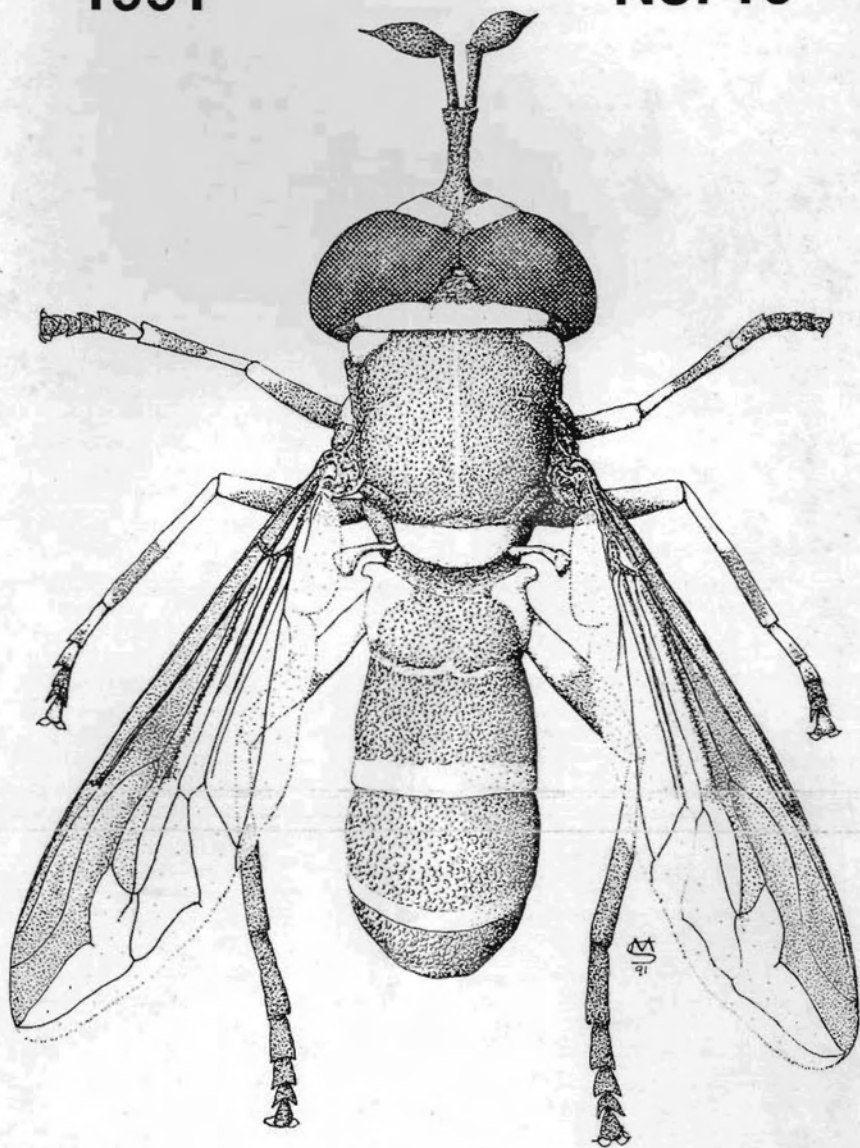


Dipterists Digest

1991

No. 10



Hoverfly Edition

Dipterists Digest is a popular journal aimed primarily at field dipterists in the UK, Ireland and adjacent countries, with interests in recording, ecology, natural history, conservation and identification of British and NW European flies.

Articles may be of any length up to 3000 words. Items exceeding this length may be serialised or printed in full, depending on the competition for space. They should be in clear concise English, preferably typed double spaced on one side of A4 paper. Only scientific names should be underlined. Tables should be on separate sheets. Figures drawn in clear black ink, about twice their printed size and lettered clearly.

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References should follow the layout in this issue.

Initially the scope of Dipterists Digest will be:-

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- Records of new or scarce species for regions, counties, districts etc.
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- Notes on identification, additions, deletions and amendments to standard key works and checklists.
- News of new publications/references/literature scan.

Texts concerned with the Diptera of parts of continental Europe adjacent to the British Isles will also be considered for publication, if submitted in English.

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CALLICERA AENEAE, C. AURATA, C. FAGESII AND C. MACQUARTII REDEFINED, WITH A KEY TO AND NOTES ON THE EUROPEAN CALLICERA SPECIES (DIPTERA: SYRPHIDAE)

Martin C.D. Speight

Summary

Callicera aurata (Rossi), *C. fagesii* Guerin-Ménéville and *C. macquartii* Rondani are withdrawn from synonymy and redefined. *C. aenea* (Fab.) is also redefined. Neotypes are designated for *C. aenea*, *C. aurata* and *C. fagesii*. Lectotypes are designated for *C. macquartii* and *C. roserii* Rondani. The names *roserii* Rondani and *zhelochovtsevi* Zimina are recognised as junior synonyms of *aurata* (Rossi), *obscura* Portevin is recognised as a junior synonym of *fagesii* Guerin-Ménéville and *loewi* Verrall in Collin is recognised as a junior synonym of *macquartii* Rondani. It is suggested that the European *Callicera* fauna may comprise only 6 species, *C. aenea*, *C. aurata*, *C. fagesii*, *C. macquartii*, *C. rufa* (Schummel) and *C. spinolae* Rondani. It is shown that the name *panzerii* Rondani is a nomen nudum and the probable significance of the use made of this name by later authors is discussed. A key to distinguish the European species is presented. Finally, it is suggested that European distribution data for *Callicera* species require to be re-appraised due to confusion between *C. aenea* and *C. aurata* on the one hand and between *C. fagesii*, *C. macquartii* and *C. rufa* on the other. All British specimens examined, standing under the name *C. aenea*, have proved to belong to *C. aurata*.

Introduction

Panzer (1809) founded the genus *Callicera* on his interpretation of Fabricius' (1777) *Bibio aenea*, but, while it is apparent that the genus is based on a European *Callicera* species, it is by no means certain that *Callicera aenea* sensu Panzer was the same species as the *aenea* of Fabricius. *C. aenea* (Fab.) was the first described European species of *Callicera*. *Syrphus auratus* of Rossi (1790) was later recognised as being also a species of *Callicera*, and was the second described European species of the genus, but was subsequently synonymised with *C. aenea*. Unfortunately, the specimens upon which *aenea* of Fabricius, *aenea* sensu Panzer and *aurata* of Rossi were based are all lost and presumed destroyed. Further, the descriptions provided by these early authors do not give sufficiently precise information to indicate, unequivocally, to which European *Callicera* species they referred.

Rondani (1844) described three new species of *Callicera* from Italy and the confusion even then surrounding the identity of *C. aenea* (Fab.) is evident from the introduction to his text. At that point he did not recognise the occurrence of *C. aenea* (Fab.) in Italy, referring to his three new species and *C. aurata* (Rossi) as comprising the Italian *Callicera* fauna, on the basis that he was reasonably sure of the identity of *aurata* of Rossi, but was not sure which species were being referred to by Fabricius or Panzer. However, it has to be said that he seems not to have had any opportunity to examine the Rossi specimen(s) of *aurata*, since he states that his interpretation of *aurata* is based on the work of Meigen and Macquart. Meigen's colour figure of the species Meigen recognised as *C. aenea*, published by Morge (1976), is clearly a male of *C. macquartii*. Rondani (1844) finishes his account with the statement that he had himself seen material of four European species of *Callicera*, but that if the German species (which could only mean *aenea* of either Fabricius or Panzer, or of both authors) has been accurately described, then he had himself seen a fifth

European species, for which he proposes the name *C.panzerii*. In the same year that Rondani described his three new species Guerin-Ménéville (1844) described a new *Callicera* species from France, *C.fagesii*.

Since 1844 various authors, including Rondani (1857), have described new European species of *Callicera*, but none of them have settled the question of the identity of *C.aenea* (Fab.). Rondani continued to demonstrate uncertainty concerning the identity of both *aenea* and *aurata* by at one stage (Rondani, 1857) giving *aurata* as a synonym of *C.aenea* (Fab.) and later stating (Rondani, 1868) that *aurata* could not be *aenea* (Fab.) but should be regarded as a distinct species, adding without further comment that at that time interpretations of *aurata* had come to encompass one of his own species, *C.macquartii*, or *C.rufa*. The Guerin-Meneville species, *C.fagesii*, was simply ignored during this period and later given as a synonym of *C.aenea*. As to Rondani's *C.panzerii*, he seems never to have mentioned it again.

It is the conclusion of the present author that the known European fauna of *Callicera* probably comprises 6 species. Over much of Europe, two of these species have been for many years confused under the name *Callicera aenea* (Fabricius) and one of these has been described under a number of different names. Similarly, three species have been confused under the name *C.rufa* (Schummel), with what may well be no more than different colour varieties of one of these 3 species having been described under a number of different names.

The objective of the present text is to provide a redefinition of *C.aenea* (Fab.) and take steps towards stabilisation of the nomenclature of the other European *Callicera* species. This falls short of a full revision of the genus *Callicera* in Europe, but until more biological information is available on some of the described species it is doubtful whether much progress could be made in carrying out a comprehensive revision, due to uncertainty over what constitutes intraspecific variation and interspecific variation among them. For purposes of the present account, redescription of species and type designations have been carried out as necessary and an identification key has been constructed to aid in distinguishing the species recognised, since existing keys can no longer be used. *C.rufa* has been re-defined by Coe (1939), and his interpretation of that species is employed here. The description of *C.spinolae* Rondani, provided by Rondani (1844), is regarded as adequate to define that species, and *C.spinolae* is not redefined here.

Callicera aenea (Fabricius, 1777)

Neotype: male, carrying a data label "Germania merid., Jöhlingen, 16 May 1966, Kormann leg.", now in the collections of the British Museum (Natural History), London.

Redescription, based on neotype:

Antennae: black, except for basal half of segment 1 (scape), which is yellowish, and the arista, which is white; segments 1 and 2 (pedicel) together about as long as segment 3; segment 1 about the same length as segment 2 (Fig.2A); segments 1 and 2 with short, black, bristly hairs; arista slightly shorter than antennal segment 2, covered in white micro-hairs. **Head:** black and shining, undusted except for thin dusting on the vertical triangle; entirely pale-haired except for vertical bands of black hairs on the eyes and some black hairs on the vertical triangle; eye hairs as long as the median length of the vertical triangle, in broad vertical bands of alternating pale (whitish) and blackish hairs; face bare in the mid-line;

frons bare; vertical triangle with mixed yellowish and almost black hairs longer than those on the eyes; facial profile as in Fig. 1A.

Thorax: almost black, mostly shining and undusted; mesoscutum mostly dusted dark grey, only vaguely shining except on 3 narrow, longitudinal strips bare of dusting, which appear black and shining from some angles; the median, bare longitudinal strip runs from close to the anterior margin of the mesoscutum back to a point approximately the same distance from the posterior margin of the mesoscutum as the scutellum is long in the mid-line; the 2 lateral bare, longitudinal strips run from the anterior margin of the mesoscutum back almost to the posterior margin of the mesoscutum; most mesoscutal hairs somewhat wavy, pale, yellowish, but a transverse belt of almost black hairs, mixed in with the yellowish hairs, is present across the middle of the mesoscutum; mesoscutal hairs the same length as those on the scutellar disc; scutellum dusted, but somewhat shining, with pale, wavy hairs on the disc, the shortest of which are two thirds as long as the maximum length of the scutellum and the longest of which are nearly as long as the maximum length of the scutellum; hairs on the posterior margin of the scutellum somewhat longer, equalling the maximum length of the scutellum; pleura shining, with patches of thin grey dusting and long, pale yellowish hairs; prosternum and metasternum hairy, hairs pale, yellowish.

Legs: coxae, trochanters and all femora black, except for distal ends of all femora, which are yellow for a length slightly greater than the apical width of a femur; hind femora decreasing in depth gradually and only slightly, from base to apex; all tibiae yellowish, except for a faint and slight brownish smudge at around mid length; all legs with basitarsus and 2nd. tarsomere yellowish, tarsomeres 3-5 greyish; fore femora with some black hairs postero-laterally towards the apical end and hind femora with some long, black, hristly hairs antero-ventrally on the apical half of the length, but other hairs on all femora whitish yellow; tibiae entirely whitish-yellow haired; tarsi with some black hairs mixed in on darkened tarsomeres, but predominantly whitish-yellow haired.

Wings: covered in microtrichia except for a narrow strip posterior to and running parallel with CuP, continuing for the length of CuP, in the anal cell; wing veins yellow-brown, stigma yellowish; calypterae with long yellow hairs on upper surface; plumule hairs yellowish.

Abdomen: tergites and sternites almost black, shining, undusted, except for tergites 1 and 2, which are dusted dark grey over most of the surface, the area of dusting on tergite 2 taking the form shown in Fig. 3A; abdomen densely covered in upstanding yellowish hairs, a little shorter than those on the mesoscutum, some black hairs present along the apical margin of abdominal tergite 4.

Additional material examined:

Austria: 29 May 1954, male, Lainzer Tiergarten bei Wein, Wienerwald, coll. Scherrpeth, in RM, Leiden; 1872, male, Roghf., coll. Egger, in RM, Leiden; male, Kreuth, coll. D. van Rosen, in collns JAW Lucas.

Czechoslovakia: 16 May 1908, male, Dornbach, coll. R von Stein, in BM, London; 25 May 1907, male, Dornbach, in RMHNB, Brussels.

France: 29 May 1898, male, Saverne, Bas-Rhin, coll. J. Bourgeois, in MNHN, Paris.

Germany: males, female, various dates, Jöhlingen, coll. K. Kormann; 24 May 1969, male, Blankenloch, Karlsruhe, coll. K. Kormann, in collns T.R. Nielsen.

Norway: 19 June 1985, male, Sauherad, Nordagatu, inner Telemark, coll. T.R. Nielsen, in collns T.R. Nielsen; 18 June 1982, female, Kjevik Kr. sand S, outer Vest-agder, coll. T.R. Nielsen, in collns T.R. Nielsen.

Poland: 16 May 1982, male, Cbojnów, Legmia WS3, coll. T. Zatzwarnicki, in RM, Leiden.

Switzerland: 5 June 1958, male, Les Pléiades, Vaud, coll. J. de Beaumont, in MZ, Lausanne.

Variability:

In the male, antennal segments 1-3 may be entirely black; ant. seg. 2 may be distinctly longer than ant. seg. 1; between the three longitudinal, undusted, shining strips on the mesoscutal disc the surface may be more heavily dusted than elsewhere, giving rise to a pair of grey, longitudinal dust stripes which reach from close to the anterior margin of the mesoscutum back to within about one length of the scutellum from the posterior margin of the mesoscutum; the black hairs on the mesoscutal surface may be sparse, so that whitish-yellow hairs predominate even across the middle of the disc and no clear transverse band of black hairs is apparent; the fore femora may be entirely pale-haired; black hairs may be numerous, intermixed in the antero-ventral fringe on the hind femora; all the tibiae may be entirely yellow, or with a brownish dorsal surface from mid length almost to apex; all tarsomeres of all legs may be more or less yellow, the apical tarsomeres being then only vaguely greyer than the basal tarsomeres; the wings may be almost entirely covered in microtrichia; abdominal tergite 3 may have a pair of small, roundish, matt black marks around the middle of the tergite, as in Fig. 3B; abdominal tergite 4 may be entirely yellow-haired; the cerci are deeper than long and rather rectangular, without a concave outer margin and the long digitate process of each stylus widens just before its apex to give a rather bulbous appearance in side view (see Fig. 4A).

In the female, the width of the face below the antennae varies from one and a half times to twice the maximum width of an eye viewed from in front; the frons is black, shining and undusted on the frontal tubercle, but otherwise thinly grey-brown dusted back to the level of the anterior ocellus; lateral to the ocellar triangle the surface of the head capsule is black, shining and almost undusted against the eyes, this more shining area continuing back onto the dorsal part of the postocular orbits; the ocellar triangle and its immediate surround are somewhat less shining, but only very thinly dusted; a pair of distinct, ovoid, densely dusted grey dust spots is present within the general frontal dusting, against the eyes and just posterior to the frontal tubercle, these grey dust spots together occupying approximately one third of the width of the frons at that level; frontal hairs yellowish for from half to two thirds of the distance from the posterior margin of the frontal tubercle back to the anterior ocellus, but the rest of the surface between the eyes predominantly black-haired back to the dorsal rim of the occiput; all or most of the hairs on the postocular orbits yellowish; facial profile, Fig. 1B; the hairs on the scutellar disc may include a scattering of black hairs; the legs are more extensively yellow than in the male, so that the fore and mid femora may be yellow for most of their length and all the tarsomeres of the fore and hind tarsi may be almost entirely yellow; towards the apical ends of the hind femora some black hairs may be present anteroventrally; a pair of matt black spots may be present on abdominal tergite 3, in the same position as in the male, and in some specimens these black spots are developed into a pair of transverse, matt black bars, as in Fig. 3C.

Discussion:

In recent literature, including Peck (1988), *C. aenea* is given as described by Fabricius in his "Species insectorum" of 1781. In fact, the original description occurs in a part of Fabricius' "Genera insectorum" which, according to Zimsen (1964), was published in 1777. Peck (1988) suggests all parts of "Genera insectorum" appeared in 1776. The description of *C. aenea* included in "Species insectorum" is an abbreviated version of that published in the earlier "Genera insectorum" and this abbreviated version was republished by Fabricius in both his "Mantisa insectorum" of 1787 and "Systema antilatorum" of 1805. The original (1777, p.305) description of *C. aenea*, in full, is as follows:

"BIBIO nigra tomentosa, abdomine aeneo.
Habitat in Germania de Hattorf.

Statura omnino Syrphi ruficornis, at antennae filatae huius generis, nigrae, extrorsum crassiores apice fubulatae, albae. Labium obscure flavescens. Thorax

tomentosus, obscurus. Abdomen aeneum tomento ferrugineo pubescens. Pedes pallidi femoribus nigris."

According to Zimsen (1964) no type material of this species remains, so that for interpretation of *aenea* the original description becomes of critical importance. Considering the two species confused under *aenea* by subsequent authors, neither could be described as predominantly "*nigra tomentosa*", even though neither of them is entirely lacking black hair on all parts of the body surface. As to "*abdomine aeneo*", this would apply to all European *Callicera* species. The information on the origin of *aenea*, given by Fabricius (1777) as "*Germania*", while in no way providing a precise type locality, can reasonably be taken to include nearly all of the modern state of Germany. The reference "de Hattorf" is taken to refer to the person from whom the specimen(s) was/were derived. There is a town of Hattorf in the Harz mountains of central Germany. Germany probably falls within the present range of both species confused under the name *aenea*, though I have not seen any German specimens of the species defined in the present text as *C. aurata*. The features mentioned by Fabricius in the supplementary part of the description of *C. aenea* (beginning "*Statura omnino*") could apply to all European *Callicera* species except *C. rufa* and *C. spinolae*.

Given the ambiguous nature of Fabricius' description of *aenea*, the redefinition of this species given here is based also on the concept of *aenea* employed by recent authors such as Zimina (1982, 1986), who have separated the two species otherwise confused under this name.

Callicera aurata (Rossi, 1790).

Neotype: female, carrying two labels, one ovoid and white bearing the printed number 364, the other rectangular, white and bearing a female symbol; standing under the name *rosarii* in the Rondani collection, Museo Zoologico della Specola, Firenze, Italy.

Redescription, based on neotype:

Antennae: black, except for extreme base of antennal segment one (scape), which is brownish, and the arista, which is white; segments 1 (scape) and 2 (pedicel) with short, black, bristly hairs; arista covered in white micro-hairs; segment 1 slightly longer than segment 2; segments 1 + 2 together about as long as segment 3 (Fig. 2D); arista longer than segment 2 and about the same length as antennal segment 1.

Head: width of the face below the antennae is less than twice the maximum width of an eye, viewed from in front; face black, shining, undusted except for two narrow silver-grey dust strips running dorso-ventrally along the anterior eye margins from just ventral to the level of the antennal insertions down to the level of the facial tubercle; frons above the antennae black, shining and undusted on the frontal tubercle but otherwise thinly dusted brownish and less shining, back to the level of the hind ocelli, with a pair of almost triangular yellow-grey dust spots against the eyes just above the antennae, these dust spots, at their maximum extent, occupying about one third of the width of the frons; post-ocular orbits thinly dusted grey to brown; hairs on the head yellowish except on the frons, where most hairs are black for the posterior two thirds of the distance back to the hind ocelli; the longest eye hairs are about as long as the shortest distance between the posterior ocelli, and the eye hairs become progressively shorter towards the posterior margins of the eyes; eye-hairs yellowish, a dorso-ventral band of denser and darker brown hairs occurring at about the middle of each eye; facial profile, Fig. 1D.

Thorax: mostly black, shining and almost undusted; mesoscutum with 2 narrow, indistinct, longitudinal stripes of greyish dusting occupying about the middle third of the dorsum,

separated by a narrow longitudinal strip of undusted surface, about half as wide as one of the longitudinal dust stripes; the 2 longitudinal dust stripes reaching from the anterior margin of the mesoscutum back to a point approximately the length of the scutellum from the posterior margin of the mesoscutum; scutellum black, shining, undusted; hairs on the mesoscutum upstanding and somewhat wavy, mostly pale brownish yellow but with scattered black hairs intermixed, particularly across the middle third of the length of the mesoscutum; hairs on the mesoscutum about as long as those on the disc of the scutellum; hairs on the scutellar disc up to half as long as the maximum length of the scutellum, wavy, yellowish; hairs on the posterior margin of the scutellum up to two thirds as long as the maximum length of the scutellum; pleura black, more or less shining but with a thin grey dusting over most of the surface; pleural hairs mostly yellowish, but predominantly black ventrally on the mesopleur, between the mid and hind coxae; prosternum and metasternum hairy; metasternal hairs black.

Legs: All coxae and trochanters black; all femora black from base for most of their length, ventrally, but the fore and mid femora are yellow antero-dorsally for the apical two thirds of their length and the hind femora are yellow antero-dorsally for the apical quarter of their length; all tibiae entirely yellow; fore basitarsus yellow but the other 4 tarsomeres of the fore leg dark grey-brown; mid and hind tarsi with the basitarsus and the second tarsomere yellow and tarsomeres 3-5 dark grey/black; hairs on the fore and mid coxae yellow; hairs on the hind coxae mixed yellow and black; hairs on all trochanters black; hairs on fore and mid femora mixed black and yellow, with black hairs predominating in the postero-lateral fringe on the fore femora; hairs on the hind femora all yellow; hairs on all tibiae yellow; yellow tarsomeres with yellow hairs, but grey/black tarsomeres with a mixture of black and yellow hairs.

Wings: second basal cell without microtrichia basally, over half its basal width and this bare area continuing as a narrow strip running parallel to CuA, to within one fifth of the distance from the apical end of the cell; anal cell bare of microtrichia over its entire width basally, this bare area continuing distally as a strip parallel to CuP as far as the end of CuP, progressively decreasing in breadth; wing veins and stigma yellow-brown; calypterae with long straw-coloured hairs on the upper surface; plumule with yellow-brown hairs.

Abdomen: tergites and sternites shining, metallic bronze except for tergites 1 and 2; tergite 1 mostly dull, dusted dark grey/black; tergite 2 with a vague central, matt black patch and a pair of faint, transverse matt black bars, making a pattern similar to that shown on tergite 2 in Fig. 3D; abdominal hairs all yellow, those on the tergites upstanding, about as long as those on the scutellar disc; hairs on the sternites upstanding or somewhat adpressed and directed posteriorly, rather longer than those on the tergites (up to two thirds as long as the maximum length of the scutellum).

Additional material examined:

France: 3-13 September 1985, females, Forêt de la Massane, Nr.Argeles, Pyrénées Orientales, ancient *Fagus/Quercus* forest at c.750m, drinking from isolated puddles of water at edge of stream, coll. MCDS, in collns MCDS; 9 August 1971, female, Massif Centrale, 1000m, in BM, London; 28 May 1971, male, Valescure, Var, coll.K.Guichard, in BM, London; 21 August 1913, female, Velmana, Pyrénées Orientales, coll. Brolemann, in MNHN, Paris; female, Wasselone, Bas-Rhin, Munchen Mus.; female, Rennes, Ille-et-Vilaine, coll. L.Bleuse, in MNHN, Paris; female, Forêt de Fontainebleau, Seine et Marne, coll. H.Marmottan, in MNHN; 2 June 1944, female, Phenissy, Côte d'Or, coll. Bayard, in MNHN, Paris; 15 October 1911, female, Argentat, Coreze, coll.J.Vachal, in MNHN, Paris; male, female, Lamballe, Côte du Nord, coll.J.Surcouf, in RMHNB, Brussels;

Great Britain: various dates, males and females, New Forest, Hampshire, various collectors, in BM, London.

Greece: 5 August 1963, females, Katara-pas, 1600-1700m, in RM, Leiden; 5 August 1975, male, Tymphrestos, 1100m, N. Phthiotidos, coll. F.& L. Williams, in collns J.A.W.Lucas.
Italy: 27 July 1959, male, Castiglione del Pepoli, Abetaia, 900m, coll. H.J.P.Lambeck, in collns J.A.W.Lucas.
Norway: 7 August 1976, female, Lindesnes, outer Vest-Agder, coll. T.R.Nielsen, in collns T.R.Nielsen; 25 June 1975, female, Harkmark, Mandal, outer Vest-Agder, coll. T.R.Nielsen, in collns T.R.Nielsen.
Spain: 17 July 1979, male, Hozzarganta-Tal by Jimena, Cadiz Prov., coll. W.Schacht, in collns J.A.W.Lucas;
Switzerland: 1 August 1964, female, Auvernieu, coll.J de Beaumont, in MZ, Lausanne.
Turkey: 14 August 1981, female, Palaz Dagi, 12 Km NE of Gundogmus, 1500m, coll. J.A.W.Lucas, in collns J.A.W.Lucas.

Variability:

In the male, the frons above the antennae is bare; antennal segments 1 and 2 may be the same length; the arista is as long as, or slightly longer than ant.seg.1 (Fig. 2C); dorsally, the eye hairs are a little longer than the distance between the outer edges of the two hind ocelli, but the eye hairs are shorter on the rest of the eye surface and decrease in both length and density from the antero-dorsal eye margin to the posterior and ventral eye margins; facial profile, Fig.1C); the hair covering on all femora may be predominantly black; the second basal cell of the wing may be almost entirely covered in microtrichia; abdominal tergite 3 may have a pair of short, matt black, transverse bars, postero-laterally, as in Fig. 3D; the cerci are deeper than long, with a slightly convex outer margin and the long digitate process of each stylus is almost parallel-sided from shortly after its base almost to its tip, without any apical widening (Fig.4B).

In the female, antennal segment 1 varies in length from being noticeably longer than ant.seg.2 to being the same length as ant.seg.2; the frontal dust spots may be roughly triangular or rather rounded; the mesoscutum may be almost entirely yellow haired; the pleura may be entirely yellow-haired, leaving the black hairs on the ventral parts of the thorax restricted to the metasternum; the black hairs on the legs may be restricted to the fore and hind coxae and basal parts of the postero-lateral fringe of the fore femora; conversely, black hairs may be present, both ventrally and postero-laterally, on the mid femora; on abdominal tergite 2 the pair of postero-lateral, matt black bars may be missing. In both sexes, the general covering of body hairs varies from pale straw to brownish orange.

Discussion:

Examination of the paper by Rossi (1790) shows that the Italian species *aurata* is clearly a *Callicera* species in which:

- The third antennal segment is about equal in length to the combined lengths of antennal segments segments 1 and 2. This can be seen from the figure of *aurata* accompanying Rossi's description.
- The femora are predominantly black in the female. Rossi states "Pedes ferruginei femoribus tarsisque nigris".

This combination of features does not occur in *C.macquartii*, *C.rufa* or *C.spinolae* as recognised here. Following Rondani (1857), *aurata* has usually been regarded as a synonym of *C.aenea* (Fabricius). But neither Rossi's figure nor his description of *aurata*, including the statement "Totus aureus tomento etiam flavo renitens. Color aureus in cadavere tractu temporis fusco-aeneus evadit" agree very well with *C.aenea* as recognised either in the present text or by Sack (1929) or Zimina (1982, 1986).

The Italian *Callicera* species which agrees best with Rossi's description and figure of *aurata* is *roserei* of Rondani (1844). Rondani (l.c.) uses the black transverse marks which can be

found on the abdominal tergites of his *roserii* as a means of distinguishing that species from his 1844 interpretation of *C.aurata*. But these black marks vary in extent and are entirely lacking even in some of the specimens of Rondani's syntype series of *roserii*. This leaves no basis for distinguishing *roserii* of Rondani from *aurata* sensu Rondani (1844). Further, the only specimen standing under the name *C.aenea* in the Rondani collection is a male of *C.roserii*, demonstrating the degree of confusion experienced by Rondani in attempting to distinguish *C.roserii* from related species.

When put together, these various pieces of evidence lead to the conclusion that *aurata* of Rossi is simply an unmaculated female of the same species later described by Rondani as *roserii*, who was misled into supposing that two different species were involved because some of his specimens carried dark abdominal maculae. Based on this conclusion I have designated one of the four females comprising Rondani's syntype series of *roserii* as both lectotype of *roserii* of Rondani and neotype of *aurata* of Rossi, since Rossi's material of *aurata* has been lost. The International Code of Zoological Nomenclature (1985) states clearly that "The fact that a specimen is already the name-bearing type of one nominal species-group taxon does not prevent its being the name-bearing type, or part of the name-bearing type, of another".

Zimina (1982) described two new species of *Callicera*, one of them, *C.zhelochovtsevi*, partly based on European material. I have examined specimens of *C.zhelochovtsevi* (Zimina) determined by Zimina, from the collections of the British Museum (London). These also clearly belong to *C.aurata*. In Zimina's key (1986) *C.zhelochovtsevi* is only distinguished from *C.aurata* (as *C.roserii*) on the basis that in *C.zhelochovtsevi* the front femora and sternopleuron are black pubescent and the abdominal pubescence is short and even, whereas in *C.aurata* (as *C.roserii*) it is said that the front femora and sternopleuron are yellow-pubescent and the abdomen carries long yellow pubescence. In reality, the condition of these features in *C.aurata* (as typified by the neotype, designated from among the syntype series of *C.roserii*) is exactly as defined by Zimina for *C.zhelochovtsevi*. From these facts I conclude that *zhelochovtsevi* of Zimina is a junior synonym of *aurata* of Rossi.

Mention was made earlier in this account of the name *C.panzerii* Rondani. According to my interpretation of the International Code of Zoological Nomenclature (1985) the name *C.panzerii* Rondani was a nomen nudum when introduced by Rondani, since he neither associated the name with the description or figure of any species, nor mentioned any specimen as belonging to *panzerii*. However, the name *panzerii* has subsequently been treated as a synonym of *C.aenea* (Fab.), firstly by Schiner (1861), then by Verrall (1901), Kertész (1910) and Peck (1988). In Schiner's (1861) account (erroneously referred to in Peck as published in 1862), *C.panzerii* is given as a synonym of *C.aenea* at the end of a definition of *C.aenea* (Fab.), but this description would as clearly apply to *C.aenea* (Fab.) as redefined here, as it would to *C.aurata* (Rossi) as redefined here. Nonetheless, so far as I can discern, this would mean that the name *C.panzerii* was first established by Schiner (1861), as a junior synonym. It is thus not an available name. This is perhaps worthy of note because the only specimen standing under the name *Callicera aenea* in the Rondani collection is a male of *C.aurata*. Given the context of Rondani's introduction of the name *panzerii* in 1844, the fact that the only specimen standing under *C.aenea* (Fab.) in his collections is a specimen of *C.aurata* might lead one to suggest that this specimen should be regarded as the lectotype of *panzerii* and that *panzerii* is thus a synonym of *aurata*, rather than *aenea*, were it not for the fact that until Schiner (1861) associated the name *panzerii* with a description of his concept of *C.aenea*, the name *panzerii* was apparently a nomen nudum. If this interpretation is correct, selection of a neotype for *C.panzerii* would have

to be made from among material standing under the name *C.aenea* in Schiner's collection and *C.panzerii* should be referred to as *C.panzerii* Schiner, 1861.

***C.fagesii* Guerin-Ménéville, 1844**

Neotype: male, labelled "Clamart 14 IV 26 F. le Cerf" on a white rectangular label, "TYPE" on a red rectangular label and "Callicera obscura Port." on a white rectangular label; in the collections of the Museum National d'Histoire Naturelle, Paris.

Redescription, based on neotype (which is somewhat teneral):

Antennae: segment 1 brown, segments 2 + 3 black, with white arista; segments 1 and 2 with short, black bristly hairs; arista densely covered in white microhairs; segment 1 more than twice as long as segment 2; segments 1 + 2 together about half the length of segment 3; arista about the same length as antennal segment 1 (Fig. 2E).

Head: face below antennae brown, shining, undusted, except for narrow, greyish dust stripes running dorso-ventrally along the anterior eye margins from just beneath the antennae to the level of the facial tubercle; frons above the antennae black/dark brown, shining black and undusted on the anterior half of the frontal tubercle, but more brown and thinly dusted grey-brown posteriorly against the eyes; vertical triangle and dorsal parts of the postocular orbits almost undusted, shining; head entirely pale brown haired, except for a wide, dark brown stripe of hairs, dorso-ventrally, on each eye, other eye hairs pale; eye hairs dorsally longer than antennal segment 2; face somewhat deformed, due to postmortem collapse.

Thorax: mesoscutum rather dull, thinly grey dusted, except for on three ill-defined, black longitudinal strips, which are more shining; mesoscutal hairs wavy, as long as antennal segment 1 across the middle of the disc, but anteriorly and posteriorly rather longer, all pale brown; scutellum thinly dusted greyish, entirely pale haired, the hairs all longer than antennal segment 1 and many of them are three quarters the maximum length of the scutellum; pleura and sterna entirely pale haired, generally shining, though with very thin greyish dusting.

Legs: coxae, trochanters and femora dark brown, almost black; femora paler at apical ends; fore and mid tibiae brown, hind tibiae mostly brown, but with apical sixth of length almost black, dorsally; tarsomeres of fore leg, including basitarsus, dark grey, nearly black; tarsomeres of mid leg with basitarsus brown and other tarsomeres very dark grey, almost black; hind leg with all tarsomeres very dark grey, almost black; leg hairs all pale brown, except for short, black, bristly hairs mixed in laterally and ventrally on tarsomeres; hind femora angled ventrally.

Wings: entirely covered in microtrichia.

Abdomen: tergites more or less shining, except for abdominal tergite 2, which is mostly dull, black and tergite 3, which is vaguely darkened and duller both medially and on a transverse band posteriorly; entirely pale-haired, the hairs rather wavy.

Additional material examined:

Belgium: 30 June 1980, female, Belvaux, Namur, coll. R.Uys, in ZMU, Amsterdam.

France: 8 May 1949, male, Forêt de Malvoisine, Seine et Marne, coll. A.Bayard, in MNHN, Paris; 10 June 1984, female, Forêt de la Massane, Pyrénées Orientales, on flowers *Sorbus aria*, clearing in *Quercus/Acer* forest beside river, 750m, coll. MCDS, in collus MCDS; 24 May 1917, male, Bois de Boulogne, Hauts de Seine, coll. S.M.Planet, in MNHN; 10 May 1941, male, Maisons Laffite, Yvelines, in MNHN, Paris.

Netherlands: 27 June 1936, female, Rheden, in collus J.A.W.Lucas; 21 July 1949, female, Eperheide e.o., coll. van Doseburg, in RM, Leiden.

Spain: 14 April 1985, female, Vent.i. Camillas Hazzarzanta-Tal, by Jimena, Cadiz Prov., coll. W.Schacht, in collns J.A.W.Lucas; 1933, male, B.W., coll. van Doseburg, in RM, Leiden.

Turkey: 18 June 1984, female, Haregos, Hakkari Sat Dagari, 1600m, coll. J.A.W.Lucas, in collns J.A.W.Lucas.

Variability:

In both sexes, the hair covering of the general body surface varies from greyish yellow to pale brown, with black hairs intermixed in a transverse band between the wing bases on the mesoscutum, on the dorsum of the scutellum, on the mid and hind femora and on the apical abdominal sclerites; these black hairs may be absent or very sparse (*obscura* form), or progressively more numerous, until a situation is reached in which they predominate on much of the mesoscutum, parts of the femora and most of the abdominal tergites and sternites (*bertolonii* form); the tibiae may be entirely orange, brownish orange, pale brown or brown with almost black apices and an ill-defined, dorsal, near-black streak; in darker specimens the tarsomeres are also progressively darkened, leaving the basitarsi a dusky orange-brown and the other tarsomeres black. Matt, black areas on the abdominal tergites are poorly developed, ill-defined, except on abd.tg.2, where the central area may be mostly dull, from the anterior margin almost to the posterior margin. On abd.tg.3 matt, black areas may be entirely absent, or a vague longitudinal, median blackish mark may be present, broadening or not posteriorly into a hardly discernable transverse band which entirely disappears before reaching the lateral margins of the tergite. In the male, the cerci are longer than deep and almost triangular, the outer margin being deeply concave. The long digitate process of each stylus narrows considerably from its base to half way along its length, then widens progressively almost to its apex, so that it appears knobbed in side view (Fig. 4C). Male and female facial profiles, Figs. 1E, 1F.

Discussion:

The Guerin-Ménéville collection is in the Muséum National d'Histoire Naturelle in Paris. But the type material of *C.fagesii*, which was described from S.France, is not in the museum collections and is presumed to be destroyed (Loic Matile, pers.comm.). For interpretation of this species it is thus necessary to rely upon the original description. In the description of *C.fagesii* Guerin-Ménéville (1844) states that the general body surface of this species is "Entièrement d'un noir un peu verdâtre, garni de poils d'un gris jaunâtre, surtout sur les côtes". Concerning the legs, he says "Pattes noires, avec les genoux, les jambes et la base des tarsi jaunâtres". He says of its antennae that "le second article de ses antennes est beaucoup plus court que le premier". Throughout the 20th. century *C.fagesii* has been regarded as a synonym of *C.rufa*. But this combination of features does not occur in *C.aenea*, *C.aurata*, *C.rufa* or *C.spinolae*. It is less easy to be certain *C.fagesii* is not the same species as *C.macquartii*, and there is the added complication that these two species were both described in the same year, in publications which neither of them carry any indication of the month in which they were published. If it had to be concluded that the names *fagesii* Guerin-Ménéville and *macquartii* Rondani both applied to the same species there would thus be no convenient method for establishing which name had priority. However, it would not be accurate to describe the hair cover of the general body surface as greyish yellow in *C.macquartii* and this would be an accurate description of the hair covering of *C.obscura* Portevin (1927), which is also well described by the other features mentioned by Guerin-Ménéville for *C.fagesii*. I have examined the holotype of *C.obscura*, which is a somewhat teneral male from the Paris Basin (in Portevin's description of *C.obscura* the date of capture of the holotype is given as 14 March 1926, whereas the specimen labelled the type of *C.obscura* is labelled that it was collected on 14 April 1926 - I conclude that in Portevin's description an error was made in citation of the month of capture), and it agrees

closely with Guerin-Ménéville's description of *C.fagesii*. Since there is no basis for concluding that *C.fagesii* and *C.obscura* are different species I consider *obscura* of Portevin has to be regarded as a junior synonym of *fagesii* of Guerin-Ménéville, which is the oldest available name for this species. I have therefore designated the holotype of *C.obscura* as the neotype of *fagesii*. But is *C.fagesii* a distinct species or merely a variety of *C.macquartii*? In my judgement, all specimens I have seen named as either *C.bertolonii*, *C.obscura* or *C.porri* belong to one species and the earliest available name for that species, if indeed it is a distinct species, is *fagesii* Guerin-Ménéville. But I am not entirely satisfied that the distinctions which can be made between *C.fagesii* and *C.macquartii* comprise an adequate basis for recognising both as distinct species. In particular, although there are small but definite distinctions between the male terminalia of other European *Callicera* species, I am unable to find such distinctions between the male terminalia of *C.fagesii* and *C.macquartii*. It may be necessary to wait until someone is able to rear *C.fagesii* and *C.macquartii*, before it can be established whether or no these taxa are specifically distinct. On balance, I incline to the view that they are distinct, not only because the general hair covering of *C.fagesii* is slightly longer and woolier than is found in *C.macquartii* and the width of the genae is different in the two species, but also because:

1. Nearly all records of *C.fagesii* are from the Spring, whereas *C.macquartii* seems to be a late summer/autumn species,
2. Both species occur in Southern Europe, but only *C.fagesii* is recorded from further North, with records from N France, Belgium and the Netherlands.

As described by Rondani (1857), *C.bertolonii* and *C.porri* differ from *C.fagesii* as described by Guerin-Ménéville (1844) in the extent of black hairs on the apical abdominal sclerites and the extent of darkening of the tibiae. Specimens I have seen, named as *C.bertolonii* or *C.porri*, only differ from the neotype of *C.fagesii* designated here in these two characters. Further, among these specimens there seems to be a continuum of variation from specimens with orange tibiae, through specimens with brownish tibiae, to specimens with almost black or actually black distal ends to the hind tibiae. Similarly, there is a continuum of variation from specimens with entirely pale abdominal hair, through specimens with only a few black hairs on the apical rim of abdominal tergite 4 to others with abd. tg. 4 more extensively black haired, ending with specimens in which abd. tgs. 3 and 4 are predominantly black-haired. The specimens with the darker legs have the more extensively black-haired tergites. I see no adequate basis for regarding any of these specimens as belonging to species distinct from *C.fagesii*. I have not seen the type material of either *C.bertolonii* or *C.porri* and so am unable to confirm that those two species are conspecific with *C.fagesii*, but to judge from the material I have seen it would seem very likely that *bertolonii* and *porri* are junior synonyms of *fagesii*.

C.macquartii Rondani, 1844

Lectotype: female, with a diamond-shaped label, carrying the information "m. 393. 131."; in the collections of the Museo Zoologico de La Specola, Firenze.

Redescription, based on lectotype:

Antennae: black, except for ant.seg.1, which is yellow at the base and the arista, which is white; ant.seg. 2 less than half the length of ant.seg.1; ant.seg. 3 twice as long as the combined length of ant.segs. 1 + 2 (Fig. 2F); ant.segs. 1 + 2 with black, bristly hairs; arista covered with white microhairs.

Head: mostly black and shining, including facial and frontal tubercles; dusting on frons and ocular strips indistinct, due to greasing; hairs on head yellow except on the frons, where they are dark brown and on the ocellar triangle, where they are black; hairs on frons as long as the distance between the outer edges of the hind ocelli; hairs on ocellar triangle as long as those on the mesoscutum; postocular fringe of hairs, dorsally behind eyes yellow, as long as antennal segment one; eye hairs white with two vertical bands of brown hairs; eye hairs about as long as the distance from the anterior margin of the front ocellus to the posterior margin of the hind ocelli, except posteriorly, where they are somewhat longer (but not as long as the hairs on the ocellar triangle); facial profile, Fig. 1H.

Thorax: black and mostly shining; mesoscutum undusted and shining except for a pair of vague, longitudinal dust stripes on the anterior half of the surface, but interpretation difficult due to discolouration and greasing; mesoscutal hairs whitish yellow, upstanding and up to as long as two thirds the length of antennal segment 1, with some black hairs intermixed; scutellum black and shining, with hairs as on the mesoscutum; hairs on scutellar disc similar in length to those on the mesoscutum, but hairs on posterior margin of the scutellum somewhat longer, including some as long as, or longer than, antennal segment 1; pleura largely obscured by greasing, with many of the hairs matted and stuck to the body surface by greasing, but visible hairs all long and yellowish; sterna not visible. Legs: all coxae and trochanters black; all femora black from base for two thirds or more of their length, the remaining portion yellow; hind femora angled ventrally, as in fig. 2L; all tibiae yellow; all basitarsi yellow, but basitarsus of fore leg somewhat darkened distally; fore leg with tarsomeres 2-5 black; mid and hind legs with tarsomere 2 more or less yellow (somewhat darkened distally) and tarsomeres 3-5 black; leg hairs all yellow except for on darkened tarsomeres, where some short, black, bristly hairs occur intermixed with pale hairs; calypterae with long white hairs on the dorsal surface; plumule with whitish-yellow hairs.

Wings: wing veins yellow-brown; 2nd. basal and anal cells with small areas bare of microtrichia.

Abdomen: partly discoloured and with matted hairs due to greasing, but unaffected areas of surface brassy, metallic and with thick, evenly distributed, upstanding orange-yellow hairs on the tergites, these hairs more whitish yellow on the anterior tergites and as long as the hairs on the mesoscutum; no distinct matt, black areas apparent (abdominal tergite 2 is badly greased and any surface dusting or matt black colouration would not be detectable); sternites with somewhat longer yellow hairs, mostly directed posteriorly, less thickly and evenly distributed than on the tergites and including many up to as long as the hairs on the posterior margin of the scutellum.

Additional material examined:

Cyprus: July-October 1902, male, Troodos, 4500m, coll.D.M.A. Bate, in BM, London.

France: 3-13 September 1985, males and females, Forêt de la Massane, Pyrénées Orientales, on flowers *pink Allium* sp. and drinking at edge of stream around mid-day, within forest, old *Fagus/Quercus* forest at 750m, coll. MCDS, in collns MCDS; September 1920, female, Blain, Loire Atlantique, coll. Hervé-Bazin, in MNHN, Paris; 8 October, female, on *Hedera* flowers, in MNHN, Paris.

Italy: 23 September 1976, female, by mouth of R. Paludo, SE Calabria, on flowers *Solidago*, dry river bed, coll. MCDS, in collns MCDS.

Spain: female, Barcelona, in RM, Leiden.

Turkey: female, Constantinople, in MNHN, Paris.

Variability:

In the lectotype, the extent of the dusting etc. on the frons and the mesoscutum is not sufficiently clear to be adequately described, due to greasing. The condition of these parts

in other specimens is thus described in more detail in the following notes, as are other features not clearly interpretable in the lectotype.

In the male, there are no long hairs on the frons above the antennae; there may be some black hairs scattered among the yellow hairs on the face; the hairs on the ocellar triangle may be all black or mixed yellow and black; the eye hairs, dorsally are slightly more than half as long as antennal segment 1; the facial profile is shown in Fig. 1H; the mesoscutum may be entirely yellow haired or with a transverse belt of black hairs mixed in across the middle of the disc, just posterior to the transverse suture; the mesoscutal hairs are slightly longer than in the female, being as long as antennal segment 1 towards the anterior margin, and elsewhere down to two thirds the length of ant.seg.1; the hairs on the posterior margin of the scutellum are up to two thirds as long as the median length of the scutellum; the wings may be almost entirely covered in microtrichia or with bare areas as in the lectotype; the second tarsomere of the hind leg may be predominantly yellow or black; some black hairs may be present, scattered among the yellow hairs, along the posterior margin of abdominal tergite 4 and on pregenital sclerites of the postabdomen (notably tergites 7 and 8); there is a central, matt black mark on abdominal tergite 2, which may occupy no more than the median third of the width of the tergite and be confined to the anterior half of the tergite, but in other specimens this black mark occupies almost the entire width of the tergite, as in Figs. 3E, 3F; abdominal tergite 3 may be without any matt black marks, or with a median matt black mark which varies from a narrow, longitudinal streak not reaching into the posterior third of the surface of the tergite to a longer median streak which widens posteriorly to give a vaguely triangular shape, as in Figs. 3E, 3F; Fig. 3F is drawn from the holotype of *C.loewi*; the long digitate process of each stylus narrows considerably from its base to half way along its length, then widens progressively almost to its apex, so that it appears rather knobbed in side view (Fig. 4D).

In the female, antennal segment 1 may be entirely black; the eyes hairs may have only one dorso-ventral stripe of black hairs among the whitish hairs; the frons may be almost entirely black haired, or with up to the anterior third of its length yellow haired; the frontal tubercle is undusted, black and shining; the frons above the frontal tubercle is dull, dusted brown for its entire width back almost to the anterior ocellus and with a pair of roughly triangular yellow-grey dust spots against the eyes, within the area of brown dusting; at their maximum extent the yellow-grey dust spots occupy less than one third of the width of the frons; below the antennae the face is undusted except along the ocular strips, which are heavily dusted yellow-grey/ yellow throughout; the mesoscutum usually has two distinct, longitudinal stripes of grey dusting from the anterior margin of the mesoscutum to within one length of the scutellum from the posterior margin of the mesoscutum, but these dust stripes may be faint; the hairs on the mesoscutum are mostly yellow, but there is a broad transverse band of black hairs across the middle of the mesoscutum just posterior to the transverse suture, this band of black hairs occupying up to nearly half the length of the mesoscutal disc; the scutellum and the pleura and the sterna are entirely yellow-haired; the hind femora may exhibit a scattering of short, black, bristly hairs ventrally, in the apical half of their length; the basitarsus and the second tarsomere may be entirely yellow on all legs; the abdominal tergites are yellow haired except for some black hairs along the posterior margins of tergites 4 and 5; the abdominal tergites are undusted, brightly shining a brassy metallic colour except for a more or less triangular, median matt black patch reaching from the anterior margin of the second tergite almost to its posterior margin.

Discussion:

This species has long been regarded as a synonym of *C.rufa*, a course of action which may have been precipitated by Rondani himself, since he (1857) points to the possibility that *C.rufa* and *C.macquartii* could be the same species. Coe (1939) redefined *C.rufa* based on Schummel's type material of the species, Verrall's (1904, in Collin 1913) descriptions of

C.yerburyi (recognised by Coe, 1939, as a synonym of *C.rufa*) and Scottish specimens of *C.rufa* bred by Coe himself. Coe's definition of *C.rufa* is employed here, based on material of *C.rufa* determined by Coe, from the series of specimens bred by him from Scotland. The Rondani collection today contains only a single female specimen under the name *macquartii*. It is this specimen that has been designated as lectotype of *C.macquartii*. Comparison between *C.rufa* and the *C.macquartii* lectotype demonstrates that these species are quite distinct. They may be distinguished using the characters employed in the key below.

Verrall's description of *C.loewi* was published after his death, based on notes compiled by Collin (1913). According to Verrall (in Collin, 1913) the arista of *C.loewi* is one third the length of antennal segment three, but this can no longer be judged from the holotype, from which both aristae are now missing. Assuming Verrall's statement to be correct, the arista in male *C.loewi* is the same length, proportionately, as that of *C.macquartii*. The holotype of *C.loewi* Verrall, now in the collections of the British Museum (Natural History) in London, differs from males of *C.macquartii* only in that the matt, black patch on abdominal tergite 3 is larger than is typical for *C.macquartii*. The extent of this black mark is subject to considerable variation in *C.macquartii* and its extent in the *C.loewi* holotype is not inconsistent with the view that *C.loewi* is the same species as *C.macquartii*. There is then no adequate basis on which to maintain *C.loewi* as a distinct species and it is here recognised as a junior synonym of *C.macquartii*.

It is possible that *C.macquartii* and *C.fagesii* are one and the same species. This matter is considered here in the discussion of *C.fagesii*.

The SE European species *C.rohdendorfi* Zimina (1982) is almost certainly the same species as *C.macquartii*, to judge from the data provided by Zimina (1987). However, I have not seen specimens of *C.rohdendorfi* determined by Zimina and am so unable to confirm this synonymy.

KEY

1. Antennal segment 2 not less than three quarters the length of ant. seg. 1 (seg.2 may be slightly longer than seg.1); ant. seg. 3 about as long as ant.segs. 1 + 2 together (Figs. 2A-D, 2H) 2
 - ant. seg. 2 no more than half as long as ant.seg. 1; ant. seg. 3 twice as long as ant.segs. 1 + 2 together (Figs. 2E-G) 6
2. Males 3
 - females 4
3. Frons, against eyes above antennae, with long hairs (as long as the hairs on adjacent parts of the eyes); abd. tg3 with a complete, dull black, transverse band close to its posterior margin; antennae as in Fig. 2H; terminalia as in Fig.4F *spinolae* Rondani
 - frons, above antennae, without hairs (other than microscopic pile); abd. tg3 entirely shining or with a pair of matt black marks (see Figs. 3A-D) 5
4. Femora entirely yellow-orange; abd. tg3 with a dull black, transverse band across close to its posterior margin *spinolae* Rondani

-- legs with femora extensively black; abd. tg3 entirely shining, brassy, or with a pair of narrow, transverse, matt black marks within the posterior half of the tergite..... 5

5. Male and female: dorsum of mesoscutum thinly but distinctly dusted greyish over almost entire surface, back to scutellum (with or without 2 or 4 distinct longitudinal dust-stripes within the general dusting); hairs on scutellar disc two thirds or more the length of the scutellum and hairs on posterior margin of scutellum as long as the scutellum; pleura entirely pale haired; legs usually entirely pale haired; all trochanters pale haired; hairs on postero-lateral surface of fore and mid tibiae including some up to as long as the maximum width of a tibia in dorsal view; all tarsomeres as yellow as the basitarsi or tarsomeres 3-5 only vaguely greyish, much paler than the blackened basal parts of the femora *aenea* (Fabricius)

-- male and female: dorsum of mesoscutum brightly shining, except for 2 longitudinal grey stripes of dusting medially, which stop abruptly between the wing bases (and so do not reach the scutellum); hairs on scutellum nowhere as long as the scutellum and on scutellar disc no more than half as long as the scutellum; pleura usually black-haired ventrally; at least fore and hind trochanters partly black haired; at least fore femora extensively black-haired postero-laterally; hairs on postero-lateral surface of fore and mid tibiae all shorter than maximum width of a tibia in dorsal view; tarsomeres 3-5 of all legs almost black, as dark as the blackened basal parts of the femora *aurata* (Rossi)

6. Hind femora smoothly curved and flat, ventrally (Figs. 2K, 2M); legs usually entirely orange, except for last 2 tarsomeres, which are black on all legs (the femora may be narrowly black at the base and the hind femora may be black on up to the basal third); mesoscutum undusted, shining; wings with extensive areas of membrane bare of microtrichia on basal cells and anal cell; (abd. tg3 with a transverse, dull black band, interrupted at the middle, close to the posterior margin of the tergite; male antenna Fig. 2G; male terminalia Fig. 4E) *rufa* (Schummel)

-- hind femora angled ventrally (Figs. 2J, 2L), ventral surface shallowly concave in apical half of length; legs with at least all femora mostly black and tarsomeres 3-5 of all legs black; mesoscutum with longitudinal stripes of grey dusting medially; wings almost entirely covered in microtrichia (often a narrow strip bare along anterior margin of anal cell and a small patch bare along mid-line of 2nd. basal cell) 7

7. Scutellar disc with many hairs no longer than antennal segment 1; hairs on general body surface orange to whitish yellow, straight; abdominal tergites almost without black hairs; all tibiae orange; genae beneath eyes proportionately narrower (Figs. 1G, 1H) *macquartii* Rondani

-- hairs on scutellar disc all longer than ant. seg. 1; hairs on general body surface yellow-brown to grey brown, somewhat wavy; at least abd. tg.4 often extensively black haired (abd. tgs. 3 + 4 and apical abdominal sternites may be extensively black haired); tibiae may be all orange, but at least hind tibiae often brownish or partly black; genae beneath eyes proportionately wider (Figs. 1E, 1F) *fagesii* Guerin-Ménéville

Notes on the species

With their spectacular antennae and their abdomens shining like polished, metallic bronze, copper or brass, *Callicera* species are frequently regarded as among the most beautiful of

European hoverflies. They are also among the most elusive, being largely arboreal as adults and inhabitants of high tree holes as larvae. Further, as with so many other saproxylic organisms, their ancient forest habitat is disappearing from Europe and they are disappearing with it. There are good grounds for concluding that, with the possible exception of *C. aurata*, all of Europe's *Callicera* species should be regarded as threatened throughout Europe and I have suggested elsewhere (Speight, 1989) that they can validly be employed to aid in the identification of forests of international importance for protection of flora and fauna. Because of the scarcity of *Callicera* species, specimens of them are rare in collections and I have seen only one European collection containing material of all of the 6 species recognised in the present account. And there is little recent material. This scarcity of specimens may well have been part responsible for the absence of revisionary work on the European *Callicera* fauna. It certainly retarded completion of the present text! The relative proportions of the antennal segments and the extent of matt, black markings on the abdominal tergites have been repeatedly used to separate *Callicera* species in the past. Having been able to study material gathered together from a number of different collections, I have found that there is more intra-specific variability in these features than has been taken into account previously. It might be anticipated that the male terminalia would provide a wealth of features distinguishing the species. But examination at x80 magnification does not reveal great differences. I have nonetheless included here basic side-view diagrams of the male terminalia of the 6 species, and have drawn attention to some differences between them which are consistent. But if there are differences between the male terminalia of *C. fagesii* and *C. macquartii*, I have failed to recognise those differences. If these latter two taxa have to be regarded as separate species it follows that there may be other *Callicera* species not easily distinguished from one another using features of the male terminalia. Similarly, given how scarce and localised *Callicera* species now are in Europe it is feasible that additional species, confined today to some limited part of the continent, remain to be discovered.

In the following species accounts, I have tried to bring together as much as possible of the data existing on each species, using a standard format for each species account. It is notable that in the major European studies of syrphid migration, by Aubert et al (1976) and Gatter and Schmid (1990), not one specimen of any *Callicera* species was encountered among the two and a half million specimens they collected.

***Callicera aenea* (Fabricius, 1777)**

Preferred environment: forest; ancient *Fagus/Quercus/Carpinus* forest with overmature and senescent trees. Adult habitat: primarily arboreal, but males are known to hover at 2-3m from the ground, in clearings and at woodland edge. Flowers visited: unknown. Flight Period: May/September, with peak May/June. Larva: unknown, possibly in rot-holes of *Acer pseudoplatanus*. Range: requires reassessment, due to confusion with *C. aurata*; can be confirmed from Norway, Poland, Czechoslovakia, France (Vosges) and Germany (Harz) through central Europe into the Alps (Switzerland, Austria) and (according to Zimina, 1986) on into European parts of the USSR, S to the Crimea and E into Siberia and on to the Pacific (Sachalin). Determination: see above; the relative lengths of antennal segments 1 and 2 are more variable in this species than is indicated by Zimina (1986); some females of *C. aurata* in which the areas of black hair on ventral parts of the thorax are very restricted can be easily mistaken for females of *C. aenea*; the male is illustrated in colour by Kormann (1988); the male terminalia illustrated by Thompson (1980) and refigured by Zimina (1986), as being those of *C. aenea*, correspond with those of *C. aenea* as redefined in the present account, shown in Fig. 4A.

Callicera aurata (Rossi, 1790).

Preferred environment: deciduous forest; ancient *Fagus/Quercus* forest with overmature and senescent trees. Adult habitat: primarily arboreal, descending rarely to feed at flowers or to visit streams to drink; descends to drink in dappled sunlight at the margin of streams within the canopy of old forest; occasionally females can be found at great distance from forest. Flowers visited: *Rubus fruticosus*. Flight Period: end May/mid October, with most records July/September. Larva: described and figured by Rotheray (in press) from larvae collected from a rot-hole high (18m above ground) in an old *Fagus* in ancient forest. Range: can only be stated provisionally, due to confusion with *C.aenea*; confirmed from Norway and Great Britain S to the Mediterranean and central Spain, including most of France; E through central and S Europe with records from Switzerland, Italy, Yugoslavia, Greece and Turkey; according to Zimina (1986) (as *C. zhelochovtsevi*) from Albania and southern parts of European USSR, including the Crimea and Caucasus and on to Azerbaijan. Determination: see above; the relative lengths of antennal segments 1 and 2 are more variable in this species than is indicated by Zimina (1986); females in which the areas of black hairs on ventral parts of the thorax are very restricted can be difficult to separate from females of *C.aenea*; the male terminalia are shown here in Fig. 4B; the female is illustrated in colour (as *C.aenea*) by Stubbs and Falk (1983).

Callicera fagesii Guerin-Ménéville 1844

Preferred environment: deciduous forest; ancient *Fagus/Quercus* forest with overmature and senescent trees. Adult habitat: primarily arboreal, descending to feed at flowers of subcanopy trees and to visit edges of streams to drink. Flowers visited: *Sorbus aria*. Flight period: beginning April/end June, with females on to mid July. Larva: unknown. Range: can be confirmed from Netherlands, Belgium, France (Paris Basin S to Mediterranean, inc. Pyrenees); Spain (Cadiz); Turkey; probably also from Italy (Rondani specimens), Yugoslavia and Turkmenia (Zimina, 1986). Determination: see above; the male terminalia are shown here in Fig. 4C;

Callicera macquartii Rondani, 1844

Preferred environment: deciduous forest; ancient *Fagus* forest with overmature and senescent trees. Adult habitat: primarily arboreal, descending occasionally to feed at flowers or to visit streams to drink; descends to drink in bright sunlight, at spots where woodland streams provide flat patches in the sun at the water's edge and clear flight paths up to the canopy; occasionally females can occur at great distance from forest. Flowers visited: pink flowered, autumnal *Allium* spp., *Hedera*, *Solidago canadensis*. Flight Period: September/October. Larva: unknown. Range: due to confusion with *C.fagesii* and *C.rufa*, can only be stated provisionally; central and S France (inc. Pyrenees); S Spain (Barcelona); central and S Italy; Turkey; if *C.rohdendorfi* is a synonym of *C.macquartii*, then *C.macquartii* occurs also in the Crimea and Caucasus. Determination: see above; the male terminalia are shown here in Fig. 4D.

Callicera rufa Schummel, 1842

Preferred environment: conifer forest; ancient *Pinus sylvestris* forest with overmature and senescent trees. Adult habitat: primarily arboreal, but females descend to visit the freshly cut stumps of old pine trees in the sun in small forest clearings, or to visit rot-holes. Flowers visited: unknown. Flight Period: mid May/August. Larva: described and figured by Coe (1938); puparium described by Coe (1939), from larvae collected from deep, standing-water tree-holes in old *Pinus sylvestris*; Rotheray and MacGowan (1990) suggest it is easier to detect the presence of *C.rufa* in a pine forest by searching for larvae in rot-holes than by collection of adults. Range: requires reassessment, due to confusion with *C.fagesii* and *C.macquartii*; confirmed from Great Britain (Scotland), Netherlands,

Corsica. Determination: see above; in the male terminalia (Fig. 4E) the cerci are longer than deep and almost triangular, and the long digitate process of each stylus is almost straight, narrows progressively, but only slightly, from base to tip and is without any obvious apical widening; the claw-like processes on the superior lobe are more widely spaced than in other species; the female is illustrated in colour by Stubbs and Falk (1983).

Callicera spinolae Rondani, 1944

Preferred environment: deciduous forest; ancient *Fagus/Quercus* forest with overmature and senescent trees. Adult habitat: primarily arboreal, but descends occasionally to feed at flowers or to visit streams to drink; visits streams in bright sunlight, choosing spots where direct sunlight falls on flat patches at the water's edge and there is direct flight path up to the canopy. Flowers visited: *Angelica*, *Hedera*, *Solidago* sp. Flight Period: September/October. Larva: Zimina (1986) reports rearing *C.spinolae* from larvae collected in a rot-hole low down on the trunk of a *Populus*; *C.spinolae* must also be associated with some other genus of deciduous tree, because I have found this fly commonly within a large, entirely deciduous forest, within which *Populus* species are entirely absent. Range: Great Britain (E England) and N France S to the Pyrenees, central Spain and the Mediterranean; Germany; Italy; Roumania; USSR (Tajikstan). Determination: see above; Stubbs and Falk (1983) suggest that the femora are "entirely or almost entirely pale" in both sexes of this species, and while this is true for the female, in the male the femora of all legs are black on almost their entire length; in the male terminalia (Fig. 4F) the cerci are longer than deep and almost triangular, and the digitate process of each stylus lacks the inner flange occurring in other European species, narrows progressively from base to shortly before the apex and then expands noticeably to give a bulbous appearance in side view; the female is illustrated in colour by Stubbs and Falk (1983).

Acknowledgements

I am indebted to Dr. Robert Blackith for his translation of various pieces of Latin text. Both he and Dr. Paddy Ashe have kindly provided their opinions on nomenclatural aspects of this text. Dr. Jean Legrand traced for me a copy of a particularly rare 19th. century publication. Through the kindness of the following, I have been able to examine specimens of *Callicera* in their care: Mr.B. Brugge (Amsterdam), Mr.C. Claussen (Flensburg), Dr.P. Goeldlin de Tiefenau and Mr.A. Maibach (Lausanne), Dr.P. Grootaert (Brussels), Mr.K. Kormann (Walzbachtal), Mr.J. Lucas (Rotterdam), Dr.M. Matile (Paris), Ms.S. Mascherini (Florence), Mr.T. Nielsen (Sandnes), Dr.B. Pitkin (London), Dr.G. Rotheray (Edinburgh), Dr.P.J. van Helsdingen (Leiden).

Herr Kurt Kormann also generously put a male of *Callicera aenea* at my disposal for designation as neotype. Dr.J. Travé made it possible for me to visit the Forêt de la Massane, from which other material critical to the production of this text was derived. Dr.G. Rotheray provided me with information on his forthcoming publication which includes description of the larva of *C.aurata*.

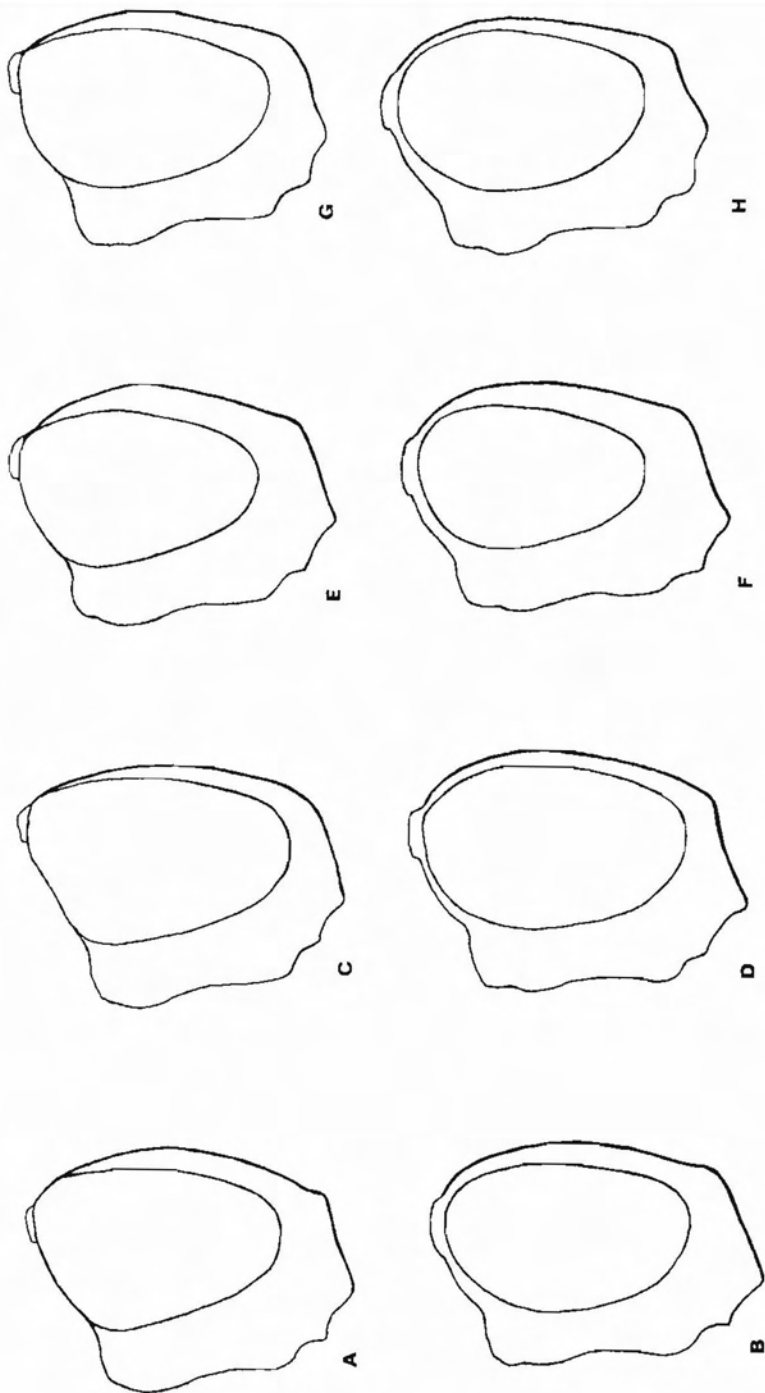


Fig. 1: *Calliocera* species, head, side view, diagrammatic, with eye hairs and facial hairs omitted.
 A,B = *C.azusa*, male (from neotype), female; C,D = *C.aurata*, male, female (from neotype); E,F = *C.fageali*, male, female; G,H = *C.masquartii*, male, female (from lectotype)

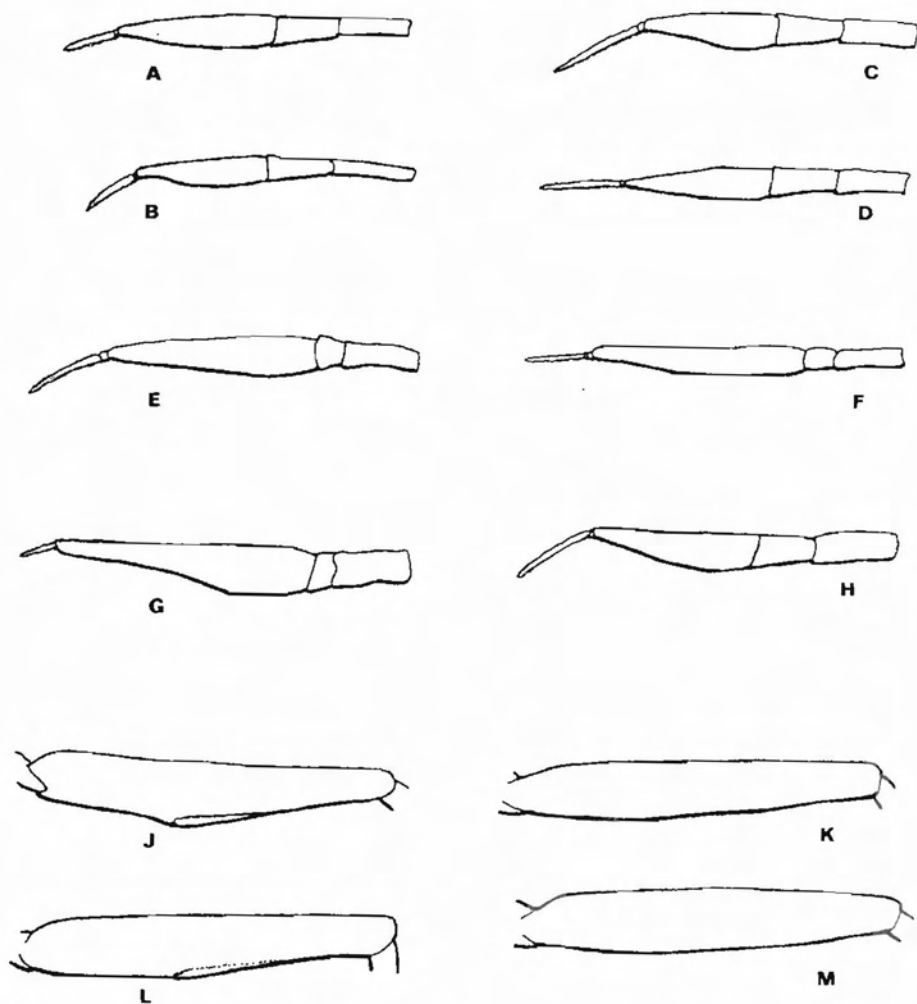
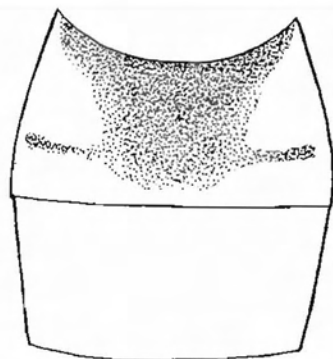
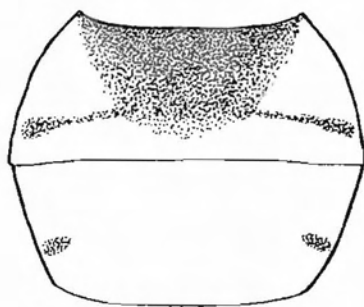


Fig.2: *Callicera* species, left antenna in side view (A-H) and left, hind femur, antero-lateral view (J-M), all diagrammatic, with hair covering omitted.

A,B = *C. aenea*, male (from neotype), female; C,D = *C. aurata*, male, female (from neotype); E = *C. fagesli*, male (from neotype); F = *C. macquartii*, female (from lectotype); G = *C. rufa*; H = *C. spinolae*; J = *C. fagesli*, male; K = *C. rufa*, male; L = *C. macquartii*, female; M = *C. rufa*, female.



A



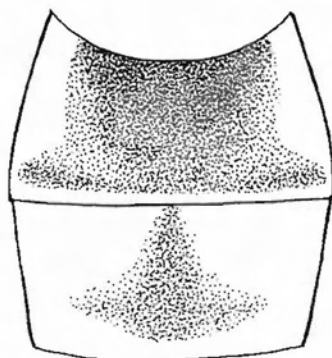
D



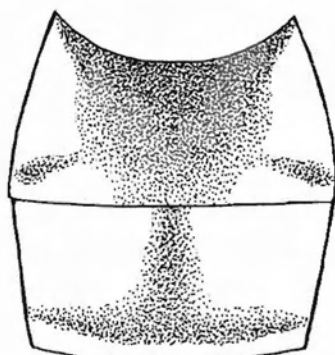
B



C



E



F

Fig.3: *Callicera* species, abdominal tergites 2 + 3 (A,D, E, F) or tergite 3 only (B,C), dorsal view, diagrammatic, hair covering omitted, stippling showing extent of matt, black marks.

A,B = *C.aenea*, males (A from neotype); C = *C.aenea*, female, showing maximum extent of markings observed on 3rd. tergite; D = *C.aurata*, male; E,F = *C.macquartii*, males, showing maximum extent of markings observed in this species.

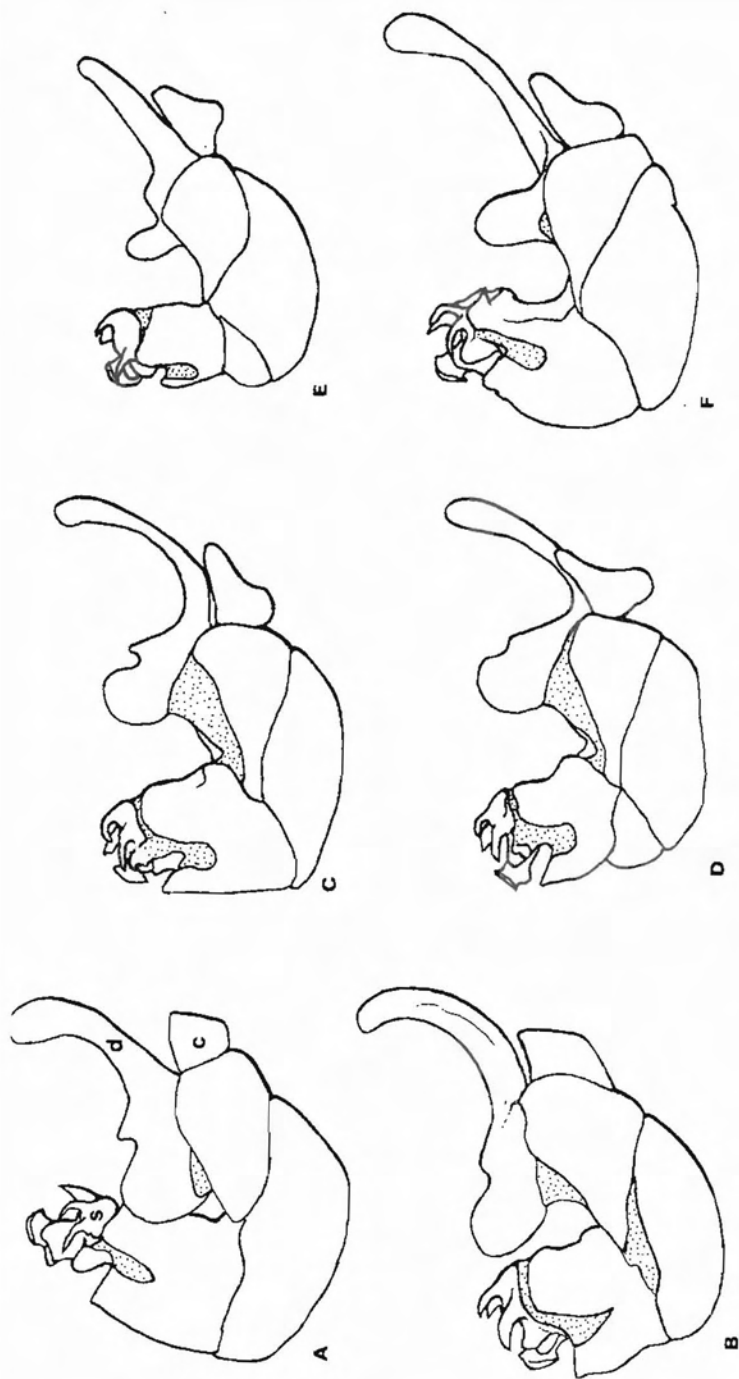


Fig. 4: *Callicera* species, general view of male terminalia, diagrammatic, hair covering omitted, stippling indicating membranous areas. Abbreviations used: c = cercus; d = digitate process of stylus; s = superior lobe.

A = *C. aenes*; B = *C. aurata*; C = *C. fagesli*; D = *C. macquartii*; E = *C. rufa*; F = *C. splinola*.

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A METHOD OF MONITORING GARDEN HOVERFLIES

Alan E Stubbs

There were two people who prompted this study. Firstly, on visiting my home Rupert Hastings asked (virtually demanded!) to see a list of hoverflies for my garden. I ferreted in the kitchen for a BRC card and rather sheepishly offered a sparse-looking list that revealed a certain lack of diligence. A little unfairly, I felt, the list was berated for not measuring up to his list for Kew Gardens. My protestations that a garden in Peterborough could not hope to be comparable were muted by the challenge that I was supposed to be the more experienced observer. I kept very quiet about Dr Jennifer Owen's garden list for Leicester.

The second influence was my wife Jane. She saw in **British Birds** (well they have two wings as well) an invitation to take part in a garden bird survey run by BTO (British Trust for Ornithology). Hence the winter of 1988/9 had us both looking out of the kitchen window seeing who could get the highest count for starlings, sparrows etc. It certainly made one more observant and aware of the weekly changes in bird numbers. Hence, come the spring, I started using the same method for hoverflies, larger Brachycera, butterflies and dragonflies.

The method certainly gave more interest and purpose to every walk round the garden. It gave me pleasure and hopefully other dipterists will try it out. I have to say to Rupert, though, that my hoverfly list was not substantially increased - but at least I need not look so sheepish about my humble list.

THE STUDY SITE

Whilst my front garden is rather inhospitable and north facing, the back garden (the study site) is south facing and of medium size (by BTO definition), 458 square metres. It is fairly well sheltered with various trees including lime, apple, birch and ornamental *Acer* and *Prunus*. There are plenty of shrubs, including *Buddleja*. The flower beds have a wide range of garden herbaceous plants, offering flowers suitable for hoverflies throughout the season. There are also small 'wild' areas with wild flowers including composites (thistles, ragwort, knapweed) and umbells (cow parsley, hogweed, *Angelica* etc). Parts of the lawn are left unmown during the summer and there is a small vegetable patch, as well as compost and leaf litter heaps.

Surrounding gardens also have trees and shrubs, though probably less flowers. Close by there is a park (mown lawns plus trees and shrubs).

The garden is 1 km north of the city centre and 2 km from the nearest open countryside (ie agricultural desert) to the east. On the suburban fringe 4-5 km to the west there are remnants of woodland. The River Nene, running west-east just south of the city centre has some adjacent rough ground in places.

METHOD

The bird scheme run by BTO was financed by BASF. Observers were sent a record card every three months, designed for optical scanning, on which details as regards size and location of garden were marked up; the presence or absence of shrubs and trees, a pond or other structural features were also noted. For my purposes a list of common birds was replaced by a list of likely hoverflies (arranged as Syrphinae and others), there being space for noting rarer species. Recording units were in weeks, running from Sunday to the following Saturday (hence absence one weekend left a reasonable chance of coverage the weekend either side). I had the advantage of coming home for lunch on work days, including a quick lap around the garden, which increased the chances of being present on occasions when hoverflies were readily seen (the other side of the equation was that I was often away for periods both weekday and weekends).

Against the species list were columns for the 13 weeks of a calendar quarter. The objective was to record the maximum number of individuals for each species seen on any occasion during the week. Hence even if there were no *Episyrphus balteatus* except for one fleeting moment when one darted across the garden and over the fence, that still counts as one seen.

For the most part, species could be identified without capture. Within the range of species that could reasonably be expected, a few generalisations were made. All *Sphaerophoria* females were recorded as *scripta* (no *menthastri* group species occur anywhere within range for many miles). The genus *Syrphus* was recorded as '*Syrphus* sp.' to avoid having to capture and check them all; where a clear view of hind femora of females was achieved, all were *S.ribesii*. '*Baccha* sp.' was also felt sufficient for recording purposes. A small net was kept in the garden and it was possible to get back in time to some of the more difficult specimens, such as *Pipiza noctiluca* which was examined under a microscope before being released in the same place.

In essence the method is not unlike the well tried butterfly transect monitoring (Pollard, 1975 & 1986). This is based on recording insects seen within a set distance around one on a standard route, walked on one occasion at weekly intervals under prescribed weather conditions above a minimum standard. A walk round a garden tends to follow the edge as a route, though some hoverflies may be in the middle open space. The important difference is that the BTO method takes the best figures for any number of occasions during a week, under any weather conditions.

A far more demanding recording method was deployed in Cambridge gardens by Gilbert (1981). Census days at weekly, and later in the season fortnightly, intervals were chosen regardless of weather. Hoverflies were observed on regular rounds from before sunrise till 1600 - 1630 hours BST. This procedure was designed to study flower foraging activity patterns rather than to monitor the hoverfly fauna.

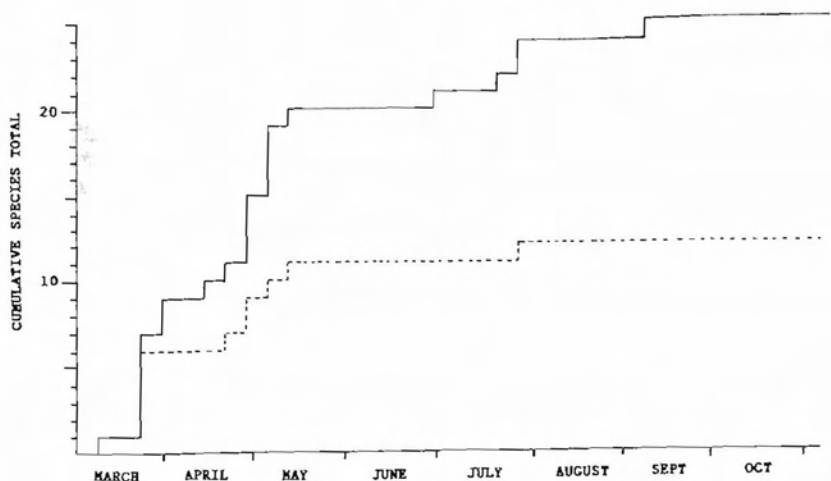


Fig. 1. Species list growth. Black line = total species; dotted line = aphid feeding species.

RESULTS

The total species list for 1990 was 25 species (since moving to the house in Peterborough in 1985 only seven others have been recorded as rarities).

Species list growth

The first hoverfly, an *Episyrphus balteatus*, was seen during the second week of March 1990. During the last week of March the list shot up to 7, all additions being Syrphinae except for *Eristalis tenax*. Both these named species had almost certainly hibernated but the size of the increase in species resulted from the fresh emergence of Syrphinae in the very warm spring weather.

The list steadily grew until the week ending 13 May. By then 20 species had been recorded, including 11 Syrphinae. Afterwards the list had reached a plateau, with no increase at all until the first week in July when a *Cheilosia proxima* was netted, checked, released and never seen again. It was not until late July/early August that any significant increase (since mid May) occurred. At this period 3 species were added, most notably the Eristalines *Eristalis arbustorum*, *Myathropa florea* and the semi- (or totally) immigrant Syrphine *Metasyrphus corollae*. There was only one subsequent final addition when at last *Eristalis nemorum*, an Eristaline, was recorded in the second week in September.

Hence 80% of the total fauna had been recorded by mid May, the only other significant period for additions being during a short time in late July/early August. Only one Syrphine was added after mid May, a *Metasyrphus corollae* in the week beginning 29 July.

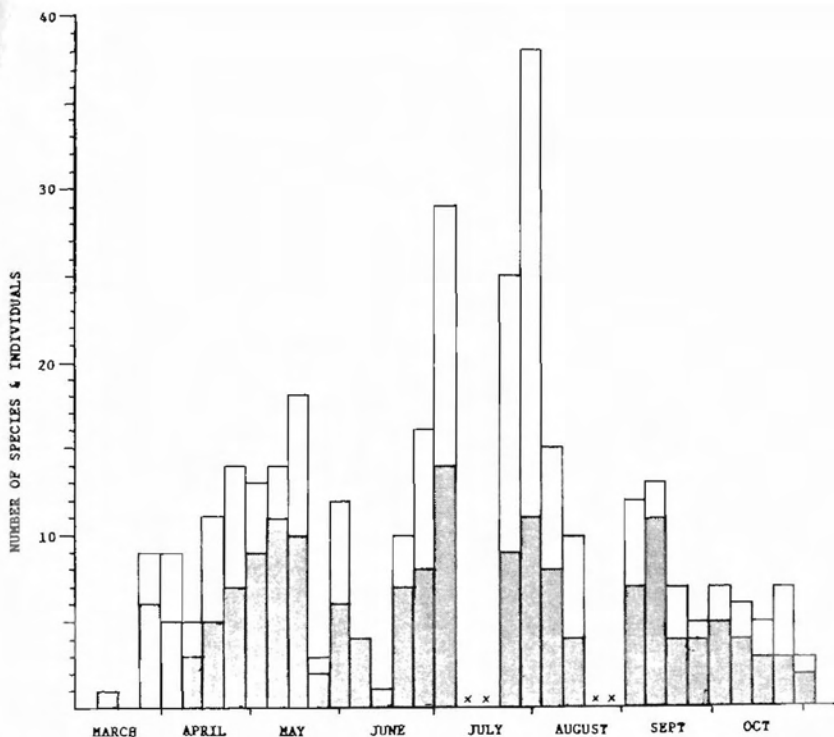


Fig. 2. Seasonal pattern of activity overall. Each column represents results for a weekly period. Dark column = number of species; full height of column = number of individuals; x = unrecorded weeks.

Seasonal pattern of activity overall

There were, to me, some surprising aspects of an analysis of the number of species and of individuals week by week

The most significant point is that the number of individuals (totalled from the maximum count of each species) was rarely much greater than the number of species, in fact rarely twice as much. In other words, most species were represented by one or, at most, two individuals. This applied even when some of these species were seen almost daily over a long period

I had expected pronounced peaks of numbers of individuals when certain species would raise the count of individuals much higher. This phenomenon only occurred from early July to early August, thanks mainly to numbers of *Episyrphus balteatus* having a few weeks of strong showing.

As seen in figure 2, the overall pattern is not unexpected, with a good representation of hoverflies early in the season (mainly Syrphinae), a bit of a trough, then a second mid-summer peak. The second peak maintained itself quite well as regards species, but not individuals, into September. By mid-October, the weather still very mild, there

were only three species left (*Syrphus ribesii*, *Episyrphus balteatus* and *Eristalis tenax*). The latter two kept going until cool weather in early November, presumably entering hibernation.

Flight periods of individual species

The data for at least the regularly occurring species is sufficient to give an analysis of flight periods which is consistent with wider experience.

Episyrphus balteatus is a partial hibernator and may be boosted by immigration from abroad. The mild winter may have favoured the species and one was seen fairly early in March, and again another at the end of April. It only became regular as from late May (ie after most other Syrphinae had initially peaked) and became dominant in mid summer. After a marked drop in numbers it settled down to a count of two or three. The absence of sightings in the last week of September was followed by a week when it was also absent apart from one occasion when three were seen. As the weather cooled into October, a few singletons were noted and it was last seen in early November. It was almost certainly breeding on aphids in the garden and probably hibernates in the urban setting. Further comments are provided later with regard to the drought.

Eristalis tenax is also a species which hibernates (and migrates). It too was seen as one individual in March. It was not until late June that single specimens were seen again, becoming more regular as singletons until in October there were regularly two and in one week five, tailing off into early November. This species almost certainly hibernates in urban areas but the nearest potential breeding site was probably some distance from the garden.

Eumerus tuberculatus provides an example of a species that was almost constantly present as single individuals over much of the summer, in fact for a period of four and a half months from the second week of May until the third week in September. Only briefly in Mid May was there a score above 1, when 3 were seen at once. I was surprised that the flight period was so long, especially without obvious brood peaks. This species is a resident, breeding in the garden.

Platycheirus albimanus shows brood separation, as might be expected. However, there were no marked peaks within brood flight periods. Much as I tried, it was never possible to find more than two individuals at a time - day after day, and within days, the same uncanny result. It is almost certainly breeding on aphids in the garden.

Epistrophe eligans displays a very clear single spring brood pattern. It was one of the few species where individuals were fairly consistently as high as three or four over a period of several weeks. This species is almost certainly resident, with shrubs and trees suitable for its aphid feeding larvae.

It is perhaps unnecessary to take space to comment on all species. However, the above examples show that the system works. Other reasonable data sets were gained for species such as *Syrphus*, *Syritta pipiens* and *Platycheirus scutatus*.

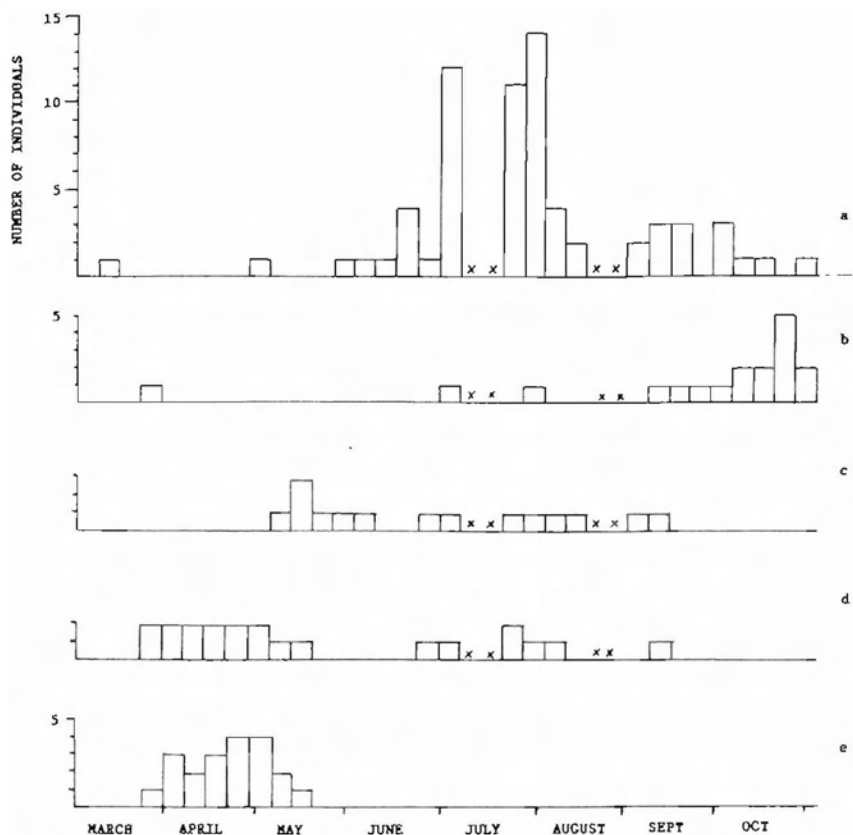


Fig. 3. Flight periods of individual species. (a) *Episyrphus balteatus*; (b) *Eristalis tenax*; (c) *Eumerus tuberculatus*; (d) *Platycheirus albimanus*; and (e) *Epistrophe eligans*.

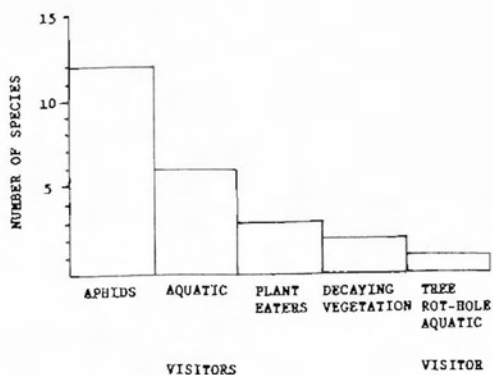


Fig. 4. Larval situation.

Larval habitats

The 25 species may be divided into five groups according to larval habitats.

Aphid feeding species are the largest component with 12 species. Many of these may breed in the garden, or at least within the general neighbourhood of gardens. Some were so rarely seen that they are likely to be casual records, such as an *Epistrophe nitidicollis* and a *Dasysyrphus albostrigatus*. In this particular year, the single *Metasyrphus corollae* may also be viewed as a casual. Species and numbers may have been boosted by local, regional or international movement so it is difficult to entirely separate garden perspective from wider perspective as regards the meaning of the monitoring results.

The next largest component is those with aquatic larvae, with 6 species. These are all Eristalines (*Eristalis*, *Helophilus*). There are no breeding sites in the garden. It is just possible a neglected garden pond might provide a breeding site nearby for one or two species. However, the greater probability is that these species have come from breeding sites on the outskirts of the city or well beyond. Hence they may be classified as visitors.

Plant eaters were represented by 3 species. *Merodon equestris* and *Eumerus tuberculatus* breed in the garden (larvae found in previous years). *Cheilosia proxima* is treated as a casual since only one individual has ever been seen in the garden and the thistles (encouraged) in the garden have not provided evidence of larval attack by this species.

Decaying vegetation accounts for 2 species. *Syritta pipiens* occurred fairly constantly over much of the summer, with several weekly counts of 2 and 4 (even 10). *Neoascia podagrica* was seen infrequently. Evidence of breeding in the garden compost heaps or elsewhere in the garden has never been confirmed. The drought conditions would have greatly lessened the chances of wet decaying material being available though the compost and litter heaps were kept inwardly moist. *Syritta* is often seen in numbers away from potential breeding sites so its presence in the garden could be semi-casual.

The last component, with one species, is that with aquatic larvae in tree rot holes. *Myathropa florea* was seen on only very few occasions and, in common with other Eristalines, often disperses beyond obvious breeding sites. There are no breeding sites in the garden but there is a chance that other trees in the urban area nearby might provide the required conditions. Alternatively this could be regarded as a species breeding some distance away.

My conclusion is that 8 Syrphines and 4 Milesines might have bred in the garden (including at a pinch *Syritta* and *Neoascia*) which is 48% of the observed fauna. The rest are regarded as casuals.

Larval biology	Species total	Likely breeding species total
Aphids	12 (48%)	8 (66.7%)
Aquatic	6 (24%)	0 (0%)
Plant eaters	3 (12%)	2 (16.7%)
Decaying vegetation	2 (8%)	2 (16.7%)
Wet rot holes	1 (4%)	0 (0%)

DISCUSSION

The importance of structure

It does not take long to recognise that particular parts of the garden are preferred by hoverflies and that successful search areas change as the sun moves across the sky. In a hot summer, it was also clear that at times shaded areas were more utilised than open, sunny ones. Hence, structural variety in the garden was an important attribute for adults, and presumably for larvae as well.

There is one particular place in the garden that is the male territorial hovering place for a solitary *Eristalis intricarius*. It is uncanny, year after year it is the same precise spot that is occupied by this species, as if it were the same individual. It has never been seen elsewhere in the garden and there is no real explanation why other positions in the garden are so unsuitable. However, it does mean that one learns to look in a mid air position that otherwise may go unnoticed.

Another species with fairly consistent habits is *Epistrophe eligans*. It was not uncommon to go round the edge of the garden, where most hoverflies are found, and not see any *E. eligans*. However, it became apparent that the males were hovering over the lawn where they were easily missed. In fact, by sitting on a garden seat, giving a low angle of view, it was often possible to get the most accurate count, especially if the hovering height was low.

Another, and very important element of structure, relates to the flora and the value of flowers. The range of flowering herbs and shrubs was good, including small 'wilderness' areas with wild flowers. Hence hoverflies were no doubt being attracted into the garden. There were two factors of note as regards the results. Firstly *Buddleja* was responsible for many of the *Eristalis* records in mid-summer so the species list would have been down several notches without the presence of these flowers (only a purple *B. davidii* was attractive, not a white flowered form). Secondly, in the autumn a pink flowered *Chrysanthemum*, *C. rubellum*, was very attractive to *Eristalis tenax*, giving the chance of yielding an autumn peak for the hoverfly that otherwise would not have been so strong.

The 1990 drought

After several very poor summers, 1989 was a major drought summer, followed by an exceptionally dry mild winter. When late March 1990 was hot, hoverflies came out with a flourish. April and much of May were hot, sunny and dry. The vegetation and many of the spring insects were well ahead of normal, by possibly 4 weeks. Hence, the spring hoverfly peaks have to be viewed in that context.

The drought and heat was to continue on a record breaking run, with only brief interludes of cool weather. One of these cooler weeks, a very passable one by normal British standards, was the first week in July. This proved the peak week for number of species, 14, and the second best for total numbers of individuals, 29. The next week was unrecorded because this was the occasion of the Winchester field meeting. An anticyclone built up with a vengeance and, in the intense heat, hoverflies were often few in Hampshire. The following week, while I was in SE England, the weather was exceedingly hot and few hoverflies were seen. It was not until the last full week of July that I returned to Peterborough and though the intense heat continued, the garden results were not too bad. During the following very hot week numbers were even better, 10 species and 38 individuals.

August 3 proved ridiculously hot, with a garden shade temperature of 99°C or perhaps even 100°C. By 7 pm BST, the temperature had cooled to 92°C and conditions were oppressively 'airless'. Under those freak conditions the hoverfly count was exceptionally good, indeed the numbers of some species were exceptionally high. Moreover, the hoverflies were extraordinarily hyperactive. Whether on flowers or hovering, my slightest movement caused them to move like lightning and even without disturbance their movements were jittery and abrupt, rather like an old film speeded up. It should be noted that at 6 pm BST the garden count had been virtually nil, though a few *Epsyrphus balteatus* and one *Metasyrphus luniger* were hovering in the 'cool' by the north facing front porch (I normally ignore the front garden for recording). Hence, for the back garden the figures below compare the count gained for the week as routine with this freak evening.

	Normal total	7 pm on 3 August
<i>Epsyrphus balteatus</i>	6	14
<i>Metasyrphus corollae</i>	1	-
<i>M. luniger</i>	-	1
<i>Platychelirus albimanus</i>	1	-
<i>Sphaerophoria scripta</i>	-	2
<i>Syrphus</i> sp.	1	5
<i>Eristalis tenax</i>	1	-
<i>Eumerus tuberculatus</i>	1	-
<i>Myathropa florea</i>	1	-
<i>Neosasia podagrica</i>	-	1
<i>Syrirta pipiens</i>	1	10

What is intriguing is that it was only certain species that were party to this phenomenon. Note that it is species often associated with mass movement that are involved - *Episyrphus balteatus*, *Sphaerophoria scripta*, *Syrphus* and *Syritta pipiens*. In a very poor year for *Metasyrphus corollae* it was not involved, nor was *M. luniger* which had been a regular in the garden through the season.

In this hot, early August period I went into Norfolk and to sites around Peterborough. What was so striking was that *Episyrphus balteatus* was hardly to be seen in the countryside, yet it was easy to locate in my garden.

There may be various ways of interpreting the facts above but my conclusion is as follows. The countryside was under intense drought in East Anglia and the East Midlands, much of the area often lacking proper shade. Plants were under considerable water stress. Hence, hoverflies associated with open or semi-open habitat would have been under heat stress and flowers were sparse and probably producing little nectar. Those hoverfly species that readily move around found a sanctuary in gardens. Here there was shade and a sufficiency of flowering plants that benefited from some watering and hence were able to produce nectar (and pollen). There was no hose pipe ban in Peterborough. Undoubtedly high temperatures aid activity and dispersal in hoverflies, just as with butterflies.

The appearance of the Eristalines, as from late July in particular, may be expected anyway but the same driving force from countryside to gardens may have been operative. During prolonged intense drought, numbers of adults could be expected to be low (for species with aquatic breeding sites of the type concerned).

It may be noted that the garden results reflect wider experience that it seemed a poor year for species which may be migrants from the Continent. In the garden it was remarkable that only one *Metasyrphus corollae* was seen, and no *Scaeva pyrastris*. My wider travels into many districts also coincided with a notable scarcity of these species. Also, though *Episyrphus balteatus* was one of the commoner hoverflies in the garden, it never became super abundant here nor in the countryside as it does in some years. Hence if there were substantial immigration from the Continent, it was not reflected in a build up of populations. Possibly the hot weather reduced adult viability or breeding conditions were poor for aphid feeding species (as with aquatic and rotting vegetation species). For multi-brooded species it is possible that the warm weather gave the advantage to parasites moving about to find hosts, so numbers of hoverflies did not build up. It is always difficult to interpret and predict under these circumstances. For instance, the 1976 drought encouraged an enormous population explosion of the seven spot ladybird *Coccinella 7-punctata*, yet despite large numbers of this aphid feeding ladybird coming out of hibernation, and good numbers of aphids, this insect too failed to become super abundant during the 1990 drought.

Some limitations of the method

It has to be recognised that the method does not measure movement in and out of the garden. There is the much quoted case of only seeing one or two blue tits yet there

may be 50 or more coming in turn, giving the impression of a very small resident population. No doubt the situation with hoverflies varied between species and with the weather conditions. Only in the case of *Eristalis intricarius*, and more doubtfully with *Epistrophe eligans*, could it be inferred that the number of individuals of particular hoverfly species was to some extent governed by the number of male territories. Individuals of some species may well have loitered in the garden, at flowers or otherwise, but for the most part there was almost certainly a flux of individuals in and out of the garden. Malaise traps would probably give very different results since they would, so to speak, trap the 50 blue tits rather than record only the one or two observed. However, malaise traps require much effort in sorting material, they kill many individuals and they do not encourage observation of habits of species. It would be possible to mark individuals if there was time and patience to do so. Holloway & McCaffery (1990) have given an account of a study on *Eristalis pertinax* using tiny dabs of paint on the wings; they marked 1223 flies in one day in an area of 2000m. However, this sort of research goes well beyond the simple leisure pursuit envisaged by my study.

As with butterfly transect monitoring, the method is not designed to give population estimates or to assess movement of individuals. The purpose is to record relative changes in numbers and there is no reason to assume that hoverflies are any less suitable than butterflies.

The value of gardens to hoverflies

The most diligent monitoring of a garden is that by Dr Jennifer Owen. Her garden, not far from the centre of the city of Leicester, yielded 88 species over a seven year period (Owen, 1981) and her list has now reached 93 species (Owen, pers. comm.). The size of this list largely reflects the continuous use of a Malaise trap over many years which yields far more species than one can expect to see by casual observation.

In Cambridge, Dr Francis Gilbert (1981) observed hoverfly activity in a partly wooded garden and in a large botanic garden. He informs me that the species totals observed for these two sites were 54 and 45 respectively. Eight species formed 80% or more of the sightings, suggesting that relatively few species especially thrive in an urban setting.

Kew Gardens has records for 82 (possibly 83) species for the period 1984-1990 as a result of observations by Rupert Hastings (he will be publishing this study). The site occupies an area of 121 hectares comprising semi-natural woodland as well as formal gardens. It lies adjacent to the River Thames towpath and other areas supporting hoverflies, including Syon Park flood meadows and carr on the opposite bank of the river.

Having lived in suburban London and now within the City of Peterborough I have long experience of the urban setting. It seems to me that gardens can provide a major habitat for some species, notably among the aphid feeding species and, of course, the bulb feeding 'pests'. In those parts of the country where agriculture is intense and

'wild' spots scarce, suburban gardens may well be one of the major hoverfly habitats. However, as the analysis of my list shows, perhaps only 50% of the species could reasonably be expected to breed in my garden (or the wider context of the surrounding area of gardens). A garden list of 93 species (in Leicester), which is difficult to equal even on high quality conservation sites, must be regarded as much higher than the resident fauna. What is demonstrated is the considerable degree of movement and dispersal achieved by many species, a very valid use of garden recording. The concentration of flowers is exploited by these hoverflies which are dispersing or which have abandoned their countryside breeding sites in search of flowers. As the countryside becomes bereft of flowers, gardens increase in significance, though whether hoverflies with restricted breeding sites can subsequently succeed in finding suitable egg laying sites is questionable. The strategy works if breeding sites are widespread and findable.

Those species which hibernate may well find urban areas to be of strong advantage since there are pre- and post-hibernation flowers, shelter from the wind (which gives a temperature advantage during the cool, sunny days of spring and autumn), and a multitude of nooks and crannies in which to hide away. By comparison, the countryside in many districts is bleak.

Though *Cheilosia grossa* adults have never been seen in the garden, it is of interest that in two previous years larvae have been found in the stem bases of *Cirsium lanceolatum*. This plant was established in the garden deliberately, allowing a few to mature and flower. It is difficult to know whether such thistles are widespread in gardens in the district. Larvae have been found at waste ground 2.5 km away, but other opportunities for breeding may well occur much closer. My dismissal of *Cheilosia proxima* as a breeding species in the garden, though lack of evidence of larval attack, must be viewed in this wider context. So far the provision of umbelliferous plants has not even attracted the ubiquitous *Cheilosia pagana*. However, it is clear that provision of food plants in gardens for some *Cheilosia* may indeed encourage species to breed, even if not in numbers that would support a viable population.

CONCLUSION

The method works. It is crude but that has merit since it accepts flexibility in recording effort. Garden recording to most of us is a leisure activity, consisting of moments to unwind. A more refined approach risks a commitment that cannot be met and hence becomes a burden.

My own finding was that the method was satisfying. Hence, I commend it to others to try out. Some gardens are no doubt too small or otherwise unsuitable but there must be plenty at dipterists' gardens that would prove equally or more satisfactory.

My starting year proved climatically extraordinary. It would have been nice to have had a run of preceding years to see what the effect of such a drought may be. However,

fortuitously, I have a record for the hottest driest year for southern Britain this century. If there were a network of such recorded gardens, interpretation of results would be much more profitable and give a valuable perspective on hoverfly numbers, whether or not the much vaunted 'greenhouse effect' causes major climatic change within the next century.

ACKNOWLEDGEMENTS

Thanks are passed to Dr Jennifer Owen, Dr Francis Gilbert and Rupert Hastings for information on species totals for the gardens they have studied. Also to Dr Ian McLean for comments on a draft text.

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APPENDIX : GARDEN SPECIES LIST

Species recorded during 1990

R = regular (often seen day by day over much of the flight season)

C = common (number of individuals often more than 2)

S = scarce (one or rarely seen for no more than 3 weeks)

* = assumed breeding

* <i>Baccha</i> sp.	S
<i>Cheiliosia proxima</i>	S (one only)
<i>Dasysyrphus albostrigatus</i>	S (one only)
<i>Epistrophe eligans</i>	R C
<i>E. nitidicollis</i>	S (one only)
* <i>Episyrphus balteatus</i>	R C
<i>Eristalis arbustorum</i>	S
<i>E. intricarius</i>	S
<i>E. nemorum</i>	S
<i>E. pertinax</i>	S
<i>E. tenax</i>	R
* <i>Eumerus tuberculatus</i>	R
<i>Helophilus pendulus</i>	S (two only)
* <i>Melanostoma scalare</i>	R
* <i>Merodon equestris</i>	R
<i>Metasyrphus corollae</i>	S (one only)
* <i>M. luniger</i>	R C
<i>Myathropa florea</i>	S
<i>Neoascia podagrica</i>	S
<i>Pipiza noctiluca</i>	S (one only)
* <i>Platycheirus albimanus</i>	R C
<i>P. scutatus</i>	R C
* <i>Sphaerophoria scripta</i>	R
<i>Syritta pipiens</i>	R C
* <i>Syrphus</i> sp. (incl. <i>ribesii</i>)	R C

Additional species recorded in period 1985-1989

* <i>Cheiliosia grossa</i>	As larvae only
<i>Epistrophe grossulariae</i>	One in 1989
<i>Eristalis horticola</i>	Rarely seen
<i>Meliscaeva cinctella</i>	Rarely seen
<i>Pipizella varipes</i>	One in 1989
<i>Scaeva pyrastris</i>	Rarely seen
<i>Volucella pellucens</i>	Rarely seen

Further records and observations of *Platycheirus* species (Syrphidae) recently added to the British list, with discussion on the identification of *P. ramsarensis*.

Steven J. Falk & Alan E. Stubbs

Since the publication of British Hoverflies (Stubbs & Falk, 1983) a number of important papers have been produced on *Platycheirus* which have resulted in the addition of five further species and the synonymization of *Pyrophaena* under *Platycheirus*. The latter results from the nearctic revision of the genus by Vockeroth (1990), who argues that the continued separation of the genera cannot be justified when using a nearctic perspective. Indeed, on the basis of male genitalia and general adult morphology, there is arguably little evidence to suggest the two European *Pyrophaena* species (which are also holarctic) are any more closely related to each other than they are to certain other *Platycheirus*.

The five new British species have resulted partly from the discrimination of two further taxa within the old concept of *P. peltatus* (Meigen), these being *P. amplus* Curran, added by Speight & Vockeroth (1988), and the newly described *P. nielsenii* Vockeroth, formally added by Vockeroth (1990) (though its presence in Britain has been known for several years as the species A of Stubbs, 1986 and 1988). Both these species are holarctic. The remaining three new British species have been discriminated following a revision of the hitherto frustratingly variable *P. clypeatus* (Meigen) - *P. angustatus* (Zetterstedt) complex by Goeldlin de Tiefenau, Maibach & Speight (1990). This has resulted in the recognition of three species new to science, *P. europaeus*, *P. occultus* and *P. ramsarensis*, which can be keyed out (though not always easily) using Speight & Goeldlin de Tiefenau (1990).

It is hoped that the additional records and observations gathered by the present authors from their collections, 1990 fieldwork and some other sources, will help in obtaining a more complete picture of the statuses, distributions and ecological requirements of most of these species (*P. amplus* excepted).

Platycheirus nielsenii. MERIONETH : Cwm Bychan (SH83) 12.7.76. ANGUS : Acharn 7.7.77. S. ABERD : Inver (NO 29) 15.7.77. ELGIN : Loch Vaa (NH9117) 19.6.76 (open pinewoods with boggy areas). E. NESS : Findhorn Valley, 1.7.84 (grassy road verges at several places along this valley); Glen Feshie (NN8497) 3.7.84 (amongst large numbers of syrphids visiting low umbellifers and bedstraw flowers on a grassy streamside at 320 metres); Loch Morlich (NH9709) 2.7.84 (grassy road verge); near Loch Garten (NH9315) 30.6.84 (grassy road verge). Common at many of these localities. Males hover in typical *peltatus* fashion, about 2-3ft above the ground. However, their smaller size and generally more slender build is quite apparent in the field. The only published locality records, as species A, are for the Sheffield area of DERBYSHIRE and S.W. YORKS (Whiteley, 1990).

Platychelrus europaeus. HUNTS : Brampton Wood (TL1870) 5.75, 5.5.90 (grassy rides of damp broadleaved woodland upon calcareous clay). NORTHANTS : Castor Hanglands NNR (TF1101) 13.5.90 (very abundant in one small spot within a damp grassy woodland clearing on calcareous clay); Yardley Chase (SP8654) 7.6.90 (damp woodland rides on calcareous clay). LEICS : Burley Wood, near Oakham (SK8909) 5.7.90 (damp woodland rides on calcareous clay). WARKS : Clowes Wood (SPI074) 11.6.86 (damp, broadleaved woodland on clay soil, taken by A. Wright). E. NESS : near Loch Garten (NH9315) 30.6.84 (either from a grassy or heathy road verge or nearby marshy spots, no substantial woodland present).

Platychelrus occultus. S. HANTS : Winnal Moor, near Winchester (SU43) 7.7.90 (flood-plain fen); Matley Bog, New Forest (SU30) 12.7.90 (poor fen); The Moors, Bishops Waltham (SUS1) 13.7.90 (fen). N. HANTS : Conford Common (SU8233) 12.7.90 (fen); Ovington (SU5631) 14.7.90 (flood-plain fen). SURREY : Chobham Common (SU69) 3.6.79 (possibly from marshy areas around Gracious Pond). BERKS : Eddington (SU36) 10.7.89 (flood-plain fen); Cothill NNR (SU4699) 14.6.90 (fen). W. NORF : Stanford Army Training Area (TL8395) 21.8.85 (marshy vegetation within breck heathland); East Walton Common (TF7316) 6.7.89 (pingo pools/damp depressions and seepage marsh associated with chalk springs); Castle Acre (TF8015) 7.8.90 (flood-plain fen). CAMBS : Wicken Fen (TL5570) 8.7.89 (open, ancient fenland). HUNTS : Woodwalton Fen NNR (TL2283) 28.5.90, 2.6.90, 17.6.90, 8.7.90, 29.7.90, 12.8.90 (open, ancient fenland, regular, but by no means abundant). NORTHANTS : Castor Hanglands NNR (TF1101) 28.7.90 (poolside and wetland vegetation associated with calcareous springs). HEREF : The Flits NNR (SO34) 24.5.90 (fen-meadow). WARKS : Sutton Park (SP0998) 19.5.90, 31.5.90, 7.9.90 (peaty pond and lake margins, especially *Menyanthes* - dominated poor fen. Very abundant on the first date, considerably outnumbering *P.clypeatus* and *P.perpallidus* which were also common). GLAM : Vaynor Gorge (SO0410) 23.5.90 (calcareous seepage marsh in wooded valley). CARDS : Banc-y-Mawlden (SN2048) 19.5.90 (seepage fen); Pentood Marshes (SN1845) 19.5.90 (flood-plain marsh). CAERNS : Pen-y-Chain Marsh, Abererch (SH4236) 18.5.90 (fen); Gyfelog (SH44) 16.5.90 (poor fen with *Menyanthes*, *Eriophorum* etc), Cors Geirch NNR (SH3235) 16.5.90 (calcareous flush). LEICS : Empingham Meadows (SK9509) 23.6.90 (fen-meadow). CHESH : Hatchmere, Delamere Forest (SJ5572) 14.5.90 (poor fen).

Platychelrus ramsarensis. S. SOM : Withypool Common, Exmoor (SS8334) 14.6.90 (moorland acid valley bog with *Molinia*, *Juncus* and *Sphagnum*). N.W. YORKS : Malham Tarn (SD9066) 5.7.83 (poor fen and acid bog complex). E. NESS : Glen Feshie (NN8497) 3.7.84 (probably amongst large numbers of other syrphids visiting low umbellifers and bedstraw flowers on a grassy, boggy streamside at 320 metres).

Comments on the statuses and apparent habitat preferences of these new species

P.nielsenii appears to be a northern and western species. All our records refer to partially wooded valleys in hilly districts, though there is no suggestion of its occurrence at the relatively high altitudes attained by species such as *P.ramsarensis*. It occurs both in high-quality semi-natural habitat such as Caledonian pine woodland and in more widely occurring grassy locations such as unimproved road verges, streamsides, etc. Like its close relative, *P.peltatus*, it is not ostensibly a wetland species, but can occur in marshy areas, as well as drier locations.

The additional records of *P.europaeus* from Midlands provides a considerable advance in our knowledge of this species in Britain. Speight & Goeldlin cite British records from only two native pinewood sites in Scotland. It proves to be very much a woodland species in the south, notably on wet clays. Within this habitat it can often be recorded alongside *P.clypeatus* and *P.angustatus*, though not typically with *P.occultus*, which seems to have quite different habitat preferences. At Castor Hanglands, Northants where both *europaeus* and *occultus* were recorded, they occurred in very different situations at some distance from each other.

P.occultus proves to be widespread in the southern half of Britain, and is probably the most frequent of the new *clypeatus*-group species. Our data confirms the strong presence in western areas, particularly Welsh peatland sites such as valley fen. However, its apparent absence from Scotland is noteworthy and fails to support the supposition that it is a 'northern and western' species. Our data also highlights its widespread though probably highly localised status in the Midlands and East Anglia, where it is seemingly confined to high quality wetland habitats. No records have been obtained from the Norfolk Broads, though its presence here is extremely likely. The strong attachment to unimproved peaty wetland (especially fens) seems to largely dictate its distribution in England and Wales. In this respect it differs markedly from the more frequent *P.clypeatus* and *P.angustatus* (with which it is usually recorded), which can additionally utilise non-peaty marshland, lower quality sites (such as agricultural drainage ditches and recently created ponds) and drier habitats. *P.occultus* can clearly utilise a wide variety of fenland types, ranging from strongly calcareous to more neutral poor fen. Although one or two of our sites have been assigned to marsh, there may have been localised peat fen present.

P.ramsarensis would appear to be the most boreal of the new *clypeatus*-group species, and does not seem to occur in southern, lowland regions. Habitat information is rather sparse, but suggests a preference for acidic, boggy situations, often at altitude. Again, this species can be recorded with the almost ubiquitous *P.clypeatus* and *P.angustatus*, and also with *P.podagratus* (Zetterstedt) which seems to have a similar distribution and habitat requirements. It also occurs alongside *P.occultus* at Malham Tarn Fen, an area of poor fen with strongly acidic boggy elements within it.

Some notes on the identification of *P. ramsarensis*

Examination of our material has revealed fundamental difficulties in distinguishing the males of *P. ramsarensis* from similar species through the use of the face shape. The reliability of this character (indeed all male *ramsarensis* characters prior to this paper) was apparently based on three specimens. Of our five male specimens, one from Glen Feshie shows the progressively broadening face as figured by Speight & Goeldlin de Tiefenau. Another male from Malham Tarn has a strongly contracting face (together with other facial characters that suggest deformation, either after killing or perhaps naturally following emergence of the imago). The three specimens from Exmoor show rather variable face shapes, both in terms of general width and the degree of progressive widening below the level of the antennae. In two of these specimens the sides are essentially parallel; in the third they diverge slightly, but not to the extent figured by Speight & Goeldlin.

The conspecificity of our male specimens to each other and to the concept of *ramsarensis* in Dipterists Digest No. 5 is based on the following combination of features and circumstances.

- the distinctive markings beneath the fore basitarsi, which correspond almost exactly with the figures given in the previous papers and appear to be very constant. The small white apical mark is more closely approximated to the end of the segment than the similar marking found in *europaeus* and *angustatus*. The basitarsus is also comparatively larger and broader than in those species (especially when compared to the apical width of the fore tibia). The basitarsus markings of *occultus* and *clypeatus* are very different.
- the comparatively broad body shape, essentially equal to *clypeatus* from which it is arguably indistinguishable in the field. This can provide a fairly reliable means of separation from *angustatus* in particular, which is a very gracile species, and to a lesser extent *europaeus* and *occultus*, which fall between *clypeatus/ramsarensis* and *angustatus* in build.
- the presence of a particularly well defined posterior fan of hairs on the basal half of the front femora, leaving the apical half virtually bare (as figured in Goeldlin de Tiefenau, Maibach & Speight fig. 6). No other similar species has this character so well developed, least of all the similarly-built *clypeatus* which has a fan of hairs occupying the full length of the femora.
- the association of the Exmoor and Glen Feshie males with females that key out as *ramsarensis* on the basis of the short hair fringe behind the front femora (though not on the basis of all the other characters given).
- the occurrence of all these specimens at upland sites consisting partially or predominantly of acidic bog habitat.

Males of *ramsarensis* are thus probably best distinguished from other similar species of the *clypeatus* group by a combination of front leg characters (especially the shape and underside markings of the fore basitarsi and the absence of fan hairs on the distal half of the front femora) and body shape. The distinctly dusted pleurae also provide a further obvious point of distinction from *angustatus*, which has these areas undusted and brightly shining. The second basal wing cell is always entirely covered by microtrichia which facilitates separation from many (but not all) specimens of *angustatus* and *europaeus*.

We know of no other similar species that can produce the progressively broadening face shape of some *ramsarensis*, so where this feature is present, it may prove to be a useful subsidiary character. However, to date, no more than four of the eight male specimens covered by this paper and the type description show this character to the extent illustrated by Speight & Goeldlin, and our Exmoor material in particular demonstrates the inherent variability of face shape.

With respect to females, the use of the short posterior hair fringe in their separation from similar species seems to work well. However, only the single Exmoor female exhibits entirely pale hairs of tergites 1-5. The two Glen Feshie females have extensive short-addressed black hairs overlying the black areas of these tergites. Caution is also urged with the use of tarsal darkening. All our females exhibit this character to an extent, but in a long series of *occultus* recently obtained from Sutton Park, a great deal of variation was observed in the extent and intensity of tarsal darkening, as well as femoral darkening.

There is still much to discover about these new species as well as other members of the genus. Botanically-minded dipterists may wish to investigate if there are any associations with particular plant species (especially sedges and grasses in the case of wetland species), or any botanically-defined plant community types. The apparent absence of *P.occultus* in Scotland and the lack of *P.ramsarensis* information from Wales are further aspects that need clarification. It will also be necessary to re-define the distribution and ecology of *P.angustatus* and *P.clypeatus*.

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This issue is dedicated to Alan Stubbs in appreciation of his support, dedication and infectious enthusiasm in furthering the study and conservation of diptera.

Fellow dipterists hereby convey their thanks, and best wishes on the occasion of his retirement from the Nature Conservancy Council.

"Keep taking the flies, Alan"

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Published by Derek Whiteley, Sheffield, England,
on behalf of the
Diptera Recording Scheme.

ISSN 0953 - 7260

Cover sponsored by

BIOSCAN (UK) LTD.

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CERIANA VESPIFORMIS (LAT.) Cover by Martin Speight

This small, black and yellow hoverfly occurs in S. Europe and N. Africa. It is a typical inhabitant of the maquis, where it flies at great speed, producing a high-pitched whine, zig-zagging at knee-height among bushes and shrubs. It is in flight from May to August and its larvae have been reported from tree wounds.