

FERUSSON, N. D. M. (1980). A revision of the British species of *Dendrocerus* Ratzburg (*Hymenoptera: Cynipidae*) with a review of their biology as aphid hyperparasites. Bull. Br. Mus. (N. S.) Entomol., 41: 255-314

almost meeting median furrow at scutal suture (Fig. 17). Pterostigma (Fig. 42) slightly less sciincircular 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 Icad. AV to AIX not so long (Fig. S7) (e.g. L/B for AV I 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 sciincircular, 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 Dessari (1972a: 102) [examinid]. [Primary homonym of *Ceraphron rufipes* Nees, 1834: 277.] Syn. n.
- Macrostigma aphidorum* Rondani, 1874: 134. [Nomen nudum.] ['Synonymized' by Dessari, 1965a: 157.]
- Macrostigma aphidum* Rondani, 1877: 184-185, pl. 1, figs 34, 36. Lectotype ♂, ITALY (MZU, Florence), designated by Dessari (1965a: 158) [examined].
- Lygocerus koebelei* Ashmead, 1904: 70. Lectotype ♂, JAPAN (USNM, Washington), designated by Masner & Muesebeck (1968: 112) [examinid]. 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) [examinid]. Syn. n.
- Lygocerus frenalisis* Kieffer, 1907: 47-48. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examinid]. Syn. n.
- Lygocerus breadalbimensis* 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 Dessari (1972a: 59) [examinid]. [Synonymized by Dessari, 1972a: 52.]
- Lygocerus neglectus* Kieffer, 1907: 64-65. Syntype(s) ♀, FRANCE: Ainiens. August (Carpentier) (lost). [Synonymized by Dessari 1972a: 52.]
- Lygocerus aphidum* (Rondani) Dessari, 1965a: 157.
- Dendrocerus aphidum* (Rondani) Dessari, 1966: 12.
- Dendrocerus lundensis* Dessari, 1966: 12. [Replacement name for *Ceraphron rufipes* Thomson, 1858.1 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 Icad. Scape usually black with a little yellow at base, sometimes entirely yellow. AII approximately equal to Icaigili 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 deni 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. Preocipital crescent small, not reaching eyes and only rarely near ocelli.

Thorax black or very dark brown, alutaceous, with short pubescence. Notaulices coniplex, 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 semioid, 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 Icaigili 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. AII 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. frenalisis* 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): *Acyrtosiphon malvae*, *A. pisum*, *A. sp.*, *Aphis evonymi*, *A. nasturtii*, *A. pomi*, *A. sp.*, *Brachycaudus persicae*, *Cavariella aegopodii*, *Clethrobium comes*, *Diuraphis frequens*, *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*, *Siobion avenae*, *S. fragariae*, *Uroleucon cirsii*, *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); Dessari (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 Siary (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 *Clethrobius comes/Trioxys betulae/Alnus incana* represents the Holarctic forest tundra faunistic complex, and *Rhopalosiphum nymphacae/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 Aphididae 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 koebeli* Ashmead, lectotype ♂, Japan: Atami (*Koebeli*) (USNM, Washington). *Lygocerus subquadratus* Kieffer, lectotype ♂, Great Britain: [Scotland, Central] Clober (*Cameron*). *Lygocerus fusciventris* Kieffer, lectotype ♂, Great Britain: [Scotland, Central] Mugdock (*Cameron*). *Lygocerus frenalii* Kieffer, lectotype ♂, Great Britain: [Scotland, Strathclyde] Loeck Libo (*Cameron*). *Lygocerus breudalbinensis* Kieffer, lectotype ♀, Great Britain: [Scotland, Tayside] 'Ben Lawers, along with 1' [= paralectotype of *bicolor*] (*Cameron*). *Lygocerus bicolor* Kieffer, lectotype ♀, Great Britain: [Scotland, Dumfries and Galloway] New Galloway (*Cameron*). *Lygocerus fuscipennis* Kieffer, lectotype ♀, Italy: Giglio 1. iv. 1902 (*Doria*) (MCSN, Genova).

23Y ♂, 147 ♀, Algeria: Esbarres; Oran. Cinary Ir: Toneriff. Egypt: Siwa. France: Durdognac, Mouleydier; Pyrennes-Orientales. Germany (East): Harz Mis, Brocken dist.: thinnundviudesi, Altvater. Great Britain: Bedfordshire: Dunstable Downs, Eaiun Uray. Steppingly; Berkshire: nr Stratly, Lambourn Down, Silwood Park, Thatcham Moor. nr Theale, Wytham; Wokinghamshire: Burnham Becches, Farnham; Cambridgeshire: Wickell Fen; Cheshire: Wray Castle; Devon: Uovey Heathfield, Lustleigh, Torquay dist., Wuulacoiibc; Dorset: nr Wareham; Dyfed: Llangranog; Essex: Hornchurch; Glamorgan; Gloucestershire: Gloucester, Staunton; Greater London: Highgate, Norwood; Gwynedd: Llanddona; 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: Sprailon; North Yorkshire: Malham Tarn; Oxfordshire: Headington, Oxford, Mapledurham, Summertown; Salop: Caer Caradoc; Somerset: Winsford; Suffolk: Minnesmere, Santon Downham, Waigford; Surrey: Ashicad. Coulsdon. East Sheen; Eflingham, Esher Coniilion. Horsley, Kew, Oxshott, Richmond; Tayside: Ben Lawers (paralectotype of *Lygocerus bicolor* Kieffer); Western Isles: Lewis, Stormoway Castle; [?] Thornhill (paralectotype of *Conostigmus dubiosus* Kieffer). Greece: Kifisia; Mi. Parnis. Greenland: Noret, nr Hlesiers Vig. Iceland: Akureyri; Dyriolacy; Eyjafjall, Skogasandur; Seljaland; Vestmannaeyjar. Ireland: Co. Dublin, Bohernabreena; Leitrim; Sligo, Trawallua; Wicklow, Blessington, Tonlagce Mi. Israel: Bet Dagen. Italy: Cortina, D'Ampezzo. Morocco: Beni Mellal. Lebanon: Beirut. Netherlands: Helmond; Tiel; Urk; Wageningen. Portugal: Lisbon; Spain: Marbella, Malaga. Sweden: Jmi Fors; Skåne, Lund; Skåne, Stenoffa; Sulnaskr. Yugoslavia: Istria.

FURTHER DISTRIBUTION. Austria (Hellén, 1966: 13); Belgium (Dessari, 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 (Dessari, 1975: 260). Australasia: Australia (Dessari, 1975: 267).

Dendrocerus bifoveatus (Kieffer)

(Figs 38, 55)

Lygocerus bifoveatus Kieffer, 1907: 55. Holotype ♀, FRANCE: Amiens, ex *Aphis* un *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 A1 and usually AX1 longer than AIII. Segments AV to AX approximately equal in length, segments AV1 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 slightly 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 iliorax. Eyes variable in size but never large. Frontal creni 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 suture. 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 gastrocuchi 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 A1 and usually AX1 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. Siary (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 *Rhopalosiphon 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