3, figs. 51 a–c.

24. *N. halia* Kirk.

Antennae reaching nearly to apex of clypeus, first segment more than half the length of second. The aedeagus appears to be an extreme development of *ipomoeicola*, the dorsal, flattened portion becoming membranous; on the right edge of this membranous surface there are three spines, the basal one large and bifurcate, the left having only one feebly furcate spine.

Pl. 3, fig. 52.

25. *N. giffardi* sp. n.

♂ Frontal carina forking a little beyond middle; antennae reaching nearly to middle of clypeus, first joint more than half the length of the second; tegmina reaching about middle of abdomen. Brown, face and clypeus darker between carinae; posterior edge of abdominal segments darker. Tegmina light brown, a small dark mark at apex of clavus, veins concolorous as membrane, very minute granules with black hairs. No spines on anal segment, ventral edge lipped; styles long and narrow; aedeagus large, laterally flattened, base very deep, apex deep, two spines on dorsal surface about middle

and a series of large spines around the rim of the dorsal portion of apex.

Length 2.7 mm.; tegmina 1.5 mm.

♀ One specimen which agrees in structure and color I place with this male.

Length 3 mm.; tegmina 1.15 mm.

Hab. Tantalus, Oahu (Giffard, March); ♀ Pacific Heights, Oahu (Swezey, March).

Pl. 3, fig. 54; Pl. 4, fig. 74.

26. *N. montis-tantalus* sp. n.

♂ Frontal carina forking at extreme base; antennae reaching to middle of clypeus, first joint considerably more than half the length of second; tegmina reaching about one-fourth from end of abdomen. Light brown, fuscous between carinae on face and clypeus, abdomen dark brown, base, median line and some medio-lateral spots on dorsum lighter. Tegmina light brown, with a darker mark from base of costa to apex of clavus a small dark mark at apex of costal cell, veins concolorous as membrane with a few fine black hairs. Shape of pygophor much like that of *giffardi;* apex of anal segment slightly emarginate, each corner produced into a short, broad, blunt point; no anal spines; styles long, thin, tapering to a point; aedeagus on plan of *giffardi* with three spines on medio-dorsal position and two on ventral side near base, two small spines at apex on dorsal side and four on right side.

Length 2.3 mm.; tegmen 1.5 mm.

♀ Similar to male, but lighter, the fuscous mark across tegmen very faint.

Length 2.5 mm.; tegmen 1.4 mm.

Hab. Mount Tantalus, Oahu (Giffard, November).

Pl. 3, fig. 55.

27. *N. sharpi* sp. n.

♂ Brachypterous, tegmina reaching nearly to end of abdomen; antennae reaching nearly to apex of clypeus, first joint considerably longer than half the second; furcation of frontal carina at extreme base.

In coloration this species is very like *wailupensis;* legs are a little more fuscous, especially the hind tarsi. In shape the aedeagus is near *wailupensis;* the anal segment is truncate at apex with a large curved spine from each corner; styles long, thin, with apices truncate and slightly expanding; the aedeagus on a plan somewhat like *giffardi* or *halia,* flattened laterally, the apex ventrally drawn out into a long point, and dorsally on right side produced into a

bifurcate prong with a small short spine below; on right side there are four spines in a small curved row; the dorsal surface, except the basal fourth, is membranous.

Length 2.9 mm.; tegmen 2.2 mm.

♀ In structure the same as male; in coloration difficult to separate from *wailupensis*.

Length 3.7 mm.; tegmen 2.3 mm.

Hab. Oahu, Punaluu (Swezey, June, September); Kaumuohona (Muir).

This species is named after Dr. David Sharp, whose work on the "Fauna Hawaiiensis" has placed all Hawaiian entomologists under a debt of gratitude.

Pl. 3, figs. 53 a–b; Pl. 4, fig. 65.

28. *N. rocki* sp. n.

♂ Brachypterous, tegmina not quite reaching apex of abdomen; frontal carina forking about one-third from apex; antennae reaching beyond base of clypeus, first joint more than half the length of second.

Brown, basal half of clypeus lighter than apical portion, carinae of head light brown or yellowish, pro and mesonotum light brown, carinae and lateral portions of pronotum fuscous, pro and mesopleura dark extending on to coxae, a round mark on metapleura; abdomen brown, base and mark down dorsum lighter, legs light brown, tegmina light brown or yellowish, a dark mark at end of costal cell and end of clavus, basal portion of claval margin dark, veins fuscous with minute granules bearing black hairs.

Pygophor ovate; anal segment short, without spines; styles in lateral view bent nearly at right angle a little above middle, narrow, truncate at apex; aedeagus forming a boat-shaped trough, the left edge higher than right with five spines near apex and two about middle, right edge without spines, a series of spines forming irregular rows across ventral surface.

Length 3 mm.; tegmen 2 mm.

♀ Slightly lighter in color than male.

Length 3.3 mm.; tegmen 2.1 mm.

Hab. Konahuanui, Oahu (Swezey, February); also one ♀ from Palolo Valley, Oahu (Swezey, January), which agrees in structure but is much lighter in color.

This species is named after Mr. J. F. Rock, whose work on Hawaiian trees has been a great assistance to Hawaiian entomology.

Pl. 3, fig. 56; Pl. 4, figs. 71, a–b.

29. *N. monticola* Kirk.

Antennae not reaching beyond base of clypeus, first segment about half the length of second. I have only seen females and can only judge of its position by those; it is very similar to *chambersi* but has no granules on tegmen.

30. *N. haleakala* Kirk.

Have only seen females; antennae reaching little beyond middle of clypeus, first segment more than half the length of second.

31. *N. argyroxiphii* Kirk.

I have only seen one damaged female without antennae.

32. *N. nephelias* Kirk.

I have only seen females of this species; antennae reaching well beyond middle of clypeus, first segment more than half the length of second.

33. *N. procellaris* Kirk.

I have only seen one female specimen of this species; the antennae reach nearly to tip of clypeus and the first segment is more than half the length of second.

34–38

The following five species are unknown to me: *N. umbratica, N. hamadryas, N. palustris, N. nubigena, N. imbricola.*

PART II.

Biogenetic.

Whilst acknowledging the great importance of experimental zoology, I still believe that the words of Dr. Jordan, quoted at the head of this Review, hold good, and for this reason the fauna and flora of the Hawaiian, and other long-isolated, Islands are of extreme interest.

Dr. Perkins, in his Introduction to the Fauna Hawaiiensis, has surveyed the insect fauna of the Archipelago in a masterly manner, and touched upon some of the fundamental problems connected with its origin and evolution. It remains for Hawaiian entomologists to periodically survey each family in the light of increased knowledge, see how far the new facts support old theories, or what new theories they lend their aid to, and to indicate in what direction more details should be accumulated. The following is an attempt at such a survey of the species dealt with in the first part of this paper.

The family of Delphacidae, as represented in the Archipelago, exhibits the same phenomena as are observed in most of the families represented in the native fauna. In it one finds a few foreign species, some of which are introductions since the advent of the white man; a certain number of native species of foreign genera, which may eventually be discovered elsewhere; and a large number of species forming closely related autochthonous genera, the species themselves being often polymorphic groups of individuals forming races, varieties or subspecies, which in many cases show distinct geographical or topographical grouping, as do many of the recognized species.

All these phenomena are well exhibited in the family under review. In *Perkinsiella saccharicida* and *Peregrinus maidis* we have two foreign species introduced into the Islands in quite recent times, both of economic importance, and the former, on account of the work done in its control by introduced parasites, of great biological interest. Three species of *Kelisia (sporobolicola, paludum* and *swezeyi)* represent the native species of foreign genera, all living in the lowlands on grasses and sedges, a habitat and food not used by the species of the autochthonous genera; these may eventually be found to be foreign species. It is the species forming the autochthonous genera that present the greatest interest and with which this Review deals.

Hawaii Oceanic or Continental?

Before considering the origin of the Hawaiian fauna it is first necessary to come to a decision as to the character of the Archipelago. Is it a purely oceanic area with a fauna (and flora) descended from a limited number of immigrants, who arrived by natural means of dispersal over large ocean areas,

— the flotsam and jetsam method as it has been called,— or is it a continental area, at one time connected up to a continental area and sharing its fauna (and flora), but having become separated at a certain period, the fauna (and flora) thus isolated having evolved into what we now find? Most of the biologists who have discussed this subject have inclined to the former opinion, but a few have held the latter.

Prof. H. A. Pilsbry accounts for the presence of certain primitive land shells and the absence of certain more modern groups by postulating a continental Pacific area in late Palaeozoic or early Mesozoic times. The northern portion of this area, of which the Hawaiian Islands are the remnants, became isolated first, the southern portion having broken up at a somewhat later date, the present land shells being the representatives of the fauna of that period.

The insects in no way support this theory and in some ways oppose it. If the insects represented that early era we should be rich in Orthoptera and Neuroptera, and especially rich in Blattidae; they should show some of the primitive characters of the species of the Carboniferous age, and among the Hemiptera there should be traces of *Protohemiptera* and *Palaeohemiptera* belonging to the Permian age. If our Islands came under the influence of the Triassic insects we should have forms of Chrysomelidae, Buprestidae and other families which are not represented. The superfamily Fulgoroidea, besides the species of Delphacidae, is represented by only two genera of Cixiidae, the world-wide *Oliarus* and the autochthonous monotypic *Iolania.** We cannot consider these as primitive forms or as representative of early Mesozoic times.

The most remarkable thing about the Hawaiian fauna is the absence of many large groups, some of which are world-wide. The enormous family of Scarabaeidae is entirely unrepresented; Lucanidae is only represented by a single autochthonous genus with one or two closely related species; Chrysomelidae is not represented by any species we can consider native. In these cases we can understand that the feeding habits of the young and the poor flight of the adult would prevent them traveling any long distance over sea. Similar cases can be drawn from each of the large orders of insects, as Dr. Per-

*I have specimens from Fiji which I consider belong to this genus.

kins has shown, and parallel cases could be drawn from the rest of the fauna and from the flora. If we postulate a continental area to account for the presence of certain land shells and for the absence of others, we confront a vastly greater task to account for the absence of vast groups of animals and plants.

Most paleogeographers insist on a larger land area in the Southern Pacific than exists at present and on an extension of the northwestern portion of South America, or the western coast of Central America, in a northwesterly direction. Such land areas would greatly alter ocean currents and increase the probabilities of "drift" reaching the Hawaiian Islands from those regions.

Prof. Pilsbry's opposition to the flotsam and jetsam method of stocking islands breaks down considerably when he admits such a method to stock low islands of the Pacific and in such cases as *Tornatellina* in the Galapagos.

After considering the evidence of the fauna and flora, and of geology and hydrography, it appears to me that the theory of the continental nature of the Hawaiian Archipelago is the less tenable, as it raises greater problems than it is called upon to solve. Therefore in the following Review I shall consider that the Islands are oceanic; that the fauna is descended from immigrants which arrived at different periods, and that the Islands are of enormous antiquity, instead of the alternative continental theory which would make our fauna the descendants of continental type which flourished in late Palaeozoic or early Mesozoic times.

Origin of the Hawaiian Alohini.

In the systematic portion of this Review it has been shown that the species can be divided into two groups. In one group, *Leialohae,* consisting of *Leialoha* and *Nesodryas,* the first joint of the antennae is very short; in the other, *Alohae,* consisting of *Aloha, Nesorestias, Dictyophorodelphax* and *Nesosydne,* the first joint of the antennae is much longer. A study of the male genitalia leads to the conclusion that they are of independent origin and form two distinct phylogenetic groups. The form of the aedeagus, the styles and the mechanism for coordinating their movements with that of the anal segment are different.

The *Alohae* consists of several groups of very distinct insects; even the genus *Nesosydne* contains groups of diverse species. This would indicate a very ancient immigration. Another point of interest is that a majority of these species are brachypterous.

The*Leialohae* consists of two genera, separated by the double or single nature of the frontal carina, but the species of both groups are closely related; the species or subspecies around *lehuae* being still in a very indefinite condition. This would indicate a much more recent immigration. The species of this group are all macropterous. *Leialoha lehuae* and allied species are attached to *Metrosideros,* a genus of tree that there are reasons to believe, so Mr. J. F. Rock informs me, does not belong to the most ancient portion of the Hawaiian flora. The only species of this tribe known outside of the Hawaiian Islands are one in Australia and one in South America, so we must look to one or the other of these localities for the ancestors of the Hawaiian *Alohini.*

The above stated facts lead me to believe that the Hawaiian *Alohini* are descended from two separate immigrants, the ancestor of the *Aloha* group having arrived at a very much earlier date than the ancestor of the *Leialoha* group. Although the latter is the more recent immigrant, yet it is not a more highly specialized form,— rather the reverse, for the short basal joint of the antenna is the more primitive in ontogeny.

Lines of Evolution.

In dividing these species into genera Kirkaldy followed the general usage of considering the nature of the frontal carinae as of primary importance. This brought *Leialoha* next to *Aloha* and *Nesorestias,* and *Nesodryas* next to *Nesosydne* and *Dictyophorodelphax.* The general build of these insects does not admit of such an association, and the male genitalia demonstrates the affinity of *Leialoha* and *Nesodryas.*

Ontogeny indicates that the double frontal carina is the more primitive form, as the nymphs of all the species have two, the transition to a single carina, simplex or furcate, taking place at the last ecdysis. It thus becomes evident that the character of a single frontal carina has arisen separately in each group and has no phylogenetic significance. This line

of evolution is not confined to the *Alohini,* but is found in each of the main divisions of *Delphacidae;* in the *Delphacini* it appears in several groups, evidently without any phylogenetic significance. In other families of Fulgoroidea it is also observed; in the *Derbidae* (i. e. *Vivaha* and *Kaha)* this narrowing of the frons is carried to such a degree as to suggest hypertely (if it were of any use at all). In *Zoraida* we have an extreme case of narrowing of the frons at the last ecdysis, not by an actual lessening of the surface, but by a longitudinal invagination of the frons, the lateral edges forming the entire frons in the adult. It is highly probable that in *Viviha* and *Kaha* a reverse process takes place, the face evaginates and collapses together. At present the nymphs of these two genera are unknown.

In the elongation of the head of *Dictyophorodelphax* we have a process which has taken place in other groups of Delphacidae (i. e. *Tropidocephala* and *Embolophora)* and in other families of Fulgoroidea.

The specific characters can be divided into two groups, chroötic* and phallic. The former consist of slight variations in length of antennae, length of furcation of frontal carina, length of tegmina, slight differences of texture of tegmina, and in differences in coloration. Among these characters I can detect no direct line of evolution which would fit more than one character, so that we must admit a great deal of parallel development. The phallic characters are more definite. *Leialohae* is a group in which the aedeagus appears to proceed from a form with a small crook at apex and a small spine on the right side near apex, to a form in which these are very long and narrow, and to a form in which a third spine appears at apex. In one group of *Nesodryas* the third spines become larger, while in the other group the crook disappears; *N. freycinetiae* appears to be an extreme development of the latter. The genital styles appear to proceed from a sickle-shape to a much straighter form.

In the *Alohae* the diversity is much greater and some distinct groups are formed, some of which are very isolated. In *Aloha ipomoeae* we have a fairly primitive type, and also in *Nesosydne koae,* the latter having several allied forms; in

*Sharp and Muir (Trans. Ent. Soc. Lond. 1912, III, p. 602) used this term to indicate the body wall apart from the phallic structure.

Aloha flavocollaris the aedeagus is flattened and deepened considerably at base, as is also the case in the four allied species *(kaalensis, campylothecae, dubautiae* and *artemisiae). Nesosydne ipomoeiocola* appears to lead to *halia* and this to *sharpi, giffardi* and *montis-tantalus. N. rocki* is very isolated. *N. nephrolepidis, blackburni* and *perkinsi* may indicate a phylogenetic group, and *N. incommoda* may lead to *cyathodis. Nesorestias* may be a development of *Nesosydne kirkaldyi. Dictyophorodelphax* is extremely isolated, but appears to have affinities to *Nesorestias filicicola.*

In *Aloha ipomoeae* the genital styles are fairly simple. The line of evolution appears to be in the development of the "ankle knob" which leads to a complexity of structure; another line of evolution is the narrowing of the styles.

It would be perfectly legitimate to call all these species phallic species, for the chroötic characters are very slight in comparison with the phallic.

Factors in Evolution.

Death Factors. Although no case of egg parasitism has been placed on record, yet the presence of Mymarids about bushes containing Delphacids indicate that such exist; judging by conditions elsewhere I should say that they play an important part in reducing the numbers of the Delphacids. Species of Pipunculidae, Dryinidae and Stylopids are common and play a very important part in the balance of these insects. Species of native predaceous Heteroptera are common in some localities; what part native birds and lizards play I cannot judge, as my experience in the field is too limited. At the present time the introduced ant *(Pheidole megacephala)* plays a very important part in the districts in which it can thrive, and it is likely it will lead to the extinction of certain species.* Judging by the little we know of the death factors it is highly probable that the chief mortality falls upon the eggs and nymphs and can have little or no effect upon adult characters, except by correlationship.

Natural Selection. None of the structural chroötic specific or generic characters show signs of direct utility, and therefore cannot be accounted for directly by Natural Selection.

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*Note:—See remarks under *Aloha plectranthi.*

It has been suggested, with very good reasons, that brachypterous forms are more prolific than macropterous; this, if correct, would account, on selective lines, for the predominance of brachypterous forms in our Delphacid fauna; this would likewise lead to stricter segregation and thence to species formation.

The elongation of the head of *Dictyoporodelphax mirabilis* may also represent the result of Natural Selection, for Kershaw has shown that among some Homoptera there is a great expansion of the stomach, which sends diverticula into every available portion of the body. In *D. mirabilis, Pyrops candelaria* and some other species one of these diverticula enters the head and fills the entire enlarged portion. It appears as if some physiological necessity (perhaps on account of the nature of the food) made an enlargement of the stomach advantageous. But if Natural Selection has brought about a monotypic evolution in this case it has not given it any advantage over other species, for *D. mirabilis* has an exceedingly restricted range.

When we consider coloration there are certain cases which look as if Natural Selection could have played some part. The nymphs and adults of *Nesosydne koae* live on the young green leaves of *Acacia koa* and are similarly colored; *N. rubescens, N. pseudorubescens* and *N. koae-phyllodii* live on the dark-colored phyllodia of the same tree and are brownish or reddish brown in color. *Nesosydne raillardiae* is colored like the leaves of its food-plant, and the dark body and whitish tegmina of *N. cyathodis* are very cryptic when associated with its food on the lava flows around Kilauea. It would be of interest to know the habitat of *N. fullawayi in* Molokai, which is practically only a color variety of *N. cyathodis.* The dark colors of the *Leialoha* group, attached to *Metrosideros,* are also cryptic in association with the main appearance of their habitats. The great majority of the species of *Alohini* are indefinite in coloration and there is a great amount of variation, especially among the females, so that it is impossible to insist upon any protective coloration — unless the variation and indefiniteness themselves are protective.

When we turn to the phallic characters we confront a very difficult problem, for we know absolutely nothing about the manner in which these organs function in the Delphacidae. At one time I held an opinion similar to Prof. V. L. Kellogg,

that it was a case of many keys to open one lock; but after an extensive study, along with Dr. David Sharp, of these organs in Coleoptra, and their function during copulation, I was forced to change my opinion, for the evidence shows that in many cases the key fits its lock, and its own lock only. In these cases the coadaptation is between the membranous internal sac and its armature and the membranous uterus. In the Derbidae I have observed a coadaptation between the genital styles and anal segment and certain knobs and depressions on the female, a coadaptation I did not suspect until I observed the sexes in copula. How far some of the minor changes (i. e. *N. koae, N. koae-phyllodii* and *oahuensis)* would prevent fertilization it is impossible to say at present, but that such structures as the aedeagi of *N. koae, N. perkinsi, N. raillardiae, N. ipomoeicola, N. halia, N. sharpi* and *N. giffardi* could all perform the same mechanical operation in a similar manner is highly improbable. On the other hand, to account for these structures along with a coadaptation in the female by Natural Selection is to me unthinkable; the more one tries to follow out in thought such an operation the greater the difficulty becomes.

Isolation. Our collections are not complete enough for us to judge of the full effect of isolation on species formation, but enough is known to demonstrate that isolation and species formation coincide to a very large extent. A few species are dispersed over two or more islands, others over one island, but a large number have very limited habitats. *D. mirabilis* is a good example of this limited range, it being found only on a small ridge a few feet wide and not more than a quarter of a mile long.* According to our present collections Oahu has 42 species, Hawaii 20, Kauai 12, Maui 11, Molokai 7 and Lanai 5. This does not represent the richness of, but only the amount of collecting done in each island.

In spite of this it is possible that a study of the distribution of these insects in the Archipelago may lead to some interesting results, if it be borne in mind that more extensive collecting is likely to modify the present conclusions. That more species will be found in the Island of Hawaii, when the

*Mr. Timberlake has since found it on the Lanihuli ridge, on the western side of Nuuanu Valley, and Mount Kaala of the Waianae Range.—Ed.

same amount of collecting is done in other districts as has been done in the vicinity of Kilauea, is nearly certain. Little or no Delphacid collecting has been done in Kohala or Kona and very little in Hamakua. Oahu has not yet been exhausted, and the other Islands have only been worked in a few localities.

One thing which the tables show up very distinctly, which is not likely to be greatly modified by more extensive collecting, is the high percentage of single-island endemism. Out of the 78 species and subspecies recorded 65 (83.3%) are confined to single islands, 9 (11.5%) are common to two islands, 3 (3.8%) to three islands and 1 (1.3%) to five islands. In comparing the two groups the *Alohae,* with 84.6%, is slightly above the *Leialohae* (with 80.8%) in single-island endemism and below (.96 to 1.5) it in two-island endemism; considering that the *Leialohae* are all macropterous and most of the *Alohae* brachypterous, one might have expected a greater difference. It indicates, if the relative antiquity of the two groups be not considered, that the power of flight, while reducing topographical evolution, had not influenced geographical evolution; that is to say, the power of flight had been sufficient to enable species to move about freely on an island, but had not been sufficient to enable them to pass freely from island to island.

Kauai has only one endemic *Alohae,* whilst it has 5 *Leialohae;* Oahu stands with 24 and 8, and Hawaii with 8 and 4, nearly the same proportion as the total species in each island, a natural condition when the number common to two or more islands is so small. This might indicate that the immigrant ancestors of the *Alohae,* arriving from the south or southeast, landed upon one of the more southeasterly islands and only a few have been able to reach the more isolated nor'-western island of Kauai. The fact that only two species of the genus *Aloha* are known outside of Oahu, and one of these the ubiquitous *A. ipomoeae,* may be due to our ignorance, but it lends support to the idea that Oahu may have been the original point of colonization and the center of distribution. The *Leialohae* are better flyers and so a greater proportion has reached Kauai. But why evolution in Kauai should have been more active among the *Leialohae* than among the *Alohae* is not evident.

In the table of two-island endemism we find that Kauai has one species common with Oahu and one with Molokai,

but nothing with the other islands, a fairly natural result from their geographical position. Oahu has nothing common with Maui, an unnatural state of affairs, and three with Hawaii. The *Alohae* have 5 cases of two-island endemism and the *Leialohae* 4, again indicating the greater power of flight of the latter.

In the 3 cases of three-island endemism the *Alohae* have 2 species and the *Leialohae* 1 *(L. ohiae),* all three being macropterous. The only case of more than three-island endemism is *Aloha ipomoeae,* which, from morphological reasons, the writer has considered as the most primitive of the group and a likely ancestor of them all. *Leialoha ohiae* is also possibly the most primitive of the *Leialohae* and may be the ancestor of that group.

The study of the distribution of these insects gives no support to the theory that the *Alohae* are of greater antiquity in the Archipelago than the *Leialohae;* this theory finds its support in the proportional amount of evolution in the two groups. The brachypterousness of the *Alohae* may be constitutional and this may have led to a greater amount of evolution.

It is to be hoped that in the near future enough material will be accumulated from the different islands to enable us to draw juster conclusions and to more clearly indicate the evolution of these insects in the Archipelago.

The reason why isolation should cause variation is not yet understood. That the norm of a few isolated specimens should differ from the norm of the species only accounts for an alteration of the norm within the limits of variation of the species, but leaves the reason for variation beyond that limit unexplained.

The Kau lava flows are very instructive, as they show the manner in which *"kipukas,"* or small isolated areas, are cut off by the lava flows surrounling them. These *kipukas* are centers of segregation and must have played an important part in the evolution of our fauna, especially with wingless insects. When we consider the enormous age of our islands and the number of such isolated spots which must have been formed during the building up of them, we can realize to some little extent the enormous help isolation could have been to species formation.

Orthogenesis. The fact that parallel development, such as the reduction of the two frontal carinae to one, has taken place not only within the *Alohini* but also within other sections of the Delphacidae, would lead one to suppose that there is a fundamental law acting in each group. Even if it could be shown that this reduction was of a utilitarian nature, and thus open to the influence of Natural Selection, it would suggest that a common cause brought about the variation in each group.

Lamarckian factors. Of true Lamarckian factors I can see no evidence among the material under discussion, unless short wings originated through disuse. I have also suggested that the development of the elongated head in *Dictyophorodelphax* may be due to mechanical causes.

Mendelism. Mendel's law states the manner in which characters are inherited in balanced crosses, and explains why certain characters are not "swamped" by crossing. Around this law there has grown up certain theories of genetic factors. According to certain Mendelian workers all variation is due to the loss of one or more inhibiting factors. This is a belief which I cannot prevent anyone from holding who wishes to do so, but I hope such believers will not try to prevent me from disbelieving it. When I think of the primeval cell containing all the genetic factors and inhibitors of all past, present and future specific characters my credulity breaks down. Even when I consider the invisible complexity of the aedeagus of the original ancestor of the *Aloha* group, as necessitated by this theory, my imagination fails me. If evolution were progressive only, then the theory of inhibiting factors would be simplified, but degeneration is as much a part of evolution as progression. The idea that the loss of inhibiting factors could bring about complexity and then, continued still further, bring about degeneration, appears to me very improbable. One would have to postulate double and triple sets of inhibiting factors.

If we consider the case of the transformation of two frontal carinae into one we must believe that the inhibiting factor is lost at the last ecdysis, for up to that period there exists two carinae. In other cases where ontogeny follows the same course as phylogeny we must suppose the inhibiting factors to be present in the germ and to be lost during development.

Another belief among these workers is that "pure lines" cannot vary, and Johannsen's experiments with beans is used as proof. To me these experiments appear as confirmation of Natural Selection, for here we have a varying species which, by selection, can be formed into two or more forms, exactly as required by Darwin's theory. To maintain that if one of these "pure lines" were isolated upon an island, where it could increase and spread over a fairly large area, it would never vary is a belief without evidence to support it. Such a belief requires us to maintain that the few immigrants, which formed the foundations of our insect fauna, were all "impure lines," from which the species, as we now know them, have been sifted out, or that they are all the results of cross-breeding.

In criticising Darwin's Natural Selection theory it is sometimes argued that his "variations" are not inheritable, whereas the whole theory of Natural Selection demands that they should be if they are to take any part in evolution. To divide "variations" into "mutations" and "fluctuations" and say that Darwin only dealt with the latter is to totally misrepresent Darwin's work. DeVries' "mutations" appear to me to be synonymous with Darwin's "sports."

Characters which we may now consider as genetic may originally not have been so. The case of *Artemia* will illustrate my meaning: supposing it was to lose the power of living in fresh water, then the characters it assumed in salt water would be genetic

Weismann's theory of the continuity of the germ cells, and his distinction between germ and soma cells, has been used by many writers to support certain theories relating to genetic factors, and the fact is sometimes lost sight of that soma cells are only germ cells modified during the course of ontogeny, and that cell association has an important role in this modification, as polyembryony shows. The capacity of reproducing the whole organism possessed by germ cells is not lost by the soma cells of certain organisms, and is not entirely lost by living cells whilst cell division takes place.

Causes of Variation.

The key to evolution lies in the causes of variation, as has been stated by many writers, and of these causes we know next to nothing. That there are many such causes I have little

doubt, and efforts to prove that only one is in operation are not likely to meet with much success. Investigations into the physico-chemical nature of organism promises to reveal interesting results. Cell association is another subject of great interest, whether we are considering ontogeny or phylogeny. In this connection polyembryony is instructive, for here we see a group of cells which left in association will form one organism, each cell forming a certain part, but if these cells be separated each one becomes a complete organism. Regeneration appears to be similar to polyembryonism. Another instructive case is the absence or presence of certain cells, such as the testes, in an organism. Every biologist should be familiar with the many cases of this nature on record. A recent case is that of Dorothy of Orono,* the Ayrshire cow; this animal assumed characters of the male, both in structure and behavior, and the only abnormality that could be observed was a slight difference in the follicles so that no corpora lutea were formed.

When collecting at Kilauea in January, I was surprised to find a number of male specimens of Delphacids in which the external genital organs were abortive or improperly developed. In all such cases I found that the testes had been destroyed by parasites, either by *Pipunculus* or *Stylopids;* when parasites were present but no damage done to the testes there was no malformation of the external genitalia. The chief alterations were in the reduction of the aedeagus, the reduction or absence of the anal spines, the reduction of the genital styles and of the mechanism that coordinates the movements of the anal segment, aedeagus and genital styles. If the destruction of these cells can bring about such a distinct alteration as this it shows that there is a very intimate association between them and the external genitalia, and that the development of the latter depends upon the nature of the former. Is it not possible that a change in the nature of these cells, either chemically or physically or both, may bring about a change in the form of the genitalia, and that the aedeagus is the most susceptible of the genital organs to such changes? We might even speculate further and consider a correspond-

*Pearl and Surface, Science 1915, No. 1060, p. 616.

ing change to take place in the females of the same family, due to the alteration of the germ-plasm of the parent.*

Future Lines of Work.

In spite of the great amount of collecting done by Messrs. Perkins, Swezey, Giffard and, in a lesser degree, others, our collections are still very imperfect. Many species are represented by females only, and others only by single specimens; the number of species yet to be found I think is quite large, as so many are exceedingly local and collecting has only been done in a very few localities in the Islands. A fuller representation may change our ideas on minor points, but I do not think it will alter the main conclusions as drawn from our present collections. Breeding experiments to show the stability of certain characters would be of interest, especially if cross-breeding can be accomplished.

In all future specific work a study of the aedeagus will be essential, so a few words as to the method I use for examining this structure may be of use. With fresh, or, if dried then thoroughly relaxed, specimens, it is easy to dissect the entire pygophor off of the abdomen; soaking or boiling in caustic potash will thoroughly clear it of all fats and then, with the aid of a pin, the base of the aedeagus can be pushed forward from inside; this will cause the anal segment to move upward, the styles to move downward and the aedeagus outward, so that all the organs become fully exposed; or the anal segment, aedeagus and styles can be dissected as one piece away from the pygophor. These should be mounted on the same card-point as the specimen. The specimen is perfect for all practical purposes and the genitalia fully exposed.

A "biological survey" of the Islands is advocated in certain quarters, mostly by those whose knowledge of what has already been accomplished is very limited. The botanists, ornithologists, conchologists and entomologists have surveyed their respective fields very efficiently, and now the task is one of detail and of close collecting. There is small hope for the ornithologists adding very much to their knowledge, either of

*Over thirty varieties of lateral lobes of *Cetonia aurata* are figured by Curti (Entom. Mittelungen II, 1913, No. 11, p. 340) from various localities. It would be of interest to know if an equal amount of variation existed in the internal sac.

new forms or of distribution; the botanists and entomologists have still much to learn in those directions, and a fuller knowledge will lead to a better understanding of the phylogeny of the various groups; that such added knowledge will change the aspect of our fauna and flora is exceedingly unlikely.

Note.

The following new *Nesosydne* has been found by Mr. P. H. Timberlake since the completion of the above:

Nesosydne lobeliae sp. n.

♂ Brachypterous; antennae reaching to about middle of clypeus, first joint more than half the length of second; median frontal carina furcate at extreme base or only thickened over that area; length of vertex about twice the width; hind legs considerably longer than body, first joint of tarsus longer than other two together, spur nearly as long as first tarsal joint, narrow, with 12 teeth on hind margin.

Brown or fuscous brown, carinae of head and thorax, clypeus, legs and ventral surface of thorax lighter, base of abdomen and line along dorsum lighter. Tegmina hyaline, tinged with light brown, veins darker with minute granules bearing black hairs; a dark fuscous spot at apex of subcostal cell and another at apex of clavus.

Pygophor broadly open, similar to *N. sharpi;* anal segment also very similar to that species, but the spines forming a broad, flat process at each ventral corner with a small spine at apex; styles very like those of *N. wailupensis*, but slightly shorter and broader; aeadegus thin, tubular, slightly curved upward, a row of small spines from dorsal point on apex across left side to a ventral point about middle, another similar row on right side with the spines larger and extending more basally, the last three spines along the ventral surface.

Length 3 mm.; tegmen 2 mm.

♀ Similar to male.

Length 3.5 mm.; tegmen 2.4 mm.

Hab. Oahu, Kaumuohona ridge, Koolau Mountains, on *Lobelia hypoleuca* Hbd. One male and a series of females (P. H. Timberlake, April). Type in coll. H. S. P. A. Exp. Sta.

This species comes next to *N. wailupensis.*

TABLE NO. 1.

LEIALOHAE.	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
Leialoha						
naniicola	....	X	....	....	....	X
lehuae	....	X	....	X	....	....
oahuensis	....	X	....	....	....	....
hawaiiensis	....	....	....	....	....	X
kauaiensis	X	....	....	....	....	....
ohiae	X	X	....	....	....	X
oceanides	X	....	....	....	....	....
pacifica	X	....	X	....	....	....
Nesodryas						
freycinetiae	....	X	....	....	....	....
giffardi	....	X	....	....	....	....
elaeocarpi	....	X	....	....	....	....
eugeniae	....	X	....	....	....	....
dodonaeae	X	....	....	....	....	....
dryope	....	X	....	....	....	X
fletus	....	....	....	....	X	....
gulicki	....	....	....	....	....	X
bobeae	....	X	....	....	....	....
maculata	....	....	....	....	....	X
frigidula	....	....	....	....	....	X
perkinsi	....	X	....	....	....	....
hula	X	....	....	....	....	....
laka	....	....	....	....	X	....
piilani	....	....	X	....	....	....
terryi	....	X	....	....	....	....
pluvialis	X	....	....	....	....	....
silvestris	....	....	....	X	....	....
ALOHAE.						
Aloha						
ipomoeae	X	X	....	X	X	X
myoporicola	....	....	....	X	....	X
plectranthi	....	X	....	....	....	....
kirkaldyi	....	X	....	....	....	....
swezeyi	....	X	....	....	....	....
wailupensis	....	X	....	....	....	....
flavocollaris	....	X	....	....	....	....
dubautiae	....	X	....	....	....	....
artemisiae	....	X	....	....	....	....
campylothecae	....	X	....	....	....	....
kaalensis	....	X	....	....	....	....

TABLE NO. 1.—(Continued.)

	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
Nesorestias						
filicicola	....	X	....	....	....	....
nimbata	....	X	....	....	....	....
Dictyophorodelphax						
mirabilis	....	X	....	....	....	....
Nesosydne						
koae	X	X	...	....	....	X
rubescens	....	X	....	....	....	X
koae-phyllodii	X	....	....	....	....	....
pseudo-rubescens	....	....	....	....	....	X
swezeyi	....	X	....	....	....	....
anceps	....	....	....	....	....	X
pele	....	....	....	....	....	X
oahuensis	....	X	....	....	....	....
cyrtandrae	....	....	....	....	X	....
gouldiae	....	X	....	....	....	....
nephrolepidis	....	X	....	....	....	....
blacburni	....	....	....	....	....	X
perkinsi	....	....	....	....	X	....
wailupensis	....	X	....	....	....	....
pipturi	....	X	X	....	....	....
chambersi	....	....	....	....	....	X
osborni	....	....	....	....	X	....
cyathodis	....	....	....	....	....	X
fullawayi	....	....	X	....	X	....
incommoda	....	X	....	....	....	....
leahi	X	X	....	....	....	....
raillardiae	....	....	....	....	....	X
ipomoeicola	X	X	....	....	....	X
halia	....	X	....	....	....	....
giffardi	....	X	....	....	....	....
montis-tantalus	....	X	....	....	....	....
sharpi	....	X	....	....	....	....
rocki	....	X	....	....	....	....
monticola	....	....	....	....	X	....
haleakala	....	....	....	....	X	....
argyroxiphii	....	....	....	....	X	....
nephelias	....	....	....	X	....	....
procellaris	....	....	X	....	....	....
umbratica	....	....	....	....	....	X
hamadryas	....	X	....	....	....	....
palustris	....	....	X	....	....	....
nubigena	....	....	X	....	....	....
imbricola	....	....	....	....	X	....

TABLE NO. 2.

Total Species in Each Island.

Islands—	Leialohae.	Alohae.	Total.
Kauai	7	5	12
Oahu	12	30	42
Molokai	2	5	7
Lanai	2	3	5
Maui	2	9	11
Hawaii	7	13	20
	32	65	97

Single-island Endemism.

Islands—	Leialohae.	Alohae.	Total.
Kauai	5	1	6
Oahu	8	24	32
Molokai	1	3	4
Lanai	1	1	2
Maui	2	7	9
Hawaii	4	8	12
	21	44	65

Two-island Endemism.

Islands—	Leialohae.	Alohae.	Total.
Kauai+Oahu	0	1	1
" +Molokai	1	0	1
" +Lanai	0	0	0
" +Maui	0	0	0
" +Hawaii	0	0	0
Oahu+Molokai	0	1	1
" +Lanai	1	0	1
" +Maui	0	0	0
" +Hawaii	2	1	3
Molokai+Lanai	0	0	0
" +Maui	0	1	1
" Hawaii	0	0	0
Lanai+Maui	0	0	0
" +Hawaii	0	1	1
Maui+Hawaii	0	0	0
	4	5	9

Three-island Endemism.

Islands—	Leialohae.	Alohae.	Total.
Kauai+Oahu+Hawaii	1	2	3

Five-island Endemism.

Islands—	Leialohae.	Alohae.	Total.
Kauai+Oahu+Lanai+Maui+Hawaii	0	1	1

PLATE 2.

NOTE:—Figs. 1 to 56 all drawn to same scale; figs. 57 to 67 all to same scale; figs. 68 to 77 and 79 all to same scale.

1. Leialoha naniicola, aedeagus.
2. " lehuae, aedeagus.
3. " oahuensis, aedeagus.
4. " hawaiiensis, aedeagus.
5. " kauaiensis, aedeagus.
6. " ohiae, aedeagus.
7. Nesodryas giffardi, aedeagus.
8. " elaeocarpi, aedeagus.
9. " eugeniae, aedeagus.
10. " dodonaeae, aedeagus.
11. " dryope(?), aedeagus.
12. " fletus, aedeagus.
13. " gulicki, aedeagus.
14. " bobeae, aedeagus.
15. " maculata, aedeagus.
16. " freycinetiae, aedeagus.
17. Aloha ipomoeae, aedeagus.
18. " myoporicola, aedeagus.
19. " plectranthi, aedeagus.
20. " kirkaldyi, aedeagus.
21. " swezeyi, aedeagus.
22. " wailupensis, aedeagus.
23. " flavocollaris, aedeagus.
24. " kaalensis, aedeagus.
25. " campylothecae, aedeagus.
26. " dubautiae, aedeagus.
27. " artemisiae, aedeagus.
28. Nesorestias filicicola, aedeagus.
29. " nimbata, aedeagus.
30. Nesosydne rubescens, aedeagus.
31. " koae-phyllodii, aedeagus.
32. " koae, aedeagus.
33. " swezeyi, aedeagus.
34. " pseudo-rubescens, aedeagus.
35. " anceps, aedeagus.
36. " pele(?), aedeagus.
37. " oahuensis, aedeagus.

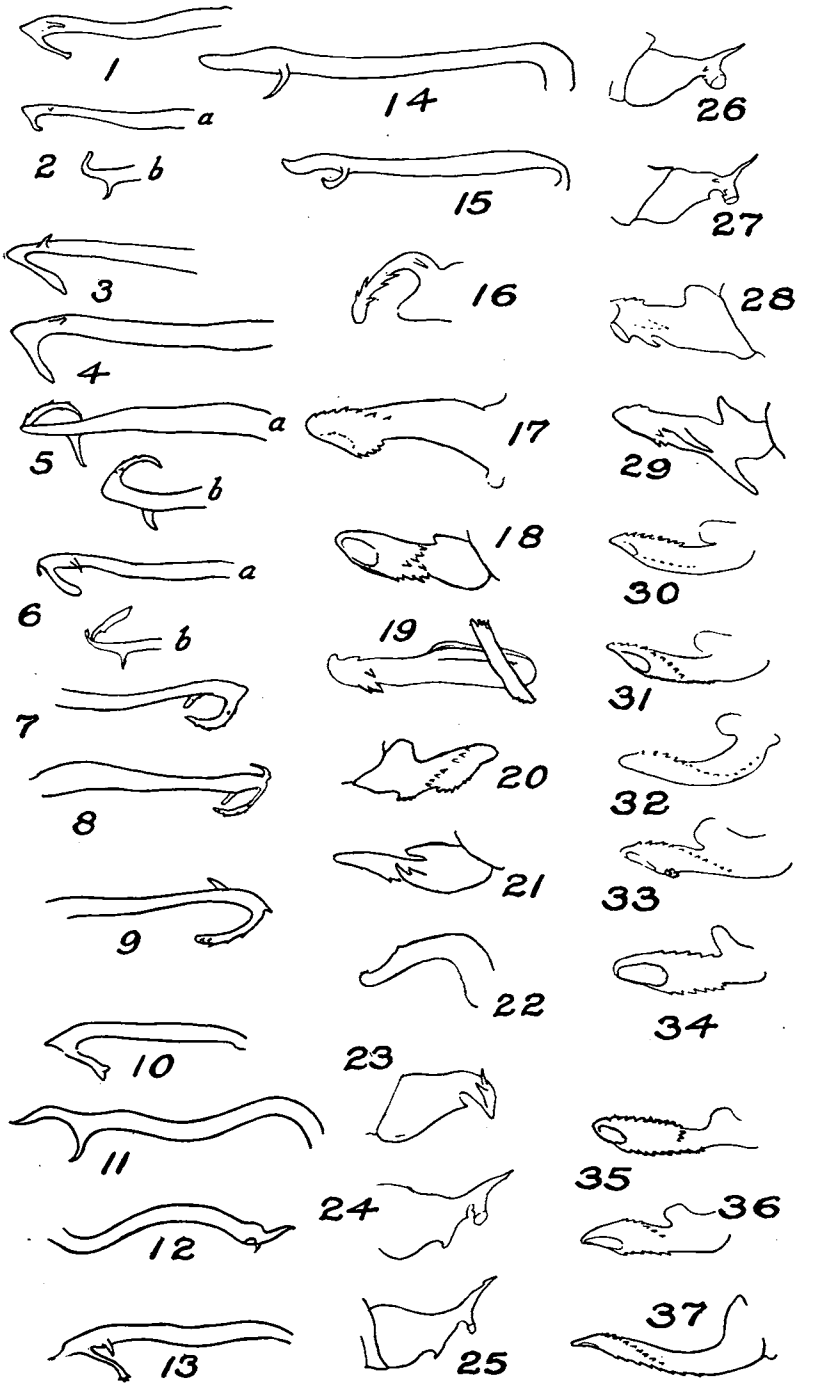
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PLATE 3.

38. Nesosydne cyrtandrae, aedeagus.
39. " gouldiae, aedeagus.
40. " nephrolepidis, aedeagus.
41. " blackburni, aedeagus.
42. " perkinsi, aedeagus.
43. " wailupensis, aedeagus.
44. " chambersi, aedeagus.
45. " pipturi, aedeagus.
46. " osborni, aedeagus.
47. " incommoda, aedeagus.
48. " cyathodis, aedeagus.
49. " leahi, aedeagus.
50. " raillardiae, aedeagus.
51.–a " ipomoeicola, aedeagus.
b " " aedeagus.
c " " aedeagus.
52. " halia, aedeagus.
53.–a " sharpi, right side, aedeagus.
b " " left side, aedeagus.
54. " giffardi, aedeagus.
55. " montis-tantalus, aedeagus.
56. " rocki, aedeagus.
57. Nesodryas elaeocarpi, full view of pygophor.
58. " fletus, full view of pygophor.
59. " giffardi, left genital style.
60. " eugeniae, left genital style.
61. " bobeae, left genital style.
62. " dryope(?), left genital style.
63. Aloha kirkaldyi, full view of pygophor.

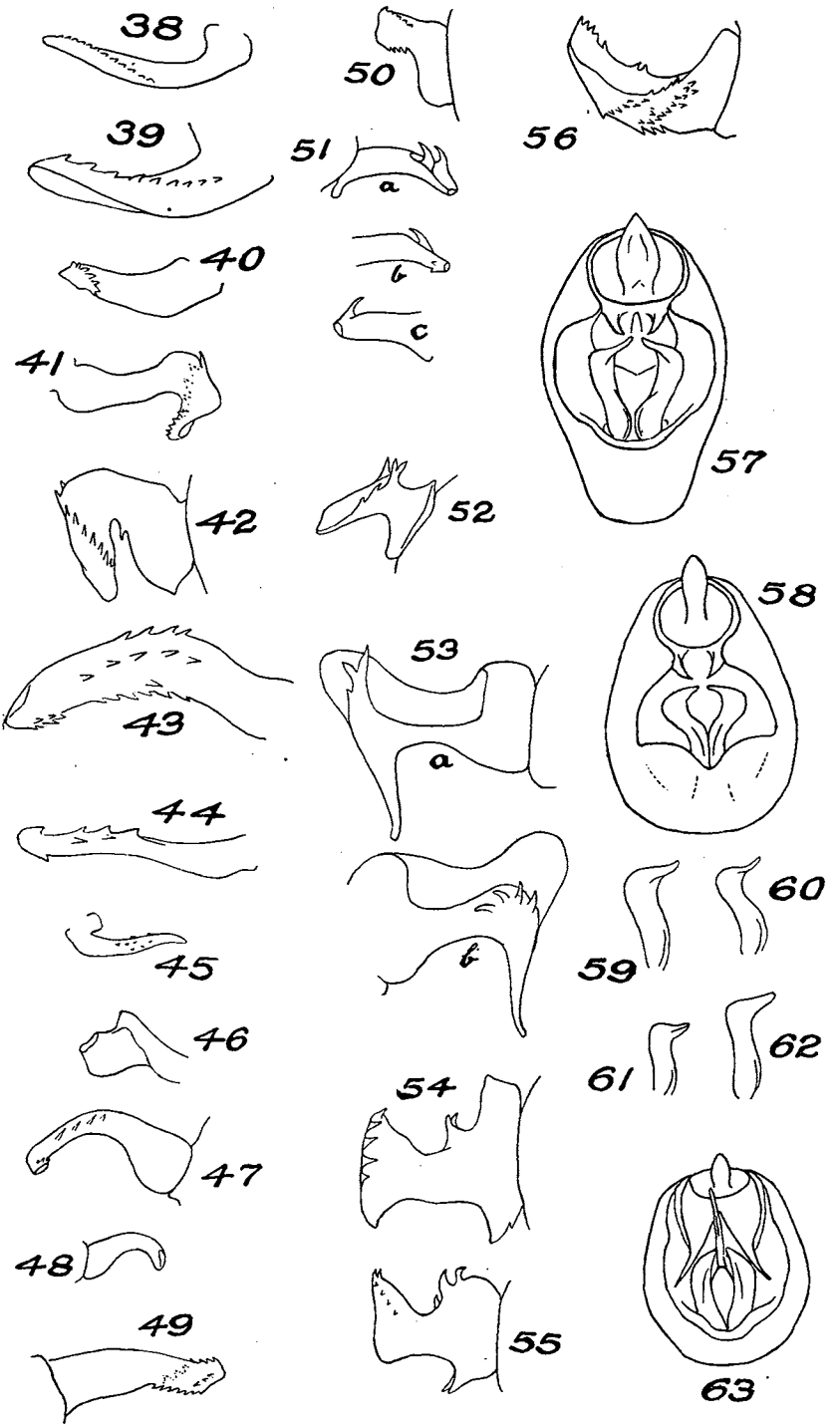
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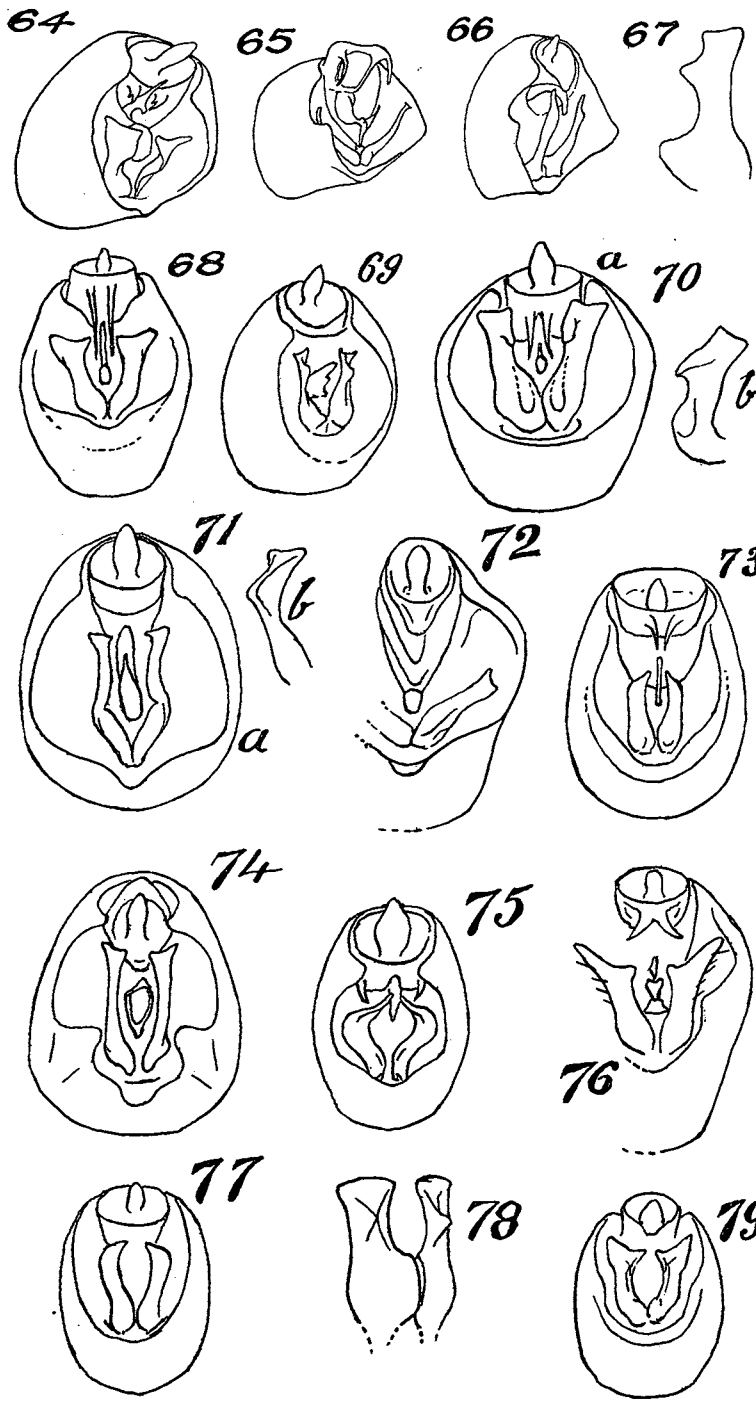
PLATE 4.

64. Aloha campylothecae, three-quarters view of pygophor.
65. Nesosydne sharpi, three-quarters view of pygophor.
66. " wailupensis, three-quarters view of pygophor.
67. " cyrtandrae, side view of right style.
68. " swezeyi, full view of pygophor.
69. " cyrtandrae, three-quarters view of pygophor.
70.–a " blackburni, full view of pygophor.
b " " side view of right style.
71.–a " rocki, full veiw of pygophor.
b " " side view of right style.
72. " gouldiae, full view of pygophor (right half).
73. " perkinsi, full view of pygophor.
74. " giffardi, full view of pygophor.
75. Leialoha naniicola, full view of pygophor.
76. Nesorestias filicicola, full view of pygophor (right half).
77. " nimbata, full view of pygophor.
78. Nesosydne pele, three-quarters view of styles.
79. " nephrolepidis(?), full view of pygophor.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NOVEMBER 4th, 1915.

The one-hundred-twenty-second regular meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Back, Illingworth, Kuhns, Pemberton, Potter and Swezey.

In the absence of the Secretary, Mr. H. T. Osborn, who would be away from Honolulu for the remainder of the year, Mr. O. H. Swezey was elected to serve as Secretary-Treasurer for the rest of the year.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Mr. Ehrhorn, who had recently returned from a vacation trip to California, remarked on conditions in the valley regions, it being the dry time of the year was very unfavorable for insect collecting. He also gave some account of his visit to the State insectary at Sacramento, and to the Panama-Pacific Exposition at San Francisco. At the latter place he had noted an interesting collection of insects in the School Exhibit from Bolivia, and in the exhibit of the Field Museum there were valuable life history exhibits.

Epyris sp.—Mr. Swezey exhibited a specimen of a large Bethylid which he had caught on a cane leaf at the Experiment Station, October 27th. It is apparently this genus, and is a foreign insect not previously observed here. It is much larger than any of the native Bethylids.

Andricus quercus-californicus (Bass.).—Mr. Swezey exhibited a large gall collected from the Oregon oak at Eugene, Oregon, in July, 1915, and specimens of the Cynipid causing it. The specimens were obtained by cutting open the gall, in which were seven cells or chambers near the center, five of which contained each a single Cynipid, while the other two contained parasites, *Tetrastichus standfordiensis* Ful., 16 and 17 respectively in each cell.

Synergus sp.—Specimens of what appeared to be a new species of this genus of Cynipidae were exhibited by Mr. Swezey. They were reared from small spherical galls on the sterile catkins of *Castinopsis chrysophylla,* collected on the summit of Mt. Tamalpais, California, August 7th, 1915.

Himalaya Butterflies.—Mr. Swezey exhibited a collection of 75 species of beautiful butterflies from the Himalaya Mountains. They were collected by Mr. Macintosh of Darjeeling, India, and were obtained through Mr. J. F. Rock of the College of Hawaii, who visited Mr. Macintosh the previous year.

DECEMBER 2nd, 1915.

The one hundred-twentythird regular meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Back, Giffard, Illingworth, Mant, Swezey, and Wilder.

Minutes of previous meeting read and approved.

Treasurer's report for 1915 read and accepted.

ENTOMOLOGICAL PROGRAM.

Kilauea moths.—Mr. Swezey reported on the examination of a collection of moths made at lights by Mr. Giffard at his bungalow, Kilauea, Hawaii, in October, 1915. There were 44 species, four of which had not previously been collected by him there. These were: *Adrapsa manifestalis, Phlyctaenia pachygramma, Scoparia* sp., and *Archips punctiferanus,* and will be additionss to the list published in Pro. Haw. Ent. Soc.,II, No. 5, p. 233, 1913.

The following corrections should be made in that list: On page 233 add "*Hyssia niphadopa* (Meyr.)"; two specimens were overlooked amongst the lot of *Eriopygodes euclidias* (Meyr.). On page 234 there should have been 3 specimens mentioned of *Agrotis selenias* Meyr. *Agrotis cinctipennis* should be omitted and "*Agrotis chersotoides,* one specimen" should be inserted.

Epyris sp.—Mr. Swezey reported having caught on a window at the Experiment Station, another specimen of this large Bethylid exhibited by him at the previous meeting.

*Gonatocerus mexicanus.**—Mr. Swezey corrected a state-

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*Specimens of this parasite sent to Dr. L. O. Howard were compared by Mr. Crawford with *G. gibsoni*, which was bred in Arizona from the same host. They were found identical; hence, *gibsoni* is a synonym, having been described more recently.—Ed.

ment made by him at the October meeting to the effect that this Jassid egg-parasite had been introduced to Hawaii by Mr. Koebele. He had recently received a letter from Dr. Perkins, in which it was stated that Mr. Koebele did not try the introduction of any leaf hopper egg-parasites from Mexico at the time mentioned, and that this species of *Gonatocerus* must have come of itself, probably along with its host.

Tyroglyphus longior infesting flour.—Prof. Illingworth reported having recently received a package of flour that had been standing for some time, and was swarming with these mites. After keeping the flour for a few days in the laboratory the pest became noticeably less, and it was found that one of the large predaceous species was rapidly devouring them. This pest has a great variety of food substances, such as dried meats, cheese, cereals, drugs, dried fruits, bulbs, etc. They are said to attack raw sugar, among other things, but Mr. Illingworth had not observed them in this food in the Islands.

The cadelle (Tenebroides mauritanicus) destroying paper. —Prof. Illingworth reported having recently had his attention called to the work of the larvae of this beetle on botanical drying blotters, by Mr. J. F. Rock.

The blotters had been piled up for some time and the larvae had worked their way in around the edges, in some cases three or four inches. Apparently their main object in entering the paper was to find a suitable place to pupate. In constructing the pupating cell the larvae chewed up the paper, forming cocoon-like nests, which fastened the sheets together. In many cases the borings had extended right through the sheets.

This is a widely distributed grain beetle, though the larvae are often predaceous. Their habit of boring into the wooden walls of the grain bins, to pupate, suggests a reason for them selecting the stack of paper for this purpose.

No grain of any kind was in the room where the beetles were found, though they possibly were feeding on some of the nuts or seeds of the botanical collection. He had previously reared this species from Brazil nuts.

Descriptions of New Hawaiian Odynerus.

BY WALTER M. GIFFARD.

Odynerus monas Perk. var. *aeneus* var. nov.

Black, coloration of first and second segments of the abdomen very variable from almost all black to having the first and second segments of the abdomen almost all red or else spotted red at the sides. The structure of the second ventral segment is also very variable, some examples indicating a very light but distinct depression whilst others show none at all or at most this character is represented by a very faint and interrupted line. The head and thorax are very finely, sparsely and shallowly punctured, the median impressed line in all the examples examined continuing through the post scutellum. The tibiae and tarsi have a distinctly fusco-testaceous appearance, and the wings are very shining fuscous, having in certain aspects a very bronzy iridescence.

Hab.—Above Manele, Lanai, approximately 1000 feet elevation, flying over wild "ilima" flowers. 12 males and 3 females, February and May, 1908 (Giffard). Not uncommon. Variety type in author's collection.

Obs.—Undoubtedly only a variety or insular form of *O. monas* Perk. of Molokai. The remarks expressed by me in the Proc. Haw. Ent. Soc., II, No 5, p. 231, lead me to separate this Lanai wasp as a variety only.

Odynerus kauensis sp. nov.

Extremely like the description of the Molokai *O. monas* Perk.* in form and sculpture, the red color markings of the abdomen being also very variable and in some instances almost all black. It differs from that species in having the wings darkly infuscate and a deep violaceous blue iridescence; mandibles mostly red; basal segment of the abdomen laterally more evenly curved from the petiole (not so abrupt as in *O. monas*) and the ventral depression of the second segment somewhat wide and deep, meeting the apices of the costae obliquely. Male and female, length 7–8 mm.

Hab.—Near Honuapo, Kau, Island of Hawaii, at a low elevation; flying over scrubby and stunted growths on ancient a-a lava flows. 10 males and 1 female, May and December, 1910; April, 1911 (Giffard). Types in author's collection.

Obs.—This species is evidently scarce, but few specimens being captured after repeated visits to the locality during 1910 to 1914; I have never met with it elsewhere on the Isl-

*Proc. Haw. Ent. Soc., I, Pt. 2, p. 73.

ands. Although the thoracic puncturation of this species follows the description of *O. monas* of Molokai, yet the specimens I have examined appear to present a more roughened or coarser surface of the thorax than the one typical example of *O. monas* which I have been able to compare with these. I have therefore hesitated to separate this Kau species from *O. monas* because of the great similarity to the latter in form, color and puncturation as described.* The constant very darkly infuscate and violaceous blue iridescence of the wings; the color of the mandibles and the somewhat deep and wide depression of the second ventral abdominal segment, however, induces me to consider it a different species, but allied to the Molokai species.

Odynerus litoralis sp. nov.

Black, with the clypeus almost entirely and the apical margins of the first and second abdominal segments always broadly bright yellow. A large frontal spot between the base of the antennae and a smaller one behind the eyes of the same color. Thorax and abdomen when viewed laterally clothed with appressed sericeous pubescence. Clypeus ample, angulate, apex depressed and acutely dentate, deeply and broadly emarginate. Mandibles shiny black, the basal tooth being emarginate at apex or with two cusps. Head and thorax dull, closely, evenly and deeply punctate, the minute system of puncturation being deep and distinct, more so in front of the head than on mesonotum. Scutellum and post scutellum distinctly but less evenly punctuate. Propodeum sub-rugose except the posterior concavity which is rugulose and feebly and sparsely punctate. Abdomen with the basal segment unevenly and shallowly punctate; second segment above simply convex, beneath, the costae are long, but in most instances ill-developed, with the depression moderate, wide at the base and shallow. Length, 8–9 mm.

The female has the same coloration as the male excepting that the clypeus is always black and the post scutellum sometimes spotted with yellow. The structure differs in the clypeus, the apex of which is less dentate and emarginate, the emargination, however, being very distinct; in the thorax, which is less deeply punctate, and in the second ventral abdominal segment, which has the costae stronger and better developed. Length, 9–10 mm.

Hab.—Waialua and Waianae (Kaena Point), Island of Oahu, along the seacoast. 1 male, Wainae, April, 1907 (Giffrd); 9 males and 8 females, Waialua, March, April, May, 1911 (Giffard). Types in the author's collection.

Obs.—This species is undoubtedly allied to *O. newelli* Perk. of Hilo, Island of Hawaii, and also to *O. smithii* Perk.

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*Proc. Haw. Ent. Soc., II, No. 5, pp. 231–232.

of Lanai, Maui and Molokai, both of the last named species also being coast species on their respective islands. The material differences are (1) in the coloration of the clypeus and the apical margins of the first and second abdominal segments, which are always largely and widely bright yellow (the clypeus in the male of *O. smithii* is entirely black or at most very occasionally with a flavous spot, whilst that of *O. newelli* has two or sometimes one spot only); (2) the clypeus is different in structure and much more dentate; (3) the head and mesonotum are more evenly and more distinctly, and the scutellum more sparsely punctate; (4) the propodeum is less rugose; and (5) the second ventral abdominal segment has the costae longer. Like *O. newelli* the mesonotum is clothed, when viewed laterally, with appressed sericeous pubescence, whilst on the contrary *O. smithii* has this clothed with erect but short hairs. The mandibles of all three species indicate their close affinity because of the peculiar rudimentary basal tooth, which, thus far, I have not yet noticed in other Hawaiian species.

Notes and List of Insects Trapped in Alameda and Santa Clara Counties, California, During a Short Auto Trip Whilst Speeding Along the Main Roads.

BY WALTER M. GIFFARD.

Following a prolonged illness, when it was not possible for me to tramp and collect insects during a recent sojourn in San Francisco, it occurred to me that the monotony of my daily automobile rides along the boulevards and main roads in the valleys of Alameda and Santa Clara Counties might be made less monotonous if I were to adopt some method of capturing some of the small insect life which was visible on sunny and otherwise favorable days. Unfortunately the idea came to me towards the close of my vacation, and I was in consequence able to carry out the simple scheme I had planned on two occasions only: once in the Niles Canyon and Livermore Valleys and once in the Valley of Santa Clara. The total time occupied in capturing the specimens hereafter referred to approximated in all three hours, being otherwise occupied

during the auto trips in question. The method referred to is the simple one of using the ordinary collecting muslin net as a trap, holding it at the side of the speeding car when the speed is not over twelve or fifteen miles per hour and the wind blowing only sufficiently strong to fill the net with air. I am now sorry that I did not think of this interesting experiment before when touring through other sections of California, as I am sure the results would have been very gratifying. In the three hours trapping above referred to (August, 1915), the following insects were captured and later mounted for determination. The *Coleoptera* were determined by Dr. Blaisdell of San Francisco, the *Hymenoptera* by Harry S. Smith of the State Insectary, Sacramento, and the *Hemiptera* by Prof. Van Duzee of the State University. To these gentlemen I am indebted for their kindly assistance. Of the *Coleoptera* there are eight families, consisting of sixteen genera and eighteen species, totaling forty-three specimens. Of the *Hymenoptera* there are five families, consisting of fourteen genera and sixteen species, totaling twenty-eight specimens. Of the *Hemiptera* there are six families, consisting of nine genera and nine species, totaling eighteen specimens. The numerous Dipterons were undetermined. The grand total comprises three orders, nineteen families, thirty-nine genera and forty-three species. In all eighty-nine specimens, excluding Dipterons.

Hereunder is a full list of all the determinations made of the insects collected at the three hours previously referred to, viz.:

HEMIPTERA.

Saldula interstitialis Say. (1 specimen).
Leptocoris trivittata Say. (1 specimen).
Lygus pratensis Linn. (1 specimen).
Triphleps tristicolor White (1 specimen).
Nyysius ericeae Schill. (*minor* Wht.), (2 specimens).
Stictocephala wickhami V. D. (1 specimen).
Agallia cinerea (5 specimens).
Fuscelis exitiosus Uhl. (1 specimen).
Corina sp. (5 specimens).

DIPTERA.

Many specimens of undetermined Dipterons.

COLEOPTERA.

STAPHYLINIDAE

Platystethus americanus Er.	(8	specimens.)
Aleschara bimaculata Grav.	(6	")
Quedius debilis Horn.	(1	")
Philonthus nigritulus Grav.	(1	")
Gnypeta sp.	(1	")
Oxytelus niger Lec.	(1	")
Oxypoda sp.	(4	")
Atheta sp.	(1	")
Species undetermined.	(4	")

CHRYSOMELIDAE

Diabrotica soror Lec.	(4	")

ANTHICIDAE

Anthicus punctulatus Lec.	(1	")
Anthicus lecate, Casey.	(1	")

BRUCHIDAE

Bruchus pruininus Horn	(1	")

PARNIDAE

Dryops productus Lec.	(1	")

CARABIDAE

Apristus laticollis Lec.	(1	")

HISTERIDAE

Saprinus lubricus Lec.	(2	")

COCCINELLIDAE

Hippodamia ambigua Lec.	(2	")
Hippodamia convergens Guer.	(1	")
Coccinella californica Mann.	(2	")

Total: 43 specimens.

Total determined: 8 families, 16 genera, 18 species.

HYMENOPTERA

PROCTOTRYPOIDEA

DIAPRIIDAE

Unknown genus related to *Galesus* (1 specimen).

CERAPHRONIDAE

Megaspilus sp. (1 specimen).

CHALCIDOIDEA

CHALCIDIDAE

Hockeria sp. (1 specimen).

PTEROMALIDAE

Pteromalus sp. (1 specimen).

EURYTOMIDAE

Eurytoma sp. (8 specimens)

VESPOIDEA

VESPIDAE

Polybia flavitarsis Sauss. (1 specimen).

SPHECOIDEA

TRYPOXYLONIDAE

Trypoxylon sp. (1 specimen).

PEMPHREDONIDAE

Stigmus sp. (1 specimen).

APOIDEA

ANDRENIDAE

Halictus catalinensis Ckll. (6 specimens).
Halictus sp. (1 specimen).
Andrena sp. (1 specimen).

BOMBIDAE

Bombus californicus Smith. (1 specimen).

ANTHOPHORIDAE

Melissodes sp. (1 specimen).

PROSOPIDAE

Prosopis episcopalis Ckll. (1 specimen).

MEGACHILIDAE

Anthidium sp. (2 specimens).

Total: 2 genera *Proctotrypoidea.*
3 " *Chalcidoidea.*
1 " *Vespoidea.*
2 " *Sphecoidea.*
6 " *Apoidea.*

14 genera, 16 species, 28 specimens.

ANNUAL ADDRESS.

Contributions to the Knowledge of the Dactylopiinae of Hawaii.

BY EDW. M. EHRHORN.

It seems to be the custom at the annual meeting of the Society for the President to read an annual address. In the past I note that these addresses generally contained some account of the insect fauna of these Islands, or dealt with the monographing of some special order, family or genus.

It is my pleasure today to be able to present to you as my address a contribution to the knowledge of the subfamily *Dactylopiinae,* suborder *Homoptera,* family *Coccidae.*

In dealing with this subject I must first call attention to the great difficulty which is met with in the determination of many species of this subfamily. Especially is this true of the genus *Pseudococcus,* the so-called mealy bugs. Many descriptions are quite inadequate to use for determination, and the literature is widely scattered. Much stress has been placed on the measurements of the segments of antennae and other appendages, and although usable at times, yet from general experience such measurements cannot be greatly relied upon. Many species have been described from dried specimens, others from specimens in alcohol. The color, secretion and size of such are only approximate at best. As all these insects,

including the whole family *Coccidae,* are microscopic subjects, it means that carefully mounted specimens are necessary so that all the minute details, so necessary for study, are brought out distinctly. It means that clean work and lots of patience are necessary to accomplish good results.

During my study of these insects I have endeavored to make my observations on the living insect as much as possible, and, fortunately, of the various species found in these Islands, I have been able to get plenty of material. As the insects of this subfamily are not all stationary, I have found that collecting them in pill boxes is best. In the laboratory they are transferred into glass vials for closer study. Many of the *Dactylopiinae* secrete a mealy substance over their body which is very often rubbed off or disturbed by ants. In the study of my specimens I have endeavored to allow the various species, by resting, to construct the secretion, filaments and other appendages as much as possible. My method is as follows: I use round-bottom glass tubes of about 5/8 inch diameter and 4 inches long, in which I place a tight-fitting piece of white cardboard, allowing about 1/2 inch for cotton stopper. The cardboard does not reach the end of the tube, so that the insects placed in the vial have free access to both sides of the card, and can attach themselves to one or the other side of it. Adult females placed in these tubes have reconstructed the secretion in a few days. They have formed their eggsac; have produced eggs, or given birth to living young, as the case may be. Species well attended by ants with almost no secretion when taken, have developed this to such an extent that it gave the insect a very different appearance than when first collected. How easy it would have been to describe the insect as first found, and then perchance run across a lot unattended by ants and not recognize the species as the same.

The color of the various species can be thoroughly studied while in these vials. The variation in habit of producing the offspring, by being either oviparous, ovoviviparous or viviparous, can also be recorded, and this has been successfully done by the vial method. The structure of the eggsac, whether only used as a bed or whether used as a complete cover for the insect and eggs, is another matter worth recording.

In addition to these interesting observations on the living insects, it is very important to note their habitat on the plants,

whether they are found on the leaves, stems, in cracks of the bark or on the roots.

I have also been successful in breeding immature specimens to the adult stage, both males and females, and it is interesting to note the variation in color of the male and female larvae of *Pseudococcus.*

SUBFAMILY DACTYLOPIINAE.

The *Dactylopiinae* are a subfamily of the *Coccidae* or scale insects of the suborder *Homoptera,* and, unlike the majority of coccids, are, with few exceptions, naked, soft-bodied insects. Their bodies are usually covered with some white powdery or cottony secretion, some living exposed on the plant, others enclosed in felted or glassy sacs. The sexes in the larval state resemble each other, but when full grown the male larva usually becomes more elongate, and at times changes color, and when full grown spins a cottony cocoon. The male is usually winged, although some apterous forms are known.

The adult female retains the larval form in most cases, especially among the true mealy bugs, increases in size, and produces more secretion, and other striking processes. Like the *Aphidae* they produce eggs or young. Owing to our semi-tropical climate, we find many of our species have continuous broods. Some species are very prolific and as many as four hundred eggs or young have been recorded. The adult male usually reaches maturity when the female is about one-third grown. In these Islands we have species which live above ground, while other species live below ground and yet other species are found above and below ground.

The first systematic account of the *Coccidae* of the Hawaiian Islands is recorded in the Fauna Hawaiiensis, Vol. III, Part 2, 1902, by the late G. W. Kirkaldy. In this account are enumerated 9 species of the *Dactylopiinae.* In Vol. II, Part 3, on page 127 of the Proceedings of the Hawaiian Entomological Society, Mr. J. Kotinsky enumerates 7 more species. I note that in Kotinsky's list *P. aurilanatus* is mentioned as having been introduced on an *Araucaria* and is believed to have been eradicated by destroying the plant. This species has not been recorded since, so that, eliminating that species, there were 15 species of *Dactylopiinae* known. In Vol. II, Part 4, page 149 of the Proceedings of our So-

ciety I added one species, *Phyllococcus (Cissococcus?) oahuensis,* making a total of 16 *Dactylopiinae* recorded up to that time.

In the present paper I am adding five genera, of which two are new to science, and nine species, making a total of 25 species of Dactylopiinae for these Islands.

Synopsis of Genera.

A Adult female stationary, enclosed in a glassy or horny, fringed ovisac. *Asterolecanium* Targ.

B. Adult female stationary, living within the ovisac or surrounded by waxy secretion, almost if not covering body. Antennae and legs either well developed or rudimentary.

1. Adult female enclosed in a felted sac. Caudal lobes well developed, body with dorsal and marginal spines. Antennae and legs well developed. Anal ring with eight hairs. *Eriococcus* Targ.

2. Adult female enclosed in a felted sac. Antennae rudimentary. Apodous. Anal orifice tubular with six hairs, secreting a long cotton tube. Caudal lobes not well developed. *Antonina* Sign.

3. Adult female resting in a mass of waxy secretion, sometimes enveloping the body, which is quite horny and dark reddish brown. Antennae rudimentary. Apodous. Last antennal segment of larva very large. *Chaetococcus* Mask.

C. Adult female living in cone-shaped galls on leaves. Body elongate oval, tapering, ending in a chitinous segment with well-developed caudal lobes, forming a funnel, in the center of which is situated the anal ring with six hairs. Antennae with seven asymmetrically formed joints. Legs short and stout, resembling crabs' claws. Anal region strongly chitinous. *Phyllococcus* n. g.

D. Adult female active, covered with mealy secretion, with or without ovisac. Anal ring with six hairs. Male pupa enclosed in a cottony sac.

1. Antennae normally eight-jointed, sometimes seven-jointed. Margin of body with filaments. Caudal lobes not strongly developed. *Pseudococcus* Westw.

2. Antennae eight-jointed, margin of body beset with projecting tubercules, bearing a number of stout short spines. *Tylococcus* Newst.
3. Antennae eight-jointed. Body usually longer than three times its width. Mentum short. Tarsus half as long as tibia. *Trionymus* Berg.
4. Antennae six-jointed. Caudal lobes well developed, each bearing a chitinous tooth or hook. Adult female enclosed in a brittle powdery white sac. *Geococcus* Green.
5. Antennae six-jointed. Adult female secreting much white meal or cotton. Caudal lobes not conspicuous. *Ripersia* Sign.

E. Adult female active. Dorsum thickly covered with fine hair, appearing glassy. Caudal lobes as in *Pseudococcus* with slender setae. Antennae seven-jointed (many individuals show only six joints). Derm with rows of large round pores on each segment, forming groups at margin. Anal ring with six hairs. *Nesococcus* n. g.

Synopsis of Species.

Genus *Asterolecanium* Targ.

Ovisac of female broadly oval. Margin with well-developed fringe. *bambusae* Boisd.

Ovisac of female much narrower, decidedly elongate, carinated in the middle, attenuated at caudal end of body. Infesting bamboo. *miliaris* Boisd.

Ovisac of female circular, usually depressed in the bark of plants, marginal fringe well developed. Infesting oleander, fig and many other plants. *pustulans* Ckll.

Genus *Eriococcus* Targ.

Adult female yellowish brown, enclosed in a closely felted white sac. Antennae and legs well developed. Anal ring with eight hairs. Infesting Araucaria species. *araucariae* Mask.

Genus *Antonina* Sign.

Adult female living at the base of leaves of bamboo, enclosed in a white felted sac. Body purplish black. *crawii* Ckll.

Adult female living at the base of leaves of grasses. Body dark blackish brown or purple. *indica* Green.

Genus *Chaetococcus* Mask.

Adult female imbedded in a white waxy secretion. Body dark brown, about 5 mm. long by 4 mm. broad. Living under the sheaths of bamboo. *bambusae* Mask.

Genus *Phyllococcus* Ehrhorn.

Adult female viviparous, of a dirty lemon color, slightly covered with white secretion. Living in cone-shaped galls. Antennae with seven asymmetrically formed joints. Legs short and stout, resembling crabs' claws. Anal region strongly chitinous. Anal ring with six hairs. Infesting leaves of *Urera sandwicensis* (Opuhe). *(Cissococcus?) oahuensis* Ehrh.

Genus *Pseudococcus* Westw.

Adult female oviparous, dull brownish yellow, marginal appendages short, of about equal length, those of caudal lobes longer. Egg sac more or less spherical. Eggs amber yellow. *citri* Risso.

Adult female ovoviviparous, resembling *P. citri,* but more convex and not as elongate. Marginal appendages not as stout. Color reddish brown. Infesting pineapple, sugarcane, banana, canna roots, nut-grass, and on roots of other plants. *bromeliae* Boisd.

Adult female viviparous, color yellow, thickly covered with white powdery secretion. Caudal appendages long and slender, marginal tufts filiform. Infesting ferns, caladiums, orchids, etc. *longispinus* Targ.

Adult female viviparous, light brown. Caudal appendages stouter than in *longispinus.* Dorsum with two dark markings running lengthwise with body. Infesting hibiscus, cotton, poinsettia, beans, etc. *virgatus* Ckll.

Adult female oviparous, dark purple, producing a globular cottony eggsac, almost covering insect. Infesting hibiscus, cotton, citrus, etc. *filamentosus* Ckll.

Adult female oviparous, elongate, narrow cephalad, of a light purplish color, covered with white secretion, giving body a grayish appearance. Four stout caudal appendages, those of margin wanting. Eggsac very elongate, when not disturbed resembling *Pulvinaria*. Infesting bulbs.
lounsburyi Brain.

Adult female oviparous, narrow, elongate oval, color gray, slightly covered with white powdery secretion. Cottony eggsac, not covering body. Infesting sugarcane.
saccharifolii Green.

Adult female viviparous, large elongate oval, convex, of a delicate pink color, producing a waxy cottony mass under body. Infesting sugarcane. *sacchari* Ckll.

Adult female viviparous, orange red, covered with a thick waxy secretion forming tufts on dorsum, like a small *Orthezia*. Infesting guava, persea, canna, palms, etc. *nipae* Mask.

Adult female viviparous, light yellow green. Margin of body with very long, slender, glassy filaments. Antennae and legs long and slender. Infesting *Straussia*. *straussiae* n. sp.

Adult female viviparous, pinkish brown, slightly covered with white secretion. Resembles *longispinus* in form, but marginal tufts wanting, only three last segments with short appendages. Caudal lobes with long setae. Found between folded leaves of *Acacia koa*. *swezeyi* n. sp.

Adult female viviparous, yellowish brown, male larva grayish green, caudal appendages as long or longer than body. Living in galls on *Santalum*. *gallicola* n. sp.

Adult female viviparous, light yellowish brown, slightly covered with secretion. Caudal appendages longer than body. Derm with many round pores and scattered hairs. Insects produce quantities of a white, fluffy, mealy substance between the foliage. Infesting *Freycinetia* and *Astelia*.
montanus n. sp.

Genus *Tylococcus* Newst.

Adult female viviparous, pink or pinkish brown, thickly covered with white powdery secretion, not hiding segmentation. Margin of body beset with long, coarse, white filaments, 17 on each side. Derm after treatment shows marginal tubercles each with a number of conical spines. Anal ring with six hairs. Antennae as in *Pseudococcus*. Infesting *Pandanus odoratissimus*. *giffardi* n. sp.

Genus *Trionymus* Berg.

Adult female oviparous, of a dark pink color, slightly covered with white powdery secretion, not hiding color nor segmentation. Antennae 8-jointed, short and stout. Eggsac longer and broader than body of female. Infesting grasses. *insularis* n. sp.

Genus *Geococcus* Green.

Adult female oviparous, pale honey yellow, broadly fusiform, surrounded by whorls of fine, glassy hair. Forms a brittle, powdery white sac. Attacking the roots of trees and plants. *radicum* Green.

Genus *Ripersia* Sign.

Adult female viviparous, pale reddish brown, thickly covered with white mealy secretion hiding segmentation. Antennae six-jointed. Margin of body with thick, white, waxy tufts, which often coalesce. Infesting a variety of palms. *palmarum* n. sp.

Genus *Nesococcus* n. g.

Adult female active. Dorsum thickly covered with fine hair, appearing glassy. Antennae seven-jointed (many individuals show only six joints). Legs short and stout, especially femur. Derm when cleared shows rows of large round pores on each segment of the body, these forming groups at margin. Caudal lobes as in *Pseudococcus* with slender setae. Anal ring with six hairs.

Adult female viviparous, light yellow green. Dorsum thickly covered with fine glassy hair. Antennae seven-jointed, but six-jointed individuals are found. Legs short and stout. Derm shows rows of large round pores which form groups near margin. Infesting leaves of *Pipturus albidus.*

pipturi n. sp.

Pseudococcus straussiae sp. n.

Adult female viviparous, light yellow green, acutely rounded cephalad, egg-shaped. Body very slightly covered with white secretion, not hiding segmentation. Margin with very slender, hairlike filaments about as long as the average width of the body. Four caudal setae present, the two inner pair 6 mm. long, the two outer pair not quite as long as body, glassy white. Insect very active, about 3 mm. long by 2 mm. broad. When placed in KOH body turns yellow with an orange tinge on the cephalic and caudal end of body. Antennae eight-jointed, very long and slender, almost aphis-like, and bearing very long, slender hairs. Joint 8 longest, but at times subequal with 3; joint 5 next; joints 2, 4 and 7 next and subequal; sometimes joint 7 is longer than 4. Joint 1 is shortest and about half as long as 6. Formula: 8, 3, 5 (2, 4, 7), 6, 1, or 8, 3, 5, 7 (2, 4), 6, 1. Legs long and slender, tarsus not quite half the length of tibia. Digitules of tarsus are long, fine hairs; those of claw are club-shaped hairs with flattened end. Caudal tubercles quite prominent, with very long setae about twice as long as the hairs of the anal orifice, also bearing two stout spines and several fine hairs all in a group of prominent round pores. Anal orifice small, with six long, fine hairs. Marginal segments with two stout, short spines in a group of round pores, which area is light brown and quite conspicuous.

Male of the usual *Pseudococcus* type, light yellowish brown. Thorax, head and end of abdomen dark reddish brown. Antennae ten-jointed; joint 3 longest, joints 1 and 2 stouter than the rest, and joint 2 almost egg-shaped. Caudal setae about one-quarter length of body.

Hab.—The species is viviparous and is found on *Straussia hawaiiensis,* at 1800 feet elevation on the Island of Oahu; and on *Myrsine* species at 2900 feet on the Island of Molokai. (Kuhns.)

Pseudococcus swezeyi sp. n.

Adult female viviparous; resembles *P. longispinus* in general appearance, but marginal filaments are not developed, only the last three segments bearing short filaments and the caudal lobes with long setae.

Adult female pinkish brown, about 2 mm. long by 1 mm. broad, quite flat, very active when disturbed. Body slightly covered with a thin, white, mealy secretion which does not hide the color nor the segmentation. Legs and antennae light yellowish brown. When placed in liquid potash body turns dark reddish brown and becomes clear after boiling. Antennae eight-jointed, with the 8th longest and 4 the shortest. Joints 1 and 2 are broader than 3, 4, 5, 6 and 7. Joint 8 swollen in the middle so as to be as broad as joints 1 and 2. Each joint with a few hairs, joint 8 with numerous hairs, some of which are quite stout. Joints 5 and 6 subequal. Formula: 8, 1, 2, 3, 7 (5, 6), 4. Legs quite stout. Femur quite swollen. Trochanter plus femur subequal with tibia plus tarsus. Tarsus one-half as long as tibia. Claw stout and sharply curved with dilated digitules. Digitules of tarsus long fine knobbed hairs. Trochanter has a very long stout hair, longer than the hind leg. Anal lobes not prominent, with long fine setae, thinner than the hairs of anal ring, which are stout and about subequal in length with the caudal setae. The lobes also have two very stout, long, conical spines and several long fine hairs surrounded by many round pores forming distinct light brown patches. There is also a similar patch on the penultimate segment near margin; the rest of the marginal patches bear two conical spines and a few round pores, but becomes less distinct as they approach the cephalic end. On the dorsum are numerous long fine hairs and round pores. Caudad of the anal ring is a double row of long fine hairs.

Male cocoon is of the usual type and firm of texture.

Male larva when ready to pupate is light grayish green.

Adult male of the usual type, of a dirty yellow green color. Thorax quite elevated above and of dark brown color; eyes red. Wings iridescent, showing a beautiful pink color in certain light. Caudal filaments snow-white, extending beyond the folded wings about half the length of the body; they are as long as the length of the body. Antennae and legs brown and

quite hairy. Antennae ten-jointed, of the usual type; joints 1 and 2 stouter than the rest, joints 3 and 4 subequal and longer than 5, 6, 7, 8 and 9, which are subequal; joint 2 is subequal with 9, and joint 1 is the shortest.

Habitat.—Between folded leaves of *Acacia koa,* Mount Tantalus, Oahu, Hawaiian Islands. Collected by Mr. O. H. Swezey, for whom I take pleasure in naming the species.

Pseudococcus gallicola sp. n.

Adult female viviparous, about 2½ mm. long, with caudal setae 3½ mm. long, by 1¼ mm. broad, convex, varying from a grayish green to a yellowish brown color, with a faint dark line running lengthwise in the center of the dorsum. There are three pairs of filaments, which are quite pronounced, the two caudal ones being about twice as long as the two preceding pairs. The filaments on the four other segments are very short. When placed in hot KOH body turns dark reddish brown. Antennae eight-jointed, joint 8 longest. Joint 1 twice as broad as 2, both broader than the rest. Joints 1, 2 and 3 subequal, joint 1 being broader than long at its base. Joints 4, 5 and 6 subequal and a little shorter than 7. Joint 8 is one-third longer than joint 2. All joints bear a few hairs. Legs short and stout. Femur much swollen (middle leg). Femur plus trochanter about subequal with tibia plus tarsus. Claw stout, with short flattened digitules; those of tarsus are long fine knobbed hairs. Tibia more than twice as long as tarsus. Caudal lobes well developed, with setae about as long as hairs on anal ring, and also bearing two very stout conical spines in a group of round pores in which are also several long fine hairs. Anal ring large, with usual six hairs, which are stouter than the caudal setae. There is a marginal patch, similar to the one on the caudal lobe, on the penultimate segment. Marginal patches become less pronounced cephalad. There are numerous hairs and round pores scattered on the last segment, as well as on the cephalic portion of the body.

The galls, or rather pockets, in which the insect lives are usually on the upper side of the leaves. The young larvae station themselves on the underside of the very young, tender leaves, and by irritation cause a depression in the leaf, which grows very quickly, forming a deep, pocket-like gall. As the

insect grows its caudal filaments protrude from the opening of the gall. Some galls are found on the underside of the leaves, but not very often.

Habitat.—In galls on leaves of *Santalum littorale,* seashore, and *S. ellipticum,* Palolo Valley, Oahu, Hawaii (O. H. Swezey).

Pseudococcus montanus sp. n.

Adult female viviparous, about 2 mm. long by 1 mm. broad, measuring with caudal filament 3 mm. long; of a light brownish yellow color. Body covered with a very thin secretion, which does not hide the color nor the segmentation. Antennae and legs light brown. Insects form in clusters between the leaves and produce quantities of white, fluffy, mealy substance, which contains the young. When placed in hot KOH body turns orange brown. Antennae eight-jointed, short and stout. Joint 8 longest, joints 1, 2 and 3 much stouter than the rest. Joints 1, 2 and 3 subequal. Joint 1 is about as broad as long. Joints 4 and 5 subequal. Joint 6 shortest. Joint 7 cup-shaped, a trifle longer than 6, but broader. Joint 8 fits into the cup of joint 7 like into a socket. All joints are quite hairy. Legs much longer than the antennae and very stout, especially the femur, which is very broad. All joints are hairy. Femur plus trochanter is subequal with tibia plus tarsus plus claw (middle leg). Digitules of tarsus, fine hairs with knob; those of claw, curved dilated hairs, reaching beyond claw. Trochanter with very long stout bristle about half as long as femur. All hairs on legs quite long and stout. Anal ring large, with very long stout hairs, much longer than the caudal setae, which are quite slender. Caudal lobes well developed, with two very stout conical spines, which are surrounded by several long stout hairs and small round pores. Each segment bears on its margin a pair of spines with a group of round pores forming distinct marginal patches, which diminish in size cephalad. Derm with very small round pores and scattered hairs.

Habitat.—On *Freycinetia arnotti,* Palolo Valley (O. H. Swezey), and on *Astelia veratroides* on Mount Olympus trail (P. H. Timberlake).

Tylococcus giffardi sp. n.

Adult female viviparous, thickly covered with white powdery secretion, not hiding segmentation. Body about 3 to 3½ mm. long by 1½ to 2 mm. broad. Margin beset with long, coarse, white appendages, 17 on each side, which are subequal in length, except the last 3 pairs near caudal end, which are much longer and more or less curved and about 2 to 2½ mm. long. The insect superficially has the appearance of an *Orthezia*. Color of body light pink or pinkish brown, which is easily seen on the ventral side. Legs and antennae light brown. When placed in potassium solution insect turns ferruginous brown, with a dark central spot in body and light margin. Antennae long and slender, of eight joints, of which the eighth is the longest. Joint 1 next, but very little shorter. Joints 6 and 7 subequal. All joints with long, stout hairs. Formula: 8, 1, 2, 3, 5, 4 (6, 7). Legs longer than antennae. Coxa broader than long. Trochanter plus femur very little longer than tibia plus tarsus plus claw. Tibia about twice as long as tarsus. Claw stout, with short flattened digitules, those of tarsus very long slender hairs. Anal orifice with six stout hairs, very little shorter than caudal setae. Caudal lobes very pronounced, quite broad, with many short, stout conical spines, varying in size, the longer ones in the center of the round-pore-area. Marginal processes or tubercles, not as prominent as those figured in the description of *T. madagascariensis* Newst., but quite pronounced.

Adult male of the usual type of Pseudococcini, with well developed caudal lobes, each bearing three long setae. Style short and stout. Antennae ten-jointed, of which joints 1 and 2 are subequal and the longest, and both are broader than the rest. Joint 3 is about twice as long as 4; the rest are subequal. Color of body reddish brown. Caudal setae snow-white; eyes black; legs and antennae of a lighter color than the body.

Habitat.—On the leaves of *Pandanus odoratissimus,* Honolulu, Hawaii. Differs from *T. madagascariensis* Newst. in not having as pronounced marginal tubercles, according to figure in text of description. Also in having more blunt spines on the tubercles. The antennae also vary in sequence of joints. I take pleasure in naming this species for my friend, W. M. Giffard, of Honolulu.

Trionymus insularis sp. n.

Adult female oviparous, about 2 mm. long by 1 mm. broad, of a dark pink color. Body slightly covered with white secretion, not sufficient to hide color or segmentation. Ovisac longer and broader than adult, loosely woven. Legs and antennae light brown. When placed in liquid potash body turns claret color. Antennae short and stout, eight-jointed, with joint 8 longest. Joint 1 twice as broad as long. Joints 1 and 2 subequal; joints 3 and 4 subequal; joints 5 and 6 subequal, and joint 7 very little longer than 6. Formula: 8 (1, 2), 7 (5, 6), 3, 4. All joints have a few hairs, which are quite long when compared with the length of the joints. On joint 7 there is one and on joint 8 four rather thick, stout, curved spines. Legs short and stout. Coxa and femur much stouter than tibia and tarsus. Femur one-third longer than tibia and tibia one-third longer than tarsus. Claw long and straight. Digitules of tarsus fine knobbed hairs, those of claw dilated hairs. The legs are quite hairy. Caudal lobes low, indicated by the long, slender setae. There are two long, fine spines and numerous hairs on each lobe. Anal ring large, with the usual six hairs, which are as thick and subequal in length with the setae. Derm thickly covered with short hairs and round pores; these are more numerous on the cephalic and caudal end of the body.

Young larva.—Antennae six-jointed. Jont 6 longest, about as long as 2, 3, 4 and 5 together. Legs long and stout, especially the femur. Caudal lobes not prominent, with long, fine setae and two sharp spines. Derm shows series of round pores on each segment and scattered over cephalic portion, also many fine hairs.

Habitat.—On *Deschampsia australis,* found in a Kipuka on the slopes of Mauna Loa, 6000 feet, Island of Hawaii (O. H. Swezey), and on *Cynodon dactylon* in various localities on the Island of Oahu, T. H.

Finding this insect in areas that have escaped lava flows (Kipukas) on the slopes of Mauna Loa would indicate that it has been on the Island for a long time. This species has been successfully transferred to *Paspalum conjugatum* in the laboratory for study.

Ripersia palmarum sp. n.

Adult female viviparous, pale reddish brown, about 3 mm. long, inclusive of caudal setae. Dorsum covered with dense white secretion, hiding segmentation. Marginal tufts very short but stout, getting longer caudad. Eight tufts at caudal end about 1 mm. long. These are sometimes curved upwards; sometimes they coalesce, forming plates which are very farinaceous. When placed in liquid potash body turns dark reddish brown, derm becomes transparent. Antennae six-jointed, stout and quite hairy. Joint 1 is broader than the rest and cone-shaped. Joint 6 is the longest; joints 1, 2 and 3 are subequal, as well as joints 4 and 5. Formula: 6, (1, 2, 3), 5, 4, or 6, (1, 2), 3 (4, 5). Legs are short and stout, a trifle longer than the antennae. Coxa broader than long. Femur about as long as tibia plus tarsus plus claw. Claw very stout. Tibia 1½ times longer than tarsus. Dorsum with rows of long fine hairs on each segment of body. Caudal lobes well defined, with two pairs of long setae, the outer pair about half as long as the inner pair, and five or six conical spines of various sizes and numerous stout hairs surrounded with many round and triocular pores. Marginal patches on the last four segments bearing groups of round pores with conical spines. Anal ring with six stout hairs about as long as caudal setae.

Larvae reddish brown, quite large when just hatched, active. Antennae and legs stout. Antennae six-jointed, the sixth the longest and as long as joints 2, 3, 4 and 5 together, which are subequal in length. Legs short and stout. Femur very stout. Tibia subequal with tarsus. Claw long and straight, abruptly curved. Caudal lobes well defined, with setae about twice as long as the hairs on anal ring. Rostral loop reaches beyond last pair of legs. Eyes red.

Male cocoon small, not densely felted.

Adult male.—Two forms have been found.

Apterous male very small, active, reddish brown, eyes red. Antennae eight-jointed, of which joint 8 is longest, about one-third longer than 2. Joints 1 and 2 are much broader than the rest, joint 2 being as broad as long. Joints 4, 5, 6, 7 are subequal. Legs long and slender, very little longer than antennae. Caudal lobes not very prominent, with short setae. Style quite pronounced.

Winged male similar to apterous form. Antennae nine-jointed. Joint 9 subequal with 2. Joint 2 is one-third longer than broad. Joint 3 with petiole. Joints 1 and 2 twice as broad as 3, 4 and 5. Joints 6, 7 and 8 are broader than 3, 4 and 5, but not quite as broad as 1 and 2. Joint 4 is shortest. All joints with numerous hairs and 8 with two stout bristles. Legs longer than antennae, quite stout. Femur plus trochanter equal to tibia. Tarsus about half as long as tibia. A few long hairs on femur and tibia on their margins. Tibia with two very stout spurs at its end. Tarsus with stout hairs on its inner margin. Digitules fine hairs. Claws very slender, long and straight, with sharp point, no digitules; at least none observed.

Habitat.—On various palms, *Cocos nucifera, Latania glaucaphylla, Thrynax* and *Areca lutescens,* at Honolulu, Hawaiian Islands. This species has more the appearance of a *Pseudococcus,* on account of the thick secretion on the body and the marginal tufts.

Nesococcus pipturi sp. n.

Adult female viviparous, about 1½ mm. long by 1 mm. broad, moderately convex, light lemon yellow, thickly covered with fine, glossy hairs on dorsum, not hiding color of insect. Segmentation indistinct. Legs and antennae same color as body, or a trifle darker. Ventral part of body naked. When placed in KOH body turns orange brown and derm becomes transparent after boiling. Dorsum thickly covered with slender bristles, and round pores on each segment near margin, formnig clusters of four or six pores as marginal patches. Antennae of seven joints, although specimens also show six-jointed antennae when third joint has not divided. Joint 7 longest, then joint 2. Joint 1 is twice as broad as long at its base. Formula of seven-jointed specimen is: 7, 2 (3, 4, 6), 1, 5, or 7, 2 (3, 4), 6, 1, 5. Each joint bears long, fine hairs, especially the last joint, which has numerous long, fine hairs. Antennae as well as the legs are short and stout. Femur is quite swollen. Tibia is two times longer than tarsus. Trochanter plus femur is subequal with tibia plus tarsus. Claw is long and sharply curved, with short, stout, curved, club-shaped digitules. The digitules of the tarsus are long, fine, knobbed hairs. The trochanter has a very long, fine hair

on its outer margin, about as long as the inner margin of the femur. Rostral loop reaches midway between second and third pair of legs. Caudal lobes not very prominent, with short, fine setae, when compared with the hairs of the anal ring, which are one-third longer and are stout and very pronounced. On the lobes are two stout spines and some fine hairs or bristles. The marginal groups of round pores on the last segment consist of eleven round pores each. In front of the anal ring on the ventral surface is a cluster of stout hairs. Between the antennae are several stout hairs.

Habitat.—On *Pipturus albidus,* Mount Tantalus, Oahu, Hawaiian Islands. January 16, 1916 (O. H. Swezey.)

NOTE:—Since the Annual Meeting when this paper was presented, several new species have been discovered. They are embodied in the original paper.—ED.

Election of Officers for 1916 resulted as follows:

President ..... J. F. Illingworth
Vice-President ..... W. R. R. Potter
Secretary-Treasurer ..... H. T. Osborn

Mr. Osborn being absent from Honolulu for the time being, Mr. O. H. Swezey was elected to serve as Secretary-Treasurer until Mr. Osborn's return.

Some New Hawaiian Coleoptera.*

BY DR. R. C. L. PERKINS.

The few species of Coleoptera described below are all of considerable interest and, with one exception, I am indebted for them to various friends in the Islands. It is for this reason that I am anxious that the descriptions be published. These descriptions were drawn up a considerable time ago and formed part of a much more extensive paper on Hawai-

*This paper was received from Dr. Perkins while this number of the Proceedings was being printed, and it seemed desirable to publish it at the present time.—ED.

ian Coleoptera, the publication of which has been delayed or postponed.

The species described belong to the Cerambycidae and Curculionidae and to genera already well-known in the Islands. Particularly interesting are the Cossonid *Heteramphus swezeyi,* the peculiar leaf-mining habits of which have already been published by Mr. Swezey; and that other member of the same group, *Dryotribus wilderi,* obtained on Midway Island by my friend Mr. G. P. Wilder. The typical species of *Dryotribus* — wrongly described by me in the "Fauna" as a new genus and species under the name *Thalattodora insignis* — is of extremely wide distribution and appears to be entirely attached to drift-wood. It occurs on several islands, at least, of the Hawaiian group, on the Australian coast, and in the West Indian Islands, apparently unchanged specifically, or practically so. Mr. Wilder found the form described below, not in drift-wood, but in the dead stem of some plant on Midway Island. The typical species I have found in the Islands on several occasions, but always in drift-wood and never away from the beach, and I have examined a West Indian example kindly given to me by Mr. G. C. Champion.

The description of one small species of that most difficult genus *Proterhinus* is included in this paper, because it is of rather special interest, being attached solely, so far as I know, to the rare and almost extinct tree *Kokia (Gossypium) drynarioides.* Only a few examples were found amongst vast numbers of the allied, widely distributed and polyphagous species *Proterhinus deceptor.*

Plagithmysus kuhnsi sp. n.

Head, thorax and femora black, the latter red basally, as also the whole of the hind tibiae; the tarsi, antennae and elytra more testaceous, the latter with the usual elongate, dark, wedge-shaped area, containing the lines of pale yellowish pubescence, which diverge anteriorly. These lines are similar in color to those of *Callithmysus koebelci.* Pronotum strongly crested and very densely punctured and scabrous, dull above, but laterally the surface becomes smooth and shining and the punctures distinct and separate, some parts being impunctate or nearly; the pubescence is sparse, whitish, and does not form bands. Elytra on the basal portion very densely sculptured and inconspicuously clothed with short white pubescence. The divergent pubescent lines are well defined. Hind tibiae with black pubescence, that on the femora short and white, but black or dark near the apex. Hind femora formed much as in male *P. darwinianus,* etc., but prob-

ably the example described is a female and the legs of the male may be more robust. Nothing is known as to the variation of the color of the legs, etc.

Length 18 mm. (including exposed tips of wings).

Hab.—Waianae Mountains, Oahu. Collected and given to me by Mr. D. B. Kuhns. I have seen trees of *Pipturus* riddled by the larvae of this species in the same mountains, but neglected to rear them. There it replaces *Callithmysus koebelei* of the Koolau Mountains.

Plagithmysus ignotus sp. n.

Of a dull red color, the legs concolorous, the bases of the femora not being notably pale compared with their other part. Head with very pale yellow pubescence, the pronotum with a very definite longitudinal band of the same on each side of the median crest, while the whole of its deflexed sides are similarly clothed. Consequently in dorsal aspect it appears to have four definite longitudinal bands. Antennae long and slender, the apical joint being four or five times as long as its greatest width. All the femora and tarsi with white, the hind tibiae with black hairs. Elytra at the base with very pale yellow pubescence and behind this on a darker area with the usual pale pubescent lines, divergent anteriorly. These lines are not continuous, but each consists of a series of regularly placed, small, pubescent spots, which form broken, but perfectly definite lines. Abdominal segments at the sides each with a spot of very dense pale pubescence, three similar spots continuing the series on each side of the thorax.

Length 15 mm. I am not certain as to the sex of the single specimen. It comes near to *P. munroi* and *P. aequalis,* but is quite distinct.

Hab.—Kauai (3,000 feet). Given to me by my friend Mr. G. C. Munro many years ago.

Acalles eugeniae sp. n.

Head, thorax and basal half of the elytra covered with ferruginous squamosity. The color is not uniform, being in some parts nearly orange and in others shading into whitish-ochreous. The rostrum is red. On the head are some markings formed by black squamosity; two small spots of the same color near the front margin of the pronotum, and another in the middle of the hind margin. The pale portion of the elytra enclose some black markings, tending to form an irregular curved band. The deep black squamosity of their apical half is at the sides continued right to the base (but this is only seen in lateral view), while at the extreme apex the squamosity is ferruginous. Femora black with a median pale ring and another at their base, the tibiae black on the basal, pale on their apical portion.

Rostrum dull and very densely punctured (no doubt a male character); the first funicle joint of the antennae elongate, distinctly longer than the elongate second joint and as long as the third and fourth together, the third and following ones moniliform. Pronotum from one-fourth to one-third longer than its basal width, with a strong longitudinal elevation on each side of the middle, these corresponding to the elevations of the second elytral interstices, the ridges irregular, approximated in front, but much more distant behind; two other ridges form most of the lateral outline of the pronotum in dorsal aspect and correspond with the elevated fourth interstice of the elytra, while an elevation on the deflexed sides forms a small part of this lateral outline on each side at about the middle of the length of the pronotum. Second, fourth and sixth interstices of the elytra strongly and unevenly raised, the highest points notably clothed with erect scales, so as to accentuate their height. Between each of the ridges two rows of coarse punctures or fovae can be seen, though the whole surface is densely covered with squamosity.

Length, excluding the rostrum, 5 mm.

Hab.—Manoa Valley near Honolulu.* Bred from a dead branch of *Eugenia* by my friend Mr. O. H. Swezey. Bred examples of *Acalles* are difficult to compare with captured specimens, which may be partly or largely denuded of their clothing, but I believe the above to be distinct from any of the Hawaiian type specimens, all of which I have examined.

Dryotribus wilderi sp. n.

Black, the antennae, legs and rostrum obscurely reddish. Like the typical species of the genus, but much more slender and elongate, the elytra being about three times as long as width at their base. The pronotum also is more elongate and less coarsely punctured, and the punctures of the elytra appear considerably coarser than those of the pronotum, while the general surface of the elytra between the punctures is much smoother or less corrugated.

Length 3.5 mm.

Hab.—Midway Island. A single specimen was found in a dead stem — not drift-wood — by Mr. G. P. Wilder, to whom I am indebted for this interesting form.

Heteramphus swezeyi sp. n.

Dark piceous or rufescent (when more or less immature), the antennae, tarsi and more or less of the tibiae in mature examples testaceous, the rostrum paler than the pronotum and elytra.

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*It has also been collected on Mount Tantalus by Mr. F. Muir, and in Palolo Valley by Dr. H. L. Lyon.—Ed.

Rostrum bare, finely punctured, the punctures becoming sparse or almost absent on the apical portion, which is dilated, the width becoming notably greater where the pterygia become outstanding. Eyes large, the space between them in dorsal aspect only about equal to the width of one of them. Pronotum bare, dull, with dense microscopic sculpture and copious punctures generally more or less irregular and coarse. Usually there is a vague depression near the base and sometimes also two vague lateral ones in front of this, sometimes too a more or less definite median impunctate line. The greatest width of the pronotum is nearly equal to its length; in front it is constricted and there about two-thirds as wide as along the hind margin. Elytra sparsely or irregularly clothed with flavescent setae on the interstices, these setae in parts extending to the base, and with seven rows of punctures, which vary somewhat in coarseness and also as to their closeness to one another in the striae.

Length 4–5 mm.

This species should be placed after *H. hirtellus* and *H. kauaiensis,* from which it differs remarkably in the bare thorax and in many other respects. Compared with those of the former, its eyes are very large, and this appears to be its most remarkable character.

Hab.—Mount Olympus, near Honolulu; bred from mines in *Elaphoglossum* by Mr. O. H. Swezey, as recorded by him previously (Proc. Haw. Ent. Soc., II, p. 210, 1913).*

Proterhinus moribundus sp. n.

Black, the antennae sometimes more or less rufescent, the legs, or at least the tibiae, generally so.

Basal joint of antennae very large, long and stout, subtriangular, as long as the next two together, the second joint being short and stout, the ninth somewhat larger than the eighth, but much smaller than the tenth. Pronotum globose, clothed with golden scales and for a large part covered with a dense patch of silvery squamosity. Elytra with the humeral angles distinct or a little produced, clothed like the pronotum with golden scales, but with more or less numerous spots of denser silvery squamosity and sparsely set with short, erect, white setae, the scutellar region bare. The femora are very stout and bear erect white setae, like those on the tibiae.

Length about 2.5 mm.

Hab.—Molokai, on the red-flowered native cotton tree.

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*Recently Mr. Swezey has bred this weevil from the same ferns at Punaluu, N.W. Koolau Mountains.—Ed.

Notes on the Hen Flea ("Echidnophaga gallinacea" Westw.)*

BY J. F. ILLINGWORTH.

[Presented at May Meeting.]

Recently an abundant infestation of my chickens led me to examine rather carefully the habits of this troublesome insect. As I reported at last meeting, I first discovered the larvae were being destroyed by our predaceous ant *(Pheidole megacephala)*. I found the dry dust which I kept on the roosting board swarming with the immature stages of this flea. I at once removed the dust and washed down the boards with the hose. Next morning the whole surface of the roosts was thickly covered with the eggs which had dropped, during the night, from the fleas on the hens. I washed down the roosting board daily, and found that the number of eggs deposited at night grew less and less. Within two weeks the adult fleas on the hens had practically disappeared.

Quantities of the newly laid eggs were collected in vials and the life history followed. The incubation period was very easy to determine, since fleas placed in the vials deposited eggs at once.

Some difficulty was at first experienced in feeding the larvae. Examining the attached fleas, I found that the blood from the hen was rapidly passing through them and being dropped in the form of small pellets of coagulated blood. I had already noticed that the food in the stomach of the larvae, collected on the roosting board, showed through the skin, a dark-red color; and had noted that other species of fleas were thought to feed upon this excrement of the parents. In the vials containing these dry pellets of blood mixed with the dust I was able to easily trace the entire development.

The larvae when ready to pupate became quite white, with the alimentary canal empty and the body stored with fat. The cocoon, made of the finest silk, is very thin, but serves

*This and the two following short papers were inadvertently overlooked when the copy went to the printers. The omission was not discovered until after the forms were made up, and so they are placed here, as they could not be inserted in proper chronological position.—Ed.

to hold together the particles of soil. Where the cocoons were made on the sides of the vials I was able to see through the thin web and note the transformations inside. The following gives a brief summary of the various stages:

March 7th	March 11th	March 17th	March 20th	March 25th	March 28th	March 29th
egg laid	Hatched	Pupaecell formed	Pupated	Pupae slightly dark color	Pupae very dark color	emerged

This makes a total of 22 days from egg to adult; other records gave from 21 to 26 days, hence the life cycle is about 3 or 4 weeks.

ACTIVITY OF ADULTS.

Fleas that emerged April 15th were put into a large glass jar with a young rooster. A careful chart was made of the top of the head, showing the distribution and sex of each of the fleas. It was found that the males move about during the night, being attached in different positions each morning—usually near females. They began dying after 2 days and at the end of 6 days all were dead—many of them in situ, with their beaks attached to the skin. The females, unless disturbed, remained attached in their original positions. After 18 days the first one died a natural death. The others died from three to four weeks after emergence, and a single female lived 40 days, producing eggs up to the time of her death, and, upon dissection, the ovaries were found to contain numerous developing ovules.

EGG LAYING.

Gelatin capsules were attached over several of the females to determine their egg-records. It was found that most of the eggs were laid at night,—under favorable conditions as many as 40 being deposited, while during the day only 2 or 3 were produced. Another interesting observation was that the females with males located near them laid many more eggs, and that their record dropped off decidedly, after 2 days, if the males were removed. Experiments were tried of introducing new males with females that had ceased laying, and it

was found that they at once began laying again — producing from 24 to 32 eggs during the next night.

ABUNDANCE OF FLEAS.

To get some idea of the number of fleas in the soil of an infested henhouse, half a pint of the dry dirt from the floor was placed in a glass jar and the fleas were removed as fast as they emerged. The experiment was concluded at the end of about three weeks, with a total of 1,027.

RESISTANCE OF THE NEWLY-EMERGED FLEAS.

In order to determine how long the fleas can live in the dry soil, without a host, they were placed in open glass jars, after emerging, and left until they died. It was found that most of them lived for over a week, and many of them much longer, some continuing for 30 days.

In no case were eggs produced by the fleas before feeding upon blood. It is also interesting to note that though the females are very resistant before finding a host, they quickly succumb if removed after they have once fed upon blood, dying within a day or two. The males, on the other hand, are not disturbed by removal from the host, and actually live longer than they do while actively mating.

A New Cockroach to the Hawaiian Islands

(Holocompsa fulva Burmeister.)

BY J. F. ILLINGWORTH.

[Presented at November Meeting.]

At a previous meeting I reported finding a tiny roach in the sphagnum moss which was used for packing the large roaches *(Rhyparobia maderae),* which Bro. Matthias Newell sent from Hilo, Hawaii, on November 14, 1914.

This adult specimen resembled so closely the new-born young of the large species that I did not discover the differ-

ence for some days after they arrived. It lived for several months in the jar with the numerous specimens of the large species, feeding upon bread, bits of cooked meat, and insect remains, but was finally attacked by ants *(Pheidole megacephala)* and succumbed.

I classified the specimen as above, in Brunner's Nouveau Systeme des Blattaires, p. 348, and sent it to Professor Lawrence Bruner for verification, since the original was named from Africa. Professor Bruner writes:

"I have gone over the specimen somewhat carefully and find that you have very evidently placed the insect in *Holocompsa fulva* Burm. It is either this insect or a very closely related species. There have been two other species described that I do not happen to have the description of at present. One of these came from the South Sea islands, the other from Africa. The South Sea island species, I believe, was considerably larger than the present, hence I do not imagine that either of them could be the insect now being considered."

Notes on Life History of "Dermestes cadaverinus" Fab.

BY J. F. ILLINGWORTH.

[Presented at November Meeting.]

Recently (September 9, 1915) a collection of the large cockroaches *(Rhyparobia maderae)* which I had drying was attacked by these insects. Each morning I found a number of the beetles hidden away under the pinned roaches. Apparently the life history of this species has not been published, unless in one of the early European publications which is not available.

OCCURRENCE IN THE UNITED STATES.

Dr. Horace J. Jayne, in his paper "A Revision of the Dermestidae of the United States" (Proc. Amer. Philosophical Soc. Vol. XX, p. 353, 1883), records this species as occurring in Florida. A second reference by F. H. Chittenden,

"Injurious Occurrence of an Exotic Dermestid in the United States" (U. S. Bur. Ent., Bul. n. s. No. 38, pp. 96–97), notes several attacks by this insect on silk cocoons, reel silk, and leather in the vicinity of New York. The dried infested silkworm cocoons had been imported from Shanghai, China.

The only other reference that I have located is by W. W. Froggatt, "Insects Infesting Woolen Tops" (Agr. Gaz. N. S. Wales, 23, p. 900, 1912). The author states that a consignment of woolen tops was found to be damaged by the cosmopolitan skin weevil *(Dermestes cadaverinus)*.

A number of the very young larvae of this species were found on the drying roaches September 13, 1915; these were placed in separate Syracuse watch-glasses and fed upon the remains of the damaged roaches. The development was very rapid, with this abundant food supply, and the early instars lasted only two or three days. As shown in the following table, the larval period consists of seven instars, and varies from twenty-eight to forty-one days; the pupal instar was very constant — nine days.

LARVAL AND PUPAL INSTARS.

Since the literature gives the larval period of other Dermestids as lasting from five to forty or more months, it is interesting to note the rapid development of this species under sub-tropical conditions.

The larvae of this species were never observed to eat their own skins and they do not destroy one another. Both larvae and beetles have the habit of feigning death when first disturbed.

Sharp (Cambridge Natural History, Vol. VI, p. 241, 1909), states that Dermestids pupate in the larval skin, but the species here studied invariably shed the last larval skin and showed the typical pupal characters of beetles.

LARVAL AND PUPAL INSTARS

Larvae	Hatched	2nd Instar	3rd Instar	4th Instar	5th Instar	6th Instar	7th Instar	Pupal Instar	Adult
No. 1.....	Sept. 7	Sept. 10	Sept. 13	Sept. 15	Sept. 17	Sept. 19	Sept. 22	Oct. 8	Oct. 17
No. 2.....	" 7	" 10	" 13	" 15	" 16	" 19	" 22	" 5	" 14
No. 3.....	" 7	" 10	" 13	" 15	" 17	" 19	" 22	" 8	" 17
No. 4.....	" 7	" 10	" 13	" 15	" 17	" 19	" 21	" 18	" 27
No. 5.....	" 10	" 13	" 15	" 17	" 19	" 22	" 27	" 21	" 30
No. 6.....	" 13	" 16	" 19	" 21	" 27	" 30	Oct. 3	" 21	" 30