

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites



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Contents

Synopsis	255
Introduction	255
Terminology and methods	256
Abbreviations	257
Depositories	257
Suprageneric classification	257
Key to families and subfamilies of the Ceraphronoidea	257
Generic classification in the Megaspilidae	258
Key to the British genera of Megaspilidae	258
<i>Dendrocerus</i> Ratzeburg	259
Subgenera	261
Synonymic list of British species	261
Key to British species	263
Species descriptions	266
Review of the biology of <i>Dendrocerus</i>	293
Host aphid list for <i>Dendrocerus</i> species	293
List of the Aphidiidae (Hymenoptera) parasitized by <i>Dendrocerus</i>	295
Other hosts	297
Host information on some non-British species of <i>Dendrocerus</i>	300
Non-British species	301
Doubtfully placed species	309
Acknowledgements	309
References	309
Index	313

Synopsis

The species of *Dendrocerus* occurring in Britain are revised; 72 nominal species are involved, of which 14 are considered to be valid. Six species are recorded as British for the first time and 17 new specific synonyms are established. All the European and some non-European species are discussed. Keys are given to the families and subfamilies of Ceraphronoidea, to the genera of Megaspilidae and to the British species of *Dendrocerus*. The genus *Dendrocerus* is redefined and its subgenera discussed, and one new generic synonym established. The biology of each species is discussed and the biology of the genus as a whole is reviewed.

Introduction

Dendrocerus Ratzeburg is the most economically important genus of the Ceraphronoidea as it contains most, if not all, of the aphid hyperparasites known from this superfamily. Species of *Dendrocerus* are also associated with other Homoptera, and with Neuroptera and Diptera. The

genus has a world wide distribution except that it has not yet been recorded from the Madagascan region.

The original idea for this study came from Dr V. F. Eastop. As a result of discussions with him and other aphid-workers, it has been possible to obtain many new host records and to present the data in a way which should be useful to them as well as to hymenopterists. The principal aims of this study are to distinguish *Dendrocerus* from other genera of Ceraphronoidea, especially *Conostigmus*, to redefine the limits of the species in *Dendrocerus*, to establish the extent of the British fauna, and to assess the basic host-parasite relationships. In addition, the subgenera have been critically reviewed.

In the course of this work nearly 3000 specimens have been examined, and most of the European species were found to occur in Britain. Examination of much foreign material, especially a large Dutch collection given to the British Museum (Natural History) by Dr Evenhuis, has helped to clarify the taxonomy and add a number of host records.

Terminology and methods

The morphological nomenclature used in this work follows that of Richards (1977) and Snodgrass (1935). The terms thorax and gaster have been used in preference to the 'mesosoma' and 'metasoma' used by Dessart (1972a). The microsculpture terminology follows Eady (1968). The term frontal dent refers to a small median depression on the frons, closer to the interantennal carina than to the median ocellus. This is the 'frontal pit' of Dessart (1972a) but not the same as the 'frontal pit' used by Bin (1977). The preoccipital crescent (Figs 25, 26) is a central area behind the lateral ocelli which is almost semicircular in shape. It is not as narrow or as well defined as the analogous postocellar area of some sawflies (Hymenoptera: Symphyta). The gastral collar (Figs 18–20) is a large projection around the petiole arising from the main tergite and sternite of the gaster. The term notaulices has been used for the pair of long furrows, one on each side of the median mesonotal furrow (Figs 13–17), which some authors have incorrectly called parapsidal furrows. Two other pairs of furrows (Fig. 14) are sometimes present as short lines; one pair at the anterior margin of the mesonotum close to the median furrow, the other pair half way down the mesonotum exterior to the notaulices. As the terminology of these furrows is confused I have followed Dessart (1972a) in calling them collectively the secondary furrows.

A standardized arrangement of information has been adopted for each species. The synonymy contains all nomenclatural changes but it was thought unnecessary to include every reference to the species. The species description is not based solely on type-material as it includes a consideration of the infraspecific variation. The male has been characterized separately, but only features differing from the female have been mentioned. The biology section contains all published host records and as many new records as it has been possible to obtain. The information has been presented as follows:

x♂, y♀, host/primary parasite/host plant, date of collection or emergence (authority for record if previously published).

A dash has been inserted in the appropriate place if the host, parasite or host plant is unknown. The records are listed in alphabetical order. The discussion of the biology is based on the classification of faunistic complexes employed by Starý (1970: 312).

All measurements used in the text are maximum distances unless otherwise stated. In males of *D. halidayi* and *D. ramicornis* the antennal process is excluded from the measurement of segment breadth. The lateral length of the head is measured from the vertex to the base of the mandible. The length of the scutellum is measured from the mesonotal border to the apex of the scutellum, and the breadth is taken as the maximum distance across the raised area. The length and breadth of the pterostigma are measured respectively parallel and perpendicular to the front edge of the wing. (The wing edge must not be curled over, making the pterostigma appear long and narrow.)

In this paper the classification and nomenclature of aphids has been taken from Eastop & Hille Ris Lambers (1976) and Kloet & Hincks (1964: 67); and that of the Aphidiidae from Kloet & Hincks (1978: 61), Mackauer (1968), Starý (1973) and Takada (1973: 1).

Abbreviations

- AI, AII, AIII, AIV, etc. – Antennal segments one, two, three, four, etc. The scape is AI, the pedicel AII and the first flagellar segment is AIII.
 L/B – Length divided by the breadth of a structure, that is the ratio of the length to the breadth with the breadth expressed as one.
 I.C.Z.N. – *International Code of Zoological Nomenclature*.

Depositories

The following abbreviations have been used for depositories containing type- or other material which has been examined.

MP, Amiens	Musée de Picardie, Amiens, France
MNHU, Berlin	Museum für Naturkunde der Humboldt-Universität, Berlin, East Germany
BMNH	British Museum (Natural History), London, England
IRSNB, Brussels	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium
TM, Budapest	Természettudományi Múzeum, Budapest, Hungary
Chambers coll.	Collection of Dr V. Chambers, Meppershall, Bedfordshire, England
NMI, Dublin	National Museum of Ireland, Dublin, Ireland
IP, Eberswalde	Institut für Pflanzenschutzforschung, Eberswalde, East Germany
MZU, Florence	Museo Zoologico della specola Università degli studi, Florence, Italy
MHN, Geneva	Muséum d'Histoire Naturelle, Geneva, Switzerland
MCSN, Genoa	Museo Civico di Storia Naturale, Genoa, Italy
RES, Harpenden	Rothamsted Experimental Station, Harpenden, England
ZMU, Helsinki	Zoological Museum of the University, Helsinki, Finland
UM, Kuala Lumpur	University of Malaya, Kuala Lumpur, Malaya
MCM, Liverpool	Merseyside County Museum, Liverpool, England
ZI, Lund	Zoologiska Institution, Lund, Sweden
NHM, Maastricht	Natuurhistorisch Museum, Maastricht, Netherlands
MM, Manchester	Manchester Museum, Manchester, England
ZMMLSU, Moscow	Zoological Museum of the Moscow Lomonosov State University, U.S.S.R.
UM, Oxford	University Museum, Oxford, England
IP, Paris	Institut Pasteur, Paris, France
MNHN, Paris	Muséum National d'Histoire Naturelle, Paris, France
NR, Stockholm	Naturhistoriska Riksmuseet, Stockholm, Sweden
MCSN, Verona	Museo Civico di Storia Naturale, Verona, Italy
NM, Victoria	National Museum of Victoria, Melbourne, Victoria, Australia
IPO, Wageningen	Instituut voor Plantenziektenkundig Onderzoek, Wageningen, Netherlands
USNM, Washington	National Museum of Natural History, Washington D.C., U.S.A.

The specimens listed under 'Material examined' without a named depository are in the BMNH.

Suprageneric classification

The Ceraphronoidea consist of two families: Ceraphronidae and Megaspilidae. The Megaspilidae are further divided into the subfamilies Megaspilinae and Lagynodinae. The following key has been designed for ease of use; for this reason characters best seen in slide preparations (e.g. genitalia characters) have not been used.

Key to the families and subfamilies of the Ceraphronoidea

- 1 Midleg with one tibial spur; mesonotum without notaulices (except *Ceraphron abnormis* Perkins, which has mesepisternum strongly striate), with or without median longitudinal furrow; longer tibial spur of foreleg not forked apically; antenna eight- to eleven-segmented

CERAPHRONIDAE

- Midleg with two tibial spurs; mesonotum, at least anteriorly, with notaulices and nearly always with median longitudinal furrow, or if notaulices absent then pronotum strongly elongate and ocelli absent or forewing has only costal vein and gastral collar has three carinae; mesepisternum with or without striations; longer tibial spur of foreleg forked apically (Fig. 11); antenna eleven-segmented (**MEGASPILIDAE**)

- 2 Ocelli usually absent; pronotum markedly elongated, mesonotum reduced (Fig. 12), gastral collar with three distinct dorsal carinae (Fig. 12). Apterous, females LAGYNODINAE (part)
- Ocelli present; pronotum and mesonotum normal, or if (rarely) thorax is modified then gastral collar has many carinae. Mostly macropterous, males and females 3
- 3 Forewing with large, obvious pterostigma (Figs 1, 33–36, 38–46); in brachypterous forms large pterostigma is conspicuous near wing apex (Fig. 9) (except in *Conostigmus dimidiatus* (Thomson), in which median longitudinal furrow of mesonotum is absent posteriorly); gastral collar not with three carinae, usually with many MEGASPILINAE
- Forewing without pterostigma, or pterostigma linear (Fig. 10) and longitudinal furrow complete; gastral collar with three distinct carinae dorsally (Fig. 12) LAGYNODINAE (part)

Generic classification in the Megaspilidae

The genera of the Megaspilidae are difficult to distinguish and *Conostigmus* and *Dendrocerus* have never been adequately delimited. The following key includes an attempt to produce a genuine disjunction for the two genera. The couplet separating females of *Conostigmus* and *Dendrocerus* is long and complex but nevertheless will not adequately distinguish *D. spissicornis* and *C. fasciatipennis*, which have therefore been keyed separately. *Conostigmus fasciatipennis* has many characters typical of *Dendrocerus* species; conversely, *D. punctipes* has several characters normally found in *Conostigmus* species.

Key to the British genera of Megaspilidae

- 1 Disc of forewing sparsely covered with very short pubescence; radial vein short, 0.5–0.8 times as long as breadth of pterostigma; propodeal spiracle large and conspicuous; hypopygium of female with distinct tuft of upright hairs; interantennal carina incomplete; wings hyaline; macropterous **TRICHOSTERESIS** Förster
(Monotypic: *T. glabra* (Boheman), a parasite of Diptera: Syrphidae)
- Forewing with normal pubescence (except *Dendrocerus punctipes*, which has inter-antennal carina complete and dark area on forewing); radial vein long, at least as long as breadth of pterostigma; propodeal spiracle not large or conspicuous; hypopygium without distinct tuft of upright hairs; macropterous or brachypterous 2
- 2 Propodeum always with distinctive median double-toothed lamellate projection (Figs 2, 3). Precoxal sulcus strongly developed, foveolate and curved (Fig. 4). Disc of scutellum always conspicuously bordered laterally and apically by strong foveae (Fig. 2). Head sculpture and ocular suture strongly foveolate. Antenna long and broad, AIII at least 4 times longer than broad, AIII of females about twice (1.7–2.1) as long as AIV, AIV of males as long as scape. Interantennal carina without sharp median projection. Macropterous **MEGASPILUS** Westwood
(A rarely collected genus)
- Propodeum without median double-toothed lamellate projection, often without any projection, or with median fovea, keel, small spine or double tooth. Precoxal sulcus absent, or if present then weakly developed and virtually straight. Disc of scutellum only rarely bordered laterally and apically by strong foveae. Head sculpture usually alutaceous, ocular suture normally without strong foveae. If antennal segments are long they are usually thin, only occasionally is AIII 4 times longer than broad, AIII of females normally less than twice as long as AIV, AIV of males usually shorter than scape. Interantennal carina sometimes with small sharp median projection (Figs 6, 12). Macropterous or brachypterous 3
- 3 Entire breadth of gaster covered anteriorly by strigose sculpture radiating from gastral collar and nearly reaching gastrocoeli (Fig. 19); head rugose; ocellar triangle with broad base; gastral collar broad and very short **DENDROCERUS** (part, *D. spissicornis*) (p. 292)
- Area of sculpture at anterior of gaster shaped and sculptured differently; if head rugose then ocellar triangle has short base or gastral collar is narrower or longer 4
- 4 Gastral collar very short and broad (Fig. 18); hairs on costal vein long, up to 0.1 mm (Fig. 39) (these hairs can be lost); ocellar triangle short with a broad base; notaulices complete and sharply angled outwards anteriorly; basal flagellar segments of male virtually cylindrical; large brown area under pterostigma in female, present but less distinct in male; frontal dent absent; disc of forewing with normal pubescence; preoccipital crescent not reaching eyes or ocelli; interantennal carina complete **CONOSTIGMUS** Dahlbom (part, *C. fasciatipennis* Kieffer)

- Gastral collar long (Fig. 20), or if short then hairs on costal vein much shorter, or ocellar triangle long with short base, or notaulices posteriorly absent (Fig. 15) or slightly smoothly angled, or basal flagellar segments of male clearly asymmetrical (Figs 30–32, 47–53), or forewing hyaline, or frontal dent present (Fig. 8), or disc of forewing with reduced pubescence, or preoccipital crescent reaching eyes or ocelli, or interantennal carina incomplete or absent 5
- 5 Males (AII globular, as in Figs 51–55) 6
- Females (AII elongate, as in Figs 56–63) 7
- 6 Basal flagellar segments clearly asymmetrical (Figs 30, 47, 49), often strongly serrate (Figs 48, 50–53) or with long projections (Figs 31, 32). If only slightly asymmetrical then mesepisternum smooth and pterostigma at least twice as long as broad (Fig. 38), or parameres exposed, large and distinctively angled (Fig. 29). Ocellar triangle always with broad base (e.g. Fig. 7); eye pubescence short; notaulices sharply angled towards anterior corners of mesonotum (Figs 14, 17) or absent posteriorly (Fig. 15) *DENDROCERUS* (part) (p. 259)
- All flagellar segments virtually cylindrical; ocellar triangle usually with short base (Figs 5, 6); eye pubescence often long and conspicuous; notaulices complete and usually only slightly smoothly angled towards anterior corners of mesonotum *CONOSTIGMUS* Dahlbom (part)
- 7 Ocellar triangle short with broad base (except *D. punctipes*, which lacks forewing fringe), often almost linear (Fig. 7). Notaulices sometimes posteriorly absent (Fig. 15), always sharply angled outwards anteriorly (when viewed from directly above) (Figs 14–17). Eye pubescence short and inconspicuous, pubescence of upper face short, or if long then ocellar triangle linear. Interantennal carina without projection, frons behind this carina flat or slightly raised with depression inwards from each torulus. Frontal dent small except in *D. pupparum* (Fig. 8). Head alutaceous, without clear frontal line or sculptured ocular suture. Occipital carina weak. Scutellum usually with raised central area, or if not raised then ocellar triangle broad. Raised area of scutellum without margin of sculpture. Mesonotum usually quadrate (Figs 14–17). Head often clearly transverse (Fig. 7). Fresh specimens are brown to black, or if lighter then notaulices incomplete, or wing pubescence strongly reduced, or brachypterous with AIII elongate (Fig. 58). Brachypterous forms are exceptionally rare *DENDROCERUS* (part) (p. 259)
- Ocellar triangle usually long with short base (Figs 5, 6) and forewing fringe present. Notaulices complete and usually only slightly, smoothly angled outwards anteriorly (when viewed from directly above) (Fig. 13). Eye pubescence often long or dense and conspicuous, pubescence of face frequently long. Interantennal carina often with a small sharp median projection (Fig. 6), frons behind this carina frequently distinctly concave (Fig. 6). Frontal dent often strongly developed. Head and ocular suture sometimes strongly sculptured and foveolate frontal line occasionally present. Occipital carina sometimes projecting and foveolate. Scutellum often flat, sometimes with margin of foveolate sculpture. Mesonotum often obviously narrowed anteriorly (Fig. 13). Head frequently globular or rounded (Fig. 6). Body colour often light brown. Frequently brachypterous *CONOSTIGMUS* Dahlbom (part)

DENDROCERUS Ratzeburg

Dendrocerus Ratzeburg, 1852: 180–181. Type-species: *Dendrocerus lichtensteinii* Ratzeburg [= *Ceraphron halidayi* Curtis], by monotypy.

Lygocerus Foerster, 1856: 97. Type-species: *Ceraphron ramicornis* Boheman, by subsequent designation (Ashmead, 1893: 107).

Macrostigma Rondani, 1877: 184. Type-species: *Macrostigma aphidum* Rondani, by monotypy. [Synonymized by Dessart, 1965a: 157.]

Atritomus Foerster, 1878: 56. Type-species: *Atritomus coccophagus* Foerster [= *Ceraphron laevis* Ratzeburg], by monotypy. [Homonym of *Atritomus* Reitter, 1877: 384.]

Prodendrocerus Kieffer, 1907: 11. Type-species: *Lygocerus ratzeburgi* Ashmead [= *Ceraphron ramicornis* Boheman], by subsequent designation (Muesebeck & Walkley, 1956: 389). [Synonymized by Dessart, 1966: 5.]

Atritomellus Kieffer, 1914: 141. [Replacement name for *Atritomus* Foerster.] [Synonymized by Hellén, 1966: 9.]

Neolygocerus Ishii, 1951: 16. Type-species: *Neolygocerus koyamai* Ishii, by monotypy. [Synonymized by Dessart, 1966: 11.]

Basoko Risbec, 1958: 111. Type-species: *Basoko africana* Risbec, by monotypy. **Syn. n.**

Antenna eleven-segmented in both sexes (except single fossil female of *D. dubitatus* Brues, which has ten segments). In females scape long, often longer than combined length of next three segments. Pedicel

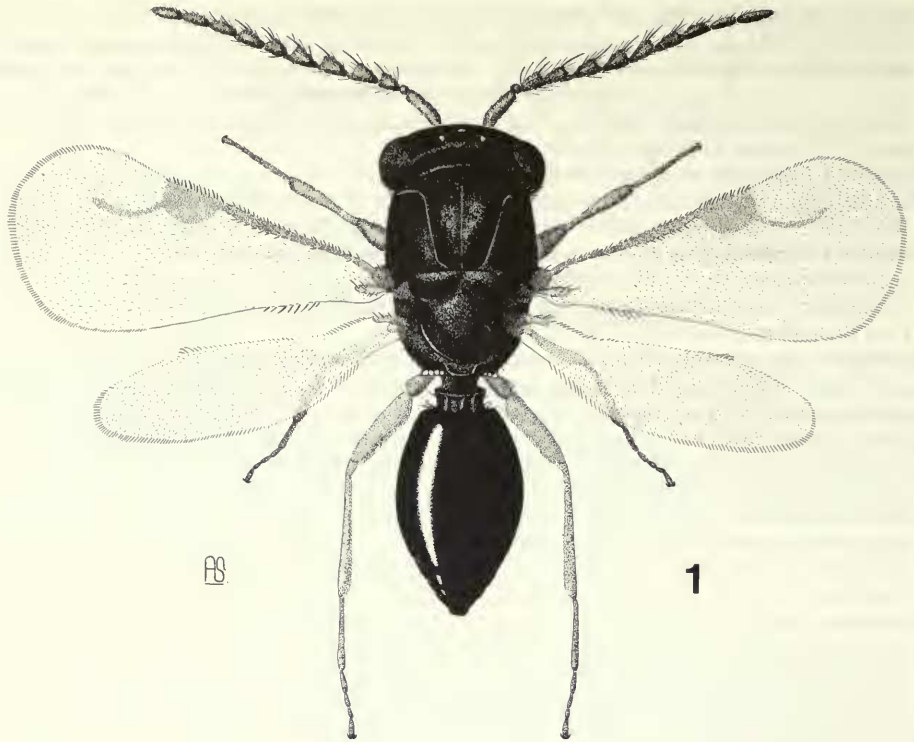


Fig. 1 *Dendrocerus carpenteri* (Curtis), male.

elongate (Figs 56–63), flagellar segments cylindrical. In males scape shorter and stout, usually shorter than combined length of next three segments. Pedicel small and almost globular (Figs 51–55). Basal flagellar segments of males never completely radially symmetrical, varying from almost cylindrical in *D. bifoveatus* (Fig. 55) to serrate in many species (Figs 50–52), strongly serrate in *D. serricornis* (Fig. 53) and ramose in *D. ramicornis* (Fig. 31); asymmetry progressively decreases towards distal segments. Pubescence of flagellum in males often longer than breadth of segment, pubescence in females shorter. Antennae alutaceous or papillate, inserted low on face close to clypeus.

Head lightly sculptured (except *D. spissicornis*, in which it is rugose); pubescence usually very short, eye pubescence short and inconspicuous; generally flat and transverse; usually black or dark brown. Mandibles bidentate. Toruli not strongly extended. Interantennal carina absent or distinctly developed, if present often with slight central hump. (Some species of *Conostigmus* have short sharp medial projection between toruli (Fig. 6) but this does not occur in *Dendrocerus*.) Frons behind interantennal carina flat, or slightly raised with depression inwards from each torulus, without large concave area. Except in *D. pupparum* (Fig. 8), frontal dent absent or present but small. Vertex slightly convex, or biconvex with slight longitudinal median depression but with no clear frontal line. Ocular suture not strongly sculptured. Ocelli present in both sexes. Ocellar triangle short with broad base (e.g. Fig. 7). Anterior ocellus situated just in front of postocellar line. Preoccipital crescent absent, or strongly developed and nearly reaching eyes and ocelli, sharply angled away from vertex. Occipital carina weak.

Side of pronotum with Y-shaped furrow, posterior arm of furrow sometimes faint. Mesonotum usually quadrate (Figs 14, 16, 17), not obviously narrowed anteriorly. Median furrow present. Notaulices sometimes absent posteriorly (Fig. 15) but always present anteriorly, sharply angled outwards (when viewed from directly above) towards anterior corners of mesonotum. In *D. spissicornis* notaulices not quite so sharply angled. Secondary furrows often present (Fig. 14). Scutellum generally convex with raised central area, only rarely with sculpture on margin of raised area. Precoxal sulcus absent. Metanotum reduced. Propodeum often with median fovea. Propodeal spiracle normal. Tibiae of all legs with two spines. Large spine of anterior leg forked at its apex. Claws simple. Brachypterous forms are exceptionally rare. Forewing with large pterostigma (Figs 33–36, 38–46). Radial vein longer than pterostigma (except in two non-British species).

Hindwing with three hamuli, proximal one almost straight, others strongly curved. Anal lobe present on hindwing in *D. ramicornis* (Fig. 37). Wings fully pubescent with fringe except in *D. punctipes*.

Large tergite of gaster with crenulate collar (Fig. 10), clearly with neck, except in *D. spissicornis* which has short broad collar (Fig. 19). Rest of gaster alutaceous or smooth. Gastrocoeli often visible. Hypopygium without distinct tuft of upright hairs. Genitalia with lamina volsellaris fused for greater part along its boundary with paramere.

FUNCTIONAL MORPHOLOGY OF MALE ANTENNAE. The most notable character of *Dendrocerus* males is the lateral extension of the basal flagellar segments. This character reaches its greatest development in the branches of *D. ramicornis* (Fig. 31) and *D. halidayi* (Fig. 32). It is likely that this is a device to increase the olfactory efficiency of the male, probably in its response to sexual attractants liberated by the female. Kaissling (1971: 351) has shown that the efficiency of an antenna as an odour filter can be defined by three terms: the outline area, the adsorption quotient and the effective fraction of adsorption. All these functions are mainly dependent upon the external geometry of the antenna. The most sensitive olfactory apparatus could be expressed as an odour filter with an extended outline area and a good subdivision of form. The antennae of male Saturniidae (Lepidoptera) approach most closely to this ideal.

Subgenera

After clarifying the generic position of *Dendrocerus*, Dessart (1972a: 26) retained some of the generic synonyms as subgenera; subgenus *Dendrocerus* for males with branched antenna, subgenus *Atritomellus* for species with the notaulices absent posteriorly, subgenus *Neolygocerus* for a Japanese species with a specialized scutellum, and subgenus *Macrostigma* for the remaining species.

The use of these subgenera is neither significant nor helpful. The separation of subgenus *Dendrocerus* applies only to males. The male of *D. (Neolygocerus) koyamai* (Ishii) has branched antennae like those found in subgenus *Dendrocerus*, and *D. (Dendrocerus) halidayi* often has the notaulices absent posteriorly as in the species of subgenus *Atritomellus*. The two European species of subgenus *Dendrocerus* have very little in common in either morphology or biology. *Atritomellus* is easily split into two groups on morphology, and the dumping of the bulk of the genus under *Macrostigma* has no advantage. For the above reasons these subgenera are listed as generic synonyms and omitted from further consideration in this paper.

Synonymic list of British species

(* = new to the British list)

aphidum (Rondani, 1877)

rufipes (Thomson, 1858) (junior homonym) **syn. n.**

aphidorum (Rondani, 1874) nomen nudum

koebelei (Ashmead, 1904) **syn. n.**

subquadratus (Kieffer, 1907) **syn. n.**

fusciventris (Kieffer, 1907) **syn. n.**

frenalis (Kieffer, 1907) **syn. n.**

breadalbimensis (Kieffer, 1907) **syn. n.**

bicolor (Kieffer, 1907) **syn. n.**

fuscipennis (Kieffer, 1907)

neglectus (Kieffer, 1907)

lundensis Dessart, 1966 **syn. n.**

bifoveatus (Kieffer, 1907)

sordidipes (Kieffer, 1907)

carpenteri (Curtis, 1829)

crispus (Curtis, 1829) nomen nudum

elegans (Curtis, 1829) nomen nudum

hyalinatus (Thomson, 1858)

niger (Howard, 1890)
proximus (Kieffer, 1907)
punctatipennis (Kieffer, 1907) **syn. n.**
rufiventris (Kieffer, 1907) (junior homonym)
campestris (Kieffer, 1907)
aphidivorus (Kieffer, 1907)
testaceimanus (Kieffer, 1907)
aphidum (Kieffer, 1907) (junior homonym)
giraudi (Kieffer, 1907)
cameroni (Kieffer, 1907)
thomsoni (Kieffer, 1907)
inquilinus (Kieffer, 1917)
ambianus (Dessart, 1965)
britannicus Dessart, 1966
tischbeini Dessart, 1966

dubiosus (Kieffer, 1907) **sp. rev.**
longicornis (Thomson, 1858) (junior homonym)
pallipes (Kirchner, 1867) nomen nudum
flavipes (Kieffer, 1907) (junior homonym) **syn. n.**
claripennis (Kieffer, 1907) **syn. n.**
rectangularis (Kieffer, 1907) **syn. n.**
alpestris (Kieffer, 1907) **syn. n.**
navaensis Dessart, 1966 **syn. n.**
flavus (Hellén, 1966) **syn. n.**

****flavipes*** Kieffer, 1907
fuscipes Kieffer, 1907

halidayi (Curtis, 1829)
lichtensteini Ratzeburg, 1852
damicornis (Foerster, 1856) nomen nudum
callicerus (Thomson, 1858)

****laevis*** (Ratzeburg, 1852)
frontalis (Thomson, 1858)
coccophagus (Foerster, 1878)
smirnoffi (Ghesquière, 1960)
applanatus Dessart, 1972 **syn. n.**

****laticeps*** (Hedicke, 1929)

****liebscheri*** Dessart, 1972
tenuicornis (Thomson, 1858) (junior homonym)

****punctipes*** (Boheman, 1832)
parvulus (Wollaston, 1858)

pupparum (Boheman, 1832)
ancyloneurus (Ratzeburg, 1844)
syrphidarum (Kieffer, 1907)

ramicornis (Boheman, 1832)
glabriculus (Thomson, 1858)
japonicus (Ashmead, 1904)
ratzeburgi (Ashmead, 1904)

serricornis (Boheman, 1832)
piceus (Ratzeburg, 1852)
lapponicus (Thomson, 1858)
semiramosus (Kieffer, 1907) **syn. n.**
subramosus (Kieffer, 1907)
zetterstedti (Ghesquière, 1960)

****spissicornis*** (Hellén, 1966)

Key to British species

The recognition of *D. liebscheri* and the separation of *D. aphidum* and *D. dubiosus* is difficult and should be based on series of both males and females. The male of *D. punctipes* is not known; it may well have the forewing pubescence reduced as in the female. An explanation of AI, L/B etc. is given on p. 257.

- 1 Males (AII globular, as in Figs 51–55) 2
- Females (AII elongate, as in Figs 56–63) 14
- 2 AIII to AVI each bearing long process always considerably longer than the segment which bears it (Figs 31, 32) 3
- Antenna without long processes; any projection present always equal to or shorter than segment which bears it (Figs 30, 47–55) 4
- 3 AVII longer than other antennal segments, longer than process it carries (Fig. 32); raised area of scutellum long and narrow, 1.5–2.0 times longer than broad. Hindwing without anal lobe; pterostigma semioval (Fig. 45); body colour brown *halidayi* (p. 279)
- AVIII longer than other antennal segments; AVII shorter than process it carries (Fig. 31); raised area of scutellum broad, 1.1–1.3 times longer than broad. Hindwing with small anal lobe (Fig. 37); pterostigma semicircular (Fig. 41); body colour black *ramicornis* (p. 288)
- 4 Notaulices incomplete, fading out anteriorly just after bend (Fig. 15) 5
- Notaulices complete, reaching posterior margin of mesonotum (Figs 14, 16, 17) 7
- 5 AIII approximately same length as scape (Fig. 30); flagellum densely pubescent; proximal flagellar segments strongly papillate; flagellar pubescence short, shorter than maximum breadth of flagellar segments; mesonotum and scutellum relatively elongate (i.e. L/B of mesonotum 0.7–0.8) *flavipes* (p. 278)
- AIII clearly shorter than scape (Figs 47, 48); flagellum sparsely pubescent; proximal flagellar segments at most with only a few papillae; flagellar pubescence long, at least as long as maximum breadth of flagellar segments; mesonotum and scutellum usually broad, only elongate in small specimens (i.e. L/B of mesonotum 0.4–0.7) 6
- 6 Flagellar segments short (Fig. 48) (e.g. L/B for AIII 1.5–2.5); scape short, about equal to length of eye; preoccipital crescent normally strongly developed, close to margin of eye (Fig. 25); scape without distinct light-coloured basal ring, usually completely dark (considerable light coloration occasionally present but vaguely delimited) *laevis* (p. 281)
- Flagellar segments elongate (Fig. 47) (e.g. L/B for AIII 2.4–3.0); scape often long, always longer than length of eye; preoccipital crescent weakly developed, not reaching margin of eye (Fig. 26); scape nearly always with distinct light-coloured basal ring, never completely dark, often with sharply defined longitudinal light-coloured stripe ventrally *laticeps* (p. 283)
- 7 Entire breadth of large gastral tergite covered by strigose sculpture, radiating from gastral collar and nearly reaching to gastrocoeli (Fig. 19); apex of scutellum with transverse carina; propodeum with large bilobed transverse keel (Fig. 19); sculpture coarse, mostly rugose *spissicornis* (p. 292)
- Large gastral tergite at most with short, narrow area of carinae not covering its entire breadth and not reaching gastrocoeli; apex of scutellum without transverse carina; propodeum without bilobed transverse keel, usually with median fovea 8
- 8 Antenna strongly serrate (Figs 51–53) (L/B for AIII 2.0 or less). Interantennal carina absent or indistinct, if weakly present then L/B for AIV approximately 1.0 (Fig. 53). Forewing always clear. Pterostigma approximately semicircular and radius deeply angled (Figs 40, 42, 43) 9
- Antenna almost cylindrical (Figs 54, 55) or only moderately serrate (Figs 49, 50) (L/B for AIII usually greater than 2.0, if less then interantennal carina present and forewing with area of brown coloration). Interantennal carina often present and forewing often with brown area. Pterostigma semioval, radius shallowly angled or evenly curved (Figs 33, 38, 44, 46) 11
- 9 Basal flagellar segments very strongly serrate (Fig. 53), AIV as long as broad (L/B 0.9–1.2). Preoccipital crescent very strongly developed, reaching eyes. Longest hairs on AVIII at least as long and usually much longer than maximum length of AIX. Thorax and gaster often long and narrow (L/B for thorax 1.4–1.8). Anterior corners of mesonotum often strongly curved downwards and rounded *serricornis* (p. 290)
- Basal flagellar segments less strongly serrate (Figs 51, 52), AIV longer than broad (L/B 1.4 or more). Preoccipital crescent well developed but not quite reaching eyes. Longest hairs on AVIII not quite as long as maximum length of AIX. Thorax and gaster always broad (L/B for thorax 1.5 or less). Anterior corners of mesonotum never strongly curved downwards 10
- 10 Notaulices strongly convergent posteriorly, meeting or almost meeting median furrow at scutal suture (Fig. 17). Parameres (viewed laterally in situ) expanded apically and broadly truncate

- (Fig. 27). Pterostigma (Fig. 42) slightly less semicircular, radius (Fig. 42) slightly less deeply angled than in following species. Gaster often narrow, scutellum narrow and strongly raised. A rare species hyperparasitic on lachnid aphids on conifers *liebscheri* (p. 285)
- Notaulices only slightly convergent, not meeting median furrow (Fig. 14), or if they meet or almost meet median furrow then they converge in curve (Fig. 16). Parameres (viewed laterally in situ) narrow and apically rounded (Fig. 28). Pterostigma (Fig. 40) (without leading edge curled over) approximately semicircular, radius (Fig. 40) deeply angled. Gaster usually broad, scutellum broad and not so high. An extremely common and widespread species on a wide range of aphids and plants *carpenteri* (p. 270)
- 11 Pterostigma distinctly long and narrow (Fig. 38), more than 2.1 times longer than broad. Mesepisternum almost totally smooth and shining. Flagellar segments almost cylindrical, only very weakly serrate (Fig. 55), flagellar pubescence longer than breadth of segment *bifoveatus* (p. 269)
- Pterostigma (without leading edge curled over) relatively broad (Figs 33, 44, 46), less than 2.0 times longer than broad. Mesepisternum clearly with alutaceous sculpture, only rarely is sculpture fine. Basal flagellar segments moderately serrate (Figs 49, 50), or if almost cylindrical (Fig. 54) then flagellar pubescence shorter than breadth of segment 12
- 12 Apex of parameres strongly upturned or expanded along dorsal edge (Fig. 29). Flagellar pubescence shorter than breadth of segment. Frontal dent strongly developed, circular and slightly linear (Fig. 8). Flagellum from AIV onwards weakly serrate, almost cylindrical (Fig. 54). Radius evenly and shallowly curved (Fig. 44) *pupparum* (p. 287)
- Apex of parameres simple, not upturned or expanded. Flagellar pubescence at least as long as breadth of segment. Frontal dent small and shallow, or absent. Flagellum serrate, or if weakly serrate then radius angled (Figs 33, 46) 13
- 13 Scape short and often stout, 4.0–5.1 times longer than broad, clearly shorter than lateral length of head. Scape often completely black, or with a small amount of yellow at base, sometimes entirely yellow but then scape short and broad, about 4.2 times longer than broad. Legs usually mostly dark, if yellow then scape short and broad (L/B about 4.2) *aphidum* (p. 266)
- Scape longer and thinner, 5.0 or more times as long as broad, nearly equal to lateral length of head. Basal third of scape usually yellow, legs not totally dark, often mostly yellow *dubiosus* (p. 276)
- 14 Thorax long and narrow, 1.5–1.9 times longer than broad, notaulices only clearly present anteriorly, fading out just after bend (Fig. 15). Body colour brown 15
- Thorax broad and stocky, at most 1.4 times as long as broad, or if long and thin then notaulices complete and distinct. Notaulices complete (Fig. 14), or if absent posteriorly then body length 1.5 mm or less, or body colour black (in fresh specimens) 16
- 15 Forewing with a distinct brown band under pterostigma and radial vein (Fig. 35); gastral collar white or light yellow, strongly contrasting with surrounding body colour; antenna dark brown but often scape lighter basally *flavipes* (p. 278)
- Forewing virtually clear; body colour uniformly brown; antenna entirely brown *halidayi* (p. 279)
- 16 Notaulices incomplete, present only anteriorly, fading out just after bend (Fig. 15) 17
- Notaulices complete, reaching posterior margin of mesonotum (Fig. 14) 18
- 17 Flagellar segments elongate (e.g. AIII longer than 0.1 mm, except in teneral specimens) (Fig. 60), first flagellar segment longer than pedicel; preoccipital crescent weakly developed (Fig. 26), clearly separated from margin of eye; scape never completely dark, normally with a distinct light-coloured basal ring (sometimes indistinct in teneral and old specimens); gastral collar long (mid lateral length normally greater than 0.04 mm); total body length very variable (1.3–2.0 mm) *laticeps* (p. 283)
- Flagellar segments short (e.g. AIII less than 0.1 mm) (Fig. 61), first flagellar segment at most as long as pedicel, usually shorter; preoccipital crescent normally well developed (Fig. 25), often close to margin of eye; scape usually completely dark, without distinct light-coloured basal ring, occasionally considerable area is light-coloured but vaguely delimited; gastral collar short (mid lateral length less than 0.04 mm); total body length less than 1.5 mm, often much smaller *laevis* (p. 281)
- 18 Entire breadth of large gastral tergite covered by strigose sculpture radiating from gastral collar and nearly reaching gastrocoeli (Fig. 19); apex of scutellum with transverse carina; propodeum with large bilobed transverse keel (Fig. 19); sculpture coarse, mostly rugose *spissicornis* (p. 292)
- Large gastral tergite at most with short, narrow area of carinae, not covering entire breadth of tergite and not reaching gastrocoeli; apex of scutellum without transverse carina; propodeum without bilobed transverse keel, usually with median fovea 19

- 19 Pubescence of forewing virtually absent, few fringe hairs present on costal vein and hairs on wing ultra-short. Scutellum completely flat, interantennal carina complete and prominent. Eyes large, occupying most of lateral length of head. Forewings with dark brown mark near pterostigma. Brachypterous specimens are known *punctipes* (p. 286)
- Pubescence of forewing normal, long fringe hairs and hairs on centre of wing conspicuous. Scutellum mostly convex, or if slightly flattened then interantennal carina absent, interrupted, or only weakly developed 20
- 20 Mesepisternum almost totally smooth and shining. Pterostigma distinctly long and narrow (Fig. 38), more than 2.1 times longer than broad. Legs mostly dark, interantennal carina weak but present, forewing evenly light brown, scape dark *bifoveatus* (p. 269)
- Mesepisternum clearly with alutaceous sculpture, only rarely is sculpture fine. Pterostigma (when flat and without leading edge curled over) relatively broad (Figs 33, 40–44, 46), less than 2.0 times longer than broad; if pterostigma is almost twice as long as broad then legs mostly yellow, or interantennal carina absent, or forewing with conspicuous brown area, or base of scape yellow 21
- 21 Frontal dent strongly developed, circular and slightly linear (Fig. 8). Forewing with brown area under radius, which is very shallowly curved (Fig. 44). Interantennal carina incomplete (Fig. 8), absent or very indistinct centrally. Scape brown. Body length 1.9–3.2 mm *pupparum* (p. 287)
- Frontal dent small and shallow, or absent. Forewing clear, radius distinctly angled (Figs 40–43), if otherwise then interantennal carina complete and prominent, or scape distinctly yellow at base, or body length less than 1.9 mm 22
- 22 Forewing with area of brown pigmentation near pterostigma (Fig. 33). Interantennal carina present, usually conspicuous. Body length less than 1.9 mm, body not long and narrow (L/B for thorax 1.5 or less). Pterostigma semioval (Figs 33, 45). Notaulices only moderately convergent, not meeting median furrow. Legs often mostly yellow or yellow-brown 23
- Forewing uniformly clear. Interantennal carina absent, or if very weakly developed then body length greater than 2.1 mm, or head (in dorsal view) rounded, anterior corners of mesonotum distinctly rounded and body clearly long and narrow (e.g. L/B for thorax 1.4–1.8). Pterostigma almost semicircular (Figs 40, 41, 43), or if semioval (Fig. 42) then notaulices strongly convergent posteriorly, meeting median furrow at scutal suture (Fig. 17). Legs often mostly dark 24
- 23 AIII clearly much longer than AII (Fig. 58). Scape 5.7–7.0 times longer than broad, much longer than head. Legs entirely yellow, very rarely basal half of hind coxa dark. Scape yellow basally. (Three brachypterous specimens are known and these have the scape slightly shorter than normal) *dubiosus* (p. 276)
- AIII about equal to or slightly longer than AII (Fig. 59). Scape less than 5.7 times longer than broad, about equal to or shorter than head. Legs always dark on basal half of hind coxa, usually dark on outside of hind femur and sometimes dark elsewhere. Scape usually mostly black but sometimes entirely yellow. (No known brachypterous specimens) *aphidum* (p. 266)
- 24 Head (in dorsal view) rounded; anterior corners of mesonotum strongly downcurved and rounded. Body clearly long and narrow (e.g. L/B for thorax 1.4–1.8). Preoccipital crescent strongly developed and virtually reaching eye margin.
Body length 1.4–1.8 mm, pterostigma as in Fig. 43. Parasite of Diptera: Chamaemyiidae on Hemiptera: Adelgidae *serriicornis* (p. 290)
- Head clearly transverse, not rounded; anterior corners of mesonotum not obviously downcurved or rounded. Body not notably long and narrow (e.g. L/B for thorax 1.5 or less). Preoccipital crescent present but not reaching eye margin, or if it does then body length 2.1 mm or more 25
- 25 Body large, 2.1–2.8 mm long; AIII clearly longer than AII (about 1.5 times longer). Interantennal carina present but not prominent. Hindwing with small pronounced anal lobe (Fig. 37). Legs often mostly light brown. Pterostigma distinctively shaped, approximately semicircular (Fig. 41).
Due to large size, head appears to be strongly transverse. Preoccipital crescent usually reaching close to margin of eye. Hyperparasite of Hemiptera: Lachnidae, often on coniferous and deciduous trees *ramicornis* (p. 288)
- Body smaller, only rarely as long as 2.1 mm; AIII approximately as long as AII. Interantennal carina absent. Anal lobe indistinct or absent. Legs mostly dark. Pterostigma roughly semicircular (Fig. 40) or semioval (Fig. 42) 26
- 26 Scape long (5–7 times longer than broad), longer than lateral length of head. AV to AIX elongate (Fig. 56) (e.g. L/B for AVI 1.6–2.0). Notaulices strongly convergent posteriorly, meeting or

- almost meeting median furrow at scutal suture (Fig. 17). Pterostigma (Fig. 42) slightly less semicircular and radius (Fig. 42) slightly less deeply angled than in following species. A rare species hyperparasitic on lachnid aphids on conifers *liebscheri* (p. 285)
- Scape shorter (at most 5 times as long as broad), shorter than lateral length of head. AV to AIX not so long (Fig. 57) (e.g. L/B for AVI 1.1–1.6). Notaulices only slightly convergent, not meeting median furrow (Fig. 14), or if they meet or almost meet median furrow then they converge in curve (Fig. 16). Pterostigma (Fig. 40) (without leading edge curled over) approximately semicircular, radius (Fig. 40) deeply angled. An extremely common and widespread species on a wide range of aphids and plants *carpenteri* (p. 270)

Species descriptions

Dendrocerus aphidum (Rondani)

(Figs 33, 50, 59)

- Ceraphron rufipes* Thomson, 1858: 293. Lectotype ♀, SWEDEN (NR, Stockholm), designated by Dessart (1972a: 102) [examined]. [Primary homonym of *Ceraphron rufipes* Nees, 1834: 277.] **Syn. n.**
- Macrostigma aphidorum* Rondani, 1874: 134. [Nomen nudum.] ['Synonymized' by Dessart, 1965a: 157.]
- Macrostigma aphidum* Rondani, 1877: 184–185, pl. 1, figs 34, 36. Lectotype ♂, ITALY (MZU, Florence), designated by Dessart (1965a: 158) [examined].
- Lygocerus koebelei* Ashmead, 1904: 70. Lectotype ♂, JAPAN (USNM, Washington), designated by Masner & Muesebeck (1968: 112) [examined]. **Syn. n.**
- Lygocerus subquadratus* Kieffer, 1907: 42. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 21) [examined]. **Syn. n.**
- Lygocerus fusciventris* Kieffer, 1907: 47. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**
- Lygocerus frenalalis* Kieffer, 1907: 47–48. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**
- Lygocerus breadalbinensis* Kieffer, 1907: 53–54. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**
- Lygocerus bicolor* Kieffer, 1907: 62. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**
- Lygocerus fuscipennis* Kieffer, 1907: 64. Lectotype ♀, ITALY (MCSN, Genoa), designated by Dessart (1972a: 59) [examined]. [Synonymized by Dessart, 1972a: 52.]
- Lygocerus neglectus* Kieffer, 1907: 64–65. Syntype(s) ♀, FRANCE: Amiens, August (*Carpentier*) (lost). [Synonymized by Dessart 1972a: 52.]
- Lygocerus aphidum* (Rondani) Dessart, 1965a: 157.
- Dendrocerus aphidum* (Rondani) Dessart, 1966: 12.
- Dendrocerus lundensis* Dessart, 1966: 12. [Replacement name for *Ceraphron rufipes* Thomson, 1858.] **Syn. n.**

FEMALE. Scape length variable (L/B less than 5.7), but longer than AII, AIII and AIV together, about equal to or less than length of head. Scape usually black with a little yellow at base, sometimes entirely yellow. AII approximately equal to length of AIII, often slightly shorter than AIII. Flagellar segments flat ventrally. Apex of AII slightly lighter than rest of flagellum which is black or brown. Antenna weakly papillate, pubescence short, quite dense.

Head alutaceous; pubescence short, except on clypeus, black; mandibles brown with red teeth, palps colourless. Head somewhat rounded but still transverse. Frons rather flat but with central swelling and small depression behind each torulus. Frontal dent absent, or small and shallow. Depression in front of median ocellus small, depressions by lateral ocelli shallow. Interantennal carina with central hump. Toruli not prominent. Ocellar triangle broad and short, Lateral Ocelli linked posteriorly by faint groove. Vertical furrow absent or very faint. Preoccipital crescent small, not reaching eyes and only rarely near ocelli.

Thorax black or very dark brown, alutaceous, with short pubescence. Notaulices complete, angled outwards but not as acutely angled as in most *Dendrocerus* species. Secondary furrows not always visible. Axillae only downcurved near outer edge. Scutellum distinctly arched but central area occasionally rather flat. Metanotal furrow strongly foveolate. Pleural sulcus foveolate. Propodeum with distinct median fovea. Leg colour variable but basal half of hind coxa always dark, usually outside of hind femur and often rest of legs dark. Tibiae and tarsi often mostly yellow. Forewing with brown area under pterostigma and often dark in proximal region so that basal veins are indicated as clear lines. Pterostigma semiovoid, 1.6–1.9 times longer than broad. Radius about 1.3 times longer than pterostigma. Wing pubescence normal.

Gastral collar long with many carinae, of which three are usually prominent. Gaster mostly smooth. Gastrocoeli visible as light brown areas. Basal half of gaster sometimes lighter in colour than posterior half.

MALE. As for female except scape short and often stout, at most 5.1 times longer than broad, clearly shorter than lateral length of head; longer than AII and AIII together. Scape often completely black or with small area of yellow at base, if entirely yellow, then it is also short and broad, about 4.2 times longer than broad. AIII longer and more slender than AIV (Fig. 50). Basal flagellar segments serrate (Fig. 50), their pubescence longer than breadth of segment.

REMARKS. The study of many specimens has shown that *D. aphidum* is very variable in size and coloration. I have been unable to find any constant method of separating the usually larger and lighter specimens (*breadalbimensis*) from the usually smaller and darker specimens of *D. aphidum*.

Previously *D. aphidum* and *D. breadalbimensis* were distinguished by leg, forewing and scape coloration; length of certain antennal segments; degree of development of interantennal carina; and differences in the male genitalia. Leg coloration varies to such an extent that it is an unreliable character at the species level. Forewing colour provides some discrimination but several specimens with quite dark wings (showing basal veins) are otherwise typical examples of *D. breadalbimensis*. The differences in length of the scape and flagellar segments reflect size variation. Several series of very dark and very small specimens of *D. aphidum* from Iceland may have unduly influenced previous concepts of this species. The scape coloration does not appear to give a reliable distinction and there are no interantennal carina differences. The main separating character was the male genitalia. In *D. aphidum* the volsella plates appeared to have a distinctive sinuous, angular termination and a non-apical hair, whereas in *D. breadalbimensis* (and *D. bicolor*) they were rounded with an apical hair. The 'sinuate form' of genitalia is in fact a slightly lateral view of the 'round form' of genitalia. The pubescence changes its position relative to the apex in the same way. In view of these considerations I am regarding all these specimens as conspecific.

The lectotypes of *Lygocerus bicolor*, *L. fusciventris*, *L. frenalis* and *L. subquadratus* are all large specimens of *D. aphidum* (= *L. breadalbimensis*). (The paralectotype of *L. bicolor* and the lectotype of *L. breadalbimensis* were collected together.) *D. bicolor* auct. nec Kieffer is *D. dubiosus* (see p. 276), the females of this species being easily recognizable by their long AIII; females of *D. aphidum* have AII and AIII about equal in length. The paralectotype of *Conostigmus dubiosus* is a specimen of *D. aphidum* and thus not conspecific with the lectotype of *C. dubiosus*. The lectotype of *Lygocerus koebelei* is a specimen of *D. aphidum*; the paralectotypes are *D. carpenteri* and *D. serricornis*.

It is not certain that this complex consists of only two species. Apart from the large specimens (*breadalbimensis*) there is a small group of males that I have tentatively placed in *D. aphidum*. These have yellow legs and scape and the latter is very broad and short, but I am not convinced that they are separable from *D. aphidum* on such characters; also they occur with typical specimens of *D. aphidum*.

The species separation detailed above and in the keys is the most practical arrangement possible at present, although it might be improved when reared series of both sexes are obtained and the biology is well known.

After *D. carpenteri*, *D. aphidum* (as defined above) is one of the most common species of *Dendrocerus*.

BIOLOGY. The following three host records for *D. rufipes* are probably misidentifications of other *Dendrocerus* or *Conostigmus* species. Henriksen (1918: 140) recorded *D. rufipes* from fly pupae. Mani (1941: 27) recorded *D. rufipes* from a chrysopid (Neuroptera) on sugar-cane and Pruthi & Mani (1942:421) gave *Chrysopa virgestes* (Neuroptera) as a host. All other host data indicate that *D. aphidum* (= *rufipes*) is a secondary parasite of aphids. The records for *D. aphidum* are too extensive to register in full; the following are alphabetical lists of hosts and parasites.

Hosts (Aphidoidea): *Acyrtosophon malvae*, *A. pisum*, *A. sp.*, *Aphis evonymi*, *A. nasturtii*, *A. pomi*, *A. sp.*, *Brachycaudus persicae*, *Cavariellia aegopodii*, *Clethrobium comes*, *Diuraphis piquens*, *D. noxius*, *Eucallipterus tiliae*, *Hyalopterus pruni*, *Liosomaphis berberidis*, *Macrosiphoniella usquertensis*, *Metopolophium dirhodum*, *M. sp.*, *Microlophium carnosum*, *M. sp.*, *Myzus persicae*, *Paraschizaphis scirpi*, *Rhopalosiphum nymphaeae*, *Schizaphis graminum*, *Sipha maydis*, *Sitobion avenae*, *S. fragariae*, *Uroleucon cirsi*, *U. sp.*

Primary parasites (Aphidiidae): *Aphidius ervi*, *A. picipes*, *A. platensis*, *A. sonchi*, *A. uzbekistanicus*, *A. sp.*, *Binodoxys acalephae*, *Diaeretiella rapae*, *Ephedrus persicae*, *E. plagiator*, *E. sp.*, *Praon abjectum*, *P. necans*, *P. volucre*, *P. sp.*, *Trioxys betulae*.

The records of hosts and parasites listed above are taken from material examined and from the following references: Boness (1958: 322); Dessart (1972a: 58; 1975: 267–269); Ivanova-Kazas (1955: 151); Kieffer (1907: 63); Kryger & Schmiedeknecht (1938: 76); Malaquin & Moitié (1914: 804); Meyer (1929: 234–244); Rondani (1877: 184) and Stary (1977: 2).

The host information for *D. aphidum* includes records that are typical elements of certain faunistic complexes. The record *Aphis sp./Binodoxys acalephae/Caltha palustris* along with several other records indicate that *D. aphidum* is part of the Eurasian steppe faunistic complex. The record *Clethrobium comes/Trioxys betulae/Alnus incana* represents the Holarctic forest tundra faunistic complex, and *Rhopalosiphum nymphaeae/Praon necans/Sagittaria sp.* is typical of the Boreal Europe faunistic complex. There are several records from grass, one from the complex of parasites on apple, and a few from deciduous forest. The aphids are Chaitophoridae (1 record), Callaphididae (2 records) and Aphididae; over half of the last family are Macrosiphinae, *Acyrtosiphon* (11 records) and *Sitobion* (8 records) being the most frequently recorded genera. The Callaphididae are a deciduous forest group. The Aphidiidae listed include most of the common genera, *Aphidius* and *Praon* being the most frequently recorded. The recorded plants are shrubs, herbs, a few trees, and many crop and grassland plants, and include both Monocotyledons and Dicotyledons. Several plants are associated with wet habitats, e.g. *Sagittaria*, *Typha* and *Angelica*. Thus *D. aphidum* is associated with cooler conditions, wet places, grass and deciduous trees and is commonly found on crops. It has been collected from March to November, its numbers reaching a peak in June and July.

MATERIAL EXAMINED

Ceraphron rufipes Thomson, lectotype ♀, **Sweden**: 'Ld. [Lund] 9/57' (NR, Stockholm). *Macrostigma aphidum* Rondani, lectotype ♂, **Italy**: (locality unknown) (MZU, Florence). *Lygocerus koebele* Ashmead, lectotype ♂, **Japan**: Atami (*Koebele*) (USNM, Washington). *Lygocerus subquadratus* Kieffer, lectotype ♂, **Great Britain**: [Scotland, Central] Clober (*Cameron*). *Lygocerus fusciventris* Kieffer, lectotype ♂, **Great Britain**: [Scotland, Central] Mugdock (*Cameron*). *Lygocerus frenalis* Kieffer, lectotype ♂, **Great Britain**: [Scotland, Strathclyde] Lock Libo (*Cameron*). *Lygocerus breadalbimensis* Kieffer, lectotype ♀, **Great Britain**: [Scotland, Tayside] 'Ben Lawers, along with 1' [1 = paralectotype of *bicolor*] (*Cameron*). *Lygocerus bicolor* Kieffer, lectotype ♀, **Great Britain**: [Scotland, Dumfries and Galloway] New Galloway (*Cameron*). *Lygocerus fuscipennis* Kieffer, lectotype ♀, **Italy**: Giglio I., iv. 1902 (*Doria*) (MCSN, Genoa).

239 ♂, 147 ♀. **Algeria**: Esbarres; Oran. **Canary Is.**: Tenerife. **Egypt**: Siwa. **France**: Dordogne, Mouleydier; Pyrénées-Orientales. **Germany (East)**: Harz Mts, Brocken dist.; Hinnundviedust, Altvater. **Great Britain**. Bedfordshire: Dunstable Downs, Eaton Bray, Steppingly; Berkshire: nr Streatly, Lambourn Down, Silwood Park, Thatcham Moor, nr Theale, Wytham; Buckinghamshire: Burnham Beeches, Farnham; Cambridgeshire: Wicken Fen; Cheshire; Cumbria: Wray Castle; Devon: Bovey Heathfield, Lustleigh, Torquay dist., Woolacombe; Dorset: nr Wareham; Dyfed: Llangranog; Essex: Hornchurch; Glamorgan; Gloucestershire: Gloucester, Staunton; Greater London: Highgate, Norwood; Gwynedd: Llandona; Hampshire: Farley, New Forest, Southampton; Hereford and Worcester: Fawnhope; Hertfordshire: Rothamsted, Royston; Highland; Isles of Scilly; Kent: Barnehurst, Eynsford; Lancashire: Ainsdale; Norfolk: Norwich, Foulden; Northamptonshire: Spratton; North Yorkshire: Malham Tarn; Oxfordshire: Headington, Oxford, Mapledurham, Summertown; Salop; Caer Caradoc; Somerset: Winsford; Suffolk: Minnesmere, Santon Downham, Wangford; Surrey: Ashted, Coulsdon, East Sheen; Effingham, Esher Common, Horsley, Kew, Oxshott, Richmond; Tayside: Ben Lawers (paralectotype of *Lygocerus bicolor* Kieffer); Western Isles: Lewis, Stornoway Castle; [?] Thornhill (paralectotype of *Conostigmus dubiosus* Kieffer). **Greece**: Kifisia; Mt. Parnis. **Greenland**: Noret, nr Mesters Vig. **Iceland**: Akureyri; Dyrhólaey; Eyjafjall, Skogasundur; Seljaland; Vestmannaeyjar. **Ireland**: Co. Dublin, Bohernabreena; Leitrim; Sligo, Trallawua; Wicklow, Blessington, Tonelagee Mt. **Israel**: Bet Dagen. **Italy**: Cortina, D'Ampezzo. **Morocco**: Beni Mellal. **Lebanon**: Beirut. **Netherlands**: Helmond; Tiel; Urk; Wageningen. **Portugal**: Lisbon; **Spain**: Marbella, Malaga. **Sweden**: Jmt Fors; Skåne, Lund; Skåne, Stensoffa; Sulnasker. **Yugoslavia**: Istria.

FURTHER DISTRIBUTION. Austria (Hellén, 1966: 13); Belgium (Dessart, 1972a: 59); Czechoslovakia (Stary, 1977: 2); Denmark (Henriksen, 1918: 140); Finland (Hellén, 1966: 13); Norway (Hellén, 1966: 13); U.S.S.R. (Ivanova-Kazas, 1955: 151). Asia: ? India (Mani, 1941: 27). South America: Chile (Dessart, 1975: 268). Australasia: Australia (Dessart, 1975: 267).

Dendrocerus bifoveatus (Kieffer)

(Figs 38, 55)

Lygocerus bifoveatus Kieffer, 1907: 55. Holotype ♀, FRANCE: Amiens, ex *Aphis* on *Cirsium arvense* (Carpentier) (lost).

Lygocerus sordidipes Kieffer, 1907: 63. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 21) [examined]. [Synonymized by Dessart, 1972a: 88.]

Dendrocerus bifoveatus (Kieffer) Dessart, 1972a: 88.

FEMALE. Scape relatively long, usually longer than AII, AIII and AIV together, nearly as long as head. Flagellum thin, AIII 3–4 times as long as broad. Only AI and usually AXI longer than AIII. Segments AV to AX approximately equal in length, segments AVI to AX about equal in breadth. AII clearly broader than AIII. Pubescence short but slightly longer on the proximal than on distal segments. Ventrally, flagellar segments flat with single central groove. Antenna weakly papillate; dark brown except distal end of AII which is often lighter in colour. Old specimens can fade to light brown.

Head smooth or weakly alutaceous; pubescence short but dense on gena, long on clypeus; dark brown, mandibles brown with red teeth, palps clear brown; transverse but not strongly so, broader than thorax. Eyes variable in size but never large. Frontal dent shallow or absent, depression behind each torulus shallow. Depression in front of median ocellus distinct and sometimes deep. Depressions near lateral ocelli almost absent. Interantennal carina weakly developed, usually almost complete over central area. Ocellar triangle broad, ocelli almost in line. Horizontal groove behind ocelli absent. Preoccipital crescent present but rounded, not limited by ridge, not reaching eyes or ocelli. Vertical furrow indistinct.

Thorax dark brown or black, weakly alutaceous. Pubescence not long except for region of dense hairs on mesepimeron and side of propodeum. Mesonotum slightly narrowed anteriorly. Anterior corners very sharp due to deep impression of notaulices in this region. Notaulices complete, usually sharply angled but can be more smoothly angled in some specimens, not meeting posteriorly. Lateral secondary furrows short; pair of anterior central furrows also present and far more evident on each side of median furrow. Median furrow distinct. Scutellum with raised central area strongly arched. Scutellum up to twice as long as broad. Propodeum weakly rugose or smooth between carinae. Propodeal fovea present, transverse propodeal carina strongly developed. Pronotum alutaceous, only bottom arm of Y-shaped furrow obvious. Mesepisternum almost completely smooth, shiny and only with peripheral pubescence; strong furrow present from near top of anterior mesepisternal boundary to episternal scrobe. Legs mostly dark brown; joints light brown in some specimens.

Forewing slightly and evenly light brown, sometimes lighter in distal region. Fringe long. Pterostigma long and thin (Fig. 38), over twice as long as broad. Radius as long as or little longer than pterostigma and only moderately curved.

Gaster 1.5–1.8 times longer than broad. Gastral collar well developed (but rather short in lectotype of *D. sordidipes*), with tuft of long hairs on each side. When visible gastrocoeli are lighter brown than rest of gaster. Gaster smooth, densely pubescent ventrally, in distal third.

A small species about 1.5 mm long.

MALE. As for female except scape short, over four times longer than broad and longer than AII plus AIII. Flagellar segments weakly serrate, nearly cylindrical (Fig. 55); elongate, AIII three times as long as broad. Only AI and usually AXI longer than AIII.

REMARKS. The holotype of *D. bifoveatus* is lost; it is therefore unfortunate that the name *bifoveatus* was chosen by the first reviser in preference to *sordidipes*, the lectotype of which is extant.

The antennae of males are unusually weakly serrated for a species of *Dendrocerus* but the ocellar triangle and other characters, and the biology, confirm the placement of *bifoveatus* in this genus. The antennae of males, the elongate pterostigma and the smooth mesepisternum distinguish *D. bifoveatus* but it is difficult to assess its affinities.

BIOLOGY. Starý (1977: 2) recorded *D. bifoveatus* from *Paraschizaphis scirpi* / *Aphidius urticae* / *Typha angustifolia* and *P. scirpi* / *Diaeretiella rapae* / *Typha angustifolia*, from moorland. In the BMNH collection there are seven specimens with host records: two from *Acyrtosiphon malvae* on *Achillea millefolium*, four from *A. auctus* and one from *Rhopalosiphonius calthae*. Kieffer (1907: 55) recorded *D. bifoveatus* from 'Aphis noir' on *Cirsium arvense*.

Kieffer's black aphid may have been an *Aphis* species of the *fabae* group, viz. *Brachycaudus cardui* (adults black) or *Uroleucon cirsii* (dark red). The *A. malvae* listed above had wandered from

its normal host plants (*Potentilla crantzii* or *Geum* sp.). *A. auctus* has a north European coastal distribution, *R. calthae* is specific to *Caltha palustris*, and *Typha angustifolia* grows in shallow water, therefore a wet marsh or moor habitat is indicated for *D. bifoveatus*. This habitat preference explains the large number of records from Iceland (the climatic and soil conditions result in a preponderance of wet moorland habitat). *D. bifoveatus* has been collected mostly in July and August.

MATERIAL EXAMINED

Lygocerus sordidipes, lectotype ♀, **Great Britain**: 'Bonar [= Bonar Bridge, Todcaster, Yorkshire (*Binnie*)], 483' (BMNH).

9 ♂, 11 ♀. **Great Britain**. Cheshire: Rostherne; North Yorkshire: Malham Tarn (*Hincks*) (MM, Manchester); Western Isles: Lewis, L. na Gainmheich. **Iceland**: Akureyri; Hornafjörður, Dynjandi (ZI, Lund); Hornafjörður, Thveit (ZI, Lund); Modruvellir, Eyjabjörður; Vestmannaeyjar, Alfsey (ZI, Lund); Vestmannaeyjar, Sudurey (ZI, Lund).

FURTHER DISTRIBUTION. France (Kieffer, 1907: 55); Czechoslovakia (Starý, 1977: 2); Sweden (Dessart, 1972a: 94).

Dendrocerus carpenteri (Curtis)

(Figs 1, 14, 16, 21–24, 28, 40, 51, 57)

Ceraphron carpenteri Curtis, 1829a: 249. Syntype(s), GREAT BRITAIN: ex aphids (*Carpenter*) (lost). Neotype ♂, BELGIUM (IRSNB, Brussels), designated by Dessart (1972a: 119) [examined].

Ceraphron crispus Curtis, 1829a: 249. Nomen nudum.

Ceraphron elegans Curtis, 1829a: 249. Nomen nudum.

Megaspilus carpenteri (Curtis) Stephens, 1829: 401.

Calliceras carpenteri (Curtis) Westwood, 1840: 77.

[*Ceraphron fuscipes* Nees; Ratzeburg, 1852: 180. Misidentification.]

Ceraphron hyalinatus Thomson, 1858: 291. Lectotype ♂, SWEDEN (ZI, Lund), designated by Dessart (1972a: 119) [examined]. [Synonymized by Dessart, 1970: 143.]

[*Ceraphron stigma* Nees; Thomson, 1858: 290. Misidentification.]

Lygocerus carpenteri (Curtis) Marshall, 1868: 158.

Coryne carpenteri (Curtis) Buckton, 1876: pl. 7.

Megaspilus niger Howard, 1890: 247. Lectotype ♀, U.S.A.: Michigan, Selkirk, vii. 1889 (USNM, Washington), designated by Masner & Muesebeck (1968: 113). [Synonymized by Dessart, 1972b: 240.]

Lygocerus carpentieri: Marshall, 1896: 569. [Incorrect subsequent spelling of *carpenteri* Curtis.]

Trichosteresis proxima Kieffer, 1907: 32. Lectotype ♀, GREAT BRITAIN: Bugbroak (*Marshall*) (TM, Budapest), designated by Dessart (1974b: 413). [Synonymized by Dessart, 1974b: 413.]

Trichosteresis punctatipennis Kieffer, 1907: 33. Holotype ♀, GREAT BRITAIN (BMNH) [examined]. **Syn. n.**

Lygocerus rufiventris Kieffer, 1907: 45. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 21) [examined]. [Secondary homonym of *Atritomus rufiventris* Ashmead, 1887. [Synonymized by Dessart, 1970: 143.]

Lygocerus campestris Kieffer, 1907: 48. Syntype(s), FRANCE: Amiens (*Carpentier*) (lost). [Synonymized by Dessart, 1972a: 107.]

Lygocerus aphidivorus Kieffer, 1907: 49–50. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 19) [examined]. [Synonymized by Dessart, 1970: 143.]

Lygocerus aphidivorus var. *inconspicuus* Kieffer, 1907: 50. Syntype(s), FRANCE: Amiens (*Carpentier*) (lost). [Synonymized by Dessart, 1972a: 107.]

Lygocerus testaceimanus Kieffer, 1907: 51. Syntype(s), FRANCE (? lost). [Synonymized by Dessart, 1970: 143.]

Lygocerus aphidum Kieffer, 1907: 52. Syntype(s), FRANCE: Amiens, ex *Aphis* on *Medicago sativa* (*Carpentier*) (lost). [Secondary homonym of *Macrostigma aphidum* Rondani, 1877.] [Synonymized by Dessart, 1972a: 107.]

Lygocerus giraudi Kieffer, 1907: 52–53. Syntype(s), AUSTRIA, FRANCE (lost). [Synonymized by Dessart, 1970: 143.]

Lygocerus cameroni Kieffer, 1907: 56–57. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. [Synonymized by Dessart, 1970: 143.]

- Lygocerus thomsoni* Kieffer, 1907: 57–58. Lectotype ♀, SWEDEN (NR, Stockholm), designated by Dessart (1972a: 119) [examined]. [Replacement name for *Ceraphron stigma* Nees; Thomson, 1858: 290.] [Synonymized by Dessart, 1970: 143.]
- Lygocerus inquilinus* Kieffer, 1917: 349. Holotype ♂, GERMANY (WEST) (NHM, Maastricht) [examined]. [Synonymized by Dessart, 1970: 143.]
- Trichosteresis carpenteri* (Curtis) Morley, 1929: 55.
- Lygocerus ambianus* Dessart, 1965a: 158. [Replacement name for *Lygocerus aphidum* Kieffer, 1907.] [Synonymized by Dessart, 1972a: 107.]
- Dendrocerus britannicus* Dessart, 1966: 12. [Replacement name for *Lygocerus rufiventris* Kieffer, 1907.] [Synonymized by Dessart, 1970: 143.]
- Dendrocerus tischbeini* Dessart, 1966: 12. Holotype ♂, GERMANY (EAST) (IP, Eberswalde). [Replacement name for *Ceraphron fuscipes* Nees; Ratzeburg, 1852: 180.] [Synonymized by Dessart, 1972a: 107.]
- Dendrocerus carpenteri* (Curtis) Dessart, 1970: 142.

FEMALE. Scape short but longer than AII, AIII and AIV together. AII and AIII approximately equal in length. Rest of flagellar segments short (L/B about 1.1–1.6), except AXI which is usually twice as long as broad (Fig. 57). Flagellar segments flattened ventrally. Antenna black but distal end of AII sometimes lighter; weakly papillate, with short dense pubescence.

Head alutaceous, with short pubescence except on or near clypeus; black, or brown in faded specimens, mandibles brown with red teeth, palps colourless; transverse, frons broad. Depressions behind toruli large, separated by distinct hump, those near lateral ocelli small, that in front of median ocellus larger, deep and in some specimens prolonged anteriorly as faint short frontal line. Interantennal carina absent. Ocellar triangle broad, the ocelli almost in line. Preoccipital crescent well developed, anteriorly limited by distinct ridge behind ocelli but not reaching eyes. Vertical furrow present.

Thorax alutaceous, black (brown in faded specimens) with short, quite dense pubescence. Mesonotum broad, almost quadrate. Notaulices complete, strongly angled and often only slightly convergent posteriorly. Four secondary furrows often visible. Scutellum broad and raised but flattened centrally. Propodeum medially very short, fovea not strongly developed. Posterior propodeal carina strongly developed, especially laterally. Y-shaped furrow on pronotum deeply impressed. Legs mostly brown-black but anterior tibiae usually lighter, as are articulations.

Wings clear, pterostigma nearly semicircular but distal edge almost straight. Radius strongly curved (Fig. 40), often continuing distally without pigmentation.

Gaster black or brown, mostly smooth. Gastral collar with strong carinae. Gastrocoeli not always visible but when present broad and lighter brown than rest of gaster.

MALE. As for female except scape short, slightly longer than AII and AIII together. Basal flagellar segments ventrally slightly concave; strongly serrate (Fig. 51), becoming less serrate distally, segments X and XI cylindrical. AIII almost twice as long as broad. Antenna brown. Flagellar pubescence long, at least as long as breadth of segment. Preoccipital crescent more developed and transverse than in female, eye slightly more rounded. Parameres rather narrow.

REMARKS. *D. carpenteri* is often found in large numbers and has been recorded from most parts of the world. Starý (1977: 6) found that *D. carpenteri* accounted for 92.6% of the 1865 specimens of *Dendrocerus* he studied. *D. carpenteri* is easily separated from most other species of *Dendrocerus* but *D. liebscheri* is very similar; very small specimens of *D. carpenteri* look like *D. aphidum*. The lectotype of *Lygocerus koebelei* is a specimen of *D. aphidum* but three of the four paralectotypes are faded specimens of *D. carpenteri*. In the Haliday collection there is a labelled specimen of *Ceraphron crispus* (listed by Curtis, 1829a: 249 but not described). It is badly damaged (only the antenna, legs and wings are left) but identifiable as a specimen of *D. carpenteri*. There is further material of *C. crispus* in the NM, Victoria and, according to Curtis's note book (in NM, Victoria), these were collected in 1850; one specimen is *D. aphidum*, the rest are *D. carpenteri*. In both the BMNH and the NM, Victoria, there is a specimen of *C. elegans* (listed by Curtis, 1829a: 249 but not described); both specimens are conspecific with *D. carpenteri*. Also in the BMNH is the holotype of *Trichosteresis punctatipennis*. The specimen is from Clobber, as stated by Cameron (1907: 161), and bears the species name in Cameron's handwriting. The antennae are brown, not testaceous, but otherwise the specimen fits the published description. It is conspecific with *D. carpenteri*.

In the Curtis collection there is a male and female of *D. carpenteri* mounted on one card. Written on the reverse of the card is 'Bred 28.6 off Roses Gl. Wool'. Curtis did not mention the type-

locality but he did say that the species was collected by T. Carpenter. If Gl. Wool is the collector's name then the male and female have no type-status; if it is a locality then they could be syntypes. G. E. J. Nixon designated (unpublished) the male as 'type'; he thought the last word on the label was Wood. I am convinced that the word in question is Wool and I am unable to ascertain the type-status of these specimens. There is a pin in the Haliday collection which bears a label '*carpenteri*' but the specimen is missing from the card and there is no other evidence, apart from the label, to indicate the type-status of the missing specimen. The microscope slides of larval stages (see 'Biology') of *carpenteri* prepared by Mrs Brindley (Miss M. D. Haviland) were donated to the BMNH. There are 36 slides, mostly serial sections of third or fourth instar larvae. There are two whole mounts labelled *Lygocerus cameroni*, and I can confirm that they are *D. carpenteri* (= *cameroni*). This is particularly important as Haviland's work forms the basis of our knowledge of larval development etc. in the genus.

BIOLOGY. As the records for *D. carpenteri* are too extensive to register in full, the following are alphabetical lists of the hosts and parasites.

Hosts (Aphidoidea): *Acyrtosiphon caraganae*, *A. cyparissiae*, *A. malvae*, *A. pisum*, *A. sp.*, *Amphorophora ampullata*, *A. idaei*, *Aphis citricola*, *A. craccae*, *A. craccivora*, *A. fabae*, *A. farinosa*, *A. frangulae*, *A. gossypii*, *A. marthae*, *A. nerii*, *A. pomi*, *A. sambuci*, *A. schneideri*, *A. urticata*, *A. viburni*, *A. sp.*, *Aulacorthum ibotum*, *A. magnoliae*, *A. solani*, *A. syringae*, *A. sp.*, *Betulaphis quadrituberculata*, *Brachycaudus cardui*, *B. helichrysi*, *B. sp.*, *Brevicoryne brassicae*, *Callipterinella calliptera*, *Capitophorus hippophaes*, *C. sp.*, *Cavariella aegopodii*, *C. araliae*, *C. salicicola*, *C. theobaldi*, *C. sp.*, *Ceruraphis eriophori*, *Chaetosiphon tetrahodus*, *Cinara juniperi*, *C. laricis*, *C. piceae*, *C. pinea*, *C. pini*, *C. sp.*, *Coloradoa sp.*, *Corylobium avellanae*, *Cryptomyzus sp.*, *Diuraphis frequens*, *D. noxius*, *Drepanosiphum platanoidis*, *D. sp.*, *Dysaphis plantaginea*, *D. sorbi*, *Elatobium abietinum*, *E. sp.*, *Euceraphis punctipennis*, *E. sp.*, *Eucallipterus tiliae*, *Hamamelistes shirakabae*, *Hayhurstia atriplicis*, *Hyadaphis foeniculi*, *H. sp.*, *Hyalopterus pruni*, *H. sp.*, *Hyperomyzus carduellinus*, *H. lactucae*, *H. niger*, *Indomegoura indica*, *Lipaphis erysimi*, *Liosomaphis berberidis*, *Macrosiphoniella absinthii*, *M. artemisiae*, *M. grandicauda*, *M. linariae*, *M. major*, *M. millefolii*, *M. oblonga*, *M. tanacetaria*, *M. sp.*, *Macrosiphum avenae*, *M. euphorbiae*, *M. gei*, *M. hellebori*, *M. rosae*, *M. rudbeckiarum*, *M. sorbi*, *M. sp.*, *Melanaphis bambusae*, *Metopeurum fuscoviride*, *Metopolophium albidum*, *M. dirhodium*, *M. festucae*, *M. poacearum*, *M. sp.*, *Microlophium carnosum*, *M. evansi*, *M. sp.*, *Mindarus japonicus*, *Myzaphis rosarum*, *Myzocallis coryli*, *Myzus boehmeriae*, *M. cerasi*, *M. ligustri*, *M. persicae*, *M. varians*, *M. sp.*, *Nasonovia nigra*, *Neophyllaphis totarae*, *Ovatus sp.*, *Parachaitophorus spiraeae*, *Periphyllus acericola*, *P. aceris*, *P. californiensis*, *P. hirticornis*, *P. lyropictus*, *P. sp.*, *Phorodon humuli*, *Plectrichophorus glandulosus*, *Prociphilus fraxini*, *P. xylostei*, *Protolachnus agilis*, *P. thunbergii*, *Pseudobrevicoryne erysimi*, *Pterocallis sp.*, *Pterocomma salicis*, *Rhopalomyzus loniceriae*, *Rhopalosiphoninus deutzifoliae*, *R. sp.*, *Rhopalosiphum insertum*, *R. nymphaeae*, *R. padi*, *Schizaphis agrostis*, *S. longicaudata*, *Schizolachnus pineri*, *S. pineti*, *S. sp.*, *Sipha maydis*, *S. sp.*, *Sitobion akebiae*, *S. avenae*, *S. fragariae*, *S. ibarae*, *S. sp.*, *Staticobium limonii*, *Symydobius oblongus*, *Tinocallis platani*, *Titanosiphon artemisiae*, *Toxoptera odinae*, *Toxopterella drepanosiphoides*, *Tuberocephalus sp.*, *Tuberculoides sp.*, *Tuberolachnus salignus*, *Uroleucon aeneus*, *U. ambrosiae*, *U. campanulae*, *U. cephalonoli*, *U. chondrillae*, *U. chondrii*, *U. cichorii*, *U. cirsii*, *U. gobonis*, *U. hypochoeridis*, *U. jaceae*, *U. picridis*, *U. rudbeckiae*, *U. sonchi*, *U. sp.*

Primary parasites (Aphidiidae): *Aphidius absinthii*, *A. aquilus*, *A. areolatus*, *A. cingulatus*, *A. equiseticola*, *A. ervi*, *A. funebris*, *A. gifuensis*, *A. hieraciorum*, *A. hortensis*, *A. longipetiolus*, *A. matricariae*, *A. phalangomyzi*, *A. picipes*, *A. polygonaphis*, *A. rosae*, *A. salicis*, *A. schimitscheki*, *A. setiger*, *A. smithi*, *A. tanacetarius*, *A. urticae*, *A. uzbekistanicus*, *A. sp.*, *Areopraon nipponicum*, *Binodoxys acalephae*, *B. angelicae*, *B. brevicornis*, *B. centaurae*, *Calaphidius watanabei*, *Diaeretiella rapae*, *Diaeretus leucopterus*, *Dyscritulus planiceps*, *D. sp.*, *Ephedrus californicus*, *E. lacertosus*, *E. minor*, *E. nacheri*, *E. niger*, *E. persicae*, *E. plagiator*, *E. salicicola*, *E. sp.*, *Lipolexis gracilis*, *Lysaphidus erysimi*, *L. matsuyamensis*, *L. plectrichophori*, *Lysiphlebia japonica*, *Lysiphlebus ambiguus*, *L. arvicola*, *L. dissolutus*, *L. fabarum*, *L. fritzmulleri*, *L. testaceipes*, *Metaphidius aterrimus*, *Monoctonus angustivalvus*, *M. cerasi*, *M. pseudoplatani*, *Pauesia abietis*, *P. akamatsucola*, *P. laricis*, *P. piceae*, *P. pini*, *P. salignae*, *P. unilachni*, *P. sp.*, *Praon abjectum*,

P. absinthii, *P. barbatum*, *P. bicolor*, *P. capitophori*, *P. dorsale*, *P. flavinode*, *P. gallicum*, *P. necans*, *P. pequodorum*, *P. silvestre*, *P. volucre*, *P. sp.*, *Trioxys betulae*, *T. cirsii*, *T. curvicaudus*, *T. euceraphis*, *T. falcatus*, *T. pallidus*, *T. pannonicus*, *T. parauctus*.

The following genera of Cynipoidea and Chalcidoidea have also been recorded as forming part of the host complex of *D. carpenteri*: Cynipoidea — *Alloxysta*, *Phaenoglyphis*; Chalcidoidea — *Aphelinus*, *Aphidencyrthus*, *Asaphes*, *Coruna*, *Cyrtogaster*, *Encyrtus*, *Pachyneuron*.

D. carpenteri has also been associated with the ants *Formica rufa* and *Lasius fuliginosus* (Hymenoptera: Formicidae) (Kieffer, 1907: 349) and with *Meromyza saltatrix* (Diptera: Chloropidae) (Meyer, 1929: 241). In the BMNH there is a specimen of *D. carpenteri* bred from a Rose Bedeguar gall.

The records of hosts, parasites etc. listed above are taken from material examined, and from the following references: Bankowska (1975: 312); Buckton (1876: 117); Campbell & Mackauer (1975: 419); Chua (1977: 125); Cumber & Eyles (1961: 404); Curtis (1829: 249; 1860: 293); Dean (1974: 414); Dessart (1972a: 115–119); Dessart (1975: 267); Dill (1937: 233); Dours (1873: 113); Dunn (1949: 105); Ferrière & Voukassovitch (1928: 28); Fülmeck (1968: 900–909); Garbarczyk (1977: 447–448); Gatenby (1919: 405); Gourlay (1930: 339); Hafez (1961: 530); Haviland (1920a: 293; 1920b: 104); Howard (1890: 247); Kieffer (1907: 48–53); Lowe (1968: 821); Maneval (1940: 96); Marshall (1872: 124; 1896: 569–572); Meyer (1929: 234–244); Muesebeck et al. (1951: 669); Paetzold & Vater (1967: 83); Pass & Parr (1971: 1153); Petherbridge & Mellor (1936: 336); Ratzeburg (1852: 180); Rothschild (1963: 126); Skripchinskii (1930: 281); Spencer (1926: 142–150); Starý (1977: 2–3); Sullivan & Van Den Bosch (1971: 389); Takada (1973: 9–11; 1976: 237); Thuneberg (1959: 23); Tillyard (1926: 283); Todd (1957: 720); Treherne (1916: 186); Valentine (1975: 61); Voukassovitch (1925: 655; 1928: 54); Walden (1926: 295–298); Ward (1934: 144); Westwood (1840: 170); Wimshurst (1925: 93); Yasumatsu et al. (1946: 12; 1947: 113).

The aphids listed above are from most of the systematic groups of the Aphidoidea. The only families not represented are the Adelgidae and Phylloxeridae. The most frequently recorded genera are *Microlophium* (261 records, mostly of *M. carnosum*), *Acyrthosiphon* (154 records), *Macrosiphum* (100), *Aphis* (78, many *A. pomi* records), *Metopolophium* (70, mostly *M. dirhodum*), *Sitobion* (66), *Periphyllus* (60), *Schizolachnus* (56), *Uroleucon* (44), *Macrosiphoniella* (34), *Rhopalosiphum* (32) and *Myzus* (28). All the major genera of Aphidiidae are included in the above records. The most frequently recorded genera are: *Ephedrus* (281 records), *Praon* (258), *Aphidius* (220) and *Pauesia* (74). Both forms of pupation (inside and outside the mummy) are represented.

D. carpenteri has been recorded from a wide range of plants, including coniferous and deciduous trees, herbs, shrubs, cultivated plants and crops, fruit-trees, and plants of wasteland, hedgerows and damp habitats.

The host information for *D. carpenteri* includes records that are typical elements of the following faunistic complexes: Eurasian steppe — *Macrosiphoniella* spp. / *Aphidius absinthii* / *Artemisia* sp.; *Titanosiphon artemisiae* / *Trioxys pannonicus* /—; *Microlophium* spp. / *Aphidius ervi* /—; *Uroleucon* spp. / *Praon dorsale*; *Acyrthosiphon caraganae* / *Aphidius ervi*: *Pseudobrevicoryne erysimi* / *Lysaphidius erysimi* /—; European and Far Eastern deciduous forest — *Drepanosiphum platanoidis* / *Dyscritulus planiceps* — *Acer pseudoplatanus*; *Periphyllus californiensis* / *Aphidius areolatus* / *Acer* sp. Coniferous forest — *Cinaria laricis* / *Pauesia pini* / *Larix leptolepis*. Holarctic forest tundra — *Pterocomma salicis* / *Aphidius cingulatus* / *Salix* sp.; *Symydobius oblongus* / *Trioxys betulae*. The most frequently represented of the faunistic complexes is the Eurasian steppe. Several gall-forming aphids are represented which are commonly parasitized by *Ephedrus persicae* or *E. plagiator*. Some wax-producing aphids and their parasites are also listed, e.g. *Brevicoryne brassicae* / *Diaretiella rapae* /—. Starý (1977: 6) records *D. carpenteri* mostly from parks, fields, meadows and waste places, and found that it was numerically the most abundant *Dendrocerus* species, but in some habitats other species were dominant, e.g. *D. bifoveolatus* in moor/pond habitats.

D. carpenteri, which is the only species of *Dendrocerus* to have had its biology well studied, is a hyperparasite of mature larvae or young pupae of Aphidiidae (or on secondary parasites); the Aphidiidae are in turn parasites of Aphidoidea. The aphidiid larva consumes the aphid and pupates inside the empty aphid skin. As the female of *D. carpenteri* only oviposits into aphids containing a

mature parasite larva or pupa, *D. carpenteri* cannot be a direct parasite of the aphid. According to Haviland (1920b: 103) and Spencer (1926: 142) *D. carpenteri* can parasitize other larvae of *D. carpenteri*, and Haviland could not find any other hymenopteron that parasitized *D. carpenteri* larvae. The complexity of parasitism and hyperparasitism can be seen from one example recorded by Haviland (1920b: 103): a *Microlophium carnosum* (= *Macrosiphum urticae*) was parasitized by *Aphidius ervi* which had been hyperparasitized by an undetermined species of Chalcid which in turn had been partially devoured by a second hyperparasite which had been hyperparasitized by *D. carpenteri*.

The development of *D. carpenteri* occurs outside the body of the host. The egg is elliptical, becoming more spherical as development proceeds. It measures 0.25 mm by 0.1 mm, is white, semi-translucent, and has a minute teat-like protuberance at one end. (Spencer, 1926: 143 records a protuberance at both ends.) The chorion surface has numerous longitudinal striae. According to Haviland (1920b: 106) and Spencer (1926: 143) the egg hatches in about 24 hours, but Rothschild (1963: 127) states that at 25°C the first instar larva hatches after two days.

The first instar larva grows to 0.45 by 0.22 mm. It is white, transparent, with thirteen body segments (Fig. 21) (there is some variation in the number of body segments given by authors for the instars). The distinct head has two small tactile papillae and the mouth has two slender mandibles. When newly hatched only two pairs of spiracles are open, one near the posterior margin of the first body segment and the other on the anterior part of the fourth body segment, but the spiracles of the third and fifth segments open shortly afterwards. The midgut is closed, it is large and its contents are yellow. The first instar lasts 20–24 hours. The larva can progress by a kind of peristaltic movement but it probably does not move around as the host skins normally have only one puncture mark. If the host is in the pupal stage the *D. carpenteri* larva is usually found feeding on the posterior part of the abdomen where the integument is still soft. As the egg is deposited on the third or fourth segment of the aphidiid the *D. carpenteri* larva must move to this position.

The second stage larva (Fig. 22) measures 0.7 by 0.35 mm and differs from the first instar chiefly by the more developed tracheal system and the greater development of the anterior part of the body so that the head appears to be divided from the thorax by a constriction. The stigmatic trunks of segments six, seven and eight are visible but the corresponding spiracles are closed. This stage lasts 24–36 hours. The hyperparasite seems to feed by suction and the skin of the aphidiid (otherwise uninjured) is gradually emptied of its contents.

The third stage larva (Fig. 23) is globose and about 1.00 mm long by 0.75 mm broad. In this stage the head is bent round ventrally, the papillae on the head disappear and the spiracles on body segments six, seven and eight are open. The mandibles work vigorously and are probably used to macerate the host organs. This stage lasts for about 40 hours.

The fourth stage larva (Fig. 24) measures 1.0 by 0.83 mm when fully fed (1.4 mm long according to Rothschild, 1963: 127). It becomes creamy white and ingests the last of its host. It differs considerably from the third stage larva. The first four body segments are greatly developed, the small head is bent round to the ventral side and is almost hidden by the large prothorax. The last abdominal segment bears dorsally a conical caudal appendage of unknown function. The body segments bear a row of chitinous papillae or spines. The salivary glands and malpighian tubes have considerable lumina. The midgut, which fills the greater part of the body cavity, contains a mass of fluid which is churned to and fro by muscular contractions. At this stage there are seven pairs of spiracles, the first pair near the posterior margin of segment one, the second on the posterior side of the third segment and the rest on the following five segments. The eighth spiracle does not become functional until metamorphosis. Rudimentary stigmatic trunks can sometimes be seen on the ninth and tenth segments. The fourth instar lasts from one and a half to three days.

D. carpenteri pupates within the cocoon spun by the aphidiid. Just before metamorphosis the midgut opens to the hindgut and the contents are voided. The pupa is yellow at first but gradually darkens until it is black. According to Spencer (1926: 145) this stage lasts six to eight days but Haviland (1920b: 121) states that the period of pupation is from 14–16 days and Rothschild (1963: 127) gives the mean duration of the pupal stage (at 25°C) as eight days. The imago gnaws a hole in the aphid mummy and emerges. The hole has irregular margins and thus differs from the emergence hole of aphidiids.

According to Spencer (1926: 145) a generation can occupy 11–16 days, the average being 12 days, while Haviland (1920b: 106–121) indicates 22–25 days and Rothschild (1963: 127) 18 days. These variations in development times are presumably due to different temperatures. Campbell & Mackauer (1975: 422) studied the influence of temperature on development rate. It took 9.4 days at 25.9°C and 42.69 days at 10.3°C for the parasite to develop from egg to adult. The parasite developed more slowly than its host, at the same temperature. This may ensure that the parasites do not appear too early in the season and that a continued minimum host supply is available.

Copulation may last from 20 seconds to 15 minutes and can take place a few hours after emergence. Rothschild (1963: 126) noted that the males mate repeatedly with the same female but Haviland (1920b: 105) stated that they only paired once.

According to Rothschild (1963: 126) oviposition may last from 90 seconds to 15 minutes. When a suitable host is found the female of *D. carpenteri* energetically examines it with her antennae. The female stands on or behind the aphid so that the ovipositor, when inserted, punctures the aphidiid larva (lying, bent head to tail in the cocoon) at its centre of curvature. Usually only one egg is laid. Spencer (1929: 143) observed that two eggs were sometimes laid but only one adult emerged. Rothschild (1963: 126) recorded one instance where an unmated *D. carpenteri* female appeared to oviposit in the normal way but no eggs were laid. Haviland (1920b: 106) estimated the total number of eggs laid by a single female to be less than 25.

Adults live up to 10 days and Takada (1976: 383) gives the possible number of generations in a year for *D. carpenteri* as between two and six. *D. carpenteri* is active from May to November. Kieffer (1907: 50) records *D. carpenteri* (as *aphidivorus* var. *inconspicuus*) over-wintering in moss, and Takada (1976: 383) and Dunn (1949: 106) indicate that it over-winters within the aphid mummy or can sometimes survive the winter as adults.

Haviland (1920b: 105) recorded that the sex ratio was 2:3 (males: females). Dunn (1949: 105) gave the sex ratio as 2:1. The work of Garbarczyk (1977:445–454) showed a preponderance of females (61.9%). Spencer (1926: 145) induced virgin females to oviposit; the resultant adults were all males.

Although *D. carpenteri* is a very common species the numbers of aphids are so great that the overall rate of parasitism is quite low. Hafez (1961: 471) and Chua (1977: 138) both give a figure of under 2%, Bankowska (1975: 312) recorded 3.4%, Low (1968: 825) recorded a 5.5% parasitism rate and Dean (1974: 415) gave 3.2% and 12% for two different hosts. Because it is last in the chain of parasites *D. carpenteri* is often the least common member of the aphid parasite complex. Haviland (1920b: 125) recorded it as comprising 32–44% of the parasites of Aphidiidae. Takada (1976: 252), studying the parasites of aphids on potatoes and cruciferous crops, found that it emerged in a higher proportion from parasitized aphids on the upper leaves, than from those on the lower leaves.

MATERIAL EXAMINED

Dendrocerus carpenteri (Curtis), neotype ♂, **Belgium**: La Hulpe, 2.vi.66 (IRSNB, Brussels). *Ceraphron hyalinatus* Thomson, lectotype ♀, **Sweden**: 'Ld [Lund], 9.viii.6' (NR, Stockholm). *Trichosteresis punctatipennis* Kieffer, holotype ♀, **Great Britain**: 'Clober [Scotland, Central] 100' (Cameron) (BMNH). *Lygocerus rufiventris* Kieffer, lectotype ♀, **Great Britain**: '439' (Cameron) (BMNH). *Lygocerus aphidivorus* Kieffer, lectotype ♀, **Great Britain**: '365 Kelvin [Scotland, Central Kelvinside] 10/6' (Cameron) (BMNH). *Lygocerus cameroni* Kieffer, lectotype ♀, **Great Britain**: 'York [=Yorkshire] 384 Cameron coll.' (BMNH). *Lygocerus thomsoni* Kieffer, lectotype ♀, **Sweden**: 'Ld [Lund] 8/6' (NR, Stockholm). *Lygocerus inquilinus* Kieffer, holotype ♂, **Germany (West)**: 'Kol [or Rol] 4. 16/9/11 Iserlohn b F. rufa' (NHM, Maastricht).

738 ♂, 1029 ♀. **Belgium**: Moresnet. **China**: Foochow. **Germany (West)**: Kehl; Westfallen, Plellenburg. **Great Britain**: Bedfordshire; Berkshire; Buckinghamshire; Cambridgeshire; Cheshire; Cumbria; Devon; Dorset; Durham; Essex; Hampshire; Hertfordshire; Highland; Isles of Scilly; Kent; Greater London; Lancashire; Greater Manchester; West Midlands; Norfolk; Northamptonshire; Northumberland; North Yorkshire; Oxfordshire; Powys; Somerset; South Glamorgan; Staffordshire; Strathclyde; Suffolk; Surrey; Sussex (East); Sussex (West); West Yorkshire. **India**: Kashmir. **Ireland**: Antrim; Down; Dublin; Kildare; Leitrim; Londonderry; Sligo; Wicklow. **Italy**: Dolomites, Seils am Schlern; Sicily, Villafranca; South Tirol. **Japan**: Atami; Hokkaido, Sapporo; Honshu, Kure. **Netherlands**: Arnhem; Bennekom; Brandvijk; Dwingelo; Ede; Epen; Groningen; Gronsveld; Hazerswonde; Helmond; Hemmen; Kootwick; Langbroek; Leersum; Lienden; Lunteren; Mheer; Oenkerk; Rhenen; Rijswijk; Schiermonnikoog; Tiel; Wageningen;

Wessem. **Sweden:** Skåne, Rolsberga, Rovurekulan; S., Lund; Sm. Våxjö S. Arede. **Switzerland:** Zürich. **U.S.S.R.:** Vilnius, Verzuva.

FURTHER DISTRIBUTION. Europe: Austria (Dessart, 1972a: 120); Czechoslovakia (Starý, 1977: 2). North & South America: Canada (Dessart, 1972b: 239); Chile (Dessart, 1975: 267). Australasia: Australia (Dessart, 1972b: 240).

***Dendrocerus dubiosus* (Kieffer) sp. rev.**

(Figs 20, 46, 49, 58)

Ceraphron longicornis Thomson, 1858: 293. Holotype ♀, SWEDEN: 'Malmö 7/56' (lost). [Primary homonym of *Ceraphron longicornis* Boheman, 1832: 337.]

Lygocerus pallipes Kirchner, 1867: 193. Nomen nudum.

Conostigmus dubiosus Kieffer, 1907: 152. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 15) [examined].

Lygocerus flavipes Kieffer, 1907: 54. Holotype ♀, ITALY (MCSN, Genoa) [examined]. [Secondary homonym of *Dendrocerus flavipes* Kieffer, 1907: 23.] **Syn. n.**

Lygocerus claripennis Kieffer, 1907: 43. Holotype ♂, ITALY: Genoa, 1894 (*Solari*) (MCSN, Genoa). **Syn. n.**

Lygocerus rectangularis Kieffer, 1907: 44–45. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**

Conostigmus alpestris Kieffer, 1907: 143–144. Holotype ♀, ITALY (MCSN, Genoa) [examined]. **Syn. n.**

Dendrocerus navaensis Dessart, 1966: 12. [Replacement name for *Lygocerus flavipes* Kieffer, 1907: 54.] **Syn. n.**

Dendrocerus dubiosus (Kieffer) Dessart, 1972a: 125.

Lygocerus flavus Hellén, 1966: 14. Holotype ♀, FINLAND (ZMU, Helsinki) [examined]. **Syn. n.**

[*Dendrocerus bicolor* sensu auct., nec Kieffer. Misidentifications.]

FEMALE. Scape very long, 5.7–7.0 times longer than broad and much longer than head (except for one brachypterous specimen in which it is 5.4 times longer than broad). AIII elongated, up to 4 times as long as broad, clearly longer than AII (Fig. 58). Segments AVI to AX 1.7–2.0 times longer than broad, AXI longer. Ventrally flagellar segments flat with central ridge. Antenna usually longer than body; weakly papillate; pubescence short, dense; brown except distal end of AII, which is slightly lighter, and base of scape, which is yellow.

Head mostly alutaceous, frons often almost smooth; black or dark brown, mandibles yellow with red teeth, palps colourless; pubescence short. Eyes large, almost as long as distance between torulus and preoccipital crescent. Eye pubescence short but distinct. Interantennal carina distinctly developed and curved over central swelling between toruli. A shallow depression present behind and inwards from each torulus. Frontal dent shallow but can be conspicuous. Depressions near lateral ocelli shallow, that in front of median ocellus usually large and conspicuous. Ocellar triangle broad. Lateral ocelli joined by distinct posterior horizontal groove. Preoccipital crescent present but not strongly developed, not usually reaching eyes.

Thorax black or dark brown, mostly alutaceous or coriaceous, pubescence short, sometimes quite dense. Anterior corners of mesonotum sharply angled. Notaulices complete, clearly curved outwards towards anterior corners of mesonotum. Four secondary furrows often visible. Axillae mostly flat, only downcurved in outer region. Metanotal and propodeal furrows strongly foveolate. Propodeal fovea small but prominent. Y-shaped furrow on side of pronotum distinct. Legs entirely yellow, basal half of hind coxa very rarely dark.

Forewing with light but distinct brown area under pterostigma, veins often indicated as clear lines in brown area. Pterostigma semiovoid, radius distinctly curved, about 1.3 times longer than pterostigma. Wing pubescence normal.

Gaster smooth; 1.5–2.0 times longer than broad. Gastral collar long, well developed, with several parallel carinae. Gastrocoeli visible in dark specimens as two lighter brown areas.

MALE. As for female except scape short (L/B 5.0 or more), nearly equal to length of head, nearly as long as AII, AIII and AIV together. Basal flagellar segments elongate (AIII usually clearly the longest), clearly asymmetrical (Fig. 49), pubescence longer than breadth of segments. Basal third of scape usually yellow, flagellum brown or black but AII distinctly lighter. Legs generally darker than in female, often mostly yellow.

REMARKS. As *Lygocerus bicolor* Kieffer, 1907 (but not *bicolor* of authors) is now synonymized under *D. aphidum* (see p. 266) a new replacement name is required for *Ceraphron longicornis* Thomson. Of the synonyms now assigned to this species the names published by Kieffer in 1907 have precedence; *Conostigmus dubiosus* has been chosen because the lectotype is female and easily accessible.

Dessart (1972a: 143) considered *D. flavus* and *D. dubiosus* (= *bicolor* auct., nec Kieffer) to be closely related but distinct; however *D. flavus* is just a brachypterous form of *D. dubiosus*. Many of the stated differences are within the range of variation of *D. dubiosus* and the rest are consistent with wing reduction. Both known specimens are female. The second specimen was collected at the same time as a normal *D. dubiosus*, and I have seen a specimen of *D. dubiosus* with three-quarter-length wings.

Females of *D. dubiosus* are separable from *D. aphidum* females by the long scape and long AIII (compared with the length of AII) of *D. dubiosus*. In large specimens of *D. aphidum* the scape is sometimes long but the length of AIII is always about equal to AII. The legs of *D. dubiosus* females are entirely yellow with the exception of two dark specimens which have a dark basal half to the hind coxa. The legs of *D. aphidum* females always have some dark coloration, at the very least the basal half of the hind coxa is dark. Small specimens of *D. aphidum* can often have entirely dark legs. The males are more difficult to separate but generally the scape is shorter and the leg colour darker in *D. aphidum* than in *D. dubiosus*. The males of *D. aphidum* and *D. dubiosus* could conceivably be placed in the same species but the range of variation in the females is far too great for synonymy.

Previously I named a series of specimens from Akureyi, Iceland as *D. bicolor* (i.e. *bicolor* sensu auct. = *dubiosus*) and Couchman (1977: 123) published this determination. After comparison with types and other material, I have now decided that they are large specimens of *D. aphidum*.

Dessart has labelled a specimen from the Cameron collection as '? paralectotype of *bicolor*'; it is not conspecific with the type-material, it is a specimen of *D. dubiosus* and has no type-status.

After *D. carpenteri*, *D. dubiosus* is one of the more common species of *Dendrocerus*.

BIOLOGY. *Acyrtosiphon pisum* / *Aphidius ervi* / *Medicago sativa* 17.vi.1967 and 18.vii.1969 (Starý, 1972: 2); *A. pisum* / *Aphidius* sp. / *Medicago sativa* (Boness, 1958: 322); 1 ♂, *A. sp.* / *Praon dorsale* / *Trifolium pratense* (Takada, 1973: 8); *Amphorophora rubi* / *Rubus* sp. 21.vi.1914; 1 ♂, 6 ♀, Aphidiid sp. / *Praon* sp. / *Orixa japonica* (Takada, 1973: 8); *Aphis craccivora* / *Binodoxys acalephae* / *Onobrychis sativa* 1.vi.1960 (Starý, 1977: 2); *A. craccivora* / *Lysiphlebus fabarum* / *Onobrychis sativa* 1.vi.1960 (Starý, 1977: 2) *A. fabae* / *Binodoxys angelicae* / *Papaver* sp. 18.vi.1959 (Starý, 1977: 2); 2 ♀, *Aulacorthum magnoliae* / *Praon volucre* / *Sambucus siebaldiana* (Takada, 1973: 8); 1 ♀, *A. magnoliae* / *Praon volucre* / 11.v.1963; 1 ♂, 2 ♀, *A. syringae* / *Praon volucre* / *Syringa reticulata* (Takada, 1973: 8); *Cryptosiphum artemisiae* / *Ephedrus nacheri* / *Artemisia vulgaris* 9.vi.1958 (Starý, 1977: 2); *Galiobium langei* / *Aphidius metricariae* / *Galium* sp. 26.vi.1974 (Starý, 1977: 2); 1 ♂, 1 ♀, *Hyalopteroides humilis* / *Dactylis glomerata* 28.v.1972; *Macrosiphum rosae* / *Aphidius rosae* / *Rosa* sp. 5.vi.1961 (Starý, 1977: 2); 1 ♀, *Microlophium carnosum* / *Praon* sp. / *Armoracia rusticana* 31.viii.1934; 1 ♀, *Rhopalosiphoninus deutzifoliae* / *Ephedrus* sp. / *Deutzia crenata* (Takada, 1973: 8); 1 ♀, *Schizolachnus* sp. / *Pauesia unilachni* / *Pinus densiflora* (Takada, 1973: 8); *Sitobion avenae* / *Aphidius ervi* / *Triticum vulgare* 2.vii.1975 (Starý, 1977: 2); *S. avenae* / *Aphidius uzbekistanicus* / *Triticum vulgare* vii. 1975 (Starý, 1977: 2); 1 ♂, *S. avenae* / *Hordeum* sp. 26.vi.1972; *S. equiseti* / *Aphidius equiseticola* / *Equisetum silvaticum* (Starý, 1977: 2); *S. equiseti* / *Ephedrus plagiator* / *Equisetum silvaticum* (Starý, 1977: 2); *S. equiseti* / *Monoctonus caricis* / *Equisetum silvaticum* (Starý, 1977: 2); *Therioaphis trifolii* / *Praon exoletum* / *Medicago sativa* 23.v.1960 and 30.viii. 1967 (Starý, 1977: 2); *Uroleucon aeneus* / *Ephedrus niger* / *Carduus acanthoides* 28.vi.1961 (Takada, 1973: 8); / *Medicago sativa* (Bankowska, 1975: 312).

Dessart (1972a: 85) recorded *D. dubiosus* from *Aphidius picipes*, *Diaeretiella rapae*, *Ephedrus plagiator* and *Praon volucre*. Donisthorpe (1927: 106) recorded it in association with *Lasius brunneus* (Hymenoptera: Formicidae); as there is no other evidence of ant association it is probable that this was just a chance encounter.

D. dubiosus is recorded from a considerable range of hosts. There are several records characteristic of the Eurasian steppe complex, i.e. *Acyrtosiphon* spp. / *Aphidius ervi*, *Aphis* spp. / *Lysiphlebus fabarum*, *Aphis* spp. / *Binodoxys angelicae*, *Cryptosiphum artemisiae* / *Ephedrus nacheri* / *Artemisia vulgaris* and *Galiobium langei* / *Aphidius metricariae*. There are also records characteristic of the European deciduous forest complex, i.e. *Macrosiphum* spp. / *Aphidius rosae*, *Sitobion* spp. / *Monoctonus caricis* and *Acyrtosiphon* / *Praon volucre*. The *Schizolachnus* sp. /

Pauesia unilachni / *Pinus* record is the only one from the coniferous forest complex. The aphids listed above are from diverse families (Lachnidae, Callaphididae and Aphididae). The primary parasites are all Aphidiidae, and all the common genera are represented. *D. dubiosus* is recorded from a wide diversity of plants, including trees, shrubs and herbs, and on three occasions from *Equisetum* (Equisetinae); it has been collected over much of the year and appears to be most abundant in July and August. Takada (1973:15) listed *D. dubiosus* (as *bicolor*) under an 'immediate' type of habitat (shrubs, orchards and gardens), but the above records indicate a much wider habitat range, from forest to fields and wasteland.

MATERIAL EXAMINED

Conostigmus dubiosus Kieffer, lectotype ♀, **Great Britain**: '356, Clober [Scotland, Central] 1.vi.' (Cameron). *Lygocerus flavipes* Kieffer, holotype ♀, **Italy**: 'Nava 108, viii. 1902' (*Solari*) (MCSN, Genoa). *Lygocerus rectangularis* Kieffer, lectotype ♂, **Great Britain**: '372, Dumfries' [Scotland, Borders] (Cameron). *Conostigmus alpestris* Kieffer, holotype ♀, **Italy**: 'Nava, viii 902' [1902] (*Solari*) (MCSN, Genoa). *Lygocerus flavus* Hellén, holotype ♀, **Finland**: Lemland, 11.viii.1953 (*Hellén*) (ZMU, Helsinki).

105 ♂, 99 ♀. **Austria**: Semmering region, Ruchenau dist. **France**: Pyrénées-Orientales, nr Vernet-les-Bains. **Great Britain**: Bedfordshire: Dunstable Down, Steppingly; Berkshire: Streatley, Silwood Pk, Thatcham Moor, Windsor, Wytham; Buckinghamshire: Burnham Beeches, Slough; Cambridgeshire; Devon: Heathfield; Dorset: nr Stoborough; Dumfries and Galloway: Dumfries; Grampian: Elgin; Greater London: Kew, New Malden, Richmond; Gwent: Newton; Hampshire: Brockenhurst, Lyndhurst, New Forest; Hertfordshire: Rothamsted; Leicestershire: Charnwood Forest; Lothian: Edinburgh: Mid Glamorgan: Kenfig Pool; Northamptonshire: Spratton; Oxfordshire: Headington; Shetland: Fetlar, Unst, Haroldswick; Somerset: Brompton Regis; Strathclyde: Aran, Catacol, Beinn Bhreac, Cawbber; Suffolk: Barton Mills; Surrey: Ashted, Bookham, Clandon Downs, Farnham, Oxshott; Western Isles: Lewis, Greeta, **Ireland**: Dublin: Bohernabreena, Grand Canal, Mantfield, Phoenix Park; Kildare: R. Canal, Landenstown, Trawallna; Longford: Castle Forbes; Wicklow: Ballyknockan, Dowry. **Italy**: Sicily, Villafranca. **Japan**: Honshu, Tokyo. **Sweden**: Bräkne, Hoby; B., Sjöard; Halleberg; Örebro, Adby; Skåne, Höör dist.; S., Kivik; S., Loderup; S., Ring; S., Stensöffa.

FURTHER DISTRIBUTION. Algeria (Dessart, 1979: 33); Belgium (Dessart, 1972a: 87); Czechoslovakia (Starý, 1977: 2); Faroes (Kryger & Schmiedeknecht, 1938: 76); Germany (West) (Dessart, 1972a: 87); Iceland (Dessart, 1972a: 87); Norway (Dessart, 1972a: 87); Switzerland (Dessart, 1972a: 87).

Dendrocerus flavipes Kieffer

(Figs 30, 35, 62)

Dendrocerus flavipes Kieffer, 1907: 22–23. Holotype ♀, ITALY (MCSN, Genoa) [examined].

Dendrocerus fuscipes Kieffer, 1907: 23–24, pl. 2, fig. 9. Holotype ♂, ITALY (MCSN, Genoa) [examined].

[Synonymized by Dessart, 1978: 181.]

Atritomellus flavipes (Kieffer) Kieffer, 1914: 143–144.

FEMALE. Scape elongate, longer than maximum breadth of thorax or antennal segments II, III and IV together. Scape brown but often lighter ventrally at base. AIII long, clearly longer than pedicel or AIV. Distal flagellar segments approximately as broad as scape. Flagellar segments with median groove, flat ventrally. Flagellum brown, papillate, with short pubescence.

Head alutaceous; brown but clypeus usually yellow, palps and mandibles yellow or colourless, teeth of mandibles red-brown. Eyes large, 0.65–0.75 times as long as lateral length of head. Pubescence short. Interantennal carina absent or indicated only by dark line. Frons alutaceous. Ocellar triangle broad, lateral ocelli slightly closer to eyes than to median ocellus. Preoccipital crescent present, with a fine vertical furrow centrally. Head rounded, not strongly transverse; pubescence short.

Thorax elongate, laterally compressed (L/B = 1.6–1.9), clearly narrower than head; generally alutaceous, brown to testaceous (sometimes bicoloured: brown with pronotum and mesonotum testaceous). Pronotum always testaceous dorsally and testaceous laterally, at least in anterior region. Propleura testaceous. Anterior margin of mesonotum clearly defined. Notaulices not reaching posterior mesonotal margin, fading out immediately after bend although, in specimens with light coloured mesonotum, their continued path is sometimes indicated by faint line. Secondary furrows distinct. Axillae strongly curved downwards. Scutellum narrow, highly arched, sometimes flattened centrally. Propodeal carinae united to form small median projection. Legs pale yellow to light brown except claws and last tarsal segments which are brown.

Forewing with brown transverse band under pterostigma and radius. Pterostigma semioval, not broad. Radius not sharply curved. Pubescence short; fringe occasionally hard to distinguish.

Gastral collar colourless or light yellow, strongly contrasting with rest of gaster, which is brown; broad with many fine carinae. Gaster long and narrow.

MALE. As for female except scape short, approximately same length as AIII, certainly shorter than AII plus AIII; broad, about 2.5 times as long as broad. Basal flagellar segments broad, strongly asymmetrical (Fig. 30), distal segments cylindrical. Antenna papillate, uniformly dark, pubescence shorter than maximum breadth of segment, pubescence of scape very short. Eyes not elongated. Frons broad; preoccipital crescent clearly developed, reaching ocelli and nearly reaching margin of eye. Body darker than female, black or brown. Wings colourless. Legs brown, distal ends of femora, tibiae and tarsi sometimes lighter. Abdominal collar dark.

REMARKS. *D. flavipes* is known only from females and *D. fuscipes* only from males. Dessart (1972a: 153) described a ♀ of *fuscipes* which is a female of *D. halidayi*, as the wings are not clearly smoked and the body coloration is uniform. The strong sexual bicoloration found in *D. flavipes* is unusual in *Dendrocerus* but it does also occur in *D. indicus* and possibly some African species. *D. flavipes* is similar in thoracic shape and to a lesser extent in general coloration to females of *D. halidayi*, and to *D. laticeps* and *D. laevis* in having the notaules only present anteriorly, but the last two species are darker and have a much broader thorax. *D. flavipes* is here recorded for the first time from Great Britain.

BIOLOGY. Dessart (1978: 177) recorded *D. flavipes* from *Coniopteryx esbenpeterseni* (Neuroptera). *D. flavipes* has been found on *Aesculus hippocastanum*, *Crataegus* and *Quercus robur*, and under *Fagus sylvatica*. Collected mostly in July and August.

MATERIAL EXAMINED

Dendrocerus flavipes Kieffer, holotype ♀, **Italy**: Genoa, '75', vi.1900 (*Borgioli*) (MCSN, Genoa). *Dendrocerus fuscipes* Kieffer, holotype ♂, **Italy**: Genoa, '105', vi.1900 (*Borgioli*) (MCSN, Genoa).

6 ♂, 10 ♀, **Great Britain**. Berkshire: Slough; Devon: Heathfield; Greater London: Kew; Hampshire: Shawford; Hereford and Worcester: Burghill; Kent: Eynsford; Northamptonshire: Spratton; Surrey: Ashstead, Oxshott Woods, Weybridge; Sussex: Eridge Park. **Ireland**: Wicklow, Dowry and Athdown. **Sweden**: Ö1... [label illegible, slide No. 6911/062] (ZI, Lund). **Yugoslavia**: Dalmatia, Korčula.

FURTHER DISTRIBUTION. France (Dessart, 1972a: 156); Germany (Hellén, 1966: 14); Switzerland (Dessart, 1972a: 156); doubtfully (see Dessart, 1972a: 142) Finland (Hellén, 1966: 14).

Dendrocerus halidayi (Curtis)

(Figs 32, 45, 63)

Ceraphron halidayi Curtis, 1829a: 249, fig. Holotype ♂, IRELAND (NMI, Dublin) [examined].

Megaspilus halidayi (Curtis) Stephens, 1829: 401.

Dendrocerus lichtensteinii Ratzeburg, 1852: 181. Syntype(s), no locality (lost). [Synonymized by Dessart, 1966: 5.]

Ceraphron damicornis Foerster, 1856: 146. Nomen nudum. ['Synonymized' by Kieffer, 1907: 20.]

Ceraphron callicerus Thomson, 1858: 292. Holotype ♂, SWEDEN (NR, Stockholm) [examined]. [Synonymized by Dessart, 1966: 5.]

Lygocerus halidayi (Curtis) Marshall, 1868: 158.

Lygocerus halidayii Marshall, 1873: 3. [Unjustified emendation.]

Dendrocerus halidayi (Curtis) Dessart, 1966: 5.

[*Dendrocerus fuscipes* Kieffer; Dessart, 1972a: 153. Misidentification.]

FEMALE. Scape (Fig. 63) long and thin (L/B 5.5–6.5), nearly as long as AII, AIII, AIV and AV together. AIII longer than AIV. AII and AIII longer and less broad (L/B 2.0–3.5) than rest of flagellum, which is relatively thick (L/B 1.2–1.5). Flagellar segments ventrally flattened. Antenna mostly coriaceous; brown, base of scape clear brown, distal segments darker brown; pubescence short, dense and evenly distributed.

Head alutaceous pubescence short, eye pubescence very short; brown, slightly darker than thorax or base of gaster. Mandibles brown with darker teeth, palps colourless. Head rounded, not transverse but clearly broader (1.3–1.4 times broader) than thorax. Interantennal carina present, with horseshoe-shaped depression linking toruli. Ocellar triangle broad and shallow, ocelli almost in line. Depression in front of median ocellus conspicuous, lateral depressions joined by groove running behind ocelli. Preoccipital crescent present but not strongly developed, not reaching margin of eye. Crescent with central furrow.

Thorax brown; alutaceous; with short pubescence except for tuft of long hairs on propodeum above hind coxa; long and thin (L/B 1.5–2.0), clearly narrower than head. Notaulices distinct anteriorly before bend but indistinct or, more often, absent posteriorly. Axillae strongly downcurved. Scutellum long, thin and highly arched, 1.6–1.8 times longer than broad. Metanotum reduced; salient median fovea present between metanotum and propodeum. Propodeum obliquely down-curved, shiny, with large carinae and fine alutaceous sculpture. Legs brown, darkest on hind coxa and lightest on anterior tibia. Wings almost hyaline, pterostigma semioval, radius thin, vannal lobe absent.

Gaster mostly smooth and brown, anterior half slightly lighter brown; long and thin (L/B 1.9–2.4), clearly longer than thorax. Gastral collar dorsally with few short carinae, often only four, and with small tuft of long hairs on each side.

MALE. As for female except scape short and broad (L/B 3.0–3.6). AIII and AIV short, even with AII they are shorter than scape (Fig. 32). AVI and AVII very long (L/B 6.0–9.5). Segments AIII to AVI each with long projection, which is slightly swollen apically (Fig. 32). On AIII to AVI the projections are longer than segments, but projection on AVII shorter than length of segment. AVII is clearly longest segment. AVIII usually with small projection or hump. Antenna with long pubescence, especially on projections; brown but basal half of scape sometimes lighter. Head 1.10–1.25 times as broad as thorax. Preoccipital crescent slightly larger than in female, reaching eyes and ocelli. Notaulices continuous but sometimes faint posteriorly. Pubescence not long but generally dense and obvious. Wings clear.

REMARKS. In his description of *Ceraphron halidayi*, Curtis (1829a: 249) stated that the insect was taken on the 8th August near Holywood (Ireland), that it was in the Haliday collection and that the female was unknown. Dr J. P. O'Connor has searched the Haliday collection for this species and found a specimen which closely corresponds with the original description and figure and also with the accepted concept of *halidayi*. The specimen is unlabelled (except for the registration number 20.2.82) but this is quite normal in the Haliday collection. This specimen is undoubtedly the holotype of *C. halidayi*; thus the neotype designation by Dessart (1972a: 161) was unnecessary.

In the Curtis collection there are two males of *D. halidayi*. As the style of card and label for one specimen is almost certainly that of Haliday, G. E. J. Nixon has labelled it 'probably paratype of *C. halidayi*'.

The antennae of *D. halidayi* males are similar in form to those of *D. ramicornis*; the females of *D. halidayi* and to a lesser extent the males have the thorax and coloration similar to those of *D. flavipes*.

Although the syntype(s) of *D. lichtensteinii* (type-species of the genus *Dendrocerus*) are lost the figure and description clearly show it to be a synonym of *D. halidayi*. Some authors have incorrectly omitted the terminal 'i' of the original spelling '*lichtensteinii*'.

BIOLOGY. *D. halidayi* is a solitary, external parasite within the cocoon of Coniopterygidae (Neuroptera).

Viggiani (1967: 173–175) bred *D. halidayi* from *Semiadalis aleyrodiformis* and the degree of parasitism was 10% or less. He described the parasite larva as orange with a distal terminal digitiform process.

Withycombe (1923: 590–591; 1924: 117) bred a *Lygocerus* sp. from *Conwentzia psociformis*. Because of the close relationship of the two host genera and Withycombe's description of the larva as orange-pink it seems likely that the *Lygocerus* sp. was *D. halidayi*. Withycombe stated that prior to oviposition a small hole was usually torn in the host envelope by the parasite female, but this hole was not always visible. When biting this hole the parasite may also bite or bruise the thorax of the larva, 'probably to prevent pupation'. A single egg is laid alongside the larva, within the cocoon. The parasite larva is fully fed by winter and pupates in early summer, the adult parasite emerging in mid-summer of the second year. Withycombe thought the parasite was single brooded but there was some evidence of two broods.

The neotype and neoparatypes of *D. halidayi* were all bred from *Semiadalis aleyrodiformis* (Dessart, 1972a: 166).

Several specimens have been obtained from galls. Ratzeburg (1852: 181) obtained *D. lichtensteinii* from galls of *Biorhiza pallida* (= *Cynips terminalis*) and specimens of *D. halidayi* have been collected from second year galls of *Biorhiza pallida* on oak. As the *Conwentzia* and *Semiadalis* species listed above are abundant on oak, it is likely that a host cocoon was present on

or in the oak gall. As the second brood of *C. psociformis* often prefers to spin its cocoon in a crevice, it may occasionally choose the inside of an empty gall.

D. halidayi has been collected as early as May, but from the records August appears to be the month of maximum emergence.

MATERIAL EXAMINED

Ceraphron halidayi Curtis, holotype ♂, **Ireland**: 20.11.82 (*Haliday*) [no further data] (NMI, Dublin). *Dendrocerus halidayi* (Curtis), neotype ♂, **Italy**: Portici, vi.-xi.1934 (IRSNB, Brussels). *Ceraphron callicerus* Thomson, holotype ♂, **Sweden**: Dalarne (Boheman) (NR, Stockholm).

5 ♂, 6 ♀. **Great Britain**. Devon: Heathfield, Torquay dist.; Hampshire: New Forest, Denny Wood. **Italy**: Portici (neoallotype and neoparatype of *D. halidayi*) (IRSNB, Brussels). **Sweden**: K 1 [rest of label illegible] (ZI, Lund); Ö. Ö. Mack. (neoparatype of *D. halidayi*) (ZI, Lund); [label illegible] (ZI, Lund); [label illegible] (ZI, Lund); [label illegible] (ZI, Lund); [label illegible] (ZI, Lund); [label illegible] (ZI, Lund).

FURTHER DISTRIBUTION. *D. halidayi* is also known from Germany (East) (Ratzeburg, 1852: 181).

Dendrocerus laevis (Ratzeburg)

(Figs 25, 36, 48, 61)

Ceraphron laevis Ratzeburg, 1852: 180. Holotype ♀, GERMANY (EAST) (IP, Eberswalde) [examined].

Ceraphron frontalis Thomson, 1858: 293. Lectotype ♀, NORWAY (NR, Stockholm), designated by Dessart (1972a: 184) [examined]. [Synonymized by Dessart 1972a: 177.]

Megaspilus laevis (Ratzeburg) Kirchner, 1867: 191.

Atritomus coccophagus Foerster, 1878: 56. Lectotype ♂, GERMANY (WEST) (MNHU, Berlin), designated by Dessart (1972c: 235) [examined]. [Synonymized by Dessart 1972a: 177.]

Ceraphron levis Dalla Torre, 1898: 526. [Unjustified emendation of *laevis* Ratzeburg.]

Atritomus levis: Kieffer, 1905: 256. [Incorrect subsequent spelling of *laevis* Ratzeburg.]

Dendrocerus levis: Kieffer, 1907: 20. [Incorrect subsequent spelling of *laevis* Ratzeburg.]

Atritomellus laevis (Ratzeburg) Kieffer, 1914: 142.

Atritomellus smirnofi Ghesquière, 1960: 208, figs 1–3. Holotype ♂, MOROCCO: Rabat, 8.vi.1949 (*Smirnofi*) (lost). [Synonymized by Dessart, 1972a: 177.]

[*Lygocerus flavipes* Kieffer; Hellén, 1966: 14. Misidentification.]

Dendrocerus applanatus Dessart, 1972a: 59, figs 25–30. Holotype ♂, BELGIUM (IRSNB, Brussels) [examined]. **Syn. n.**

Dendrocerus laevis (Ratzeburg); Dessart, 1972a: 176.

FEMALE. Scape clearly longer than combined length of AII, AIII and AIV, and shorter than maximum breadth of thorax. Pedicel at least as long as AIII, normally much longer. Flagellar segments extremely short, AIV and AV approximately same length, segments AIV to AX only slightly longer than broad. Segments AII, AIII and AIV usually noticeably thinner than following segments. Flagellar segments flat ventrally; black or brown. Scape usually completely dark but occasionally considerably lighter, never with distinct light-coloured basal ring. Old specimens often uniformly light brown or yellow.

Head finely alutaceous or smooth; pubescence short; brown or black, mandible colour lighter than that of head, mandibular teeth red or brown, palps testaceous. Head relatively broad, wider than thorax; transverse when viewed anteriorly. Interantennal carina present but not developed. Groove directly behind lateral ocelli almost absent. Preoccipital crescent always present and normally strongly developed, often reaching margin of eye. Preoccipital crescent often gives apex of head, when viewed laterally, sharply angled appearance.

Thorax finely alutaceous; brown (testaceous in some faded specimens); pubescence short; not elongate (L/B 1.1–1.4). Mesonotum very short, considerably wider than long. Anterior margin of mesonotum not sharply angular. Median furrow present, notaulices not reaching posterior mesonotal margin, but fading out near bend. Mesonotum sometimes flattened dorsally, especially in central region. Secondary furrows not usually visible. Scutellum variable, often broad and shallowly arched, or narrow and almost flat; arching occasionally more pronounced. Median propodeal projection weakly developed. Propodeum sharply sloping laterally, posterior propodeal carina strongly developed. Leg coloration varies from dark black or brown on proximal segments of posterior legs to light brown or yellow on distal segments of anterior legs. Tarsal segments often slightly darker than preceding segments.

Wings clear, fringe obvious. Pterostigma often semiovoid, shape of pterostigma variable, especially in depth. Radius shallowly curved.

Gaster broad (L/B 1.2–1.9), smooth. Gastral collar short, mid lateral length less than 0.04 mm. Gastrocoeli often indistinct. Ovipositor relatively long.

Overall body length under 1.5 mm, often much smaller.

MALE. As for female except scape short, about equal to length of eye, longer than combined length of AII and AIII. Flagellar segments short (e.g., L/B for AIII 1.5–2.5). Segments AIV, AV, AVI and AVII approximately equal in length, AIII slightly larger. Flagellar pubescence very long, often as much as twice breadth of segment. Flagellum serrate, sometimes strongly serrate. Parameres short, thick, with blunt termination.

REMARKS. *D. laevis* is here recorded for the first time from Great Britain.

Dessart (1972a: 59) described *D. applanatus* which, apart from a flattened thorax, was 'virtually deprived of other salient characters'; he separated it from *D. laevis* by the flattened thorax, the shape of the male genitalia and the degree of development of the preoccipital crescent. Such small differences are of no more than infraspecific value. Flattening of the thorax can occur in *D. laevis* (also to a much lesser extent in *D. laticeps*) but this character and the degree of development of the preoccipital crescent are quite variable. The holotypes of *D. laevis* and *D. applanatus* are merely opposite extremes of one species.

The type-locality of *Ceraphron frontalis*, Dovre fjell, is in Norway, but many authors give the locality as being in Sweden.

D. laevis is closely related to *D. laticeps*; both are broad species with short notaulices. The elongate antennae and greater size of *D. laticeps* distinguish it from *D. laevis* but small specimens are difficult to recognize.

D. laevis has been only rarely collected but it is probably more common than the records suggest. It is one of the smallest species in the genus.

BIOLOGY. The original host record published by Ratzeburg (1852:180) of *Cecidomyia salicina* (=probably *Rhabdophaga rosaria*) is unlikely and the true host, a coccid or an aphid, may have been overlooked.

D. laevis has been recorded from both the Coccoidea and the Aphidoidea.

Coccoidea records. Foerster (1878:56) recorded *Atritomus coccophagus* from a coccid on *Acer*. Ghesquière (1960:206) gave the hosts of *Atritomellus smirnoffi* from Morocco as *Eriococcus araucariae* (Eriococcidae), *Planococcus citri* and *P. longispinus* [= *adonidum*] (Pseudococcidae) via the following primary parasites, *Leptomastidea abnormis* [= *aurantiaca*] *Tetracnemus diversicornis* and *Microterys silvestrii* [?] (Chalcidoidea, Encyrtidae). *A. smirnoffi* was most common in the autumn and its life-cycle was 30–35 days. In the BMNH are 1 ♂ and 4 ♀ of *D. laevis* bred from *Heterococcus nudus* (Pseudococcidae) on *Holcus* sp. Viggiani (1970:58) has recorded *D. laevis* as a parasite of *Pseudococcus fragilis*.

Aphidoidea records. Ivanova-Kazas (1955:151) recorded *D. frontalis* from *Hyalopterus pruni* (= *H. arundinis*) on Spanish reed. Evenhuis (1964:229; 1966:39; 1968:113) recorded *D. frontalis* from *Metopolophium albidum*, *Dysaphis angelicae*, *D. plantaginea*, *Aphis pomi*, *Rhopalosiphum insertum* and *Sitobion avenae*. In the case of *Aphis pomi* the primary parasite was *Binodoxys angelicae*. The hyperparasites generally appeared late in the season.

Dessart (1972a: 149, 185) questioned all the above records from aphids and considered *D. laevis* to be solely a hyperparasite of coccids. I have, however, seen specimens of *D. laevis* bred from *Aphis pomi* / *Binodoxys angelicae* / apple and *Tuberculoides annulatus* / *Trioxys pallidus* / *Quercus robur*, and Takada (1973:7) has recorded it from *Shivaphis celti* / *Trioxys shivaphis* / *Celtis* sp.

The *Shivaphis* and *Tuberculoides* records are respectively typical of the Far Eastern and European deciduous forest faunistic complexes. All the aphids listed above are recorded from deciduous trees except *Hyalopterus pruni* on Spanish reed.

The aphids are Aphididae and Callaphididae and include gall-forming species. Apart from *Binodoxys* listed above, *Ephedrus persicae* is a likely host for *D. laevis*, as it is a parasite of *A. pomi*, *H. pruni* and *Dysaphis* spp.

D. laevis has been collected from May to September and the data labels of the material examined indicate that emergence is at a maximum in July and August.

MATERIAL EXAMINED

Ceraphron laevis Ratzeburg, holotype ♀, **Germany (East)**: '147d laevis Rtz' (IP, Eberswalde). *Ceraphron frontalis* Thomson, lectotype ♀, **Norway**: 'alp' (*Boheman*) (NR, Stockholm). *Atritomus coccophagus* Foerster, lectotype ♂, **Germany (West)**: '*Atritomus coccophagus* m, Cocc., Aceris' [no further data] (MNHU, Berlin). *Dendrocerus applanatus* Dessart, holotype ♂, **Belgium**: 'Knokhe, Fauchage prairie, 12.vii.1967' (*Dessart*) (IRSNB, Belgium).

11 ♂, 24 ♀. **Germany (West)**: same data as lectotype (MNHU, Berlin) (paralectotypes of *Atritomus coccophagus* Foerster). **Great Britain**. Berkshire: Silwood Pk; Cheshire: Abbots Moss; Cumbria: Skirwith (MM, Manchester); Greater London: Acton, New Malden, Wimbledon Common; Hampshire: Heckfield Heath. **Ireland**: Wicklow, Devil's Glen. **Italy**: Duino, Triest. **Netherlands**: Bennekom; Tiel. **Sweden**: Skåne, Röstanga; Nörke, Markkärret (ZI, Lund), [label unreadable] (ZI, Lund) (paratypes of *Dendrocerus applanatus* Dessart). **Switzerland**: Geneva (IRSNB, Brussels) (allotype of *Ceraphron laevis* Ratzeburg).

FURTHER DISTRIBUTION. Finland (Hellén, 1966:15); France (*Dessart*, 1972a:185); Japan (Takada, 1973:6); Morocco (Ghesquière, 1960:208); U.S.S.R. (Ivanova-Kazas, 1955:150).

Dendrocerus laticeps (Hedicke)

(Figs 15, 26, 34, 47, 60)

Atritomellus laticeps Hedicke, 1929:60–61, figs 1, 2. Holotype ♂, GERMANY (EAST) (lost) (MNHU, Berlin).

Neotype ♂, GERMANY (EAST), designated by *Dessart* (1972c:235) (MNHU, Berlin) [examined].

Lygocerus laticeps (Hedicke) Hellén, 1966:15.

Dendrocerus laticeps (Hedicke) *Dessart*, 1972a:186.

FEMALE. Scape approximately equal to combined lengths of AII, AIII and AIV, not as long as maximum breadth of thorax and broader than rest of antenna. AIII longer than AII (in female paratype nearly equal). Pedicel long. AIII long and thin, about 3 times as long as broad, distal flagellar segments broader, less elongate, with flat area ventrally. AIV sometimes slightly asymmetrical. Scape never completely dark, normally (when viewed dorsally) with distinct light-coloured basal ring, but this sometimes indistinct. Flagellum black or brown. Pubescence rather short.

Head broad; alutaceous; pubescence short; usually black, mouthparts brown or yellow, mandibular teeth red. Eyes usually large. Interantennal carina distinct and sinuate. Ocellar triangle broad and short, lateral ocelli well separated from eyes. Depression anterior to median ocellus large, lateral depressions often extended to form groove running behind ocelli. Preoccipital crescent present but weakly developed, clearly separated from margin of eye. Occipital carina strongly developed.

Thorax usually black, sometimes brown; broad (L/B 1.1–1.4). Notaulices very distinct but present only anteriorly, disappearing immediately after bend. Median furrow distinct. Axillae not strongly curved downwards. Scutellum broad, only strongly arched in small specimens. Anterior metanotal margin with conspicuous furrow passing under apex of scutellum. Propodeum posteriorly with prominent, sparsely crenulate furrow. Median propodeal projection weakly developed. Lateral thoracic segments bordered by conspicuous foveolate or crenulate furrows. Legs usually yellow, sometimes darkened proximally, especially on outside of hindlegs.

Wings clear, pubescence long, fringe long and obvious. Pterostigma noticeably semioval, long and thin. Radius evenly curved.

Gaster broad (L/B 1.2–1.8), mostly smooth. Gastral collar large with prominent carinae. Gastrocoeli visible as light or alutaceous patches.

MALE. As for female except interantennal carina and preoccipital crescent sometimes less distinct. Axillary depression less obvious. Wings slightly and legs considerably darker. Scape always longer than length of eye; alutaceous; pubescence short. Flagellum elongate (AIII long, L/B 2.4–3.0); weakly serrate (AIII almost evenly cylindrical); papillate, especially distally; pubescence long, longer than breadth of segment, except on terminal segment. Parameres long, thin and distally rounded.

REMARKS. Hedicke described this species from two males and two females, retained the holotype male and the allotype in his own collection, and donated the two other paratypes to the MNHU, Berlin. *Dessart* (1972c:235), unable to find the holotype or allotype, designated a male paratype as a neotype.

The paratypes do not agree entirely with the original description and figures as regards the length of the scape, the termination of the radius and the shape of AIII in the female; these discrepancies

are nevertheless within the limits of variation of *D. laticeps*. The paratypes are lighter and slightly smaller than is normal for the species.

D. laticeps is closely related to *D. laevis*; both are broad species with short notaulices. The elongate antennae and greater size of *D. laticeps* distinguishes it from *D. laevis*, but small specimens can be difficult to identify. *D. laticeps* is unusually variable in body length, ranging between 1–2 mm. It is the most frequently collected species which has incomplete notaulices. *D. laticeps* is here recorded as British for the first time.

BIOLOGY. The original record: 2 ♀, 2 ♂, *Stenopelmus rufinasus* [Coleoptera] /—/ *Azolla filliculoides*, 25.x.–1.xi.1927 published by Hedicke (1929:59), has been strongly doubted by Dessart (1972a:192; 1972c:235). This single coleopterous record seems unlikely, and aphids were probably present but overlooked.

2 ♂, 3 ♀, *Acyrtosiphon nipponicus* / *Aphidius amamioshimensis* / *Paederia scandens mairei* (Takada, 1973:6); 1 ♂, Aphidiid sp. / *Aphidius* sp. / *Beta vulgaris rapa* (Takada, 1973:6); *Aphis gossypii* / *Lysiphlebia japonica* /— (Takada, 1976:237); 2 ♀, *Aphis pomi* / *Binodoxys angelicae* / *Malus sylvestris mitis*, 25.vii.1962 and 28.viii.1963; *Brevicoryne brassicae* / *Diaeretiella rapae* /— Takada, 1976:237); 1 ♀, *Brachycaudus helichrysi* /—/ *Chrysanthemum parthenium*, 9.vi.1915; 1 ♂, *Capitophorus* sp. *Ephedrus persicae* / *Elaeagnus umbellata* (Takada, 1973:6); *Cavariella* sp. / *Aphidius salicis* / *Selinum carvifolia*, 21.vi.1961 (Starý, 1977:3); *C. aegopodii* /—/ *Daucus* sp., 11.vi.1970 (Dessart, 1972c:236); *C. theobaldi* / *Aphidius salicis* / *Heracleum* sp., 16.vii.1974 (Starý, 1977:3); *Chromaphis juglandicola* / *Trioxys pallidus* / *Juglans regia*, 2.viii.1958 (Starý, 1977:3); *Coloradoa* sp. / *Lysaphidus arvensis* / *Artemisia vulgaris*, 28.vii.1960 (Starý, 1977:3); 1 ♀, *Lipaphis ?erysimi* /—/—, 22–28.x.1971; *L. erysimi* / *Diaeretiella rapae* / *Raphanus sativus* (Takada, 1973:6); 1 ♀, *Macrosiphoniella grandicauda* / *Aphidius longipetiolus* / *Artemisia* sp. (Takada, 1973:6); 1 ♀, 2 ♀, *Macrosiphum akebiae* / *Aphidius picipes* / *Oryza sativa* (Takada, 1973:6), *M. euphorbiae* /—/ *Solanum tuberosum*, 12.vi.1970 (Dessart, 1972c:236); 1 ♂, 1 ♀, *Microlophium carnosum* /—/ *Urtica dioica*, 25.vii.1962–28.viii.1963; 3 ♂, 8 ♀, *Myzus persicae* / *Aphidius gifuensis* / *Raphanus sativus* (Takada, 1973:6); 4 ♂, 3 ♀, *M. persicae* / *Diaeretiella rapae* / *Raphanus sativus* (Takada, 1973:6); *Periphyllus hirticornis* / *Trioxys falcatus* / *Acer campestre*, 25.vii.70 (Starý, 1977:3); 1 ♂, 1 ♀, *Rhopalosiphum padi* / Aphidiid sp. / *Triticum aestivum* (Takada, 1973:6); *R. padi* [*Macrosiphum padi* error?] / *Aphelinus chaonia* / *Prunus padus*, 26.ix.1968 (Dessart, 1972c:236); *R. padi* / *Aphelinus daucicola* / *Poa annua*, 19.x.1970 (Dessart, 1972c:236); *R. padi* / *Aphidius* sp. / *Poa annua*, 19.x.1970 (Dessart, 1972c:236); *R. padi* / *Ephedrus plagiator* / *Poa annua*, 19.x.1970 (Dessart, 1972c:236); *R. padi* / *Trioxys auctus* / *Poa annua* 11.x.1970 (Dessart, 1972c:236); 1 ♀, *Staegeriella necopinata* /—/ *Galium verum*, 7.vii.1915; *Sitobion avenae* /—/— vi.–vii.1976; 1 ♂, *Toxoptera odinae* / *Ephedrus plagiator* / *Pittosporum tobira* (Takada, 1973:6); 9 ♂, 14 ♀, —/ *Binodoxys sinensis* /—, 29.viii.1974; 1 ♀, —/—/ *Crataegus* sp., 3.ix.1977; 6 ♀, —/—/ *Vicia* sp., 1–9.viii.1974.

The host records *Aphis pomi*, *Chromaphis juglandicola* and *Periphyllus*, parasitized by *Trioxys* or *Binodoxys*, are typical of the European deciduous forest faunistic complex; the two last-mentioned aphids are the only non-Aphididae recorded. There are no conifer aphids in the host list but the Aphididae are widely represented. The Far Eastern deciduous forest faunistic complex is represented by the *Myzus persicae* / *Aphidius gifuensis* record. The *Coloradoa* sp. record is typical of the Eurasian steppe faunistic complex, although *Artemisia vulgaris* is also found in hedgerows and waste ground, etc. Several leaf curling aphids are hyperparasitized by *D. laticeps*, e.g. *Rhopalosiphum padi* / *Ephedrus plagiator*. The two *Aphelinus* (Chalcidoidea) records are from late in the year.

The plant records include trees, shrubs, herbs, crops and grasses, thus extending the field and intermediate habitat distribution recorded by Takada (1973:15). One specimen of *D. laticeps* was collected in a salt marsh.

From the material examined, July to September appears to be the time of maximum emergence.

MATERIAL EXAMINED

Atritomellus laticeps Hedicke, neotype ♂, **Germany (East):** 'Schönebecke [Elbe], aus *Stenopelm. rufinasus* 1.xi.1927' (Manzeck) (MNHU, Berlin).

25♂, 56♀. **China:** Foochow. **Channel Islands:** Jersey, St. Aubins. **Germany (East):** same data as neotype (MNHU, Berlin) (paratype of *Atritomellus laticeps* Hedicke). **Great Britain:** Bedfordshire: Steppingley (Chambers coll.), White Lane, Odell (Chambers coll.); Berkshire: Hamm Wood; Devon: Newton Abbot; Greater London: Battersea Fields (UM, Oxford), Coulsdon, Kew; Hertfordshire: Rothamsted (Rothamsted Exp. Stn.); Royston; Humberside: Spurn (MM, Manchester); Isles of Scilly: Bryhr; Norfolk: Foulden Common, North Wooton; Northamptonshire: Spratton; Oxfordshire: Oxford (UM, Oxford), Shotover Hill (UM, Oxford); Suffolk: Barton Mills, Santon Downham; Surrey: Dorking, Esher Common; Sussex (West): Littlehampton; no further data (UM, Oxford). **Japan:** Honshu, Niigata; Kyoto, Shimogamo. **Netherlands:** De Loete, Hazerswoude (IPO, Wageningen); Tiel.

FURTHER DISTRIBUTION. Belgium (Dessart, 1972a: 192); Czechoslovakia (Starý, 1977: 3); Finland (Hellén, 1966: 15); Germany (West) (Dessart, 1972a: 192); Sweden (Dessart, 1972a: 192).

Dendrocerus liebscheri Dessart

(Figs 17, 27, 42, 52, 56)

Ceraphron tenuicornis Thomson, 1858: 291. Holotype ♀, SWEDEN (ZI, Lund) [examined]. [Primary homonym of *Ceraphron tenuicornis* Boheman, 1832: 332.]

Lygocerus tenuicornis (Thomson) Dalla Torre, 1898: 535.

Dendrocerus liebscheri Dessart, 1972a: 193. [Replacement name for *tenuicornis* Thomson, 1858: 291.]

FEMALE. Scape long (L/B 5.0–7.0); longer than AII, AIII and AIV together; longer than head. AII nearly as long as AIII. AIII thin and relatively long (L/B 2.8–3.2). Rest of flagellar segments stout, relatively elongate, about 1.8 times longer than broad. Flagellum flat ventrally. Pubescence short and dense. Antenna papillate, completely black or at most with slightly light area at apex of AII.

Head alutaceous; pubescence short; black, mandibles black with red teeth, palps clear brown. Depression in front of median ocellus small but deep, depressions by lateral ocelli very small. Interantennal carina absent or sometimes very faintly indicated near toruli. Ocellar triangle broad, short, ocelli almost in line. Vertical furrow present from median ocellus to occipital carina. Preoccipital crescent present, not strongly developed, not reaching eyes.

Thorax approximately 1.5 times longer than broad, slightly flat in profile. Thorax black, alutaceous. Notaulices complete, sharply angled outwards anteriorly, convergent posteriorly, meeting or almost meeting median furrow at scutal suture (Fig. 17).

Median furrow not as deeply marked as notaulices. Secondary furrows often present, relatively long. Axillae strongly downcurved distally. Scutellum about 1.2 times longer than broad, central raised area strongly arched. Propodeum slightly more coarsely sculptured than rest of thorax. Central propodeal fovea normally not strongly developed. Pronotum with Y-shaped furrow but posterior arm of Y faint. Legs mostly dark, joints and tibiae yellow-brown. Wings clear, fringe present, pterostigma large, semiovoid. Radius distinctly curved (Fig. 42).

Gaster about 1.7 times longer than broad, brown or black. Collar prominent, with short carinae. Rest of gaster smooth, becoming alutaceous distally. The gastrocoeli are visible.

MALE. As for female except scape short, very stout, 3–4 times longer than broad, not as long as AII, AIII and AIV together. Segments AIII to AX similar in length but varying in breadth (e.g. L/B for AIV 1.7 and L/B for AX often over 2.5). Basal flagellar segments serrate (Fig. 52). Pubescence of scape short, pubescence of basal flagellar segments much longer than breadth of segment. Antenna sparsely papillate.

Preoccipital crescent larger, almost reaching eyes. Parameres apically broad and truncate (Fig. 27).

REMARKS. This species is similar in appearance to *D. carpenteri* but much less common. *D. liebscheri* is here recorded as British for the first time.

BIOLOGY. *Cinara laricis* / *Pauesia pini* / *Larix* sp., 15.vii.1963 (Starý, 1977: 3); *C. nuda* [*C. pini* or *C. eschlerichi* ?] *P. sp.* / *Pinus sylvestris* (Dessart, 1972a: 200); *C. pectinatae* / *P. infulata* / *Abies alba*, 23.vi.1960 and 22.vi.1974 (Starý, 1977: 3); *C. pilicornis* / *P. sp.* / *Picea excelsa* (Dessart, 1972a: 200); 1♂, 1♀, *C. pinea* / *P. sp.* / *Pinus sylvestris*, 18.viii.1974; 3♂, 9♀, *C. pinea* /—/ *Pinus sylvestris* viii.1977 [5 from 1 mummy]; 1♂, 4♀, *C. pinea* /—/ *Pinus sylvestris* 16.vi.1978; 2♂, 3♀, *C. juniperi* /—/ *Juniperus communis* 14.vii. and 1.viii.1971; *C. sp.* / *P. Pini* / *Pinus sylvestris* 22.vii.1959 and 13.vii.1974 (Starý, 1977: 3); *C. sp.* / *P. pini* / *Pinus sylvestris* (Dessart, 1972a: 200); *C. sp.* / *P. sp.* / *Pinus sylvestris* (Dessart, 1972a: 200); *Protolachnus agilis* / *Diaeretus leucopterus* / *Pinus sylvestris*, 22.vii.1959 and 13.vii.1974 (Starý, 1977: 3); *Protolachnus agilis* /

Praon bicolor / *Pinus sylvestris* 22.vii.1959 and 13.vii.1974 (Starý, 1977:3); *Protolachnus agilis* / *Praon bicolor* / *Pinus sylvestris* (Dessart, 1972a:200); *Schizolachnus pineti* / *Pauesia unilachni* / *Pinus sylvestris*, 13.vii.1974 (Starý, 1977:3); *Schizolachnus pineti* / *Pauesia unilachni* / *Pinus sylvestris* (Dessart, 1972a:200).

Specimens of *D. liebscheri* have been collected in June, July and August and the data indicate a peak in emergence in late July or early August. The above host records are typical of the East Eurasian coniferous forest faunistic complex and to a lesser extent of the West Eurasian coniferous complex. *D. liebscheri* has been recorded only from Aphidiinae parasitizing Lachnid aphids (Lachnidae: Cinarinae) on conifers (Pinaceae or Cupressaceae) except for two records from *Praon bicolor* (Ephedrinae). Although *Praon bicolor* is normally a deciduous forest species (Starý, 1970:314) it is, when parasitic on *Protolachnus* species, a secondary element in the West Eurasian coniferous complex. With the exception of *Praon* all the Aphidiidae listed are specialized parasites of the Lachnidae.

D. liebscheri is the only known gregarious aphid hyperparasite in *Dendrocerus*. Starý (1977:7) recorded as many as eight specimens from a single aphid mummy and I have seen five specimens from one *Cinara pinea* mummy. Both sexes were present in these series and the specimens emerged from the same exit hole in the mummy.

D. liebscheri is a specialized hyperparasite of coniferous forest aphids and although it has only been rarely collected it is probably common where it occurs.

Several of the Aphididae/Aphidiidae relationships recorded above as hosts for *D. liebscheri* are known to occur in the coniferous forests of France, West Germany, Italy and Japan, thus *D. liebscheri* may also be found in these countries.

MATERIAL EXAMINED

Ceraphron tenuicornis Thomson, holotype ♀, **Sweden**: 'Rshn [=Rysjöholm] 20.vi.1857' (ZI, Lund).

7 ♂, 17 ♀. **Germany (East)**: Mirow. **Great Britain**: South Glamorgan: Cardiff; Coed-y-wenallt; Wiltshire: Porton Blake.

FURTHER DISTRIBUTION. Czechoslovakia (Starý, 1977:3).

Dendrocerus punctipes (Boheman)

Ceraphron punctipes Boheman, 1832:332. Holotype ♀, SWEDEN (NR, Stockholm).

Ceraphron parvulum Wollaston, 1858: 26, pl. 4, fig. 8. Lectotype ♀, MADEIRA (BMNH), designated by

Dessart (1972a:223) [examined]. [Synonymized by Dessart, 1972a:213.]

Conostigmus punctipes (Boheman) Kieffer, 1907: 137–138.

Dendrocerus punctipes (Boheman) Dessart, 1972a: 213.

FEMALE. Scape long (L/B over 4.0), slightly longer than AII, AIII and AIV together; brown, lighter brown basally; coarsely coriaceous. AIII clearly longer than AIV. Flagellum flat ventrally; brown; finely coriaceous; pubescence very short.

Head coriaceous; pubescence extremely sparse and short except on clypeus; brown or almost black, palps colourless, mandibles brown-yellow, mandibular teeth red. Eyes large, occupying most of lateral length of head. Eye pubescence very short. Ocular suture narrow. Head rounded, not conspicuously transverse but clearly broader than thorax. Interantennal carina strongly developed, almost straight but slightly sinuate over central hump. Toruli not prominent. Frons, above interantennal carina, almost flat with two shallow depressions above toruli. Frontal dent shallow and indistinct. Depression in front of median ocellus distinct but rather shallow, the depressions in front of lateral ocelli less evident. Depressions of lateral ocelli sometimes linked by faint groove. Ocelli arranged in broad-based isosceles triangle. Preoccipital crescent almost absent, vertical furrow present, starting within ocellar triangle.

Thorax brown, alutaceous, relatively long and narrow. Pubescence short and sparse. Notaulices complete, sharply angular, converging posteriorly but not meeting median furrow. Secondary furrows visible in some specimens. Axillae only strongly curved in outer region. Scutellum broad and flat. Propodeum without any strongly projecting sculpture. Pronotum long with large crenulate furrow. Legs yellow to brown, darkest on coxae. Long hairs present at junction of coxae and thorax. Most of distal half of forewing dark brown, rarely lighter in colour. Apart from few hairs on costal vein, forewing totally without fringe. Hindwing with fringe of long hairs on posterior edge, rest of wing pubescence ultra-short. Pterostigma long and thin, approximately twice as long as broad, with blunt distal edge. Radius about as long as pterostigma. Brachypterous examples have radius shorter than pterostigma.

Gastral collar long with many distinct carinae and several long lateral hairs. Gaster slightly flat dorsally, smooth or alutaceous. Gastrocoeli clearly marked as light patches on brown gaster.

MALE. Unknown.

REMARKS. Wollaston (1958:26) described *Ceraphron parvulum* from an unspecified number of females. Masner (1965: 17) listed four female specimens of *C. parvulum*, 'one of which bears a BMNH type label'; Dessart (1972a: 273) designated the latter specimen as lectotype and the three others as paralectotypes.

Dendrocerus and *Conostigmus* are extremely difficult to separate and *D. punctipes* shows clear affinities with both genera. The notaulices of *D. punctipes* indicate a place in *Dendrocerus* but its flat scutellum and general appearance are similar to one group of species in *Conostigmus*. Brachypterous forms are rare in *Dendrocerus*, only occurring occasionally in *D. dubiosus* and *D. punctipes*, but are relatively common in *Conostigmus*. When the male is discovered the characteristics of its antennae should enable the generic placement of the species to be clarified. Like *D. punctipes*, *D. wollastoni* (Dodd) from St Helena has the forewing pubescence reduced, but the two species are definitely not conspecific. *D. punctipes* is rarely collected; it is here recorded as British for the first time

BIOLOGY. Unknown. Specimens have been collected from June to September.

MATERIAL EXAMINED

Ceraphron parvulum Wollaston, lectotype ♀, **Madeira**: '55.7' (Wollaston).

7 ♀. **Great Britain**. Berkshire: Windsor Forest; Devon: Torquay dist.; Surrey: Oxshott. **Madeira**: (paralectotypes of *Ceraphron parvulum* Wollaston). **Sweden**: Or. Sommarro (ZI, Lund).

FURTHER DISTRIBUTION. Algeria (Dessart, 1979: 34); Finland (Hellén, 1966: 19); Germany (West) (Dessart, 1972a: 223); Norway (Dessart, 1972a: 223).

Dendrocerus pupparum (Boheman)

(Figs 8, 29, 44, 54)

Ceraphron pupparum Boheman, 1832: 333–334. Holotype ♀, SWEDEN (NR, Stockholm) [examined].

Ceraphron ancyloneurus Ratzeburg, 1844: 217. Syntype(s), [GERMANY]: ex *Syrphus* larvae (Saxesen) (lost). [Synonymized by Dessart, 1972a: 224].

Ceraphron puparum: Thomson, 1868: 292–293. [Incorrect subsequent spelling of *pupparum* Boheman.]

Lygocerus puparum (Boheman) Dalla Torre, 1898: 534. [Unjustified emendation of *pupparum* Boheman.]

Lygocerus syrphidarum Kieffer, 1907: 35–36. Lectotype ♀, FRANCE: 'April ex Syrphidae pupae' (Carpentier) (MP, Amiens), designated by Dessart (1974b: 401). [Synonymized by Dessart, 1972a: 224.]

Dendrocerus puparum: Dessart, 1972a: 223. [Incorrect subsequent spelling of *pupparum* Boheman.]

FEMALE. Scape long (L/B over 4.0), nearly as long as AII, AIII and AIV together; thin in basal third and with central swelling; mostly coriaceous but also papillate. AIII longer than AII or AIV. Rest of flagellar segments short and broad (L/B 1.5–1.7), ventrally flat with longitudinal ridge and coriaceous. Antenna black or brown; yellow or light brown within antennal socket; pubescence short and dense distally but longer on three basal segments.

Head alutaceous; pubescence long, up to 0.07 mm (unusually long for this genus), eye pubescence shorter; black or dark brown, mandibles brown with red teeth, palps clear-brown; strongly transverse, in dorsal view slightly biconvex about midline. Frons behind interantennal carina with U-shaped depression (as found in *Conostigmus*) but with central hump (unlike *Conostigmus*). Hairs in this area sparse and bent outwards towards eyes. Interantennal carina incomplete; absent medially, or if complete then very weak and indistinct centrally. A groove often present behind the carina, but also absent centrally. Frontal dent large and deep (Fig. 8) with tendency to be linear. Depression in front of median ocellus deep, very close to median ocellus, sometimes slightly prolonged anteriorly. Depressions by lateral ocelli obsolescent. Ocellar triangle very broad, ocelli almost in straight line. Lateral ocelli without posterior groove. Preoccipital crescent present but poorly developed, not reaching eyes or ocelli. Vertical furrow starts as prominent depression between lateral ocelli. Occipital carina slightly prominent centrally.

Thorax alutaceous, black or dark brown, pubescence long. Mesonotum broad, anterior corners sharp, not rounded. Notaulices sharply curving outwards anteriorly; converging posteriorly; deeply impressed (median furrow not as deeply marked). Four very short secondary furrows present on mesonotum. Scutellum broad.

Transverse furrow of metanotum deep and foveolate. Propodeal carinae prominent with pronounced central ridge and fovea. Y-shaped furrow on pronotum strongly developed. Legs proximally brown, becoming light brown or yellow distally, hind coxa always brown.

Forewing with small brown area under radius. Radius very shallowly curved, almost straight. Pterostigma long and broad (L/B about 1.7), distinctively rounded (Fig. 44). Wing pubescence long, especially on costal vein, fringe absent centrally from hind margin of forewing.

Gaster brown-black, alutaceous, dorsally flat and ventrally swollen. Gastral collar broad, fluted, with short strong carinae and long lateral hairs

MALE. As for female except scape about as long as AII plus AIII. Flagellar segments not strongly serrate; strongly papillate; densely pubescent, but hairs shorter than breadth of segment; broad, AIV to AIX about twice as long as broad (Fig. 54). Radius slightly shorter than in females. Wings not coloured. Parameres long, projecting from end of gaster and distinctively expanded upwards apically (Fig. 29).

REMARKS. *D. pupparum* is probably most closely related to *D. basalis* (unrecorded in Britain) which is easily distinguished by coloration. The hind coxa of *D. basalis* females is black/brown on the proximal half and yellow on the distal half. The scape of the males is yellow.

The holotype of *Ceraphron pupparum* Boheman was labelled in error by Dessart & Sundholm as the 'lectotype of *Ceraphron puparum* Thomson'.

BIOLOGY. A parasite of Diptera, Syrphidae. Ratzeburg (1844:217) recorded *C. ancyloneurus* from *Syrphus* larvae and Kieffer (1907:36) recorded *L. syrphidarum* from a Syrphid puparium as did Dessart (1972a:232). Régnier (1923:174) listed *Syrphus ribesii* and *Episyrphus balteatus* (= *Syrphus balteatus*) as hosts, and Boheman (1832:333) also gave *Syrphus ribesii* (= *Scaeva ribesii*) as a host. One specimen in the BMNH was bred from an *Episyrphus balteatus* puparium. Bankowska (1975:312) recorded *D. pupparum* on *Medicago sativa*. Both the above-mentioned Syrphids are common in Britain. *D. pupparum* has been found on the following plants: *Armoracia rusticana*, *Crataegus oxyacanthoides*, *Pinus* sp. *Quercus robur* and *Sambucus niger*, and has been collected between May and September.

MATERIAL EXAMINED

Ceraphron pupparum Boheman, holotype ♀, Sweden: 'Sm. Bhm' [Boheman] 'Lectotypus *C. puparum* Thomson design. Dessart et Sundholm, 1965' (NR, Stockholm).

5 ♂, 17 ♀. **Belgium:** Kessel, Antwerp Prov. **Great Britain.** Bedfordshire; Buckinghamshire: Slough; Cambridgeshire: Ent. Fld. Lab. Storeys Way (*Varley*); Cambridge; Greater London: Kew, Wimbledon; Norfolk: Thuxton (spoliotype [?]) of *Ceraphron pupparum* Boheman, designated by Dessart); Northamptonshire: Spratton.

FURTHER DISTRIBUTION. Algeria (Dessart, 1979:34); France (Kieffer, 1907:35); Finland (Hellén, 1966:14); Germany (Dessart, 1972a:232).

Dendrocerus ramicornis (Boheman)

(Figs 7, 31, 37, 41)

Ceraphron ramicornis Boheman, 1832:329–330. Lectotype ♂, SWEDEN (NR, Stockholm), designated by Dessart (1972a:243) [examined].

Ceraphron ramicornis Zetterstedt, 1838:413. Lectotype ♂, SWEDEN (NR, Stockholm), designated by Dessart (1972a:234, 243) [examined]. [Synonymized by Dessart, 1972a:234.]

Ceraphron glabriculus Thomson, 1858:291. Lectotype ♂, SWEDEN (ZI, Lund), designated by Dessart (1972a:234) [examined]. [Synonymized by Dessart, 1972a:243.]

Lygocerus ramicornis (Boheman) Marshall, 1868:158.

Lygocerus japonicus Ashmead, 1904:70. Lectotype ♀, JAPAN (USNM, Washington), designated by Masner & Muesebeck (1968:112) [examined]. [Synonymized by Takada, 1973:13.]

Lygocerus ratzeburgi Ashmead, 1904:70–71. Lectotype ♂, JAPAN (USNM, Washington), designated by Masner & Muesebeck (1968:113) [examined]. [Synonymized by Takada, 1973:13.]

Dendrocerus ramicornis (Boheman) Dessart, 1966:5.

FEMALE. Scape long and broad (L/B 4.0–6.0), about as long as AII, AIII and AIV together and much longer than eye; with median swelling and flat ventrally. AIII is longest flagellar segment although AXI can be almost as long. Flagellar segments broad (L/B 1.5–2.0), except AII and AIII (e.g. L/B for AIII 2.0–3.0).

Antenna papillate; pubescence short, much less than breadth of segment; black (or brown in some old specimens), distal end of AII and base of scape often lighter.

Head alutaceous to coriaceous; black, mandibles basally black, yellow near apex, teeth red, palps yellow; pubescence relatively long; strongly transverse. Eyes broad, almost as broad as long. Interantennal carina faintly indicated. Frontal dent and two depressions behind toruli shallow. Depressions by lateral ocelli shallow, crescent-shaped. Median ocellus preceded by small shallow depression. Ocellar triangle very broad, prominent, ocelli almost in line. Lateral ocelli joined posteriorly by groove. Preoccipital crescent strongly developed, coming close to ocelli and close to but not quite reaching margin of eye, sharply angled, especially behind ocelli. Vertical furrow present.

Thorax black (brown in old and faded specimens), alutaceous. Mesonotum broad, anterior mesonotal corners sharply angled due to deep impressions of notaulices. Notaulices complete, but sometimes less distinct posteriorly, sharply angled. Four secondary furrows visible. Scutellum broad but strongly arched. Axillae only strongly curved in outer third. Axillary depression large. Posterior propodeal carina prominent. Furrow present from top of anterior mesepisternal boundary to episternal scrobe. Short trace present of smooth straight precoxal sulcus. Legs mostly light brown, coxae brown-black, often smooth and shiny or weakly alutaceous.

Wings clear. Hindwing with distinct anal lobe (Fig. 37) but indentation of vannal fold smooth and rounded. Pterostigma rounded, radius clearly angled.

Gaster broad but sometimes rather short; flattened dorsally and convex ventrally; smooth or alutaceous; dark brown. Gastrocoeli unusually broad but only faintly indicated as light brown patches. Gastral collar well developed.

A large species, body length 2.1–2.8 mm.

MALE. As for female except scape black; short, about three times longer than broad. AII, AIII, and AIV very short, AVIII longest segment. AIII to AVII each with long projection, longer than segment (Fig. 31). AVIII with small hump, AX and AXI cylindrical. Projection on AVII longer than segment AVIII. Pubescence long. Gaster slightly less broad than in female. Parameres broad with long hairs.

REMARKS. The antennae of *D. ramicornis* males (Fig. 31) are obviously similar to those of *D. halidayi* (Fig. 32), but the former is a darker and larger species.

D. ramicornis Boheman, 1832 was also described as new by Zetterstedt (1838:413). Dessart (1972a:234, 243) has treated them as two synonymous species and designated a lectotype for each.

BIOLOGY. 1 ♂, *Cinara* sp. / *Pauesia* sp. / *Abies firma* (Takada, 1973:14); 1 ♂, 2 ♀, *Cinara* sp. / *Pauesia* sp. / *Chamaecyparis pisifirma* (Takada, 1973:14); 1 ♂, 1 ♀, *Cinara* sp. / *Pauesia momicola* / *Abies firma* (Takada, 1973:14); 1 ♂, *C. laricis* / *P. pini* / *Larix leptolepis* (Takada, 1973:14); 3 ♀, *C. longipennis* / *P. konoi* / *Abies firma* (Takada, 1973:14); 1 ♂, *C. pilicornis* / *P. abietis* /—; 4 ♂, 4 ♀, *C. pinea* /—/ *Pinus sylvestris*; 13 ♂, 25 ♀, *C. pineti* / *P. abietis* / *Pinus densiflora* (Takada, 1973:14); 3 ♂, *Lachniella costata* / *Pauesia jezoensis* / *Picea jezoensis* (Takada, 1973:14); 2 ♂, 2 ♀, *Lachnus tropicalis* / *Pauesia japonica* / *Quercus* sp. (Takada, 1973:14); 2 ♀, *Lachnus* sp. /—/ *Pinus* sp. (Ashmead, 1904:70); [?] *Pineus pini* /—/ (Hellén, 1966:11); *Protolachnus thunbergii* / *Diaeretus leucopterus* / *Pinus thunbergii* (Takada, 1973:14); 5 ♂, *Schizolachnus* sp. / *P. unilachni* / *Pinus densiflora* (Takada, 1973:14); *Tuberolachnus salignus* / *Euneura nawai* /— (Yasumatsu et al. 1946:12); *Tuberolachnus salignus* / *Pauesia salignae* /— (Yasumatsu et al. 1946:12).

The above records are of Aphidoidea: Cinarinae in association with Eurasian coniferous forest and Aphidoidea: Lachninae in association with deciduous forest, thus the host preference of *D. ramicornis* is linked to the Lachnidae rather than the host plant. The *Pineus pini* record seems unlikely as this is the only record from the Adelgidae: also this is a very small aphid compared with the other hosts and *D. ramicornis* is a large species. Ashmead (1904:71) recorded *D. ramicornis* (as *ratzeburgi*) from 'Aphis' but elsewhere he used this to mean just aphid. Yasumatsu et al. (1946:12) indicated that *D. ramicornis* (as *ratzeburgi* and *japonicus*) could be a tertiary parasite of *Tuberolachnus salignus* via Aphidiidae and Chalcidoidea.

From the material examined *D. ramicornis* seems to be most common in July.

MATERIAL EXAMINED

Ceraphron ramicornis Boheman, lectotype ♂, **Sweden**: 'Sc. Bhn.' [Scania (*Boheman*)] (NR, Stockholm), *Ceraphron ramicornis* Zetterstedt, lectotype ♂, **Sweden**: Kengis (NR, Stockholm). *Ceraphron glabriculus* Thomson, lectotype ♂, **Sweden**: 'Rhn' (ZI, Lund). *Lygocerus japonicus* Ashmead, lectotype ♀, **Japan**: Atami

(*Koebele*) (USNM, Washington). *Lygocerus ratzeburgi* Ashmead, lectotype ♂, **Japan**: (*Koebele*) (USNM, Washington).

12 ♂, 9 ♀. **Germany (West)**: Würbenthal. **Great Britain**. Buckinghamshire: Soulbury, Rammamere Heath; Hampshire: New Forest; Highland: Caledonian Forest, Glen Afric; Strathclyde: Beinn Eigh; Surrey: Esher Common. **Japan**: Honshu, Kobe; Honshu, Kyoto; no further data (paralectotype of *Lygocerus ratzeburgi* Ashmead) (USNM, Washington). **Netherlands**: Wageningen. **Spain**: Castellon, Benicasim. **Sweden**: Gtl, Ostergarn, Vike (ZI, Lund); [label illegible] (ZI, Lund).

FURTHER DISTRIBUTION. Finland (Hellén, (1966: 11).

Dendrocerus serricornis (Boheman)

(Figs 43, 53)

Ceraphron serricornis Boheman, 1832:334–335. Holotype ♂, SWEDEN (ZI, Lund) [examined].

Ceraphron serricornis Zetterstedt, 1838:413. Holotype ♂, SWEDEN (ZI, Lund) [examined, same specimen as above]. [Synonymized by Dessart, 1972a: 253.]

Ceraphron piceae Ratzeburg, 1852:179. Syntype(s), GERMANY (lost). [Synonymized by Dessart, 1972a:253.]

Ceraphron lapponicus Thomson, 1858:290. Holotype ♀, SWEDEN (NR, Stockholm) [examined]. [Synonymized by Dessart, 1972a:253.]

Lygocerus serricornis (Boheman) Marshall, 1868:158.

Lygocerus semiramosus Kieffer, 1907:38. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965:21) [examined]. **Syn. n.**

Lygocerus subramosus Kieffer, 1907:39. Syntype(s), FRANCE (lost). [Synonymized by Dessart, 1972a: 253.]

Lygocerus testaceimanus Kieffer; Wilson, 1938:378. Misidentification.]

Atritomellus zetterstedti Ghesquière, 1960:208. [Replacement name for *Ceraphron serricornis* Zetterstedt, 1838.] [Synonymized by Dessart, 1972a:253.]

Ceraphron serraticornis: Ghesquière, 1960:208. [Incorrect subsequent spelling of *serricornis* Zetterstedt.]

Dendrocerus serricornis (Boheman) Dessart, 1966:13.

FEMALE. Scape short (L/B 4.0–4.5), slightly shorter than length of head; longer than AII, AIII and AIV together. In small specimens antennal segments very short and scape often longer than next four segments together. AII about as long as AIII and often longer than AIV. AIII longer than any of following basal segments which are stout (roughly 1.5 times longer than broad). Antenna black except for distal end of AII, which is lighter. Scape coriaceous to papillate, flagellum weakly papillate, pubescence short and dense.

Head coriaceous or alutaceous; pubescence not long but quite noticeable, clypeal hairs long, eye pubescence short; black, mandibles brown with red-brown teeth, palps clear-yellow; rounded (especially in dorsal view), less transverse than in many species of *Dendrocerus*. Interantennal carina variable, sometimes almost absent or just complete, but usually present near toruli and absent over median hump. Depressions behind and inwards from each torulus united to form large, slightly depressed area above interantennal carina. Median hump between toruli gives this depression an appearance similar to the stronger, horseshoe-shaped depression found in some *Conostigmus* species. Frontal dent absent. Depressions near ocelli usually shallow but median depression often deeper in large specimens. Ocellar triangle broad, very short. Lateral ocellar depressions sometimes linked by groove. Vertical furrow present on preoccipital crescent. Preoccipital crescent very strongly developed, reaching ocelli and margin of eye; abruptly angled downwards from vertex. Occipital carina foveolate.

Thorax black (or dark brown in old specimens); often long and narrow, 1.4–1.8 times longer than broad. Anterior corners of mesonotum rounded. In lateral view mesonotum swollen anteriorly; this may be enhanced by a backward slant of pronotum and propleuron. Notaulices complete, four secondary furrows usually distinct. Notaulices very strongly angled anteriorly, almost straight posteriorly except for last fraction where they curve towards midline. Scutellum rather narrow, raised region about 1.4 times longer than wide, clearly arched but sometimes slightly flat dorsally. Metanotal furrow strongly foveolate or canaliculate. Propodeum coriaceous to rugose, appreciably more coarsely sculptured than rest of dorsal surface of thorax. Propodeal fovea not prominent. Pleural suture foveolate, episternal scrobe distinct. Legs black-brown, lighter or clear brown on tibia and tarsus (especially of forelegs). Wings clear, pubescence normal. Radius well curved, about 1.3 times longer than pterostigma. Pterostigma characteristically shaped (Fig. 43), about 1.5 times longer than broad.

Gaster 1.5–2.0 times longer than broad. Gastral collar large with distinct carinae. Gaster mostly smooth or finely alutaceous, gastrocoeli visible. Gaster lighter brown anteriorly, dark brown posteriorly.

MALE. As for female except scape very short, much less than length of head and not as long as combined length of AII, AIII and AIV. Basal flagellar segments strongly serrate (Fig. 53), AIII characteristically shaped, 1.0–1.5 times longer than broad. AIV as long as broad (L/B 0.9–1.2). Flagellar pubescence much longer than breadth of segment. Depression behind interantennal carina less obvious, head more transverse and thorax less rounded than in female.

REMARKS. *D. serricornis* Boheman, 1832 was also described as new by Zetterstedt (1838:413). Dessart (1972a: 253, 261) has treated them as two synonymous species having the same holotype.

The specimens misidentified by Wilson (1938:378) as *Lygocerus testaceimanus* are in the BMNH and are *D. serricornis*, as Dessart (1972a: 254) suspected.

D. serricornis is recognizable by the shape of the male antenna, head and thorax, but females of this species and *D. carpenteri* are sometimes hard to distinguish. The basal flagellar segments of *D. serricornis* males are more strongly serrate than in other British species (except those with ramose antennae, i.e. *D. halidayi*, Fig. 32 and *D. ramicornis*, Fig. 31).

BIOLOGY. Host information indicates that *D. serricornis* is chiefly a parasite of Chamaemyiidae (Diptera) which prey on Adelgidae (Hemiptera).

Wilson (1938:378) reared *D. serricornis* (as *Lygocerus testaceimanus*) from pupae of *Leucopis obscura* (Diptera: Chamaemyiidae) which were preying upon the Adelgids *Pineus pini* (on *Pinus sylvestris*) and *P. strobi* (on *Pinus strobus*). *D. serricornis* can subsequently emerge from the pupae (collected in July) or can diapause and emerge in the following May. *Melanips longitarsis* (Hymenoptera, Cynipoidea) and *Aphidencyrus aphidivorus* (Hymenoptera, Chalcidoidea) were also parasitic on *L. obscura* but *D. serricornis* was the most common parasite. These three parasites seem to be most efficient as Wilson states that 'all the *L. obscura* puparia present in the field from late summer to late winter are parasitized specimens'. In addition to Wilson's records, I have seen a specimen of *D. serricornis* bred from a *Leucopis* sp. puparium found on *Fagus sylvatica*.

Schremmer (1956:58) recorded *D. serricornis* (as *Lygocerus piceae*) as a parasite of *Cremifania nigrocellulata* (Diptera: Chamaemyiidae) which was preying on *Adelges (Dreyfusia) piceae* (Hemiptera, Adelgidae). Delucchi & Pschorn-Walcher (1954:102) recorded *D. serricornis* (= *piceae*) as a parasite of the 3rd larval stage of *Cremifania nigrocellulata*. *Pachyneuron vitodurensis* (= *P. ferrierei* Delucchi) and *P. cremifaniae* (Chalcidoidea, Pteromalidae) were given as parasites of the puparia of *Cremifania*. *D. serricornis* and *P. vitodurensis* were also listed as parasites of *Leucopis obscura* and *L. griseola*. These *Leucopis* species and *Cremifania nigrocellulata* are all predators on related Adelgids. Ratzeburg (1848: 216) recorded *D. serricornis* (as *piceae*) from *Adelges piceae* (*Chermes piceae*).

According to Stary (1970:200) no Aphidiidae have been recorded as primary parasites of Adelgids; if *D. serricornis* is a hyperparasite then it is likely to be via Chalcids, like those mentioned above.

D. serricornis is known from other hosts. Lal (1934:328) recorded *L. semiramosus* as 'believed to be' a hyperparasite of *Prionomitus mitratus* (Chalcidoidea, Encyrtidae) which was in turn a primary parasite of *Psylla peregrina* on *Crataegus*. This chalcid has also been listed as a parasite of other *Psylla* species. The hyperparasites appeared in mid September. One nymph contained three recently hatched *Dendrocerus* larvae. Lal presumed that the *Dendrocerus* 'were acting as tertiary parasites of a secondary parasite, or of their own species'. Haviland (1920b: 103) recorded a similar case. The egg of *serricornis* is long and elliptical, 0.67 × 0.28 mm, the surface sculptured with fine longitudinal striae. The larva, which emerges through an operculum at the end of the egg, is small, creamy white, and measures 0.45 × 0.15 mm.

A male and female of *D. serricornis* in the BMNH were bred from second instars of *Parthenolecanium corni* (Coccoidea) on *Corylus avellana*. *D. serricornis* has been found on the following plants: *Crataegus*, *Humulus lupulus*, *Populus nigra italica* and *Pinus* sp. With the exception of hop all the plant records are of trees or shrubs, and many of the trees are conifers.

Kieffer (1907:39) recorded *L. subramosus* from *Cecidomyia pini* (Diptera, Cecidomyiidae).

From the material examined *D. serricornis* seems to be most common in late July.

MATERIAL EXAMINED

Ceraphron serricornis Boheman and *Ceraphron serricornis* Zetterstedt, holotype ♂ [of both nominal taxa], **Sweden**: 'Joh No' (ZI, Lund). *Ceraphron lapponicus* Thomson, holotype ♀, **Sweden**: Lappland (Boheman) (NR, Stockholm). *Lygocerus semiramosus* Kieffer, lectotype ♂, **Great Britain**: 'Cad' [Strathclyde, Cadder] (Cameron) (BMNH).

35 ♂, 13 ♀, **Great Britain**. Bedfordshire (Chambers coll.); Buckinghamshire: Farnham House; Cheshire: Delamere (MM, Manchester); Cumbria: Skirwith (MM, Manchester); Grampian: Elgin; Greater London: Kew; Hertfordshire: Tring; Kent: Barnehurst, East Malling, Eynsford; Norfolk: North Wooton; Northamptonshire: Spratton; North Yorkshire: Malham Tarn (NM, Manchester); Oxfordshire: Oxford; Suffolk: Santon Downham, Barton Mills; Wiltshire: Corsham. **Ireland**: Co. Dublin, Grand Canal; Leitrim; Co. Wicklow, Killegar. **Japan**: Atami (paralectotype of *Lygocerus koebelei*) (USNM, Washington). **Spain**: Valencia, El Perelló. **Sweden**: Skane, Ring; Ör (ZI, Lund).

FURTHER DISTRIBUTION. Finland (Hellén, 1966:11); France (Dessart, 1972a:266); Germany (Dessart, 1972a:266).

Dendrocerus spissicornis (Hellén)

(Fig. 19)

Lygocerus spissicornis Hellén, 1966: 12. Holotype ♀, FINLAND, (ZMU, Helsinki) [examined].

Dendrocerus spissicornis (Hellén) Dessart, 1972a: 274–281.

FEMALE. Scape short and broad (L/B 3.6–5.0), thinner at base than apex, slightly longer than AII, AIII and AIV together; colour varying from entirely dark to orange-yellow, often lighter basally. AIII thinner (L/B 1.4 or greater) than AIV to AX, which are quadrate. AII and proximal part of AIII often orange-yellow, rest of flagellum brown. Antennal insertion orange-yellow. Flagellar segments flat ventrally with single central ridge. Antenna papillate with dense pubescence.

Head sculpture mostly rugose, large depression above interantennal carina sometimes weakly sculptured but usually strongly strigose. Eye margin smooth. Head black, palps yellow or orange. Mandibles basally black, yellow or orange medially, with red-black teeth. Toruli very short, especially internally. Interantennal carina distinct, often slightly sinuate centrally over small hump. Large depression present above toruli. Depression in front of median ocellus deep and distinct. Depressions near lateral ocelli linear and not joined by ridge running behind ocelli. Preoccipital crescent strongly developed but not quite reaching margin of eye or lateral ocelli, with central vertical furrow. Last segment of maxillary palps much longer than penultimate segment. Hair round mandibles and on clypeus longer than on rest of head.

Thorax black, strongly sculptured, granulate, punctate and rugose; all furrows deeply foveolate. Mesonotum and scutellum flattened but central area between notaulices slightly raised anteriorly. Mesonotum with notaulices complete, reaching posterior margin and meeting median furrow. Notaulices not deeply curved. Secondary furrows evident. Scutellum broad, very flat, with transverse carina apically. Narrow band of strigose sculpture present running parallel to edge of scutellum from axillae to transverse carina. Metanotum reduced, obscured by large bilobed transverse keel situated in middle of propodeum. Femora brown, or black in fresh specimens, tibiae and tarsae lighter.

Wings almost clear but with feeble brown mark around radius; however, one old specimen (c. 1826) has distinct brown cloud under radius. Pterostigma semioval, radius approximately as long as breadth of pterostigma. Fringe short and fine.

Gastral collar broad, very short. Entire breadth of gaster covered by area of strigose sculpture radiating from gastral collar and nearly reaching gastrocoeli (Fig. 19). Rest of gaster smooth or alutaceous.

MALE. As for female except scape longer than segments AII, AIII and AIV together, just over 3 times as long as broad. AII shorter than AIII. AIII about 1.5 times longer than broad. AIV and AV as long as broad. Rest of flagellar segments progressively less broad, AXI being 3 times longer than broad. Basal flagellar segments clearly asymmetrical, especially segments AIV to AVII. Antenna brown except for AII and small light area at base of scape; papillate; with dense pubescence shorter than breadth of segment.

REMARKS. *D. spissicornis* is here recorded as British for the first time. It is generally more grossly sculptured than is usual in *Dendrocerus*, also the notaulices are not as deeply curved as they are in other species of the genus. *D. spissicornis* is rare, at least in collections.

BIOLOGY. Dessart (1972a:281) has seen two specimens of *D. spissicornis* for which the puparia of *Cyclorrhapha* (Diptera) are indicated as hosts. Half of the British specimens so far known were collected on dead beech or oak trees. Dates of collection range from late June to early September.

MATERIAL EXAMINED

Lygocerus spissicornis Hellén, holotype ♀, **Finland**: Nystad (*Hellén*) (ZMU, Helsinki).

1 ♂, 11 ♀. **Great Britain**. Buckinghamshire: Shabbington Wood, nr Oakley; Cheshire: Abbots Moss (MM, Manchester), Rostherne; Hampshire: W. of Winchester, Crab Wood; Surrey: Woodcote (MM, Manchester); no further data (UM, Oxford). **Sweden**: [label illegible,] (ZI, Lund); Upl. Vallentuna (NR, Stockholm) (male allotype).

FURTHER DISTRIBUTION. Belgium (Dessart, 1972a:281); France (Dessart, 1972a:281).

Review of the biology of *Dendrocerus*

The host records for the British species of *Dendrocerus* are here listed under host classification. The basic host relationships of *Dendrocerus* are summarized in tabular form. The biology of the British species is associated mostly with the Homoptera Sternorrhyncha and is typical of the genus as a whole. The faunistic complexes used in this work are briefly defined.

Host aphid list for *Dendrocerus* species

Host	<i>Dendrocerus</i> species
APHIDOIDEA	
LACHNIDAE	
Cinarinae	
<i>Protolachnus</i>	<i>carpenteri, liebscheri, ramicornis</i>
<i>Schizolachnus</i>	<i>carpenteri, dubiosus, liebscheri, ramicornis</i>
<i>Cinara</i>	<i>carpenteri, liebscheri, ramicornis</i>
<i>Lachniella</i>	<i>ramicornis</i>
Lachninae	
Lachnini	
<i>Tuberolachnus</i>	<i>carpenteri, ramicornis</i>
<i>Lachnus</i>	<i>ramicornis</i>
CHAITOPHORIDAE	
Chaitophorinae	
<i>Periphyllus</i>	<i>carpenteri, laticeps</i>
<i>Parachaitophorus</i>	<i>carpenteri</i>
Siphinae	
<i>Sipha</i>	<i>aphidum, carpenteri</i>
CALLAPHIDIDAE	
Callaphidinae	
Callaphidini	
<i>Chromaphis</i>	<i>laticeps</i>
Myzocallidini	
<i>Myzocallis</i>	<i>carpenteri</i>
<i>Tuberculoides</i>	<i>carpenteri, laevis</i>
<i>Eucallipterus</i>	<i>aphidum, carpenteri</i>
<i>Tinocallis</i>	<i>carpenteri</i>
<i>Shivaphis</i>	<i>laevis</i>
<i>Pterocallis</i>	<i>carpenteri</i>
Phyllaphidinae	
Phyllaphidini	
<i>Callipterinella</i>	<i>carpenteri</i>
<i>Betulaphis</i>	<i>carpenteri</i>
<i>Symydobius</i>	<i>carpenteri</i>
<i>Clethrobius</i>	<i>aphidum</i>
<i>Euceraphis</i>	<i>carpenteri</i>
<i>Parachaitophorus</i>	<i>carpenteri</i>
Drepanosiphini	
<i>Drepanosiphum</i>	<i>carpenteri</i>

Therioaphidinae	
<i>Therioaphis</i>	<i>dubiosus</i>
Neophyllaphidinae	
<i>Neophyllaphis</i>	<i>carpenteri</i>
APHIDIDAE	
Pterocommatinae	
<i>Pterocomma</i>	<i>carpenteri</i>
Aphidinae	
<i>Hyalopterus</i>	<i>aphidum, carpenteri, laevis</i>
<i>Rhopalosiphum</i>	<i>aphidum, carpenteri, laevis,</i> <i>laticeps</i>
<i>Schizaphis</i>	<i>aphidum, carpenteri, laevis</i>
<i>Paraschizaphis</i>	<i>aphidum, bifoveatus</i>
<i>Melanaphis</i>	<i>carpenteri</i>
<i>Aphis</i>	<i>aphidum, bifoveatus, carpenteri,</i> <i>dubiosus, laevis, laticeps</i>
<i>Toxoptera</i>	<i>carpenteri, laticeps</i>
Myzinae	
<i>Cryptosiphum</i>	<i>dubiosus</i>
<i>Ceruraphis</i>	<i>carpenteri</i>
<i>Dysaphis</i>	<i>carpenteri, laevis</i>
<i>Brachycaudus</i>	<i>aphidum, carpenteri, laticeps</i>
<i>Diuraphis</i>	<i>aphidum, carpenteri</i>
<i>Hayhurstia</i>	<i>carpenteri</i>
<i>Brevicoryne</i>	<i>carpenteri, laticeps</i>
<i>Pseudobrevicoryne</i>	<i>carpenteri</i>
<i>Lipaphis</i>	<i>carpenteri, laticeps</i>
<i>Hyadaphis</i>	<i>carpenteri</i>
<i>Staegeriella</i>	? <i>laticeps</i>
<i>Toxopterella</i>	<i>carpenteri</i>
<i>Hyalopteroides</i>	<i>dubiosus</i>
<i>Coloradoa</i>	<i>carpenteri, laticeps</i>
<i>Myzaphis</i>	<i>carpenteri</i>
<i>Chaetosiphon</i>	<i>carpenteri</i>
<i>Elatobium</i>	<i>carpenteri</i>
<i>Liosomaphis</i>	<i>aphidum, carpenteri</i>
<i>Cavariella</i>	<i>aphidum, carpenteri, laticeps</i>
<i>Ovatus</i>	<i>carpenteri</i>
<i>Phorodon</i>	<i>carpenteri</i>
<i>Rhopalomyzus</i>	<i>carpenteri</i>
<i>Myzus</i>	<i>aphidum, carpenteri, laticeps</i>
<i>Galiobium</i>	<i>dubiosus</i>
<i>Tuberocephalus</i>	<i>carpenteri</i>
<i>Cryptomyzus</i>	<i>carpenteri</i>
<i>Capitophorus</i>	<i>carpenteri, laticeps</i>
<i>Pleotrichophorus</i>	<i>carpenteri</i>
<i>Nasonovia</i>	<i>carpenteri</i>
<i>Hyperomyzus</i>	<i>carpenteri</i>
<i>Rhopalosiphoninus</i>	<i>bifoveatus, carpenteri, dubiosus</i>
<i>Indomegoura</i>	<i>carpenteri</i>
Macrosiphinae	
<i>Microlophium</i>	<i>aphidum, carpenteri, dubiosus,</i> <i>laticeps</i>
<i>Aulacorthum</i>	<i>carpenteri, dubiosus</i>
<i>Acyrtosiphon</i>	<i>aphidum, bifoveatus, carpenteri,</i> <i>dubiosus, laticeps</i>
<i>Metopolophium</i>	<i>aphidum, carpenteri, laevis</i>
<i>Corylobium</i>	<i>carpenteri</i>
<i>Staticobium</i>	<i>carpenteri</i>

<i>Macrosiphum</i>	<i>carpenteri, dubiosus, laticeps</i>
<i>Sitobion</i>	<i>aphidum, carpenteri, dubiosus, laevis, laticeps</i>
<i>Titanosiphon</i>	<i>carpenteri</i>
<i>Metopeurum</i>	<i>carpenteri</i>
<i>Uroleucon</i>	<i>aphidum, carpenteri, dubiosus</i>
<i>Macrosiphoniella</i>	<i>aphidum, carpenteri, laticeps</i>
<i>Amphorophora</i>	<i>carpenteri</i>
THELAXIDAE	
Thelaxinae	
<i>Mindarus</i>	<i>carpenteri</i>
Hormaphidinae	
<i>Hamamelistes</i>	<i>carpenteri</i>
PEMPHIGIDAE	
Eriosomatinae	
	* —
Pemphiginae	
<i>Prociphilus</i>	<i>carpenteri</i>
ADELGIDAE	
Pineinae	
<i>Pineus</i>	? <i>ramicornis, serricornis</i>
Adelginae	
<i>Adelges</i>	<i>serricornis</i>

* Starý (1977:4) recorded *Dendrocerus* sp. from *Eriosoma ulmi* but the specimens have not been made available for identification.

List of the Aphidiidae (Hymenoptera) parasitized by *Dendrocerus*

Host	<i>Dendrocerus</i> species
APHIDIIDAE	
Ephedrinae	
<i>Ephedrus californicus</i>	<i>carpenteri</i>
<i>E. lacertosus</i>	<i>carpenteri</i>
<i>E. minor</i>	<i>carpenteri</i>
<i>E. nacheri</i>	<i>carpenteri, dubiosus</i>
<i>E. niger</i>	<i>carpenteri, dubiosus</i>
<i>E. persicae</i>	<i>aphidum, carpenteri, laticeps</i>
<i>E. plagiator</i>	<i>aphidum, carpenteri, dubiosus, laticeps</i>
<i>E. salicicola</i>	<i>carpenteri</i>
<i>E. sp.</i>	<i>aphidum, carpenteri, dubiosus</i>
Praina	
<i>Areopraon nipponicum</i>	<i>carpenteri</i>
<i>Praon abjectum</i>	<i>aphidum, carpenteri</i>
<i>P. absinthii</i>	<i>carpenteri</i>
<i>P. barbatum</i>	<i>carpenteri</i>
<i>P. bicolor</i>	<i>carpenteri, liebscheri</i>
<i>P. capitophori</i>	<i>carpenteri</i>
<i>P. dorsale</i>	<i>carpenteri, dubiosus</i>
<i>P. exsoletum</i>	<i>dubiosus</i>
<i>P. flavinode</i>	<i>carpenteri</i>
<i>P. gallicum</i>	<i>carpenteri</i>
<i>P. necans</i>	<i>aphidum, carpenteri</i>
<i>P. pequodorum</i>	<i>carpenteri</i>
<i>P. silvestre</i>	<i>carpenteri</i>
<i>P. volucre</i>	<i>aphidum, carpenteri, dubiosus</i>
<i>P. sp.</i>	<i>aphidum, carpenteri, dubiosus</i>
<i>Dyscritulus planiceps</i>	<i>carpenteri</i>
<i>D. sp.</i>	<i>carpenteri</i>

Aphidiinae

Aphidiini

<i>Lysiphlebus ambiguus</i>	<i>carpenteri</i>
<i>L. arvicola</i>	<i>carpenteri</i>
<i>L. dissolutus</i>	<i>carpenteri</i>
<i>L. fabarum</i>	<i>carpenteri, dubiosus</i>
<i>L. fritzmuelleri</i>	<i>carpenteri</i>
<i>L. testaceipes</i>	<i>carpenteri</i>
<i>Lysiphlebia japonica</i>	<i>carpenteri, laticeps</i>
<i>Pauesia abietis</i>	<i>carpenteri, ramicornis</i>
<i>P. akamatsucola</i>	<i>carpenteri</i>
<i>P. infulata</i>	<i>liebscheri</i>
<i>P. japonica</i>	<i>ramicornis</i>
<i>P. jezoensis</i>	<i>ramicornis</i>
<i>P. konoii</i>	<i>ramicornis</i>
<i>P. laricis</i>	<i>carpenteri</i>
<i>P. momicola</i>	<i>ramicornis</i>
<i>P. piceaecollis</i>	<i>carpenteri</i>
<i>P. pini</i>	<i>carpenteri, liebscheri, ramicornis</i>
<i>P. salignae</i>	<i>carpenteri, ramicornis</i>
<i>P. unilachni</i>	<i>carpenteri, dubiosus, liebscheri, ramicornis</i>
<i>P. sp.</i>	<i>carpenteri, liebscheri, ramicornis</i>
<i>Metaphidius aterrimus</i>	<i>carpenteri</i>
<i>Diaeretus leucopterus</i>	<i>carpenteri, liebscheri, ramicornis</i>
<i>Aphidius absinthii</i>	<i>carpenteri</i>
<i>A. amamioshimensis</i>	<i>laticeps</i>
<i>A. aquilus</i>	<i>carpenteri</i>
<i>A. areolatus</i>	<i>carpenteri</i>
<i>A. cingulatus</i>	<i>carpenteri</i>
<i>A. equiseticola</i>	<i>carpenteri, dubiosus</i>
<i>A. ervi</i>	<i>aphidum, carpenteri, dubiosus</i>
<i>A. funebris</i>	<i>carpenteri</i>
<i>A. gifuensis</i>	<i>carpenteri, laticeps</i>
<i>A. hieraciorum</i>	<i>carpenteri</i>
<i>A. hortensis</i>	<i>carpenteri</i>
<i>A. longipetiolus</i>	<i>carpenteri, laticeps</i>
<i>A. matricariae</i>	<i>carpenteri, dubiosus</i>
<i>A. phalangomyzi</i>	<i>carpenteri</i>
<i>A. picipes</i>	<i>aphidum, carpenteri, dubiosus, laticeps</i>
<i>A. platensis</i>	<i>aphidum</i>
<i>A. polygonaphis</i>	<i>carpenteri</i>
<i>A. rosae</i>	<i>carpenteri, dubiosus</i>
<i>A. salicis</i>	<i>carpenteri, laticeps</i>
<i>A. schimitscheki</i>	<i>carpenteri</i>
<i>A. setiger</i>	<i>carpenteri</i>
<i>A. smithi</i>	<i>carpenteri</i>
<i>A. sonchi</i>	<i>aphidum</i>
<i>A. tanacetarius</i>	<i>carpenteri</i>
<i>A. urticae</i>	<i>bifoveatus, carpenteri</i>
<i>A. uzbekistanicus</i>	<i>aphidum, carpenteri, dubiosus</i>
<i>A. sp.</i>	<i>aphidum, carpenteri, dubiosus, laticeps</i>
<i>Lysaphidus arvensis</i>	<i>laticeps</i>
<i>L. erysimi</i>	<i>carpenteri</i>
<i>L. matsuyamensis</i>	<i>carpenteri</i>
<i>L. pleotrichophori</i>	<i>carpenteri</i>
<i>Diaeretiella rapae</i>	<i>aphidum, bifoveatus, carpenteri, dubiosus, laticeps</i>

Trioxini

<i>Monoctonus angustivalvus</i>	<i>carpenteri</i>
<i>M. caricis</i>	<i>dubiosus</i>
<i>M. cerasi</i>	<i>carpenteri</i>
<i>M. pseudoplatani</i>	<i>carpenteri</i>
<i>Lipolexis gracilis</i>	<i>carpenteri</i>
<i>Calaphidius watanabei</i>	<i>carpenteri</i>
<i>Trioxys auctus</i>	<i>laticeps</i>
<i>T. betulae</i>	<i>aphidum, carpenteri</i>
<i>T. cirsii</i>	<i>carpenteri</i>
<i>T. curvicaudus</i>	<i>carpenteri</i>
<i>T. euceraphis</i>	<i>carpenteri</i>
<i>T. falcatus</i>	<i>carpenteri, laticeps</i>
<i>T. pallidus</i>	<i>carpenteri, laevis, laticeps</i>
<i>T. pannonicus</i>	<i>carpenteri</i>
<i>T. parauctus</i>	<i>carpenteri</i>
<i>T. shivaphis</i>	<i>laevis</i>
<i>Binodoxys acalephae</i>	<i>aphidum, carpenteri, dubiosus</i>
<i>B. angelicae</i>	<i>carpenteri, dubiosus, laevis,</i> <i>laticeps</i>
<i>B. brevicornis</i>	<i>carpenteri</i>
<i>B. centaureae</i>	<i>carpenteri</i>
<i>B. sinensis</i>	<i>laticeps</i>

Starý (1977: 5) recorded an unidentified species of *Dendrocerus* from *Areopraon lepelleyi*.

Other hosts

Host	<i>Dendrocerus</i> species
HEMIPTERA	
HOMOPTERA	
PSYLLOIDEA	
<i>Psylla peregrina</i>	<i>serricornis</i>
COCCOIDEA	
Coccidae	
<i>Parthenolecanium corni</i>	<i>serricornis</i>
Eriococcidae	
<i>Eriococcus araucariae</i>	<i>laevis</i>
Pseudococcidae	
<i>Heterococcus nudus</i>	<i>laevis</i>
<i>Planococcus citri</i>	<i>laevis</i>
<i>P. longispinus</i>	<i>laevis</i>
<i>Pseudococcus fragilis</i>	<i>laevis</i>
NEUROPTERA	
SIALOIDEA	
Coniopterygidae	
<i>Conwentzia psociformis</i>	<i>halidayi</i>
<i>Semiadalis aleyrodiformis</i>	<i>halidayi</i>
<i>Coniopteryx esbenpeterseni</i>	<i>flavipes</i>
Chrysopidae	
<i>Chrysopa virgestes</i>	? <i>aphidum</i>
COLEOPTERA	
Curculionidae	
Erihinae	
<i>Stenopelmus rufinasus</i>	? <i>laticeps</i>
DIPTERA	
	? <i>aphidum</i>

NEMATOCERA

Cecidomyiidae

Rhabdophaga rosaria? *laevis**Cecidomyia pini**serricornis***CYCLORRHAPHA**

Syrphidae

*Syrphus ribesii**pupparum**S. sp.**pupparum**Episyrphus balteatus**pupparum*

Chamaemyiidae

*Leucopis griseola**serricornis**L. obscura**serricornis**L. sp.**serricornis**Cremifania nigrocellulata**serricornis*

Chloropidae

*Meromyza saltatrix**carpenteri***HYMENOPTERA****FORMICOIDEA***Formica rufa**carpenteri**Lasius brunneus**dubiosus**L. fuliginosus**carpenteri***CYNIPOIDEA**

Alloxystinae

*Phaenoglyphis sp.**carpenteri**Alloxysta brassicae**carpenteri**A. victrix**carpenteri**A. sp.**carpenteri*

Figitidae

Melanips longitarsis? *serricornis*

Cynipidae

Gall of *Biorhiza pallida**halidayi*Gall of *Diplolepis rosae**carpenteri***CHALCIDOIDEA**

Aphelinidae

*Aphelinus abdominalis**carpenteri**A. chaonia**laticeps**A. daucicola**laticeps*

Encyrtidae

*Leptomastidea abnormis**laevis**Tetracnemus diversicornis**laevis**Microterys sp.**laevis**Aphidencyrtus aphidivorus**carpenteri*, ? *serricornis**Prionomitus mitratus**serricornis**Encyrtus sp.**carpenteri*

Pteromalidae

*Asaphes lucens**carpenteri**A. suspensus**carpenteri**A. vulgaris**carpenteri**Cyrtogaster vulgaris**carpenteri**Pachyneuron aphidis**carpenteri**P. cremifaniae**serricornis**P. siphonophorae**carpenteri**P. vitodurensis**serricornis**Euneura nawai**ramicornis**Coruna clavata**carpenteri*

Occasional fortuitous plant records may result from parasitized aphids moving from their normal host plant before becoming mummified.

The host lists show that the British species of *Dendrocercus* are mostly aphid hyperparasites, but

<i>Dendrocerus</i> species	Host Diptera	Host Neuroptera	Host Coccoidea	Host Aphidoidea	Host Aphidiidae	Biotope
<i>aphidum</i>				various genera but not Lachnidae	various genera	steppe, deciduous forest, Holarctic forest tundra, boreal, wet habitats, crops etc.
<i>bifoveatus</i>				various Aphidiidae	Aphidiini	wet habitats
<i>carpenteri</i>				most genera	most genera	most habitats: steppe, deciduous and coniferous forest, Holarctic forest tundra, crops etc.
<i>dubiosus</i>				various genera	many genera	steppe, deciduous and coniferous forest, waste land etc.
<i>flavipes</i>		Coniopterygidae				
<i>halidayi</i>		Coniopterygidae				
<i>laevis</i>			Eriococcidae and Pseudococcidae	Aphidiidae and Callaphidiidae	Trioxini	deciduous forest
<i>laticeps</i>				various aphids but not Lachnidae	various genera	deciduous forest, steppe and salt marsh
<i>liebscheri</i>				exclusively on Lachnidae	Prainae and Aphidiini	coniferous forest
<i>punctipes</i>	?	?	?	?	?	?
<i>papparum</i>	Syrphidae					
<i>ramicornis</i>				Lachnidae	Aphidiini	coniferous and deciduous forest
<i>serriicornis</i>	Chamaemyiidae Cecidomyiidae		<i>Parthenolecanium</i>			trees and shrubs
<i>spissicornis</i>	? Cyclorhapha					dead deciduous trees

Table 1 Summary of host relationships

some are parasitic on Diptera, some on Neuroptera and *D. laevis* is parasitic on coccids as well as aphids. The biology of *Dendrocerus* is clearly very closely related to the Homoptera-Sternorrhyncha (i.e. Psylloidea, Aleyrodoidea, Aphidoidea and Coccoidea), and even the hosts listed from other groups are often predators on aphids (e.g. Neuroptera; Diptera, Syrphidae, etc.).

Host information on some non-British species of *Dendrocerus*

The above pattern of host choice is typical of the genus as a whole. Host information about other *Dendrocerus* species is briefly listed below.

Host	<i>Dendrocerus</i> species	Country	Reference
DIPTERA			
Chamaemyiidae			
<i>Leucopis atrifacies</i>	<i>D. pinicolus</i>	U.S.A.	Muesebeck (1959:93)
<i>L. sp.</i>	<i>D. leucopidis</i>	U.S.A.	Muesebeck (1959:92)
Cecidomyiidae			
<i>Mayetiola destructor</i>	<i>D. triticum</i>	U.S.A.	Ashmead (1893:110)
Dipterous larvae	<i>D. koyamai</i>	Italy, Japan	Dessart (1972a:176)
NEUROPTERA			
Coniopterygidae			
<i>Conwentzia hageni</i>	<i>D. conwentziae</i>	U.S.A.	Gahan (1919:122)
<i>Nimboa basipunctata</i>	<i>D. indicus</i>	India	Dessart (1972a:171)
Hemerobiidae			
	<i>D. latifrons</i>	U.S.A.	Muesebeck (1959:94)
Chrysopidae			
<i>Chrysopa madestes</i>	<i>D. propodealis</i>	India	Dessart (1973:274)
<i>C. sp.</i>	<i>D. noumeae</i>	New Caledonia	Dessart (1967:346)
HEMIPTERA			
HOMOPTERA			
APHIDOIDEA			
<i>Plocamaphis goernitzi</i>	<i>D. remaudierei</i>	Europe	Dessart (1974a:82)
<i>Macrosiphum euphorbiae</i>	<i>D. attentus</i>	U.S.A.	Muesebeck (1959:96)
<i>Macrosiphum euphorbiae</i>	<i>D. incompletus</i>	U.S.A.	Muesebeck (1959:96)
<i>Neuquenaphis similis</i>	<i>D. henkvlugti</i>	Chile	Dessart (1975:266)
A wide range of aphids	<i>D. floridanus</i>	Japan, U.S.A.	Ashmead (1881:xxxiv)
COCCOIDEA			
<i>Saissetia oleae</i>	<i>D. noumeae</i>	New Caledonia	Dessart (1967:346)
COLEOPTERA			
Coccinellidae			
<i>Pharoscymnus ovoideus</i>	<i>D. ergensis</i>	Spain, North Africa	Ghesquière (1960:207)
<i>P. numidicus</i>	<i>D. ergensis</i>	North Africa	Ghesquière (1960:207)
<i>Scymnus sp.</i>	<i>D. ergensis</i>	North Africa	Ghesquière (1960:207)
<i>Chilocorus kuwanae</i>	<i>D. chilocori</i>	Japan	Ishii (1951:93)
HYMENOPTERA			
CHALCIDOIDEA			
Encyrtidae			
<i>Homalotytus flaminis</i>	<i>D. ergensis</i>	Spain, North Africa	Ghesquière (1960:207)
<i>Homalotytus flaminis</i>	<i>D. chilocori</i>	Japan	Ishii (1951:94)

Conostigmus has often been reported as a parasite of aphids, but it is probable that these records actually pertain to *Dendrocerus*. The record published by Jones (1972:13) refers to a specimen of *Dendrocerus* and not to *Conostigmus* (Jones, pers. comm.). According to Ashmead (1893:103) Riley reared a *Dendrocerus* sp. from a tortricid larva but Haviland (1920b:102) considered this to be unlikely.

In order that the biology of *Dendrocerus* can be easily related to that of the Aphidiidae, I have used the faunistic complexes adopted by Starý (1970:201–202, 312–321), as very briefly indicated below

Boreal Europe faunistic complex. Cooler climatic conditions, restricted to northern parts of Europe. Some typical species: *Decorosiphon* spp. / *Diaeretellus ephippium* / mosses; *Rhopalosiphum nymphaeae* / *Praon necans* / secondary host plants.

Eurasian steppe faunistic complex. Typical complex of steppe zone plus the cultivated steppe landscape. Some typical species: *Macrosiphoniella* spp. / *Aphidius absinthii* /-; *Acyrtosiphon* spp. / *Aphidius ervi* /-; *Cryptosiphum* spp. / *Ephedrus nacheri* /-; *Coloradoa* spp. / *Lysaphidus arvensis* /-; *Uroleucon* spp. / *Praon dorsale* /-; *Aphis* spp. / *Binodoxys acalephae* /-.

Deciduous forest (European) faunistic complex. Typical of the deciduous forests of Europe to which they are mostly restricted. Some typical species: *Liosomaphis berberidis* / *Aphidius hortensis* / *Berberis*; *Macrosiphum* spp. / *Aphidius rosae* /-; *Macrosiphum* spp. / *Aphidius lonicerae* /-; *Drepanosiphum* spp. / *Dyscritulus planiceps* / *Acer*; *Sitobion* spp. / *Monoctonus caricis* /-; *Periphyllus* spp. / *Trioxys falcatus* /-.

Deciduous forest (Far Eastern) faunistic complex. Typical of the deciduous forests of the Far East and penetrating to the allied tropics but some elements have a wide trans-palaearctic distribution. Some typical species: *Periphyllus* spp. / *Aphidius areolatus* / *Acer*; *Myzus* spp. / *Aphidius gifuensis* /-; *Tuberolachnus salignae* / *Salix*.

Coniferous forest (West Eurasian) faunistic complex. Members of this complex are distributed all over Europe in coniferous forests. Some typical species: *Cinara* spp. / *Metaphidius aterrimus* / conifers; Lachnidae aphids / *Pauesia* spp. / conifers.

Coniferous forest (East Eurasian) faunistic complex. Typical of the Far Eastern type of coniferous forest but some species are widely distributed in Europe. Typical species: Lachnidae aphids / *Pauesia* spp. / conifers; *Eulachnus* spp. / *Diaeretus leucopterus* / conifers.

Holarctic forest tundra faunistic complex. Typical of cool arctic conditions, it is a transitional zone between forest-free tundra to the north and mostly coniferous forests to the south. Typical trees: *Salix*, *Alnus*, *Betula* etc. Many elements of this complex are found further south. Typical species: *Pterocomma* spp. / *Aphidius cingulatus* / *Salix*, *Populus*; *Symydobius* / *Trioxys betulae*.

Non-British species

The following species occur in Europe but have not been found in the British Isles.

D. basalis (Thomson, 1858) was mentioned by Marshall (1868:158; 1873:3) as a synonym of *D. carpenteri* but it has not been directly recorded as a British species. The most similar British species to *D. basalis* is *D. pupparum*; in the discussion of the latter I have shown how the two species can be separated.

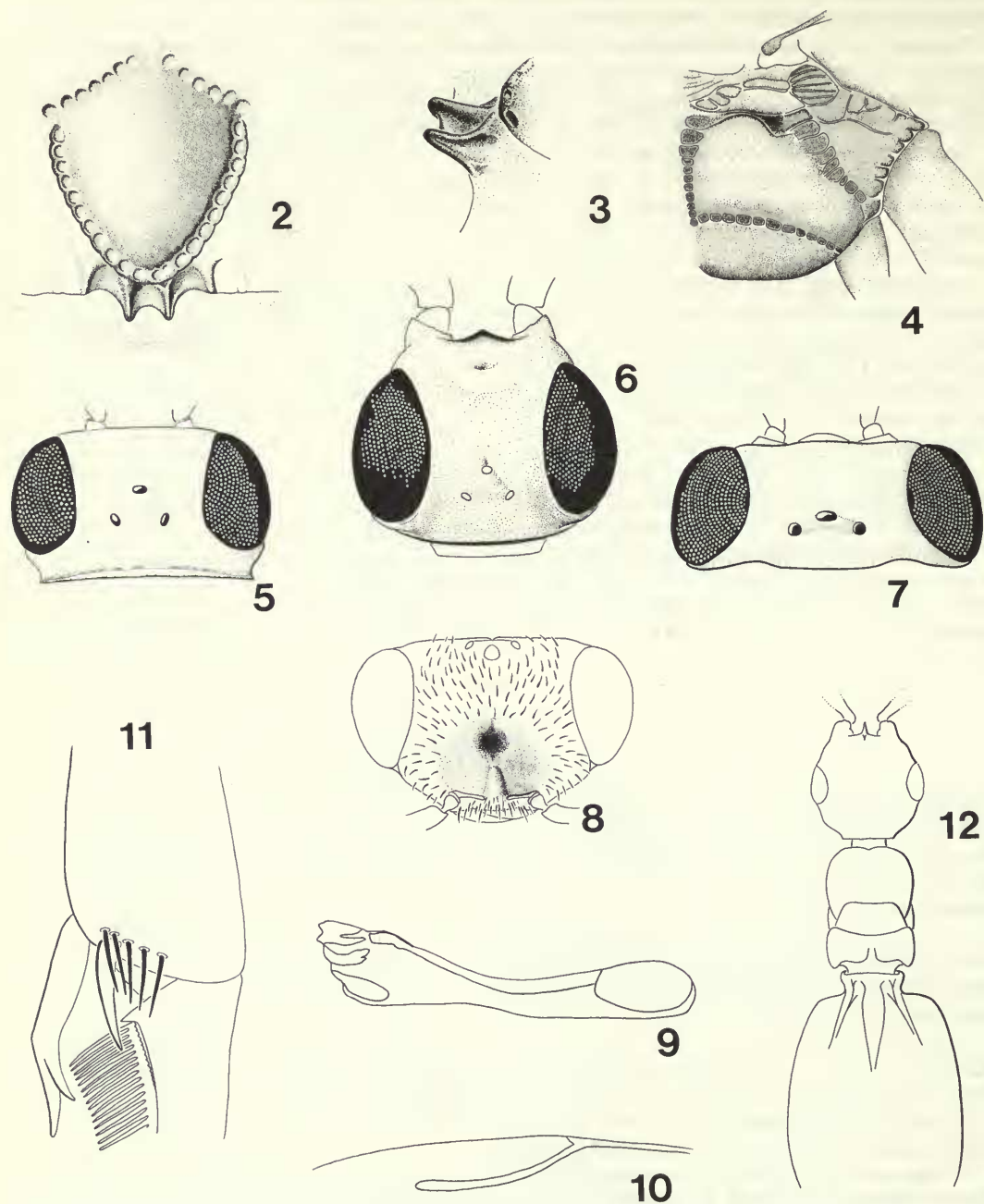
D. ergensis (Ghesquière, 1960) was described from North Africa, but I have seen specimens from Spain. This species is easily identified as the radius is shorter than the pterostigma and the notaulices are only present anteriorly; in males the basal flagellar segments are strongly serrate, about as long as broad.

D. koyamai (Ishii, 1951). This species was known only from Japan until Dessart (1974a: 75) recorded it from Italy. The radius is just shorter than the pterostigma, and in males the basal flagellar segments have projections similar to those found in *D. halidayi* and *D. ramicornis*.

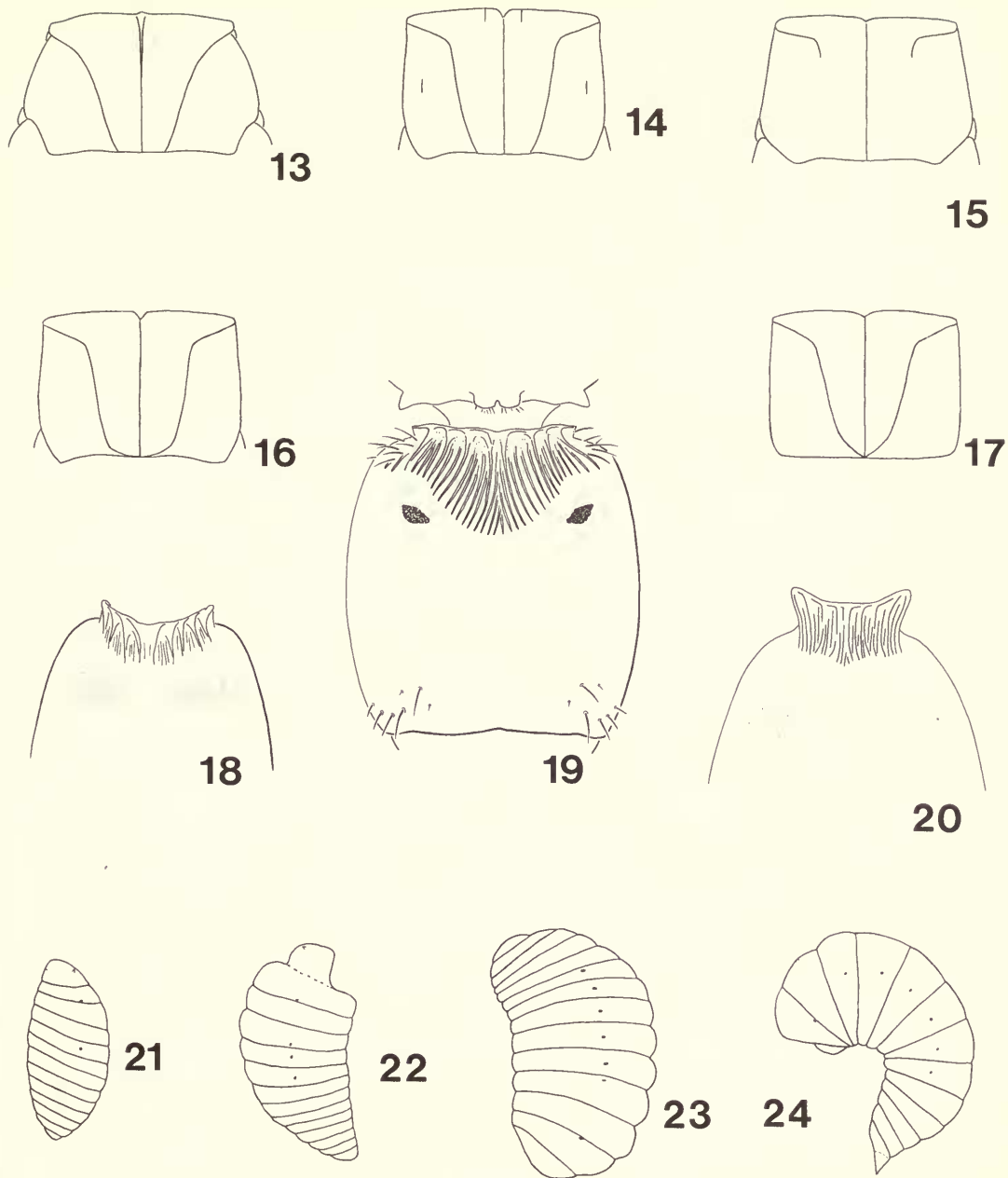
D. omostenus Dessart, 1979 is known only from the Algerian female holotype which I have examined and believe to be a *Conostigmus* species.

D. remaudierei Dessart, 1974 was described from France. It has characters in common with several different species of *Dendrocerus*, but it is distinguished by the following combination of characters. The notaulices are complete, the interantennal carina is absent, the wings are hyaline, the male antennae are only moderately serrate (L/B for AIII about 2.35), the flagellar pubescence in males is longer than the breadth of the segment and the parameres are enlarged and truncate.

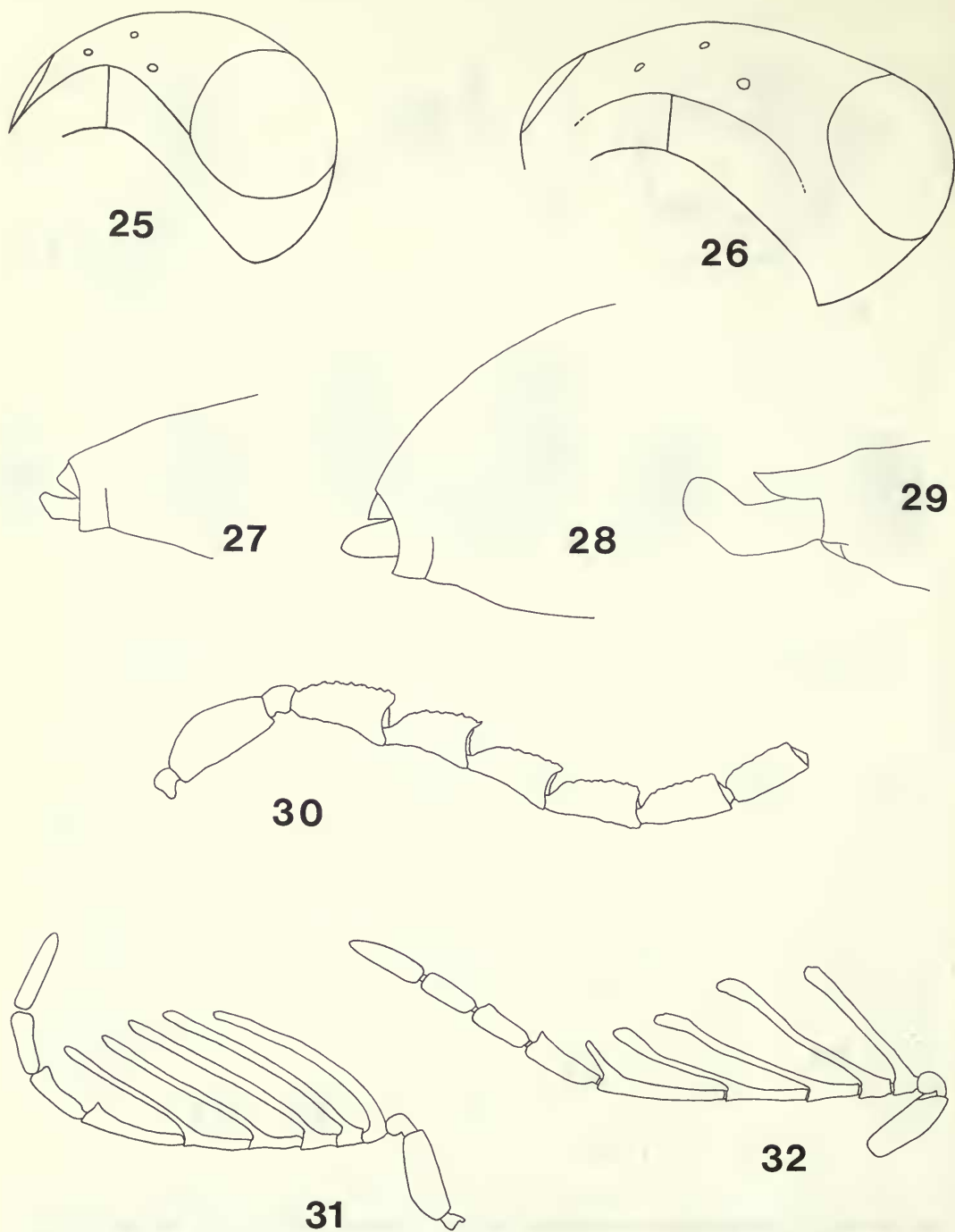
D. solarii (Kieffer, 1907) is known only from the Italian female holotype. It is distinguished from other European species by the following characters. The apex of the scutellum has foveolate sculpture which fades out laterally, the third antennal segment is elongate, about 3 times longer than broad, and the median fovea on the propodeum is prominent.



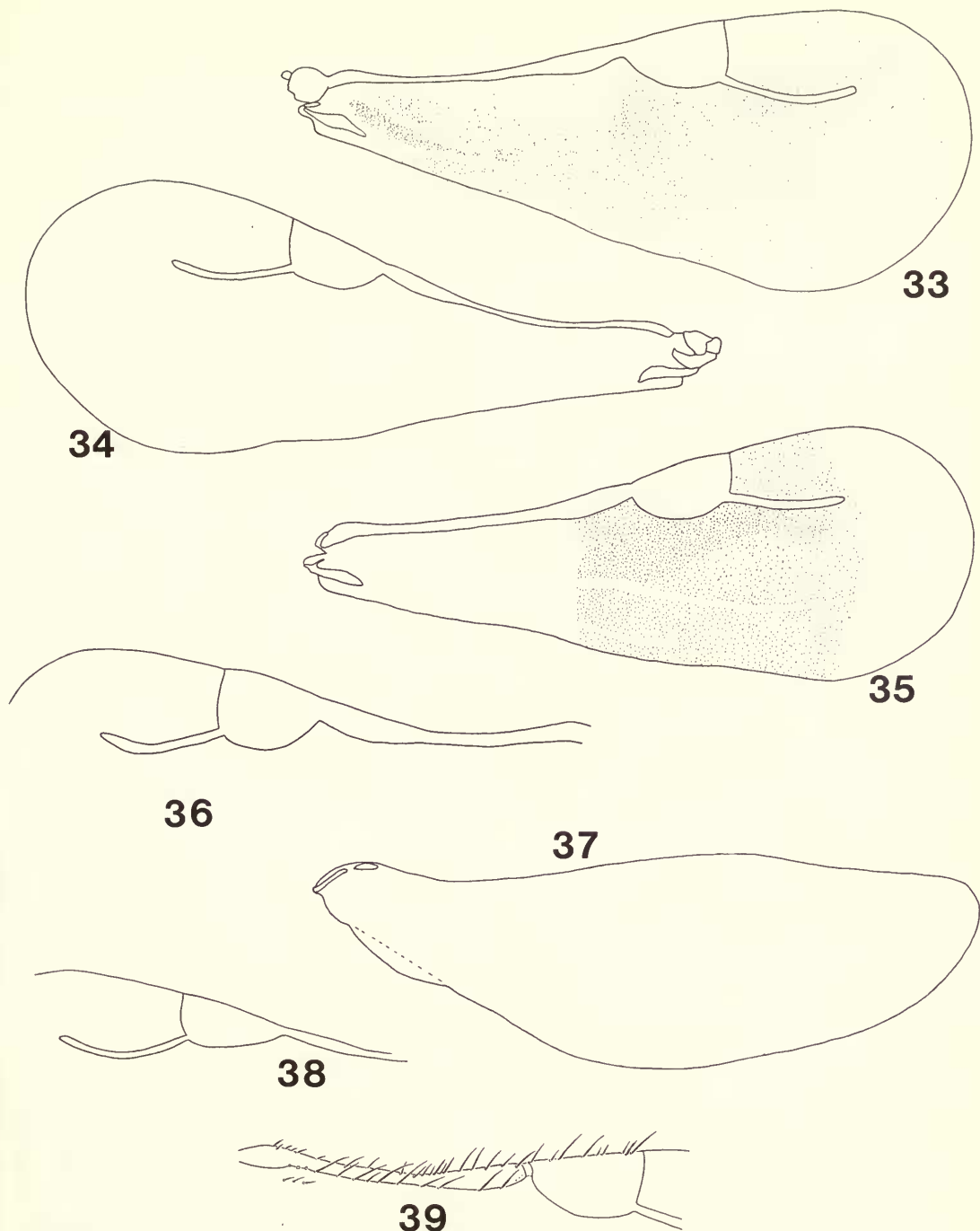
Figs 2-12 2-4, *Megaspilus* sp., (2) scutellum and propodeal projection; (3) dorso-lateral view of propodeal projection; (4) precoxal sulcus. 5, 6, heads of *Conostigmus* species. 7, 8, heads of (7) *Dendrocerus ramicornis*; (8) *D. pupparum*. 9, *Conostigmus* sp., brachypterous forewing. 10-12, *Lagynodes pallidus*, (10) forewing of male; (11) tibial spurs of foreleg; (12) female.



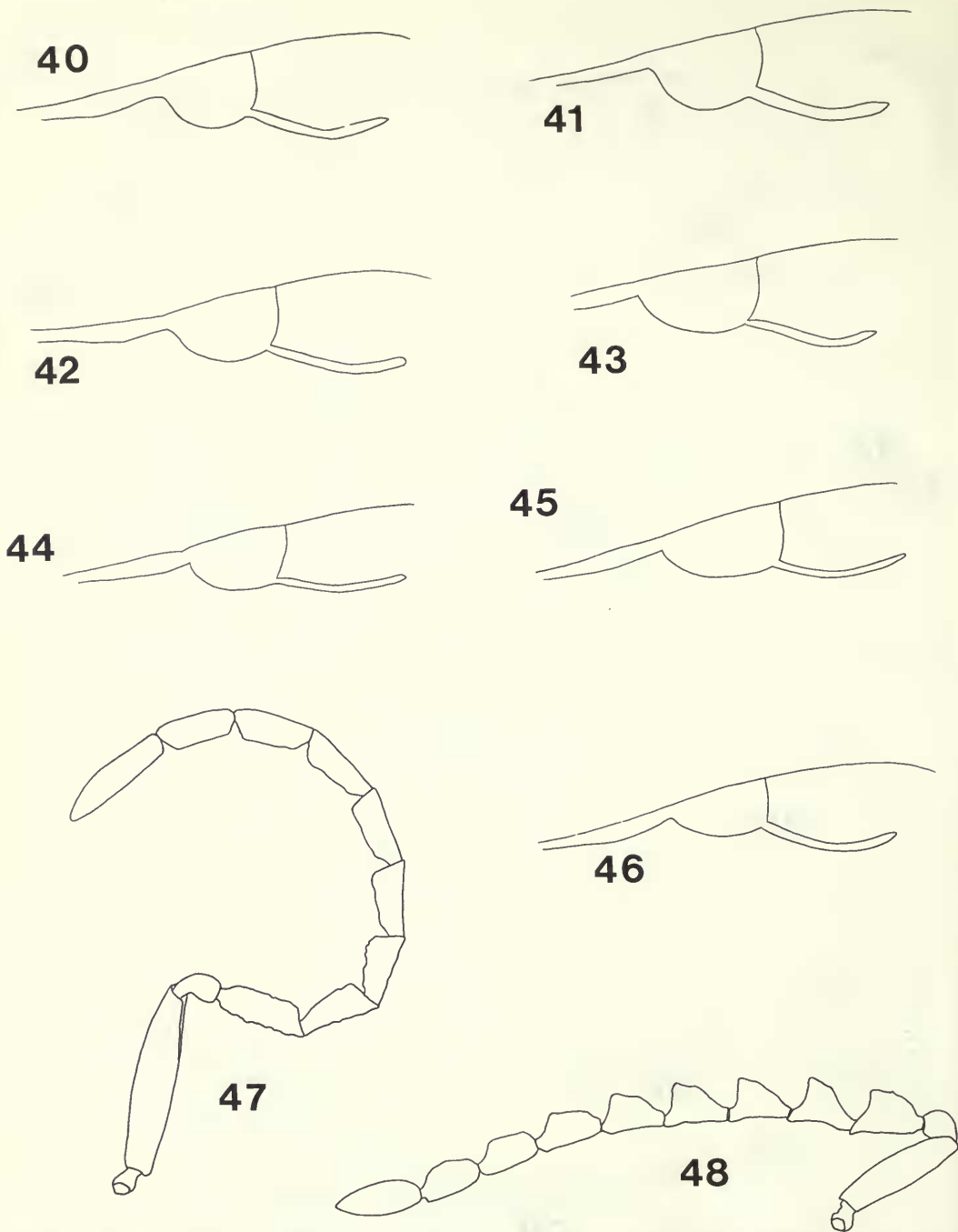
Figs 13–24 13, mesonotum of *Conostigmus* sp. 14–17, mesonota of (14) and (16) *Dendrocerus carpenteri*; (15) *D. laticeps*; (17) *D. liebscheri*. 18–20, gastral collar of (18) *Conostigmus fasciatipennis*; (19) *Dendrocerus spissicornis*; (20) *D. dubiosus*. 21–24, *D. carpenteri*, larval stages, (21) first instar; (22) second instar; (23) third instar; (24) fourth instar.



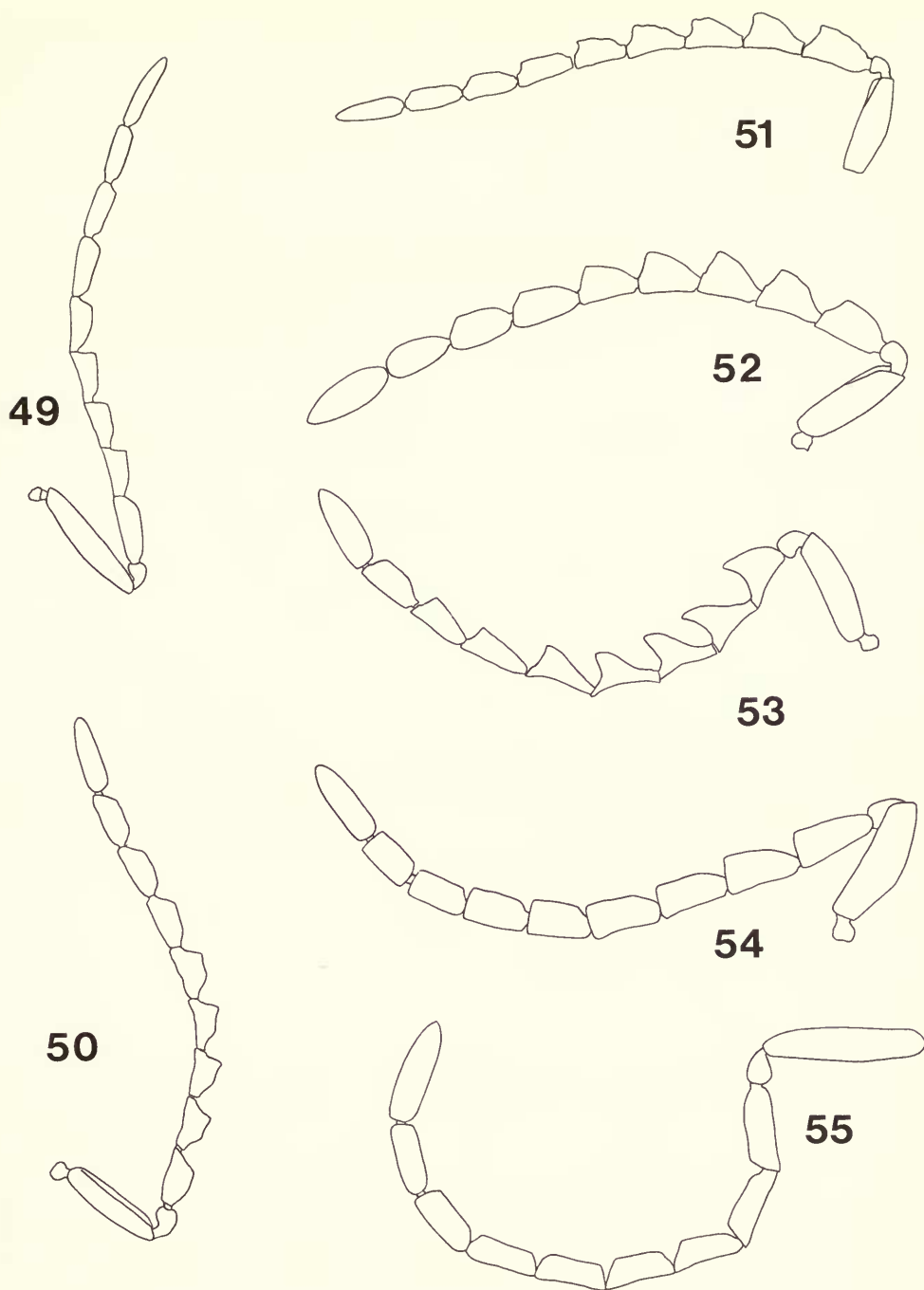
Figs 25–32 Males. 25, 26, head of (25) *Dendrocerus laevis*; (26) *D. laticeps*. 27–29, gaster showing parameres of (27) *D. liebscheri*; (28) *D. carpenteri*; (29) *D. pupparum*. 30–32, antennae of (30) *D. flavipes*; (31) *D. ramicornis*; (32) *D. halidayi*.



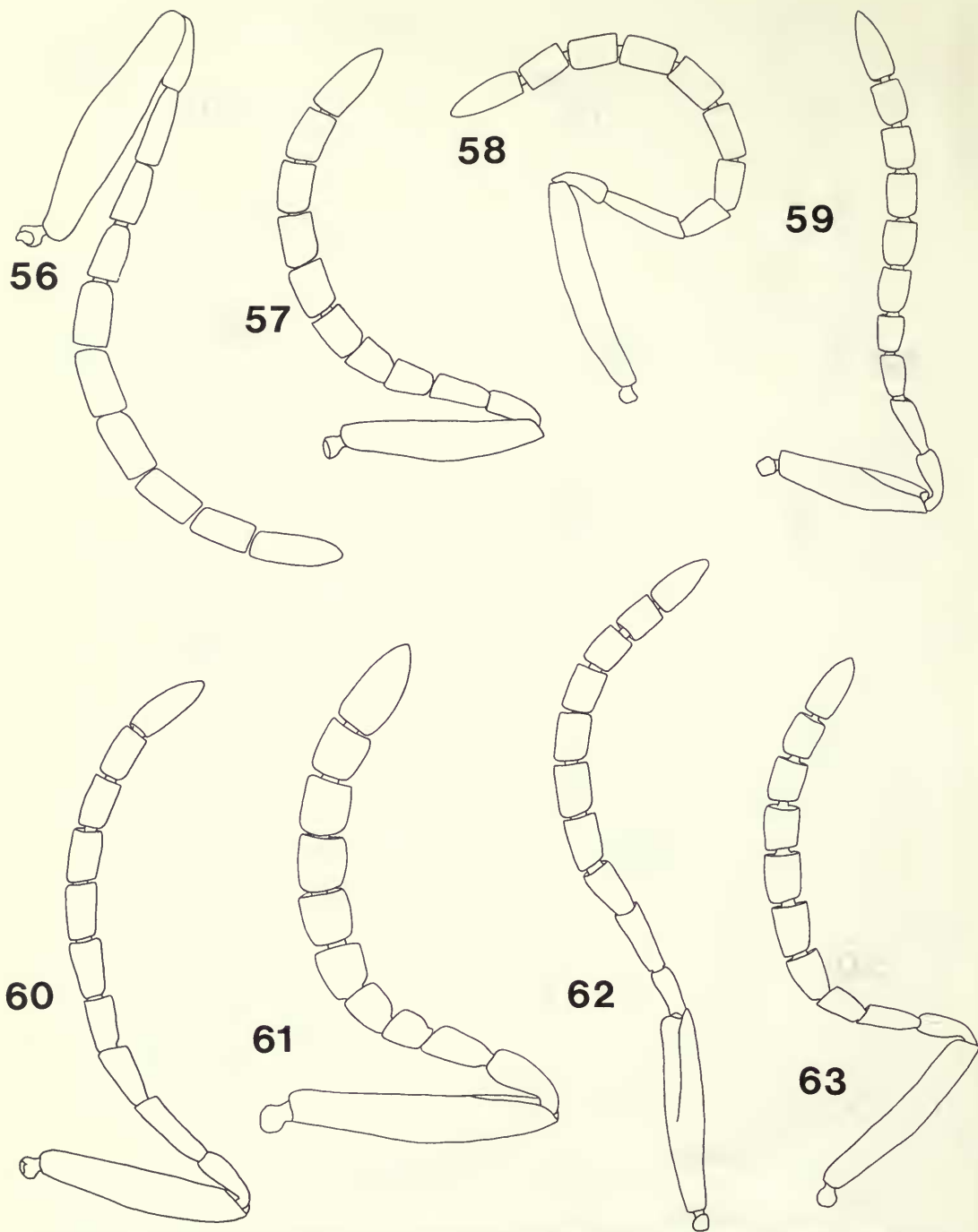
Figs 33–39 33–38, wings of (33) *Dendrocerus aphidum*; (34) *D. laticeps*; (35) *D. flavipes*; (36) *D. laevis*; (37) *D. ramicornis*; (38) *D. bifoveatus*. 39, coastal vein and pterostigma of *Conostigmus fasciatipennis*.



Figs 40–48 40–46, pterostigma and radius of (40) *Dendrocerus carpenteri*; (41) *D. ramicornis*; (42) *D. liebscheri*; (43) *D. serricornis*; (44) *D. pupparum*; (45) *D. halidayi*; (46) *D. dubiosus*. 47, 48, antennae of males of (47) *D. laticeps*; (48) *D. laevis*.



Figs 49–55 Antennae of males of (49) *Dendrocerus dubiosus*; (50) *D. aphidum*; (51) *D. carpenter*; (52) *D. liebscheri*; (53) *D. serricornis*; (54) *D. pupparum*; (55) *D. bifoveatus*.



Figs 56–63 Antennae of females of (56) *Dendrocerus liebscheri*; (57) *D. carpenteri*; (58) *D. dubiosus*; (59) *D. aphidum*; (60) *D. laticeps*; (61) *D. laevis*; (62) *D. flavipes*; (63) *D. halidayi*.

Doubtfully placed species

Kieffer described the following species from specimens in the L. Carpentier collection: *Lygocerus antennalis* Kieffer, 1907:46; *L. antennalis subserratus* Kieffer, 1907:62 and *L. subtruncatus* Kieffer, 1907:44. The type-material cannot be found amongst the Carpentier material in the MP, Amiens and the identity of these species cannot be ascertained from the descriptions alone.

The type of *Ceraphron rosularum* Ratzeburg is lost. Dessart (1972a:262) and Bouček (1964:664) have been unable to recognize the type from the mixed series of three specimens (one *D. serricornis* and two *D. carpenteri*) remaining under this name in the Ratzeburg collection.

Tshumakova (1956:114) described *Lygocerus dauricus* from the U.S.S.R. The type of this species has not been located.

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References

- Ashmead, W. H. 1881. Studies on the North American Chalcididae with descriptions of new species from Florida. *Trans. Am. ent. Soc.* **9**: xxix–xxxv.
- 1887. Studies on the North American Proctotrupidae with descriptions of new species from Florida. *Entomologica am.* **3**: 73–76, 97–100, 117–119.
- 1893. Monograph of the North American Proctotrypidae. *Bull. U.S. natn. Mus.* **45**: 472 pp.
- 1904. Descriptions of new Hymenoptera from Japan – 1. *Jl. N.Y. ent. Soc.* **12**: 65–84.
- Bankowska, R. 1975. Aphid-aphidophage community in alfalfa cultures (*Medicago sativa* L) in Poland. Pt. 1 Structure and phenology of the community. *Annls zool. Warsz.* **32**: 299–345.
- Bin, F. 1977. Preliminary report on a new structure in *Trissolcus* Ashm. (Hymenoptera, Scelionidae). *Redia* **60**: 453–456.
- Blanchard, M. E. 1840. *Histoire naturelle des insectes* **3**: 672 pp. Paris.
- Boheman, C. H. 1832. Försök till beskrifning af de i Sverige funne Arter, hörande till Insekt-slägtet *Ceraphron*. *K. svenska VetenskAkad. Handl.* **1831**: 322–339.
- Boness, M. 1958. Biocoenotische Untersuchungen über die Tierwelt von Klee- und Luzernefeldern. *Z. Morph. Ökol. Tiere* **47**: 309–373.
- Bouček, Z. 1964. Proctotrupoidea und Chalcidoidea aus den Resten der Ratzeburg-Sammlung. *Beitr. Ent.* **14**: 663–673.
- Buckton, G. B. 1876. *Monograph of the British aphides* **1**: 193 pp., 38 pls. London.
- Cameron, P. 1907. On the Scottish species of *Oxyura* (Proctotrypidae) – Part 2. *Ann. Scot. nat. Hist.* **63**: 158–161.
- Campbell, A. & Mackauer, M. 1975. Thermal constants for development of the pea aphid (Homoptera: Aphididae) and some of its parasites. *Can. Ent.* **107**: 419–423.
- Chua, T. H. 1977. Population studies of *Brevicoryne brassicae* its parasites and hyperparasites in England. *Res. pop. Ecol.* **19**: 125–139.

- Couchman, J. R.** 1977. A collection of aphid parasites and hyperparasites (Hym.) from Iceland. *Norw. J. Ent.* **24**: 121–124.
- Cumber, R. A. & Eyles, A. C.** 1961. Insects associated with the major fodder crops in the North Island. IV Hymenoptera. *N.Z. Jl agric. Res.* **4**: 390–408.
- Curtis, J.** 1829a. *British entomology*. **6**: folios 242–289. London.
- 1829b. *A guide to an arrangement of British insects* 256 pp. London.
- 1860. *Farm insects*. 528 pp. London.
- Dalla Torre, C. G.** 1898. *Catalogus Hymenopterorum* **5**: Chalcididae et Proctotrupidae. 598 pp.
- Dean, G. J.** 1974. Effects of parasites and predators on the cereal aphids *Metopolophium dirhodum* and *Macrosiphum avenae* (Hem., Aphididae). *Bull. ent. Res.* **63**: 411–422.
- Delucchi, V. & Pschorn-Walcher, H.** 1954. *Cremifania nigrocellulata* Czerny (Diptera, ?Chamaemyiidae), ein Räuber an *Dreyfusia (Adelges) piceae* Ratz. (Hemiptera, Adelgidae). *Z. angew. Ent.* **36**: 84–107.
- Dessart, P.** 1965a. Contribution à l'étude des Hyménoptères Proctotrupeoidea (IX). Revision du genre *Macrostigma* Rondani 1877 (Ceraphronidae, Megaspilinae). *Redia* **49**: 157–163.
- 1965b. Contribution à l'étude des Hyménoptères Proctotrupeoidea (VI). Les Ceraphroninae et Quelques Megaspilinae (Ceraphronidae) du Musée Civique d'Histoire Naturelle de Genes. *Bull. Annl. Soc. r. ent. Belg.* **101**: 105–192.
- 1966. Contribution à l'étude des Hyménoptères Proctotrupeoidea (XII). A propos des Ceraphronidae Megaspilinae mâles à antennes rameuses. *Bull. Inst. r. Sci. nat. Belg.* **42** (32): 1–16.
- 1967. Description de *Dendrocerus (Macrostigma) noumeae* sp. nov. de Nouvelle Calédonie. *Entomophaga* **12**: 343–349.
- 1970. A propos de l'identité de *Ceraphron carpenteri* Curtis, 1829 (Hym. Ceraphronoidea, Megaspilidae). *Bull. Annl. Soc. r. ent. Belg.* **106**: 142–144.
- 1972a. Révision des espèces européennes du genre *Dendrocerus* Ratzeburg, 1852 (Hymenoptera, Ceraphronoidea). *Mém. Soc. r. ent. Belg.* **32**: 310 pp.
- 1972b. Un synonyme Américain et Australien de *Dendrocerus carpenteri* (Curtis, 1829). *Bull. Annl. Soc. r. ent. Belg.* **108**: 239–241.
- 1972c. A propos de quelques types d'anciennes espèces de Megaspilidae. *Bull. Annl. Soc. r. ent. Belg.* **108**: 234–238.
- 1973. *Dendrocerus propodealis* sp. n. (Hym. Ceraphronoidea) parasite de *Chrysopa madestes* Banks (Neur. Chrysopidae) en Inde. *Bull. Annl. Soc. r. ent. Belg.* **109**: 269–276.
- 1974a. Compléments à l'étude des *Dendrocerus* Européens (Hym. Ceraphronoidea Megaspilidae). *Bull. Annl. Soc. r. ent. Belg.* **110**: 69–84.
- 1974b. Les Mégaspilides Européens (Hym. Ceraphronoidea) parasites des Diptères Syrphides avec une révision du genre *Trichostereosis*. *Annl. Soc. ent. Fr.* (N.S.) **10**: 395–448.
- 1975. Quelques *Dendrocerus* (Hym. Ceraphronoidea Megaspilidae) du Chili. *Bull. Annl. Soc. r. ent. Belg.* **111**: 262–269.
- 1978. On two species of *Dendrocerus (Atritromellus)* (Hym. Ceraphronoidea Megaspilidae), parasites of *Coniopteryx esbenpeterseni* (Neuroptera) in Italy. *Bull. Annl. Soc. r. ent. Belg.* **114**: 117–182.
- 1979. Quelques Megaspilidae d'Algérie (Hym. Ceraphronoidea). *Bull. Annl. Soc. r. ent. Belg.* **115**: 33–38.
- Dill, W.** 1937. Der Entwicklungsgang der mehligten Pflaumenblattlaus *Hyalopterus arundinis* Fabr. im schweizerischen Mittelland. *Mitt. aargau. naturf. Ges.* **20**: 157–240.
- Donisthorpe, H. St. J. K.** 1927. *The guests of British ants. Their habits and life-histories* xxiii + 244 pp. London.
- Dours, A.** 1873. Catalogue synonymique des Hyménoptères de France. *Mém. Soc. linn. N. Fr.* **3**: 1–230.
- Dunn, J. A.** 1949. The parasites and predators of potato aphids. *Bull. ent. Res.* **40**: 97–122.
- Eady, R. D.** 1968. Some illustrations of microsculpture in the Hymenoptera. *Proc. R. ent. Soc. Lond.* **43**: 66–72.
- Eastop, V. F. & Hille Ris Lambers, D.** 1976. *Survey of the world's aphids* 573 pp. The Hague.
- Evenhuis, H. H.** 1964. The interrelations between apple aphids and their parasites and hyperparasites. *Entomophaga* **9**: 227–231.
- 1966. Host specificity in the parasites and hyperparasites of apple aphids. In Hodek, I., *Ecology of aphidophagous insects* 360 pp. The Hague.
- 1968. The natural control of the apple-grass aphid, *Rhopalosiphum insertum*, with remarks on the control of apple aphids in the Netherlands in general. *Neth. J. Pl. Path.* **74**: 106–117.
- Ferrière, C. & Voukassovitch, P.** 1928. Sur les parasites des aphides et leurs hyperparasites. *Bull. Soc. ent. Fr.* **2**: 26–29.
- Foerster, A.** 1856. *Hymenopterologische Studien* 2 Chalcidiae und Proctotrupii 152 pp.

- 1878. Kleine Monographien parasitischer Hymenopteren. *Verh. naturh. Ver. preuss. Rheinl.* **35**: 42–82.
- Fulmek, C.** 1968. Parasitinsekten der Insektengallen Europas. *Beitr. Ent.* **18**: 719–952.
- Gahan, A. B.** 1919. A new species of the serphoid genus *Dendrocerus* (Hymenoptera). *Proc. ent. Soc. Wash.* **21**: 121–123.
- Garbarczyk, H.** 1977. Sex structure of the populations of species forming a complex of parasitoids of the pea aphid, *Acyrtosiphon pisum*. *Annls zool. Warsz.* **33**: 445–454.
- Gatenby, J. G.** 1919. Notes on the bionomics, embryology, and anatomy of certain Hymenoptera Parasitica especially of *Microgaster connexus* (Nees). *J. Linn. Soc. (Zool.)* **33**: 387–416, 3 pls.
- Ghesquière, J.** 1960. Le genre *Atritomellus* Kieffer en Afrique du Nord. *Bull. Annls Soc. r. ent. Belg.* **96**: 205–215.
- Giraud, J. E. & Laboulbène, A.** 1877. Liste des éclosions d'insectes. *Annls Soc. ent. Fr.* **7**: 397–436.
- Gourlay, E. S.** 1930. Some parasitic Hymenoptera of economic importance in New Zealand. *N.Z. Jl Sci. Technol.* **11**: 339–343.
- Hafez, M.** 1961. Seasonal fluctuations of population density of the cabbage aphid, *Brevicoryne brassicae* (L.), in the Netherlands, and the role of its parasite, *Aphidius* (*Diaeretiella*) *rapae* (Curtis). *Tijdschr. Plantenziekten* **67**: 445–548.
- Haviland, M. D.** 1920a. Preliminary note on the life history of *Lygocerus* (Proctotrypidae), hyperparasite of *Aphidius*. *Proc. Camb. phil. Soc.* **19**: 293–295.
- 1920b. On the bionomics and development of *Lygocerus testaceimanus* Kieffer, and *Lygocerus cameroni* Kieffer (Proctotrypoidea – Ceraphronidae), parasites of *Aphidius* (Braconidae). *Q. Jl microsc. Sci.* **65**: 101–127.
- Hedicke, H.** 1929. *Atritomellus laticeps* n. sp. (Hym. Callicerat.), ein neuer Parasit eines eingeschleppten Rüsselkäfers. *Z. wiss. InsektBiol.* **24**: 59–61.
- Hellén, W.** 1966. Die Ceraphroniden Finnlands (Hymenoptera: Proctotrupeoidea). *Fauna fenn.* **20**: 1–45.
- Henriksen, K. L.** 1918. De europæiske vandsnyltehvepse og deres Biologi. *Ent. Meddr* **12**: 137–251.
- Howard, L. O.** 1890. Some new parasites of the grain plant louse. *Insect Life, Wash.* **2**: 246–248.
- International Commission on Zoological Nomenclature.** 1964. *International code of zoological nomenclature* xix + 176 pp. London.
- Ishii, T.** 1951. Eine neue Gattung und zwei neue Arten von Calliceratidae (Ceraphronidae). *Oyo-Dobuts. Zasshi* **16**: 93–95.
- Ivanova-Kazas, O. M.** 1955. Secondary parasites of certain aphids of Turkmenistan (Hymenoptera: Chalcidoidea, Serphoidea, Cynipoidea). *Ent. Obozr.* **34**: 144–156.
- Jones, M. G.** 1972. Cereal aphids, their parasites and predators caught in cages over oat and winter wheat crops. *Ann. appl. Biol.* **72**: 13–25.
- Kaissling, K. E.** 1971. Insect olfaction. *Handbk sensory Physiol.* **4**: 351–431.
- Kieffer, J. J.** 1905. Beschreibung neuer Proctotrypiden aus Nord- und Zentralamerika. *Berl. ent. Z.* **50**: 237–290.
- 1907. Ceraphroninae. In André, E., *Species des Hyménoptères d'Europe et d'Algérie* **10**: 1–288.
- 1914. Hymenoptera Proctotrupeoidea. Serphidae (=Proctotrupidae) et Calliceratidae (=Ceraphronidae). *Tierreich* **42**: xvii + 254 pp.
- 1917. Über neue und bekannte Microhymenopteren. *Ent. Meddr* **11**: 341–350.
- Kirchner, L.** 1867. *Catalogus hymenopterorum Europae* 285 pp. Vienna.
- Kloet, G. S. & Hincks, W. D.** 1945. *A check list of British insects* lix + 483 pp. Stockport.
- 1964. A check list of British insects. Second edition (revised), part I: small orders and Hemiptera. *Handbk Ident. Br. Insects* **11** (1): xv + 119 pp.
- 1978. A check list of British insects. Second edition (completely revised), part 4: Hymenoptera. *Handbk Ident. Br. Insects* **11** (4): ix + 159 pp.
- Kryger, I. P. & Schmiedeknecht, O.** 1938. XLIII Hymenoptera *Zoology Faroës.* **2** (2): 1–108.
- Lal, K. B.** 1934. Insect parasites of Psyllidae. *Parasitology, Cambridge* **26**: 325–334.
- Lowe, A. D.** 1968. The incidence of parasitism and disease in some populations of the cabbage aphid (*Brevicoryne brassicae* L.) in New Zealand. *N.Z. Jl agric. Res.* **11**: 821–848.
- Mackauer, M.** 1968. *Hymenopterorum Catalogus (nova editio)* Pars 3 Aphidiidae. 103 pp. The Hague.
- Malaquin, A. & Moitié, A.** 1914. Les Hyménoptères parasites de l'*Aphis euonymi* (Puceron noir de la Betterave). *C. r. Séanc. Soc. Biol.* **76**: 803–805.
- Maneval, H.** 1940. In Berland, L., Hyménoptères. *Faune Fr.* **7**: 94–118.
- Mani, M. S.** 1939. Descriptions of new and records of some known chalcidoid and other hymenopterous parasites from India. *Indian J. Ent.* **1**: 69–99.
- 1941. Studies on Indian parasitic Hymenoptera – 1. *Indian J. Ent.* **3**: 25–36.

- Marshall, T. A. 1868. Notes on some parasitic Hymenoptera, with descriptions of new species. *Entomologist's mon. Mag.* 5: 154–160.
- 1872. Description of a new species of *Aphidius* from Britain. *Entomologist's mon. Mag.* 9: 123–124.
- 1873. *A catalogue of British Hymenoptera; Oxyura* viii + 27 pp. London.
- 1891–96. Les Braconides. In André, E., *Species des Hyménoptères d'Europe et d'Algérie* 5: 635 pp., 20 pls. Paris.
- Masner, L. 1965. The types of Proctotrupoidea (Hymenoptera) in the British Museum (Natural History) and in the Hope Department of Entomology, Oxford. *Bull. Br. Mus. nat. Hist. (Ent.) Suppl.* 1: 154 pp.
- Masner, L. & Muesebeck, C. F. W. 1968. The types of Proctotrupoidea (Hymenoptera) in the United States National Museum. *Bull. U.S. natn. Mus.* no. 270: 143 pp.
- Meyer, N. F. 1929. Schlupfwespen die in Russland in den Jahren 1881–1926 aus Schädlingen gezogen sind (Vortsetzung). [In Russian.] *Izv. Otd. prikl. Ent.* 4: 231–248.
- Morley, C. 1929. Catalogus Oxyurorum Britannicorum. *Trans. Suffolk Nat. Soc.* 1: 39–60.
- Muesebeck, C. F. W. 1959. New reared species of *Lygocerus* Foerster (Hymenoptera: Ceraphronidae). *Ent. News* 70: 91–96.
- Muesebeck, C. F. W., Krombein, K. V. & Townes, H. K. 1951. Hymenoptera of America north of Mexico. Synoptic catalog. *U.S. Dept. Agric. Monogr.* 2: 1420 pp.
- Muesebeck, C. F. W. & Walkley, L. M. 1956. Type species of the genera and subgenera of parasitic wasps comprising the superfamily Proctotrupoidea (Order Hymenoptera). *Proc. U.S. natn. Mus.* 105: 319–419.
- Nees ab Esenbeck, C. G. 1834. *Hymenopterorum Ichneumonibus affinium monographiae, genera Europaea et species illustrantes* 2: 448 pp. Stuttgart & Tubingen.
- Paetzold, D. & Vater, G. 1967. Populationsdynamische Untersuchungen an den Parasiten und Hyperparasiten von *Brevicoryne brassicae* (L.) (Homoptera, Aphididae). *Acta ent. bohemoslovaca* 64: 83–90.
- Pass, B. C. & Parr, J. C. 1971. Seasonal occurrence of the pea aphid and a braconid parasite *Aphidius smithi* in Kentucky. *J. econ. Ent.* 64: 1150–1153.
- Petherbridge, F. R. & Mellor, J. E. 1936. Observations on the life history and control of the cabbage aphid *Brevicoryne brassicae*. *Ann. appl. Biol.* 23: 329–341.
- Pruthi, H. S. & Mani, M. S. 1942. Distribution, hosts and habits of the Indian Serphoidea and Bethyloidea. *Mem. Indian Mus.* 13: 405–444.
- Ratzeburg, J. T. C. 1844. *Die Ichneumonien der Forstinsecten in forstlicher und entomologischer Beziehung, Ein Anhang zur Abbildung und Beschreibung der Forstinsecten* 1: 244 pp., 4 pls. Berlin.
- 1848. *Ibid* — 2: 238 pp. Berlin.
- 1852. *Ibid* — 3: 272. Berlin.
- Regnier, R. 1923. De quelques grands ennemis du pommier et de leurs parasites. *Revue Bot. appl. Agric. col.* 3: 169–185.
- Reitter, E. 1877. Beiträge zur Käferfauna von Japan. *Dt. ent. Z.* 21: 369–384.
- Richards, O. W. 1977. Hymenoptera: introduction and key to families. Second (revised) edition. *Handbk Ident. Br. Insects* 6 (1): 100 pp.
- Risbec, J. 1858. Contributions à la connaissance des Hyménoptères Chalcidoïdes et Proctotrupoïdes de l'Afrique Noire. *Annls Mus. r. Congo Belge* 64: 7–139.
- Rondani, C. 1874. Nuove osservazioni sugli insetti fitofagi e sui loro parassiti. *Boll. Soc. ent. ital.* 6: 130–136.
- 1877. *Vesparia* parasita non vel minus cognita. *Boll. Soc. ent. ital.* 9: 166–213.
- Rothschild, G. H. L. 1963. Records of hymenopterous parasites and hyperparasites of certain fruit-tree aphids. *Entomologist's mon. Mag.* 99: 126–127.
- Schremmer, F. 1956. Über ein Vorkommen der Tannenstammlaus *Dreyfusia (Adelges) piceae* Ratz. im Wienerwald und ihren Vertilgerkreis. *Pflanzenschutzberichte* 16: 49–69.
- Skrjabin, G. 1930. Zur Biologie von *Aphidius granarius* Marsh. und *Ephedrus plagiator* Nees (Braconidae) parasiten von *Aphis padi* L. *Rev. appl. Ent. (A)* 19: 281.
- Snodgrass, R. E. 1935. *Principles of insect morphology* ix + 667 pp. New York & London.
- Spencer, H. 1926. Biology of the parasites and hyperparasites of aphids. *Ann. ent. Soc. Am.* 19: 119–157.
- Starý, P. 1970. *Biology of aphid parasites (Hymenoptera: Aphidiidae) with respect to integrated control* 643 pp. The Hague.
- 1973. A review of the *Aphidius* species (Hymenoptera, Aphidiidae) of Europe. *Annotnes Zool. Bot. Bratislava* 84: 1–85.
- 1977. *Dendrocerus* hyperparasites of aphids in Czechoslovakia (Hymenoptera, Ceraphronoidea). *Acta ent. bohemoslovaca* 74: 1–9, 1 pl.
- Stephens, J. F. 1829. *A systematic catalogue of British insects* xxxiv + 416 + 388 pp. London.

- Sullivan, D. J. & Van Den Bosch, R.** 1971. Field ecology of the primary parasites and hyperparasites of the potato aphid *Macrosiphum euphorbiae* in the east San Francisco bay area. *Ann. ent. Soc. Am.* **64**: 389–394.
- Takada, H.** 1973. Studies on aphid hyperparasites of Japan. I, aphid hyperparasites of the genus *Dendrocerus* Ratzeburg occurring in Japan (Hymenoptera: Ceraphronidae). *Insecta matsum.* (N.S.) **2**: 1–37.
- 1976. Studies of aphids and their parasites on cruciferous crops and potatoes. *Kontyû* **44**: 234–253, 366–384.
- Thomson, C. G.** 1858. Sveriges Proctotruper. *K. Svenska VetenskAkad. Förh. Stockh.* **15**: 287–358.
- Thuneberg, E.** 1959. Ein kleiner Beitrag zur Kenntnis der Schlupfwespen Finnlands. *Natul. ent.* **39**: 23–24.
- Tillyard, R. J.** 1926. *The insects of Australia and New Zealand* 560 pp. Sydney.
- Todd, D. H.** 1957. Incidence and parasitism of insect pests of cruciferous crops in Hawke's Bay Wairarapa and Manawatu, 1955–56. *N.Z. Jl Sci. Technol.* (A) **38**(7): 720–727.
- Treherne, R. C.** 1916. A preliminary list of parasitic insects known to occur in Canada. *Rep. ent. Soc. Ont.* **36** (1915): 178–193.
- Tshumakova, B. M.** 1956. On some Hymenoptera Chalcidoidea and Serphoidea parasites of Coccoidea in Ussuri land. [In Russian.] *Ent. Obozr.* **35**: 109–119.
- Valentine, E. W.** 1975. Additions and corrections to Hymenoptera hyperparasitic on aphids in New Zealand. *NZ. Ent.* **6**: 59–61.
- Viggiani, G.** 1967. Ricerche sugli Hymenoptera Chalcidoidea XIII sugli entomoparassiti della *Semidalis aleurodifformis* Steph. (Neur. Coniopterygidae), con descrizione di un nuovo genere di Encyrtidae (Prima nota). *Boll. Lab. Ent. agr. Filippo Silvestri* **25**: 163–175.
- 1970. Lo *Pseudococcus fragilis* Brain (Homoptera Pseudococcidae) sugli Agrumi in Campania (notizie preliminari). *Boll. Lab. Ent. agr. Filippo Silvestri* **28**: 55–59.
- Voukassovitch P.** 1925. Observations biologiques sur quelques parasites des pucerons du rosier et leurs hyperparasites. *C. r. Séanc. Soc. Biol.* **93**: 655–656.
- 1928. Contribution à l'étude des insectes parasites entomophages. *Glasn. srpsk. Akad. Nauka* **62**: 49–72.
- Walden, B. H.** 1926. Outbreak of pea aphid on alfalfa. *Bull. Conn. agric. Exp. Stn.* no. 275: 295–298.
- Ward, K. M.** 1934. The green peach aphid (*Myzus persicae* Sulzer) in relation to the peach in Victoria, and the measures investigated for its control. *J. Dep. Agric. Vict.* **32**: 144–145.
- Westwood, J. O.** 1840. *An introduction to the modern classification of insects* **2**: xi + 587 + 158 pp. London.
- Wilson, F.** 1938. Notes on the insect enemies of *Chermes* with particular reference to *Pineus pini*, Koch, and *P. strobi*, Hartig. *Bull. ent. Res.* **29**: 373–389.
- Wimshurst, F. M.** 1925. The cherry black fly (*Myzus cerasi*). *Bull. ent. Res.* **16**: 85–94.
- Withycombe, C. L.** 1923. Notes on the biology of some British Neuroptera (Planipennia). *Trans. ent. Soc. Lond.* **1922**: 501–594.
- 1924. Note on the economic value of the Neuroptera, with special reference to the Coniopterygidae. *Ann. appl. Biol.* **11**: 112–125.
- Wollaston, T. V.** 1858. Brief diagnostic characters of undescribed Madeiran insects. *Ann. Mag. nat. Hist.* (3) **1**: 18–28.
- Yasumatsu, K.** 1947. Two hymenopterous parasites of the grain Aphis *Macrosiphum granarium* (Kirby) in Hikosan Kyushu. *Mushi* **17** (17): 113–114.
- , **Ishihara, T. & Moritsu, M.** 1946. Five hymenopterous parasites of *Tuberolachnus saligna* Gmelin (Aphididae) from Japan. *Mushi* **17** (3): 9–12.
- Zetterstedt, J. W.** 1838. *Insecta Lapponica* vi + 1139 pp. Leipzig.

Index

Page numbers of principal references are in **bold**. Synonyms and unavailable names are in *italics*.

africanus 259
alpestris 262, **276**
ambianus 262, **271**
ancyloneurus 262, **287**
antennalis 309
aphidivorus 262, **270**

aphidorum 261, **266**
aphidum 259, 261, 262, 263, 264, 265, **266**, 270,
 271, 276, 277, 293, 294, 295, 296, 297, 299,
 305, 307, 308
applanatus 262, 281, **282**
attentus 300

- basalis* 288
bicolor 261, 266, **267**, 276, 277
bifoveatus 260, 261, 264, **269**, 294, 296, 299, 305, 307
breadalbimensis 266, **267**
britannicus 262, **271**

callicerus 262, **279**
cameroni 262, **270**, 272
campestris 262, **270**
carpenteri 260, 261, 264, 266, **270**, 293, 294, 295, 296, 297, 298, 299, 303, 304, 306, 307, 308
chilocori 300
claripennis 262, **276**
coccophagus 259, 262, **281**
conwentziae 300
crispus 261, 270, **271**

damicornis 262, **279**
dauricus 309
dubiosus 262, 263, 264, **276**, 293, 294, 295, 296, 297, 298, 299, 306, 307, 308
dubitatus 259

elegans 261, **270**, 271
ergensis 300, **301**

flavipes 262, 263, 264, 276, **278**, 281, 297, 299, 304, 305, 308
flavus 262, **276**
floridanus 300
frenalis 261, **266**, 267
frontalis 262, **281**, 282
fuscipennis 261, **266**
fuscipes 262, 270, 271, **278**, 279
fusciventris 261, **266**, 267

giraudi 262, **270**
glabriculus 262, **288**

halidayi 256, 259, 261, 262, 263, 264, **279**, 297, 298, 299, 304, 306, 308
henkvlugi 300
hyalinatus 261, **270**

incompletus 300
indicus 279, **300**
inquilinus 262, **271**

japonicus 262, **288**

koebeleri 261, **266**, 271
koyamai 259, 261, 300, **301**

laevis 259, 262, 263, 279, **281**, 293, 294, 295, 297, 298, 304, 305, 306, 308
lapponicus 262, **290**
laticeps 262, 263, 264, 279, **283**, 293, 294, 295, 296, 297, 298, 299, 303, 304, 305, 306, 308
latifrons 300

leucopidis 300
levis 281
lichtensteinii 259, 262, 279, **280**
liebscheri 262, 263, 264, 266, 271, **285**, 293, 295, 296, 299, 303, 304, 306, 307, 308
longicornis 262, **276**
lundensis 261, **266**

navaensis 262, **276**
neglectus 261, **266**
niger 262, **270**
noumeae 300

omostenus 301

pallipes 262, **276**
parvulus 262, **286**
piceus 262, **290**
pinicolus 300
propodealis 300
proximus 262, **270**
punctatipennis 262, 270, **271**
punctipes 258, 259, 261, 262, 263, 265, **286**, 299
puparum 287
pupparum 259, 260, 262, 264, 265, **287**, 298, 299, 301, 302, 304, 306, 307

ramicornis 256, 259, 260, 261, 262, 263, 265, **288**, 293, 295, 296, 298, 299, 302, 304, 305, 306
ratzeburgi 259, 262, **288**
rectangularis 262, **276**
remaudierei 300, **301**
rosularum 309
rufipes 261, 266, **267**
rufiventris 262, **270**

semiramosus 262, **290**
serraticornis 290
serricornis 260, 262, 263, 265, 267, **290**, 295, 297, 298, 299, 306, 307
smirnofi 262, **281**
solarii 301
sordidipes 261, **269**
spissicornis 258, 260, 261, 262, 263, 264, **292**, 299, 303
subquadratus 261, 266, **267**
subramosus 262, **290**
subtruncatus 309
syrphidarum 262, **287**

tenuicornis 262, **285**
testaceimanus 262, **270**, 290
thomsoni 262, **271**
tischbeini 262, **271**
triticum 300

wollastoni 287

zetterstedti 262, **290**