

# Dipterists Digest



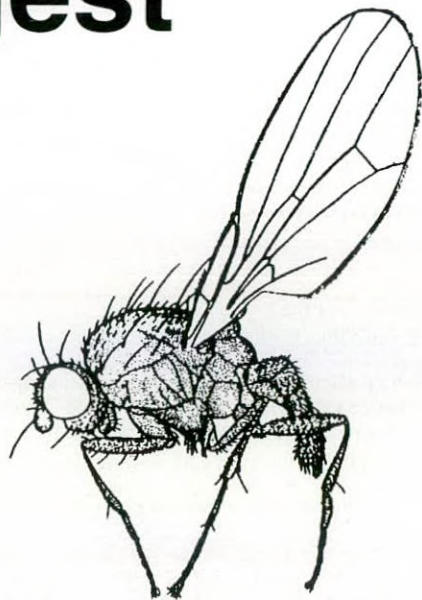
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Female frons and basal tergites of *Xanthogramma* species: *X. pedissequum* (Harris) left and *X. stackelbergi* Violovitsch right.



Cover illustration: *Xanthogramma stackelbergi* Violovitsch, male from Fineshade Wood, Duddington, Northamptonshire (see page 102).

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# Dipterists Digest

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**Dipterists Digest** is the journal of the **Dipterists Forum**. It is intended for amateur, semi-professional and professional field dipterists with interests in British and European flies. All notes and papers submitted to **Dipterists Digest** are refereed.

The scope of **Dipterists Digest** is:

- the behaviour, ecology and natural history of flies;
- new and improved techniques (e.g. collecting, rearing etc.);
- the conservation of flies;
- provisional and interim reports from the Diptera Recording Schemes, including maps;
- records and assessments of rare or scarce species and those new to regions, countries etc.;
- local faunal accounts and field meeting results, especially if accompanied by good ecological or natural history interpretation;
- descriptions of species new to science;
- notes on identification and deletions or amendments to standard key works and checklists.

Articles must not have been accepted for publication elsewhere and should be written in clear and concise English. Items exceeding 3000 words may be serialised or printed in full, depending on competition for space. **Contributions should preferably be supplied either as E-mail attachments or on 3.5" computer disc or CD in Word or compatible formats and accompanied by hard copy.**

**NEW INSTRUCTIONS: Articles should be supplied in A5 format with text in 9-point font, title 12 point and author's name 10.5 point, with 0.55" side margins. Figures should be supplied separately as jpeg files to fit in the above page format, or as hard copy.**

**Style and format should follow articles published in the most recent issue.** A short Summary (in the form of an Abstract) should be included at the beginning of each article. References to journals should give the title of the journal in full. Scientific names should be italicised. Authors of scientific names should be given in full and nomenclature should follow the most recent checklist, unless reflecting subsequent changes. Figures should be drawn in clear black ink, about 1.5 times their printed size and lettered clearly. **Colour photographs will also be considered.** Descriptions of new species should include a statement of the museum or institution in which type material is being deposited.

Authors will be provided with twenty separates of papers of two or more pages in length.

Articles and notes for publication should be sent to the Editor at the address given above. Enquiries about subscriptions and information about the **Dipterists Forum** should be addressed to the Membership Secretary, John Showers, 103 Desborough Road, Rothwell, Kettering, Northamptonshire NN14 6JQ

## Species accounts for Sciomyzidae and Phaeomyiidae (Diptera) known from the Atlantic zone of Europe

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### Summary

Species accounts, comprising a referenced summary of information available on macrohabitat, flight period, immature stages, range and determination, are provided for the 78 species of Sciomyzidae known from Atlantic parts of Europe, plus 4 others that might be found there. Additional accounts are provided for the 3 European species of Phaeomyiidae, until recently regarded as sciomyzids. Use of species account information digitised into a database is briefly discussed.

### Introduction

The present text provides a first compilation of species accounts for the 81 species of Sciomyzidae and Phaeomyiidae known from the Atlantic zone (for definition see below) of Europe, together with four other species that might turn up there sooner or later. In Britain, 71 of these 81 species are known, whereas in Ireland 59 are known, only one of which, *Pherbellia stackelbergi*, remains unknown in Britain. None of the European phaeomyiids have been reported from Ireland.

Information about European insects is scattered throughout the literature of various countries and in various languages. Moreover, observational information on habitats often remains in the heads of entomologists, being inconvenient to publish in the dribs and drabs in which it is gathered. The data presented here have been brought together from published sources and the authors' experience with the species in the field. Nomenclature follows Knutson and Vala (2011), which is also a source of taxonomic, distributional, behavioural and biological information on the Sciomyzidae of the world. While compilation of species accounts is a valid end in itself, it also brings together data that can be digitised into an "expert system database" (Speight 2005). The practical application of species account information digitised into a computerised database is discussed following presentation of the species accounts, with species habitat association data used as an example.

### Geographic coverage of the species accounts

For purposes of this text, the Atlantic zone of Europe is defined as including Ireland, Britain, Atlantic parts of Denmark, plus the Netherlands, Belgium, northern France (Départements Aisne, Ardennes, Calvados, Cotes-du-Nord, Eure, Finistère, Ille-et-Vilaine, Manche, Morbihan, Nord, Oise, Orne, Pas-de-Calais, Seine-et-Oise, Somme) and the French Atlantic coastal strip south to the Pyrenees. Lack of published data specifically from Atlantic parts of Germany may have resulted in omission of some species that would otherwise validly be consigned to the Atlantic zone.

Species are treated alphabetically within each family, without suprageneric grouping, with the Phaeomyiidae accounts preceding the Sciomyzidae accounts. A brief statement on species representation of the genus in Europe (as delimited in the 10<sup>th</sup> edition of the Times Atlas of the World) precedes the species accounts for each genus.

## Content of the species accounts

Information is provided for each species under five subheadings: Macrohabitat; Flight period; Immature stages; Range and Determination.

**Macrohabitat:** the term “macrohabitat” is used here in contradistinction to “microhabitat,” of which those of sciomyzids are not addressed in this text. Macrohabitats in this sense coincide with “habitats” as referred to in habitat classification systems such as CORINE (Devillers *et al.* 1991) and for convenience are generally referred to as “habitats” in this text. In the macrohabitat section of each species account, an overview is provided of the range of natural/semi-natural (semi-natural *sensu* CORINE: “resulting from a long history of extensive use by man and domestic animals and constituting most of the habitat .... of the wild fauna”) habitats with which the species is known to be associated in Europe, with reference made where possible to habitat categories used in the CORINE system. Definitions of these habitat categories can be found in Speight *et al.* (2010). Except where indicated otherwise, the information presented here is based on observations of the authors.

**Flight period:** an overview of flight period data, based largely on information from the Atlantic zone. Regional variation in flight period can be significant, especially between more northern and more Mediterranean parts of the area under consideration.

**Immature stages:** the principal published sources of information on the morphology of immature stages, larval biology and larval host(s)/prey are given, together with a précis of other associated data that are available. The essential features of the life cycles of 59 of the species treated here are now known, and the developmental stages of most of the species have been described. In the literature on laboratory rearing of sciomyzid species, repeated reference is made to larvae pupariating just under the surface of the substrate provided in the rearing containers, but this behaviour may be an artefact of the artificial conditions in which larvae are kept and is not generally referred to in the species accounts presented here. Similarly, there are literature references to sciomyzid puparia of various species being found in nature either in “flood refuse” or floating at the water surface, at the edge of water bodies. Puparia in flood refuse are as likely to have originated somewhere else and deposited there by receding water as they are to have been formed in flood refuse, so flood refuse is not referred to in the species accounts as a site of pupariation. Whether floating puparia have been dislodged from elsewhere by fluctuating water levels or are in their “normal” location floating at the surface film is in many instances unclear. Certainly, morphological adaptations to floating are exhibited by a range of sciomyzid puparia.

**Range:** an overview of the geographic range of the species, with greater detail provided for their range within Europe. Not all European countries from which a species is known are listed, other than in exceptional circumstances, e.g., for species known from very few countries or for species for which most published range data are of uncertain value, due to changes in status of the species. In the latter case, only range data deemed reliable are mentioned.

**Determination:** keys that can be used for identification of adults of the species are referred to, citing, where possible, keys which provide pan-European coverage. Genus-level keys which cover the widest range of species, and which may be used reliably, have been cited in preference to those dealing only with local faunas. On occasion, hints are provided on

separation of similar species. Sources providing published figures of the male terminalia are cited. This section also refers to recent nomenclatural change or controversy and, in particular, to changes introduced since publication of the catalogue of Rozkošný and Elberg (1984). Keys to genera of adult sciomyzids are available in a number of recent publications, including Knutson and Lyneborg (1965), Rozkošný (1984a), Vala (1989), Rivošecchi (1992) and Knutson and Vala (2011). Existing keys, both generic and otherwise, to adults, are based on dried specimens, so extra care needs to be taken when identifying specimens preserved in alcohol (e.g., from Malaise trap samples), particularly in respect to dusting/pruinosity and features involving presence/absence of hairs or of hair length. Keys to larvae and puparia can be found in Rozkošný (2002).

### PHAEOMYIIDAE

The phaeomyiids are represented in Europe by three *Pelidnoptera* species. The family was formerly regarded as a subfamily of the Sciomyzidae. Phaeomyiids and sciomyzids are certainly closely related, whether or not the phaeomyiids are consigned taxonomically to a separate family.

#### *Pelidnoptera fuscipennis* (Meigen, 1830)

**Macrohabitat:** forest; along streams and beside pools in deciduous forest (alluvial hardwood, acidophilous *Quercus* and *Fagus*) and at forest edge. **Flight period:** end of May to August. **Immature stages:** unknown. **Range:** Scandinavia south to northern France (Vosges) and from Britain eastwards through northern (Baltic States) and central Europe (Alps) into European parts of Russia and the Ukraine; parts of the former Yugoslavia. **Determination:** Vala (1989) provided a key to adults of European species and figured the male terminalia.

#### *Pelidnoptera leptiformis* (Schiner, 1864)

**Macrohabitat:** forest; stream-sides in montane *Fagus/Picea* forest. **Flight period:** May to July. **Immature stages:** unknown. **Range:** Belgium and the Netherlands through central Europe (Poland, Germany, Czech Republic) to the Alps (France, Switzerland, Liechtenstein, Austria, Italy) and Hungary. **Determination:** Vala (1989) provided a key to adults of European species and figured the male terminalia.

#### *Pelidnoptera nigripennis* (Fabricius, 1794)

**Macrohabitat:** forest; open Mediterranean pine forest with a scrub layer including *Cistus* (Bailey 1989). **Flight period:** February to May. **Immature stages:** Vala *et al.* (1990) described and figured the immature stages. Baker (1985) (as *Eginia* sp.) and Bailey (1989) provided detailed information on developmental biology. The larva is a true, solitary internal parasitoid of terrestrial millipedes of the genus *Ommatoiulus*. Eggs are laid on the host during the millipede's second year of development and at a time of year when the millipede's activity is maximal (i.e. when the host is most available). The first-instar larva penetrates via an intersegmental membrane and remains there, inactive, through the summer. In the autumn the larva rapidly consumes its host's tissues, completing its development by October to November, then forming a puparium within the dead host. It overwinters in the puparium, the adult emerging in the following spring. **Range:** southern Scandinavia south to Iberia and the Mediterranean; Britain eastwards through central and southern Europe into European parts of Russia and the Ukraine, parts of the former Yugoslavia and Romania; Azerbaijan, Armenia. **Determination:** Vala (1989) provided a key to adults of European species and figured the male terminalia.

## SCIOMYZIDAE

### ANTICHETA

Rozkošný and Elberg (1984) listed six *Anticheta* species as occurring in Europe. Vala (1989) keyed adults of all six species.

#### *Anticheta analis* (Meigen, 1830)

**Macrohabitat:** wetland/freshwater; edges of pools and streams, both permanent and temporary (and margins of permanently-wet drainage ditches with slow-moving water), in humid grassland and fen and at the edge of raised bog. **Flight period:** beginning May to beginning June and end July to August. **Immature stages:** larvae feed on exposed egg masses of *Galba truncatula* on which the females have oviposited. Knutson (1966) observed the complete life cycle. He found larvae "most commonly on and in egg capsules on moist, dead leaves at the margin of a small permanent pond". Some occurred on egg capsules on dead stalks of *Sparganium* projecting above water level. In all cases egg masses in at least partial shade were used. The larvae remain within the egg masses, with their posterior spiracles protruding. Puparia are formed in the empty egg masses. Overwintering occurs as a puparium. Knutson (1966) described and figured the egg, larva and puparium. Rozkošný (1967) also described and figured puparial morphology. **Range:** Britain and Ireland; much of Fennoscandia south to northern France and eastwards through northern, central (Poland, Czech Republic, Hungary) and southern Europe (southern Italy) into European parts of Russia and on to Armenia. **Determination:** Vala (1989) figured the male terminalia and provided a key to adults of European *Anticheta* species.

#### *Anticheta atriseta* (Loew, 1849)

**Macrohabitat:** forest/wetland: along streams within deciduous forest; along shallowly flooding dead arms of rivers vegetated by *Carex* and *Iris*, in alluvial forest; seasonally-flooded *Alnus incana/Fraxinus* forest with dense *Equisetum* ground layer vegetation; grazed or cut margins of tall sedge beds or reed beds. **Flight period:** April to beginning September. **Immature stages:** unknown. **Range:** Britain; Fennoscandia south to France and eastwards through northern and central Europe into European parts of Russia. **Determination:** Vala (1989) figured the male terminalia and provided a key to adults of European *Anticheta* species.

#### *Anticheta brevipennis* (Zetterstedt, 1846)

**Macrohabitat:** forest/freshwater; tall-herb vegetation at the edge of pools, at the margin of, or within, *Salix/Alnus* swamp forest or in humid, seasonally-flooded grassland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** May to September. **Immature stages:** "eggs and larvae were found on and in egg masses of *Succinea* species at the bases of grasses" along the woodland edge of a marsh in Denmark (Knutson 1966). The larvae feed within the egg mass, with their posterior spiracles exposed. Knutson (*op. cit.*) also recorded puparia floating among grasses at a similar location and among sedges and rushes in swamp and marsh. Larval development is apparently 5-7 weeks; puparial duration 3-4 weeks. In the laboratory, Knutson (*op. cit.*) observed that larvae will also feed in egg masses of *Lymnaea* and found that puparia were formed either within or without the consumed egg masses. Knutson (1966) described and figured the larva and puparium. Rozkošný (1967) also described and figured puparial morphology. **Range:** Britain and Ireland; southern Fennoscandia south to central France and eastwards through north-central Europe (Poland, Germany, Czech Republic) into European parts of Russia.



**Determination:** Vala (1989) figured the male terminalia and provided a key to adults of European *Anticheta* species.

*Anticheta obliviosa* Enderlein, 1939

**Macrohabitat:** forest/freshwater; margins of pools in open areas within deciduous forest; along shallowly-flooding dead arms of rivers vegetated by *Carex* and *Iris*, in alluvial forest.

**Flight period:** April to June. **Immature stages:** unknown. Knutson (1966) described and figured the puparium. **Range:** Britain; Denmark, Belgium, Germany, France, Hungary, Italy.

**Determination:** Vala (1989) figured the male terminalia and provided a key to adults of European *Anticheta* species.

**COLOBAEA**

Rozkošný and Elberg (1984) listed six *Colobaea* species for Europe. Rozkošný (1984b) described a seventh species, *C. nigroaristata*, from Finnish and Swedish Lapland. Rozkošný (1984b) and Vala (1989) included those seven species in their keys. Carles-Tolrá (2008) described another species, *C. acuticerca* Carles-Tolrá from central Spain.

*Colobaea bifasciella* (Fallén, 1820)

**Macrohabitat:** open ground/wetland/freshwater; tall-herb vegetation at the edge of streams or on flushes at the edge of fens and in unimproved, lightly-grazed, humid, seasonally-flooded grassland. **Flight period:** end May to October. **Immature stages:** the larva feeds on lymnaeids stranded away from the water, upon which the female has oviposited. Mc Donnell *et al.* (2010) reported finding empty puparia in shells of *Galba truncatula*, *Radix balthica* and *Stagnicola fuscus*. The entire larval development occurs within one snail. There are one or two generations per year, and overwintering occurs in the puparium, within the host. **Range:** Britain and Ireland; Lapland to northern France and through northern and central Europe to northern Italy, Hungary and European parts of Russia. **Determination:** Rozkošný (1984b) and Vala (1989), who figured the male terminalia.

*Colobaea distincta* (Meigen, 1830)

**Macrohabitat:** open ground/freshwater; grassy shores of pools/lakes with a wide marginal zone and greatly fluctuating water levels (Ryder *et al.* 2003). **Flight period:** beginning May to mid September. **Immature stages:** Rozkošný (1967) reared it from a puparium in the shell of *Anisus spirorbis* and described and figured the puparium. **Range:** Britain and Ireland; Fennoscandia and Estonia south to France and eastwards through central Europe (Poland, Czech Republic, Switzerland) to northern Italy and Romania. **Determination:** Rozkošný (1984b) and Vala (1989), who figured the male terminalia.

*Colobaea pectoralis* (Zetterstedt, 1847)

**Macrohabitat:** fen/temporary pools in humid grassland; has been collected by Malaise trap from moderately tall, patchy vegetation of a seasonal flush/temporary pool in poor fen/humid, unimproved grassland with *Schoenus nigricans*, shortly after the surface water had gone (T. Gittings *pers. comm.*); beside permanently wet drainage ditches with slow-moving water.

**Flight period:** May to September. **Immature stages:** Vala (1989) summarised the published information available on the developmental biology of this species. The larva is an internal parasitoid of *Anisus vortex*, developing within the shell. Overwintering occurs in the puparium. Rozkošný (1967) described and figured the puparium. **Range:** Britain and Ireland; Fennoscandia and Estonia south to northern France; eastwards through central Europe

(Poland, Switzerland) to Romania. **Determination:** Rozkošný (1984b) and Vala (1989), who figured the male terminalia.

*Colobaea punctata* (Lundbeck, 1923)

**Macrohabitat:** open ground/freshwater; sparsely-vegetated margins of pools/lakes with a wide marginal zone and greatly fluctuating water levels; beside permanently wet drainage ditches with slow-moving water. **Flight period:** April and August to September. **Immature stages:** Vala (1989) summarised the information published on the developmental biology of this species. The larva is an internal parasitoid of *Gyraulus albus*, *Lymnaea peregra*, *Radix labiata* and young *Planorbarius corneus*. The broad host/prey range must contribute to the success of this widespread species. **Range:** Britain and Ireland; Fennoscandia and the Baltic states south to south-eastern Spain; eastwards through central Europe (Poland, Switzerland) to northern Italy and parts of the former Yugoslavia; Belarus; Kazakhstan; Iran; Pakistan; Siberia; Ethiopia. **Determination:** Rozkošný (1984b) and Vala (1989), who figured the male terminalia.

**COREMACERA**

Rozkošný and Elberg (1984) listed nine *Coremacera* species for Europe, mostly from southern or south-eastern parts of the continent. Three species reach Atlantic parts of Europe. Rozkošný (1987) and Vala (1989) included these species in their keys.

*Coremacera catenata* (Loew, 1847)

**Macrohabitat:** open ground/forest; shaded, dry grassy areas within *Pinus* forest. **Flight period:** May to October. **Immature stages:** Vala (1989) described and figured morphological features of the first-instar larva, but other information on the developmental stages remains lacking. **Range:** Germany and Poland south to southern France; eastwards through central and southern Europe to northern Italy and Albania and on into European parts of Russia and the Ukraine; Georgia; Turkey; Iran; Iraq. **Determination:** Vala (1989), who figured the male terminalia.

*Coremacera halensis* (Loew, 1864)

**Macrohabitat:** forest/open ground; grassy areas within and edging *Pinus* forest. **Flight period:** June to August. **Immature stages:** unknown. **Range:** central Germany and northern France south to Spain and through central Europe to Hungary. **Determination:** Vala (1989), who figured the male terminalia.

*Coremacera marginata* (Fabricius, 1775)

**Macrohabitat:** open ground/forest; lightly-grazed, unimproved, humid, seasonally flooded grassland; unimproved, lightly-grazed dry grassland with dense vegetation cover; hay meadow; fixed dune grassland; sub-xeric grassland; tall-herb communities in humid, deciduous woodland; thermophilous *Quercus* forest and garrigue; dry scrub; Mediterranean shrub formations. **Flight period:** early June to beginning October. **Immature stages:** Knutson (1973) described and figured the larva and puparium. Eggs may be laid either on snails or in their vicinity. The larva is a predator of terrestrial gastropods, and the species has been reared, under laboratory conditions, on *Cochlicopa lubrica*, *C. minima*, *Discus rotundatus*, *Helicella itala*, *H. caperata*, *H. virgata*, *Eulota fruticum*, *Hygromia hispida* and *Oxychilus* spp. Larvae rarely feed on more than two individual snails, and they continue to feed on the host's tissues once it has died. Puparia are formed away from the host.

Overwintering appears to occur first as a mature larva, then in the puparium. **Range:** Britain and Ireland; widespread in Europe from Fennoscandia to the Mediterranean and to European parts of Russia; Georgia; Armenia; Azerbaijan; Turkey. **Determination:** Vala (1989), who figured the male terminalia.

### **DICHETOPHORA**

Rozkošný and Elberg (1984) listed two *Dichetophora* species for Europe.

#### *Dichetophora finlandica* Verbeke, 1954

**Macrohabitat:** forest/open ground; open, grassy or herb-rich areas with flushes, within and at the edge of humid, deciduous forest and in *Salix* swamp forest. **Flight period:** July to September. **Immature stages:** unknown. **Range:** Britain; Fennoscandia and the Baltic States south to the Alps (France, Switzerland, Italy, Austria); eastwards through northern and central Europe to parts of the former Yugoslavia and European parts of Russia. **Determination:** Rozkošný (1987) and Vala (1989), who figured the male terminalia and provided keys to adults of the two European species.

#### *Dichetophora obliterated* (Fabricius, 1805)

**Macrohabitat:** forest/open ground; along streams in mesophilous *Fagus* and thermophilous *Quercus* forest and partially-shaded, dry, unimproved grassland. **Flight period:** beginning May to beginning October. Vala *et al.* (1987) provided information to show that this is a univoltine species, despite its long flight period. **Immature stages:** Vala *et al.* (1987) provided information on the developmental biology and described and figured features of all the developmental stages. The eggs are often laid (after a prolonged pre-oviposition period of up to 2 months) on the shells of living terrestrial snails. In the laboratory, first-instar larvae fed as internal parasitoids on *Lauria cylindracea* and later instars also fed on *Helicella* and *Theba*. Overwintering occurs as the larva. Pupariation occurs either in the shell of the host or away from it. **Range:** Britain; Atlantic, central and Mediterranean parts of Europe eastwards to Romania and round the Mediterranean basin to Turkey and Morocco; Iran; Iraq; Syria. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the two European species.

### **DICTYA**

Steyskal (1954) pointed out that European *Dictya* material seen by him could not all belong to the same species, but later authors have not addressed this issue and Rozkošný and Elberg (1984) listed only one *Dictya* species for the entire Palaearctic Region. By contrast, thirty-three *Dictya* species are known from the Nearctic.

#### *Dictya umbrarum* (Linnaeus, 1758) *sensu* Orth (1991)

**Macrohabitat:** wetland; flushes in marsh, fen and transition mire, plus calcareous flushes and along streams in raised bog and blanket bog. **Flight period:** February to September. **Immature stages:** Rozkošný (2002) described the larva and puparium. Willomitzer and Rozkošný (1977) provided information on a laboratory culture of *D. umbrarum* and reared the species using *Stagnicola palustris* and *Lymnaea tomentosa* (an Australasian species) as larval prey. The larvae are aquatic predators. The puparium is formed away from the host. Knutson and Berg (1971) recorded *Helisoma* (Nearctic), *Lymnaea*, *Planorbis* and *Succinea* as larval prey. Overwintering probably occurs in the puparium, as in the case of Nearctic *Dictya* species. Valley and Berg (1977) described and compared the developmental stages of 21

Nearctic species of *Dictya*, observing that the larvae and puparia of most species are so similar that they are very difficult to distinguish. **Range:** Britain and Ireland; Iceland; Faroes; Fennoscandia and the Baltic States south to mountainous parts of southern France; eastwards through most of Europe into European parts of Russia and the Ukraine and throughout Siberia. **Determination:** some confusion remains surrounding application of the name *umbrarum* (see Steyskal in Stone *et al.* 1965). Here the name is used *sensu* Orth (1991), who provided a key to world *Dictya* species and figured the male terminalia, including those of *D. umbrarum*. The figure of the male terminalia of *D. umbrarum* provided by Vala (1989) appears to show a different species from that found commonly in the Atlantic zone. There is a clear need for review of the *Dictya* species occurring in Europe.

#### **DITAENIELLA**

Rozkošný and Elberg (1984) did not recognise this genus, but included *D. griseescens* in *Pherbellia*. Rozkošný (1987) reinstated the genus, which has only one Palaearctic species.

#### ***Ditaeniella griseescens* (Meigen, 1830)**

**Macrohabitat:** open ground/wetland; beside streams and pools and in flushes in unimproved, lightly-grazed, seasonally-flooded, humid grassland; edges of lakeside reed (*Phragmites*) beds. **Flight period:** May to September. **Immature stages:** in the laboratory, the larva is a predator of freshwater and terrestrial gastropods of the Haplotrematidae, Helicidae, Lymnaeidae, Physidae, Planorbidae, Polygyridae and Succineidae. Bratt *et al.* (1969) described and figured features of larval and puparial morphology (as *Pherbellia griseescens*). Rozkošný (1967) also described and figured larval and puparial morphology. Usually the puparium is formed away from the host. **Range:** Britain and Ireland; Fennoscandia and the Baltic States south to the Mediterranean; eastwards through most of Europe into European parts of Russia and on to eastern Siberia; round the Mediterranean basin to Lebanon and northern Africa; Iran, Afghanistan, Mongolia, China; Japan; Oriental Region. **Determination:** Vala (1989), who figured the male terminalia.

#### **ECTINOCERA**

There is only one described *Ectinocera* species, which is known only from the Palaearctic Region (Rozkošný and Elberg 1984).

#### ***Ectinocera borealis* Zetterstedt, 1838**

**Macrohabitat:** coniferous and deciduous forest; closed canopy or open, humid *Pinus sylvestris* forest with *Juniperus*; subalpine *Pinus uncinata* forest; *Betula* forest. **Flight period:** May to July. **Immature stages:** unknown. **Range:** Britain; Fennoscandia south to Germany; eastwards through central Europe to the Alps (France, Switzerland, Austria, Italy); European parts of Russia. **Determination:** Vala (1989), who figured the male terminalia.

#### **ELGIVA**

There are three *Elgiva* species known to occur in Europe (Rozkošný and Elberg 1984).

#### ***Elgiva cucularia* (Linnaeus, 1767)**

**Macrohabitat:** wetland; marsh, fen and transition mire and tall-herb communities in seasonally-flooded, humid, lightly-grazed, unimproved grassland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** the adult apparently overwinters, but records of adults are from April to October. **Immature stages:** Knutson and Berg (1964)

described and figured egg, larval and puparial morphology. Rozkošný (1967, 2002) also described and figured larval and puparial morphology. Knutson and Berg (1964) and Rozkošný (2002) provided keys for separation of the larvae and puparia of *E. cucularia* and *E. sollicita*. The larva is an aquatic predator of Lymnaeidae, Physidae and Planorbidae, which it hunts at the surface film of standing waters. The puparium is formed away from the host. **Range:** Britain and Ireland; widespread in Europe from Fennoscandia to the Mediterranean and round the Mediterranean basin to Greece and European parts of Russia; North Africa. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

*Elgiva divisa* (Loew, 1845)

**Macrohabitat:** wetland; riparian marsh. **Flight period:** May to September. The adult apparently overwinters. **Immature stages:** the developmental stages have not been described or figured, but Orth and Knutson (1987) provided details of larval biology. The larvae are aquatic/subaquatic predators, primarily of freshwater snails. Under laboratory conditions they have been found to feed on species of *Lymnaea*, *Planorbis* and *Helisoma* (Nearctic) and on occasion were observed to attack and consume the slug *Deroceras* and terrestrial snails such as *Zonitoides*. The puparium is formed away from the host. **Range:** not known from Atlantic parts of Europe; Fennoscandia south to Germany; European parts of Russia and Siberia to the Pacific; Mongolia; Nearctic (Alaska, NW Territories, Yukon). **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

*Elgiva sollicita* (Harris, 1780)

**Macrohabitat:** wetland; fen and tall-herb communities in seasonally flooded, humid, lightly-grazed, unimproved grassland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** the adult of this species apparently overwinters. Records of adults are from spring and autumn (May and September to October). **Immature stages:** Knutson and Berg (1964) and Rozkošný (1967) described and figured egg, larval and puparial morphology. Rozkošný (2002) provided a key for separation of the larvae and puparia of *E. cucularia* and *E. sollicita*. Smith (1959) described and figured the puparium, from material found floating among *Lemna* species, at the edge of a pond. The larvae float at the surface film of standing waters, where they prey on a wide range of aquatic gastropods (Lymnaeidae, Physidae, Planorbidae). Puparial formation occurs in the water. The puparia float and are highly modified to enable them to do so. **Range:** Britain and Ireland; from Lapland south to Spain and the Mediterranean; eastwards through most of Europe to the Ukraine and on through Asiatic Russia into eastern Siberia; round the northern part of the Mediterranean basin to Algeria; Nearctic (Alaska and Nova Scotia south to Nevada and New York). **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species. This species has appeared in recent literature under the names *sundewalli* Kloet and Hincks and *rufa* (Panzer).

**EUTHYCERA**

Rozkošný and Elberg (1984) listed 12 species of *Euthycera* as occurring in Europe. Leclercq *et al.* (1983) reduced this number to 11, augmented subsequently by *Euthycera vockerothi* (Rozkošný, 1988), *E. alaris* (Vala, 1983) and *E. seguyi* (Vala, 1990). Due to recent synonymies the total number of known European species is once again 12. Four *Euthycera* species are known to reach the Atlantic zone.

*Euthycera alaris* Vala, 1983

**Macrohabitat:** open ground/forest; shaded, dry, unimproved grassland; open, grassy areas in thermophilous *Quercus* forest; garrigue; thermophilous forest fringes. **Flight period:** April to October. **Immature stages:** unknown. **Range:** northern France south to Spain (including the Balearic Islands) and the Mediterranean; round the Mediterranean basin to Italy, Tunisia and Morocco. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Euthycera* species.

*Euthycera chaerophylli* (Fabricius, 1798)

**Macrohabitat:** forest: humid deciduous forest and swamp woodland. **Flight period:** June to August; a univoltine species (Vala 1989). **Immature stages:** Rozkošný (1967) figured the puparium. Vala (1989) summarised information on the larval development. The first-instar larva has been found to attack *Deroceras* in the laboratory and appears to be an internal parasitoid of slugs, but the species has not been reared to maturity. **Range:** from Fennoscandia south to Spain, Italy and Greece; Netherlands eastwards through most of Europe into European parts of Russia and the Ukraine; Turkey. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Euthycera* species.

*Euthycera fumigata* (Scopoli, 1763)

**Macrohabitat:** open ground; unimproved, dry grassland with more-or-less complete cover of ground vegetation, from lowland grassland up to and including subalpine grassland. **Flight period:** May to October. **Immature stages:** unknown. **Range:** Britain; Fennoscandia south to Spain; eastwards through most of Europe to Greece and European parts of Russia. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Euthycera* species.

*Euthycera stichospila* (Czerny, 1909)

**Macrohabitat:** open ground; dry grassland and grassy, open areas within thermophilous *Quercus* forest. **Flight period:** April to October; univoltine (Vala 1989). **Immature stages:** Vala (1989) described and figured the larva and puparium. The larva is initially an internal parasitoid of smaller terrestrial gastropods, but more strictly predatory/saprophagous in the second and third instars, continuing to feed on its host's tissues once the snail is dead. In the laboratory it has been reared from *Lauria cylindracea*, *Fruticicola hispida*, *Helicella fasciata* and small individuals of the slug *Deroceras reticulatum*. The puparium is formed away from the host. **Range:** northern France south to the Mediterranean and Spain; Morocco; Algeria. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Euthycera* species.

## HYDROMYA

*Hydromya* is a monotypic Palaearctic genus.

*Hydromya dorsalis* (Fabricius, 1775)

**Macrohabitat:** wetland/open ground; tall herb communities in fen; temporary pools in lightly-grazed, humid, seasonally-flooded, unimproved grassland; calcareous flushes and stream-sides in blanket bog; pool and lake-edge tall herb communities; pool and stream edge in marsh; edges of temporary streams and drainage ditches containing canalised streams in humid grassland. **Flight period:** April to November. **Immature stages:** Knutson and Berg (1963) described and figured the predatory, aquatic larvae, together with the eggs and puparia.

Under laboratory conditions, puparia were formed just beneath the surface of damp sand. The larvae prey on a range of aquatic gastropods (especially Lymnaeidae), particularly those exposed on wet ground by fluctuations in water level; they may also feed on the host's egg masses, and can live in a shallow film of slow-moving surface water and a broad range of other aquatic microhabitats. The puparium is formed away from the host. **Range:** Britain and Ireland; more or less throughout Europe and round the Mediterranean basin to Algeria and Morocco; through Siberia to the Pacific, the Kuril Islands and Japan; Mongolia. **Determination:** Vala (1989), who figured the male terminalia.

### *ILIONE*

*Ilione* species have appeared in much recent literature (including Rozkošný and Elberg 1984) under the name *Knutsonia* Verbeke. Rozkošný and Elberg (1984) listed seven *Ilione* species as occurring in Europe. Steyskal *et al.* (2003) reviewed the nomenclatural history of the name *Ilione* and suggested that there is need for recognition of two subgenera: s.g. *Ilione* for the pea-mussel associated species and s.g. *Knutsonia* for the snail-killing species.

#### *Ilione albiseta* (Scopoli, 1763)

**Macrohabitat:** wetland/open ground; fen and tall-herb communities; lightly-grazed, humid, seasonally-flooded grassland; lightly-grazed salt-marsh grassland; calcareous flushes in blanket bog and raised bog; stream and pool edges in marsh, stream and pool edges in the open, in wet woodland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** late May to mid October. **Immature stages:** in the laboratory the larvae are predators of several genera of non-operculate snails. Knutson and Berg (1967) and Rozkošný (1967) described and figured the developmental stages. As with various other sciomyzids, the puparia have been found floating among pond edge vegetation. This is a univoltine species that overwinters as a larva. Lindsay *et al.* (2011) comprehensively treated the larval biology of this species. **Range:** Britain and Ireland; more or less throughout Europe; from European parts of Russia eastwards throughout Siberia; around the Mediterranean basin to Turkey, Israel and North Africa; Iran, Mongolia. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

#### *Ilione lineata* (Fallén, 1820)

**Macrohabitat:** wetland/open ground/freshwater; densely-vegetated, seasonally-flooded, humid grassland and open fen and calcareous flushes with tall herb vegetation, with a slow-flowing surface film of water rather than standing water. **Flight period:** May to mid September. **Immature stages:** Foote and Knutson (1970) and Knutson (1970b) gave details of some elements of the larval biology. The eggs apparently will not hatch until they have been immersed in water for some days. The larvae are aquatic predators of Sphaeriidae. The young larvae search for and consume their prey underwater, but the older larvae return to the surface film to replenish their oxygen supply. Each larva characteristically consumes 20-30 specimens of mature pea mussels like *Pisidium casertanum*, during the course of its development; *I. lineata* has been reared using *P. casertanum*, *P. milium*, *P. obtusale* and *P. subtruncatum* as hosts. The puparium is formed in the water and has been found in the field, floating in standing water. Knutson and Berg (1967) described and figured the developmental stages. **Range:** Britain and Ireland; northern and Atlantic zones of Europe south to northern France; eastwards through northern and central Europe (Switzerland) to southern Italy; in Russia to eastern Siberia. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

## LIMNIA

Rozkošný and Elberg (1984) listed two *Limnia* species as occurring in Europe.

### *Limnia paludicola* Elberg, 1965

**Macrohabitat:** wetland/open ground; fen and tall-herb communities; lightly-grazed, humid, seasonally-flooded, unimproved grassland; calcareous flushes in blanket and raised bog. **Flight period:** end May to September. **Immature stages:** Rozkošný (1967) described the egg and first-instar larva. Knutson and Berg (1971) recorded rearing this species to pupariation using *Succinea* as larval host. The puparium is formed away from the host. **Range:** Britain and Ireland; Fennoscandia south to central France; eastwards through northern and central Europe, including the Alps (Switzerland, Italy), into European parts of Russia and throughout Siberia. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the two European species. Rozkošný (1987) gave mesoscutal coloration as the only reliable feature for distinguishing the female of this species from that of *L. unguicornis*. However, this is difficult to interpret, especially for specimens preserved in alcohol.

### *Limnia unguicornis* (Scopoli, 1763)

**Macrohabitat:** open ground; lightly-grazed, unimproved, dry grassland; lightly to moderately-grazed, unimproved and improved humid, non-flooded grassland; dune slacks. **Flight period:** May to October. A univoltine species (Vala and Knutson 1990). **Immature stages:** Vala and Knutson (1990) described and figured the egg, larva and puparium and also provided some information on developmental biology. There is a prolonged pre-oviposition period, of approximately 100 days. Where the eggs are laid is not recorded and the mollusc hosts of the larvae are uncertain, since in the laboratory rearing proved difficult, with only *Lauria* and *Succinea* being named as snails attacked and consumed by larvae and no clear indication given of whether development was successfully completed in these snails. Larvae were also observed to attack "quelques limaces" (unspecified). It seems that this species overwinters in the puparium, which is formed away from the host. **Range:** distribution data for this species that predate description of *L. paludicola* are unreliable, due to the potential for confusion with that species. Known from Britain and Ireland; Fennoscandia and the Baltic States south to the Mediterranean in Spain, France, Italy and Greece; eastwards through most of Europe to European parts of Russia and Turkey and central Asia. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species. See under *L. paludicola* regarding separation of females from that species.

## PHORBELLIA

In Europe, *Pherbellia* is represented by more species than any other sciomyzid genus. Rozkošný and Elberg (1984) listed 37 European species. Since then, *P. grisescens* (Meigen), has been consigned to a separate genus, *Ditaeniella*. Also, some European species have been synonymised and the following additional species have been described: *P. dentata* Merz & Rozkošný, *P. garganica* Rivosecchi, *P. hackmani* Rozkošný, *P. lutheri* Rozkošný and *P. silana* Rivosecchi. After these various changes the total number of European species stands at 38. This large, world-wide genus is biologically one of the most diverse and best studied in the family.

### *Pherbellia albocostata* (Fallén, 1820)



**Macrohabitat:** forest; both coniferous and deciduous forest and scrub; acidophilous *Quercus*, humid *Fagus*, *Betula* and *Picea* forest; open, subalpine *Pinus uncinata* forest; Atlantic scrub (*Corylus/Prunus spinosa*). **Flight period:** end May to September. **Immature stages:** in the laboratory the larva has been found to attack various terrestrial gastropods: *Balea perversa*, *Cochlicopa lubrica*, *C. minima*, *Discus rotundatus*, *D. ruderatus*, *Euconulus fulvus*, *Retinella nitidula* and *Zonitoides* species. In nature the larva has been found in *D. rotundatus*. Bratt *et al.* (1969) described and figured features of the developmental stages, and provided information on larval biology, based on rearing the species through its entire life cycle. It is a univoltine species that overwinters in the puparium, away from the host. **Range:** Britain and Ireland; Fennoscandia south to the Pyrenees (France); eastwards through most of Europe into European parts of Russia and on through Siberia to the Pacific; transcontinental in the Nearctic Region. **Determination:** Rozkošný (1991). Vala (1989) and Rozkošný (2002) also figured the male terminalia.

*Pherbellia annulipes* (Zetterstedt, 1846)

**Macrohabitat:** forest; mature/overmature humid/mesophilous deciduous forest of *Fagus*; *Alnus incana* alluvial forest. **Flight period:** May to October. **Immature stages:** in the laboratory the larva has only been found to attack *Discus rotundatus*. Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on rearing the species through its entire life cycle. *Pherbellia annulipes* is univoltine and the puparium overwinters in the host. **Range:** Britain; southern parts of Fennoscandia south to the Mediterranean (Corsica); eastwards through central and southern Europe to parts of the former Yugoslavia. **Determination:** Rozkošný (1991, 2002) and Vala (1989), who figured the male terminalia.

*Pherbellia argyra* Verbeke, 1967

**Macrohabitat:** wetland; edges of pools with seasonally, widely-fluctuating water levels, in thinly-vegetated marsh; seasonally water-filled drainage ditches in wetland. **Flight period:** end May to September. **Immature stages:** in the laboratory the larva has been found to attack a wide range of both aquatic and terrestrial snails. In nature, larvae have been found in *Aplexa hypnorum* and *Planorbis planorbis* and puparia in *P. planorbis* and *Anisus vortex*. The species has been reared in both Europe and North America. Bratt *et al.* (1969) described and figured features of the larva and puparium and provided information on larval biology, based on rearing the species through its entire life cycle. It is a polyvoltine species that in nature overwinters in the puparium, either in the substrate or in the host. **Range:** Britain and Ireland; Fennoscandia south to the Pyrenees through Atlantic parts of Europe; eastwards through northern Europe to European Russia and through central Europe (Czech Republic, Switzerland) to Austria; transcontinental in the Nearctic Region. **Determination:** Rozkošný (1991, 2002), who figured the male gonostyli. Vala (1989) also figured the male terminalia.

*Pherbellia brunnipes* (Meigen, 1838)

**Macrohabitat:** wetland/open ground; tall herb communities; marshy and fenny lake and pool margins. **Flight period:** April to August. **Immature stages:** Bratt *et al.* (1969) described and figured features of the third-instar larva and the puparium. First-instar larvae obtained in the laboratory did not feed. Overwintering occurs in the puparium, away from the host. **Range:** Britain and Ireland; Fennoscandia and the Baltic States south to northern France; eastwards through northern and central Europe to European parts of Russia, Italy and the Ukraine;

Mongolia. **Determination:** Rozkošný (1991, 2002), who figured the male gonostyli. Vala (1989) also figured the male terminalia.

*Pherbellia cinerella* (Fallén, 1820)

**Macrohabitat:** open ground/wetland; unimproved, lightly-grazed, sub-xeric grassland, dry grassland and fixed dune grassland; karstic, unimproved, subalpine grassland; lightly-grazed, unimproved and improved, humid, non-flooded grassland; unimproved, humid, seasonally-flooded grassland; fen and marsh. **Flight period:** end April to September; throughout the year in southern Europe. **Immature stages:** Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on laboratory rearings of the species through its entire life cycle. In the laboratory the larva attacks a wide range of both terrestrial and aquatic gastropods, but has not been found in nature. Rozkošný (1967) also described and figured larval morphology. This polyvoltine species overwinters in the puparium, which is formed outside the shell of the larval host (Bratt *et al.* 1969). But, according to Vala (1989), the adult overwinters in southern France. **Range:** Britain and Ireland; central parts of Fennoscandia south to the Mediterranean and round the Mediterranean basin into North Africa; eastwards through most of Europe into European parts of Russia; Armenia, Turkey, Tajikistan, Afghanistan; Oriental Region. **Determination:** Rozkošný (1991, 2002) and Vala (1989), who figured the male terminalia.

*Pherbellia dorsata* (Zetterstedt, 1846)

**Macrohabitat:** wetland/open ground; lightly-grazed fen and fenny margins to pools and temporary pools, including vegetated margins of pools in open areas within forest (*Fagus*); thinly-vegetated seasonal streams in garrigue and dry scrub. **Flight period:** April to September. **Immature stages:** this species has been reared in the laboratory from a wide range of snails, including Cochlicopidae, Endodontidae, Helicidae, Lymnaeidae, Physidae, Planorbidae, and Succineidae. In the field, it has been reared from *Planorbis planorbis*. Bratt *et al.* (1969) described and figured features of all developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle. Rozkošný (2002) also described and figured the developmental stages. There are 4-5 generations per year. Overwintering occurs in the puparium, within the shell of the host. **Range:** Britain and Ireland; the Baltic States and southern parts of Fennoscandia south to Spain and the Mediterranean; eastwards through central Europe into European parts of Russia and the Ukraine and on to western Siberia; Kazakhstan. **Determination:** Rozkošný (1991), who figured the male gonostyli; Vala (1989) and Rozkošný (2002) also figured the male terminalia.

*Pherbellia dubia* (Fallén, 1820)

**Macrohabitat:** forest/open ground; wet woodland of *Alnus* and along streams in acidophilous *Quercus* forest and *Betula* forest or coniferous forest (humid *Pinus*, *Picea*); Atlantic scrub (*Corylus/Prunus spinosa*), hedgerows with associated field margins, in humid grassland; lightly-grazed, unimproved, humid, non-flooded grassland. **Flight period:** April to September. **Immature stages:** the larva has been reared in the laboratory from *Cochlicopa lubrica*, *Discus rotundatus*, *D. ruderatus*, *Hygromia hispida*, *Oxychilus cellarius*, *O. helveticus*, *Retinella indentata* and other terrestrial gastropods. In nature the larva has been found in a live snail of *Cochlicopa lubrica*, and puparia have been found in *Discus rotundatus*, *Oxychilus cellarius*, *O. helveticus*, *Retinella nitidula* and *Hygromia hispida*. Bratt *et al.* (1969) described and figured features of the developmental stages and provided

information on larval biology, based on laboratory rearing of the species through its entire life cycle; *P. dubia* overwinters in the puparium, in the shell of its host. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) south through Atlantic parts of Europe to northern France; eastwards through northern (Baltic States) and parts of central Europe (including the Alps, in Switzerland) to Italy, Romania and European parts of Russia; through Siberia to the Pacific (Kamchatka) and Japan. **Determination:** Rozkošný (1991), who figured the male gonostyli. Vala (1989) and Rozkošný (2002) also figured the male terminalia.

*Pherbellia goberti* (Pandellé, 1902)

**Macrohabitat:** a flush on the mown margin of woodland (Stuke 2005). **Flight period:** May, July. **Immature stages:** unknown. **Range:** Britain; Sweden and Finland; the Netherlands; Germany; SW France. **Determination:** this species appeared in recent literature as *P. stylifera* Rozkošný. Rozkošný (1982) and Vala (1989) provided figures of the male terminalia under the name *P. stylifera*, which Stuke (2005) established as a synonym of *P. goberti*.

*Pherbellia griseola* (Fallén, 1820)

**Macrohabitat:** wetland; fen and tall-herb communities; fenny pool margins (with seasonally or erratically fluctuating water levels) in lightly-grazed, humid, unimproved grassland, up to and including montane fen. **Flight period:** April to October. **Immature stages:** in the laboratory, the larva is a predator of Lymnaeidae, Physidae, Planorbidae and Succineidae. In nature, larvae and puparia have been found in *Stagnicola palustris*. Bratt *et al.* (1969) described and figured features of all developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle. Rozkošný (1967, 2002) also described and figured the morphology of the developmental stages. This polyvoltine species usually forms its puparium within the host and probably overwinters in the puparium. **Range:** Britain and Ireland; Fennoscandia and the Baltic States south to Spain and the Mediterranean and round the Mediterranean basin to North Africa (Tunisia); eastwards through most of Europe into European parts of Russia, the Ukraine and Turkey; Iran, Mongolia, China; Japan; transcontinental in the Nearctic Region. **Determination:** Rozkošný (1991), who figured the male gonostyli; Vala (1989) and Rozkošný (2002) also figured the male terminalia.

*Pherbellia knutsoni* Verbeke, 1967

**Macrohabitat:** open ground; dune slacks in lightly-grazed, coastal fixed-dune grassland; dry, unimproved grassland; open, grassy areas in karstic, subalpine *Pinus uncinata* forest. **Flight period:** April to September. **Immature stages:** in nature the larva is an internal parasitoid of the terrestrial gastropods *Cochlicella acuta*, *Helicella caperata*, *H. itala* and *H. virgata*. In the laboratory it has also been found to attack several other species of terrestrial snail. Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle. This species overwinters in the puparium, either within or away from its host. **Range:** eastern Ireland, south-west Britain (Wales, south-west England) and north-west France (Brittany) and central Europe (French Alps: Speight *et al.* 2005; Swiss Jura: Merz 1996). **Determination:** Rozkošný (1991), who figured the male gonostyli. Vala (1989) also figured the male terminalia.

*Pherbellia n. nana* (Fallén, 1820)

**Macrohabitat:** wetland/forest; flushes and edges of pools in fen and marsh; shaded pool margins in forest; beside permanently wet drainage ditches with slow-moving water. **Flight period:** April to October. **Immature stages:** in the laboratory, the larva attacks many species of both terrestrial and aquatic snails. In the field puparia have been obtained from *Gyraulus parvus*, *Galba humilis*, *Stagnicola palustris* and *Physa* sp. Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle. Rozkošný (2002) also described and figured the developmental stages. This species forms its puparium in the shell of its host, where it overwinters. In southern parts of its range it probably breeds throughout the year. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) south to northern France; eastwards through northern (Baltic States) and central Europe to European parts of Russia and Greece; around the Mediterranean basin into north Africa (Algeria, Morocco); through Siberia to the Pacific and Japan; Afghanistan, Mongolia, China; Nearctic Region (where it is the most widely distributed *Pherbellia* species). **Determination:** Rozkošný (1991, 2002) and Vala (1989), who figured the male terminalia.

*Pherbellia obscura* (Ringdahl, 1948)

**Macrohabitat:** open ground/freshwater; grassy and muddy margins of pools and lakes. **Flight period:** March to September. **Immature stages:** Bratt *et al.* (1969) supplied information on the third-instar larva and puparium, based on laboratory rearings, but this probably does not relate to this species, since Orth *et al.* (1980) reared further material originating from the same locality and found that it belonged to *P. subtilis* Orth & Steyskal. **Range:** not recorded from the Atlantic zone; Fennoscandia, European parts of Russia; transcontinental in the Nearctic Region. **Determination:** Rozkošný (1991), who figured the male gonostyli. Orth *et al.* (1980) and Vala (1989) also figured the male terminalia. Also see comments under *P. ventralis*.

*Pherbellia obtusa* (Fallén, 1820)

**Macrohabitat:** wetland/open ground; fen; beside thinly-vegetated temporary pools in seasonally-flooded grassland; along the thinly-vegetated beds of temporary streams in non-flooded, humid grassland. **Flight period:** May to November. **Immature stages:** neither larva nor puparium have been found in nature, but in the laboratory the larva has been found to kill and feed on many species of terrestrial and aquatic snail. Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle (the identity of voucher specimens from the reared material was confirmed by Verbeke as *P. obtusa*, not his then newly described species *P. argyra*). This species usually forms its puparium in the shell of its host. **Range:** uncertain, due to confusion until recently with *P. argyra*. Sweden, Finland and Denmark; Belgium, Estonia, Germany, Belarus and on through Siberia to the Pacific. British records of this species are apparently based on misdeterminations of *P. argyra*. **Determination:** Rozkošný (1991), who figured the male gonostyli. Vala (1989) and Rozkošný (2002) also figured the male terminalia.

*Pherbellia pallidiventris* (Fallén, 1820)

**Macrohabitat:** forest/open ground; humid deciduous forest, including *Betula* forest; lightly-grazed, unimproved, humid, non-flooded grassland; montane/subalpine *Vaccinium* heath with *Alnus viridis* thickets; open, subalpine *Pinus uncinata* forest. **Flight period:** end May to beginning October. **Immature stages:** unknown. **Range:** Britain and Ireland; northern

Fennoscandia (Lapland) south through Atlantic parts of Europe to the Pyrenees (France); eastward through northern (Baltic States) and central Europe to European parts of Russia and the Ukraine. **Determination:** Rozkošný (1991), who figured the male gonostyli. Vala (1989) and Rozkošný (2002) also figured the male terminalia.

*Pherbellia rozkosnyi* Verbeke, 1967

**Macrohabitat:** forest; deciduous forest (acidophilous *Quercus* and *Betula*); subalpine coniferous forest of *Pinus uncinata*; humid grassland with tall-herb communities and suburban gardens. **Flight period:** June to September. **Immature stages:** unknown. **Range:** Fennoscandia south to Germany; Britain and Ireland; eastwards through central Europe (the Czech Republic, Slovakia, Switzerland) to northern Italy. **Determination:** Rozkošný (1991), who figured the male gonostyli. Vala (1989) and Rozkošný (2002) also figured the male terminalia.

*Pherbellia s. schoenherri* (Fallén, 1826)

**Macrohabitat:** wetland; marsh, fen, reed and tall sedge beds; tall-herb open areas in alluvial forest. **Flight period:** April to October. **Immature stages:** the larva is an internal parasitoid of *Succinea* species. For the Palaearctic subspecies, Moor (1980) and Vala and Ghamizi (1992) provided extensive information on larval biology. Rozkošný (1967) described its egg and puparium. For the Nearctic subspecies, Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle and collection of larvae in nature. In the Palaearctic subspecies the female fly oviposits on the shell of the host, whereas the Nearctic subspecies does not. Eggs of the Palaearctic subspecies have been found on living *Succinea elegans* and *S. putris*. Larvae of the North American subspecies were found in nature in *Oxyloma* and *Succinea* species. The larva usually develops entirely within one snail. In both subspecies the puparium is usually formed away from the host. **Range:** Britain and Ireland; Fennoscandia south to Spain and the Pyrenees (France); eastwards through northern and central Europe into European parts of Russia; Turkey, Mongolia; Japan; transcontinental in the Nearctic Region (subspecies *maculata*). **Determination:** Rozkošný (1991, 2002) and Vala (1989), who figured the male terminalia. The status of the Palaearctic and Nearctic "subspecies" requires further investigation.

*Pherbellia scutellaris* (von Roser, 1840)

**Macrohabitat:** forest; both coniferous and deciduous forest; small, open, grassy areas with flushes in humid/mesophilous *Fagus* forest and *Picea* forest; mature, suburban ornamental gardens. **Flight period:** end May to September. **Immature stages:** *P. scutellaris* has been reared from two species of *Clausilia* in the field and from a wide range of terrestrial gastropods in the laboratory. Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle. The puparium is formed away from its host and the species probably overwinters as a larva. **Range:** requires review due to potential confusion with closely-related species (*P. pallidicarpa*, *P. rozkosnyi*, *P. sordida*), but probably widespread in the Atlantic and continental zones (confirmed from Britain and Ireland, Belgium, northern and continental France and from Switzerland); southern Norway; European Russia; Mongolia. **Determination:** Rozkošný (1991), who figured the male gonostyli of this and related species. Vala (1989) and Rozkošný (2002) also figured the male terminalia. Rozkošný and Zuska (1965) provided more comprehensive figures of the male terminalia.

*Pherbellia scutellaris* can only reliably be distinguished from *P. rozkošnyi* using characters of the male terminalia, though the number of hairs present in the pteropleural hair patch is usually greater in *P. scutellaris* (normally 6 or 7) than in *P. rozkošnyi* (normally 3).

*Pherbellia silana* Rivosecchi, 1989

**Macrohabitat:** temporary water bodies with wetland vegetation, in grassland. **Flight period:** unusually early in the year, from February to May, though it occurs later (July) at higher altitudes. **Immature stages:** unknown. **Range:** not recorded from the Atlantic zone; Spain, France, Switzerland, Czech Republic, Italy. **Determination:** Rozkošný (1991, 2002). This species is distinguishable from *P. ventralis* only by means of features of the male terminalia, and may occur with *P. ventralis* in the field.

*Pherbellia sordida* (Hendel, 1902)

**Macrohabitat:** small open areas with flushes in deciduous woodland (Kassebeer 2001). **Flight period:** end April to beginning September. **Immature stages:** unknown. **Range:** Britain; Fennoscandia south to the Pyrenees (France); eastwards through northern (Estonia) and central Europe (including the Alps) to Italy, Hungary and Romania and European parts of Russia and the Ukraine. **Determination:** Rozkošný (1991, 2002) and Vala (1989), who figured the male terminalia.

*Pherbellia stackelbergi* Elberg, 1965

**Macrohabitat:** humid, seasonally-flooded, unimproved grassland; tall herb communities (Staunton *et al.* 2008). **Flight period:** mid May to end October. **Immature stages:** unknown. **Range:** Ireland; Fennoscandia south to Denmark, Germany and Poland; eastwards through northern parts of European Russia into Siberia. **Determination:** Rozkošný (1991), who figured the male terminalia.

*Pherbellia steyskali* Rozkošný & Zuska, 1965

**Macrohabitat:** *Picea* forest up to subalpine heath with flushes and *Alnus viridis* thickets. **Flight period:** July to August. **Immature stages:** unknown. **Range:** not known from the Atlantic zone; Czech Republic, Slovakia, Switzerland, France (Alps). **Determination:** Rozkošný (1991), who figured the male gonostyli. Rozkošný and Zuska (1965) provided more comprehensive figures of the male terminalia.

*Pherbellia ventralis* (Fallén, 1820)

**Macrohabitat:** wetland; fen and tall-herb communities; calcareous flushes and stream-sides in blanket bog and raised bog; lightly-grazed, humid, seasonally-flooded, unimproved grassland; stream-sides and pool-edges in lightly-grazed, humid, non-flooded, unimproved grassland. **Flight period:** April to August. **Immature stages:** in nature, one larva has been found in *Stagnicola palustris*. In the laboratory it has been reared from various physids, planorbids and Succineidae. Bratt *et al.* (1969) described and figured features of the developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle. Rozkošný (2002) also described and figured all immature stages. This polyvoltine species forms its puparium either within or away from its host. It apparently overwinters in the puparium. **Range:** Britain and Ireland; Iceland and Fennoscandia south through Atlantic parts of Europe to northern France and eastwards through northern and continental parts of Europe to Italy and parts of European Russia. Its distribution in southern Europe requires re-appraisal, due to confusion with *P. silana*.

**Determination:** Rozkošný (1991, 2002), who figured the male gonostyli of this and related species. Orth *et al.* (1980) figured the male terminalia of *P. obscura* and *P. ventralis*; *P. ventralis* is only distinguishable from *P. silana* using features of the male terminalia and is only reliably distinguished from *P. obscura* in the same way, since colour characters used to separate *P. ventralis* and *P. obscura* are not precise. Further, differences in the constitution of the hair patch on the pteropleuron, used to distinguish *P. ventralis* from species such as *P. rozkosnyi* and *P. scutellaris*, are less pronounced than is suggested in the literature. In particular, there may be no difference between the character of this hair patch in *P. ventralis* and *P. scutellaris*, these species being more easily distinguished on size and general body colour.

### **PHERBINA**

Rozkošný and Elberg (1984) listed four European species of *Pherbina*, which Vala (1989) included in his keys to adults.

#### ***Pherbina coryleti*** (Scopoli, 1763)

**Macrohabitat:** wetland/open ground; fen, marsh, reed and tall sedge beds and lightly-grazed, humid, seasonally-flooded, unimproved grassland; lightly-grazed salt-marsh grassland; flushes in lightly-grazed, humid, non-flooded, unimproved grassland. **Flight period:** May to September. **Immature stages:** Knutson *et al.* (1975) described and figured the developmental stages and provided information on larval biology, based on laboratory rearing of the species through its entire life cycle. Rozkošný (2002) provided keys for separation of the larvae and puparia of *P. coryleti* and *P. intermedia*. The larva is an aquatic predator that may be found in open water and floating at the vegetated edges of standing water, including temporary pools. In the laboratory, larvae of this species have been found to kill and consume a wider range of terrestrial and freshwater gastropods, and in greater numbers, than any other aquatic/semi-aquatic tetanocerine sciomyzid (Knutson *et al.* 1975). Eggs are laid on and among water-margin vegetation. The species is univoltine and overwintering occurs as a third-instar larva. Pupariation occurs away from the host and the floating puparium may be found among water-margin vegetation. **Range:** Britain and Ireland; Fennoscandia south to Spain and the European rim of the Mediterranean; eastwards through most of Europe into European parts of Russia and on into Siberia, Azerbaijan and Turkey; Iran and Afghanistan. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

#### ***Pherbina intermedia*** Verbeke, 1948

**Macrohabitat:** wetland; edges of pools and water-filled ditches, with marginal tall-herb vegetation or reed/tall sedge beds. **Flight period:** late May to end August. **Immature stages:** Knutson *et al.* (1975) described and figured larval and puparial morphology and provided some information on larval biology. Both they and Rozkošný (2002) provided a key for separation of the larvae of *P. coryleti* and *P. intermedia*. The larva is an aquatic predator that feeds on *Helisoma* (Nearctic), *Lymnaea* and *Physa* in the laboratory, but the species has not been reared to pupariation under laboratory conditions. **Range:** southern Sweden south to Spain and Italy (including Sicily); Belgium eastwards through most of Europe into European parts of Russia and on through Siberia to the Pacific and Japan; Mongolia, China (Szechwan). **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

## PSACADINA

Rozkošný and Elberg (1984) listed four European species of *Psacadina*, which Vala (1989) included in his keys to adults.

### *Psacadina verbekei* Rozkošný, 1975

**Macrohabitat:** wetland/forest; fen and *Salix* swamp woodland. **Flight period:** April to May and end July to beginning September. **Immature stages:** Knutson *et al.* (1975) described and figured the developmental stages and provided information on larval biology, based on rearing the species through its complete life cycle in the laboratory. In nature, larvae have been found on emergent grasses in slow moving water at the edge of forest and the eggs also appear to be laid in such situations. The larvae are aquatic predators inhabiting the water's edge zone, and have successfully completed development in the laboratory using as prey aquatic snails belonging to five different genera, showing a strong preference for Lymnaeids. Pupariation occurs just under/at the surface of damp, water margin plant litter, or soil. **Range:** Britain and Ireland; southern parts of Fennoscandia south to Spain and southern Italy (including Sicily); eastwards through most of Europe to Greece and European parts of Russia; Turkey, Iran. **Determination:** Vala (1989), who figured the male terminalia and provided a key to males of the European species. Kassebeer (2002) provided a key that is more useful for recognition of females.

### *Psacadina vittigera* (Schiner, 1864)

**Macrohabitat:** wetland; fen and tall sedge beds along river margins. **Flight period:** April to October. **Immature stages:** unknown. **Range:** Britain; the Baltic States south to central France; eastwards through central Europe into European parts of Russia, Hungary and Romania. **Determination:** Vala (1989), who figured the male terminalia and provided a key to males of the European species. Kassebeer (2002) provided a key that is more useful for recognition of females.

### *Psacadina zernyi* (Mayer, 1953)

**Macrohabitat:** wetland; fen and marsh. **Flight period:** May and August to September. **Immature stages:** Knutson *et al.* (1975) described and figured the developmental stages, having reared the species through its complete life cycle. The larva is a predator of various freshwater gastropods: *Aplexa hypnorum*, *Bathymphalus contortus*, *Galba truncatula*, species of *Succinea* (and the African species *Biomphalaria glabrata*), which it feeds on at the water's edge. Puparia are formed out of the water, on or just under the surface of, plant debris or other substrate. It overwinters in the puparium. **Range:** Britain and Ireland; Fennoscandia south to the Alps; eastwards through northern and central Europe into European parts of Russia; Greece, Turkey, Iran. **Determination:** Vala (1989), who figured the male terminalia and provided a key to males of the European species. Kassebeer (2002) provided a key that is more useful for recognition of females.

## PTEROMICRA

Rozkošný and Elberg (1984) listed five European species of *Pteromicra*, which Rozkošný and Knutson (1970) and Vala (1989) included in their keys to adults.

### *Pteromicra angustipennis* (Staeger, 1845)

**Macrohabitat:** open ground; flushes and temporary pools in lightly-grazed or mown, humid, seasonally-flooded, unimproved grassland (including alluvial grassland); beside permanently



wet drainage ditches with slow-moving water. **Flight period:** May to September. **Immature stages:** Rozkošný and Knutson (1970) described and figured all developmental stages. In the laboratory, the larva is predatory on various freshwater and terrestrial gastropods: *Anisus vortex*, *Bathymphalus contortus*, *Galba truncatula*, young specimens of *Planorbis planorbis*, *Segmentina nitida*, *Succinea* species and *Trochulus hispida*. Snails invaded by a larva of this fly may live for 2 days but then die; thereafter the larva buries itself in the snail's tissues, with only its posterior spiracles protruding, until its host is consumed. Occasionally the puparium is formed in the shell of the host, but more usually within damp substrates nearby. The species is believed to overwinter in the puparium. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) south to northern France; eastwards through northern and central Europe into European parts of Russia and on through Siberia to the Pacific; Mongolia; north-western parts of the Nearctic Region. **Determination:** Rozkošný and Knutson (1970) and Vala (1989), who figured the male terminalia and provided keys to adults of the European species.

*Pteromicra glabricula* (Fallén, 1820)

**Macrohabitat:** edges of standing waters in partial shade, where there is a zone of seasonally fluctuating water level along the margin of the water body. **Flight period:** May to September. **Immature stages:** Rozkošný and Knutson (1970) described and figured all larval instars and the puparium. In the laboratory the larva is predatory on a wide range of freshwater gastropods and the terrestrial genus *Discus*. The puparium is only rarely formed within the shell of the consumed host; usually it is formed under the surface of some damp substrate. The species is believed to overwinter in the puparium. **Range:** distribution data published under this species name prior to 1970 is unreliable, since it may refer to the species now known as *P. angustipennis* (see Rozkošný and Knutson 1970). Britain and Ireland; Iceland and Lapland south to northern France; eastwards through northern and central Europe into Hungary and European parts of Russia and on through Siberia to the Pacific; Kazakhstan. **Determination:** Rozkošný and Knutson (1970) and Vala (1989), who figured the male terminalia and provided keys to adults of the European species.

*Pteromicra leucopeza* (Meigen, 1838)

**Macrohabitat:** open ground/freshwater; thinly vegetated margins of pools in lightly-grazed, humid, seasonally-flooded, unimproved grassland; partially shaded, thinly vegetated pool edges in acidophilous *Quercus* forest and wet woodland of *Salix*; beside permanently wet drainage ditches with slow-moving water. **Flight period:** May to September. **Immature stages:** Rozkošný and Knutson (1970) described and figured the developmental stages. Rozkošný (1967) also described and figured larval and puparial morphology. In nature, the larva has been found to prey on *Bathymphalus contortus*, and in the laboratory it has been reared also from *Anisus vortex*. Puparia are formed within a damp substrate in the vicinity of the consumed host and the species overwinters in the puparium. **Range:** Britain and Ireland; southern Fennoscandia south to northern France; eastwards through northern and central Europe (including the Alps) to parts of European Russia; Massachusetts to South Dakota in the Nearctic Region. **Determination:** Rozkošný and Knutson (1970) and Vala (1989), who figured the male terminalia and provided keys to adults of the European species.

*Pteromicra pectorosa* (Hendel, 1902)

**Macrohabitat:** open ground; lightly-grazed, humid, seasonally-flooded, unimproved grassland and edges of pools in non-flooded, humid, unimproved grassland. **Flight period:**

May to September. **Immature stages:** Rozkošný and Knutson (1970) described and figured the developmental stages. The larva is predatory on *Anisus vortex* and *Segmentina nitida* under laboratory conditions. The puparium is formed either in the shell of the dead host or in damp substrate and the species is believed to overwinter in the puparium. **Range:** Britain and Ireland; southern Fennoscandia south to Germany; eastwards through northern and central Europe (Poland, Czech Republic) to Hungary; transcontinental in the Nearctic Region. **Determination:** Rozkošný and Knutson (1970) and Vala (1989), who figured the male terminalia and provided keys to adults of the European species.

### **RENOCERA**

Rozkošný and Elberg (1984) listed four European species of *Renocera*. One of these, *R. praetextata* Mueller, has subsequently been synonymised. Vala (1989) included the other three in his keys to adults. Withers (2009) described a further European species, *R. lyami*, from Mallorca.

#### ***Renocera pallida*** (Fallén, 1820)

**Macrohabitat:** open ground/forest; lightly-grazed, humid, seasonally-flooded, unimproved grassland; flushes and stream-sides in humid, non-flooded, unimproved grassland and in wet woodland of *Alnus*; alluvial hardwood forest; fenny lake margins; ditches channeling seasonal, ground-water streams. **Flight period:** late April to mid October. **Immature stages:** Horsáková (2003), who reared the species through its complete life cycle, provided details of the morphology of the developmental stages, together with information on larval biology. The larvae are predators of pea mussels (*Sphaeriidae*) in water-logged ground, smaller larvae attacking small *Pisidium* species, but larger larvae also attacking the larger *Musculium* and *Sphaerium* species (laboratory observations). The larvae generally do not penetrate below the surface of the water and prefer water-saturated ground where such species as *Pisidium personatum* occur. Puparium formation occurs outside the host mussel and the species overwinters in the puparium. There appear to be two generations per annum. **Range:** Britain and Ireland; Fennoscandia (Lapland) south to central France and north east Spain; eastwards through northern and central Europe to northern Italy; Romania; the Ukraine and European parts of Russia; through Siberia to the Pacific. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

#### ***Renocera striata*** (Meigen, 1830)

**Macrohabitat:** wetland/freshwater; flushes at the margin of raised bogs and fen; calcareous flushes in blanket bog and transition mire. **Flight period:** beginning May to end September. **Immature stages:** Foote (1976) reared this species through its complete life cycle in North America, using the name *R. brevis* Cresson, now known to be a synonym of *R. striata*. The larvae were found to feed on one *Pisidium* species and three species of *Sphaerium*. The first-instar larvae forage beneath the water surface, but in the second and third instar the larvae keep the posterior spiracles at the water surface. The puparium is formed away from the host. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) to southern France; eastwards through northern and central Europe (Switzerland, Austria) into European parts of Russia and on through Siberia to the Pacific; northern parts of the Nearctic. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species.

#### ***Renocera stroblii*** Hendel, 1900

**Macrohabitat:** freshwater/wetland; edges of backwaters, permanent pools and dead arms of rivers on alluvial floodplains; edges of water-filled drainage ditches in fen. **Flight period:** late May and June to September. **Immature stages:** unknown. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) to southern France and northern Italy; eastwards through most of Europe into European parts of Russia and on through Siberia to the Pacific; Mongolia. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of the European species. This species has appeared in recent literature under the names *R. praetextata* Mueller and *R. fuscinervis* (Zetterstedt).

### SALTICELLA

Rozkošný and Elberg (1984) listed only one species of *Salticella* from Europe, also the only known Palaearctic species.

#### *Salticella fasciata* (Meigen, 1830)

**Macrohabitat:** unimproved, lightly-grazed dry grassland; lightly-grazed fixed dune grassland; mesophilous *Fagus* forest and abandoned vineyards etc, in southern Europe. **Flight period:** April to May and end July to October. **Immature stages:** Knutson *et al.* (1970), who also provided detailed observations on laboratory rearing of the species, described and figured the developmental stages. The larva is an internal parasitoid-saprophage of various terrestrial molluscs: *Arianta arbustorum*, *Cepaea nemoralis*, *Cerutuella virgata*, *Cochlicella acuta*, *Helicella bolensis*, *H. itala*, *Trochulus striolatus*, *Monacha cantiana*, *Theba pisana* and *Xerolenta obvia*. Larvae leave the snail before puparium formation, which under laboratory conditions occurred just below the surface of damp sand. Coupland *et al.* (1994) provided field observations on developmental biology. The eggs are laid on snails, the flies exhibiting strong preference for individuals of more than 10mm in length and only ovipositing on *Theba pisana* and *Cerutuella virgata*. Further, the flight period of *Salticella* coincides with periods of onset of breeding activity by those snails. Coupland *et al.* (*op. cit.*) considered that the larva of *Salticella* is more saprophage than predator. The species overwinters in the puparium. There seem to be two generations per year at the northern edge of its range, three further south and, in the Mediterranean zone, breeding appears to be continuous throughout the year. **Range:** Britain and Ireland; Atlantic parts of mainland Europe from northern France south to the Pyrenees; central Europe (Czech Republic and Hungary); Mediterranean parts of Europe from Iberia to Greece and onwards around the Mediterranean basin through Turkey to Egypt, Tunisia and Algeria; the Ukraine (Crimea) and the southern edge of European Russia; Iran. **Determination:** Vala (1989), who figured the male terminalia.

### SCIOMYZA

Rozkošný and Elberg (1984) listed four European species for this genus. Subsequently one of these, *S. lucida* (Hendel), was synonymised under *S. dryomyzina*. Roller (1996) described *S. pulchra*, from southern Slovakia and Pržhiboro (2001) described *S. sebezihica* from European Russia (Pskov Province, south of St. Petersburg). However, Vihrev (2011) recognised *S. sebezihica* as a synonym of *S. testacea*, bringing the European fauna back to the four species keyed by Roller (1996).

#### *Sciomyza dryomyzina* Zetterstedt, 1846

**Macrohabitat:** wetland; tall herb communities in seasonally-flooded, humid grassland of alluvial floodplain systems and in fen. **Flight period:** mid May to November. **Immature**

**stages:** Foote (1959) described and figured the puparium. The larva is an internal parasitoid/predator/saprophage of Succineidae. In the field, this species has been reared through its complete life cycle from *Oxyloma* and *Succinea* (Knutson 1988). In the laboratory, *S. dryomyzina* has been reared through its complete life cycle on *Succinea pfeifferi*. The puparium is formed away from the host and the species overwinters in the puparium. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) south to central France; eastwards through northern and central Europe to European parts of Russia and western Siberia; transcontinental in northern parts of the Nearctic. **Determination:** Roller (1996), who provided a key to the European *Sciomyza* species. Vala (1989) figured the male terminalia and provided a key to the three species dealt with here.

#### *Sciomyza simplex* Fallén, 1820

**Macrohabitat:** wetland; tall sedge beds and reed beds, along edges of standing water bodies in wetland and on alluvial floodplains; beside permanently wet drainage ditches with slow-moving water. **Flight period:** April to early October. **Immature stages:** Foote (1959), who observed the complete life cycle in North America, described the developmental stages. Knutson (1988) reared the species through its complete life cycle in Europe. The larvae are parasitoids/predators of both freshwater and terrestrial gastropods, moving from one snail to another as they are consumed. In North America they have been reared from stranded specimens of *Stagnicola* collected in the field. Puparia may be formed either inside or away from the host and the species overwinters in the puparium. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) south to central France and eastwards through most of Europe to the Balkans; European parts of Russia and western Siberia; Kazakhstan; transcontinental in the Nearctic Region. **Determination:** Roller (1996), who provided a key to the European *Sciomyza* species. Vala (1989) figured the male terminalia and provided a key to the three species dealt with here.

#### *Sciomyza testacea* Macquart, 1835

**Macrohabitat:** forest/wetland; deciduous swamp forest; rich fen/seasonally-flooded, humid grassland; flushes and streamside tall-herb vegetation in sedge and reed beds (Gittings and Speight 2011). **Flight period:** end April to mid September. **Immature stages:** the developmental stages have not been described. The larvae are parasitoids/predators/sarcophagous on *Succinea* species in the field, and have been reared from snails collected on tall herb vegetation, in heavy shade in swamp forest (Knutson 1988). **Range:** Britain and Ireland; southern Sweden and the Baltic States south to northern France; eastwards through northern and central Europe to European parts of Russia; the Balkans; NE Turkey. **Determination:** Roller (1996), who provided a key to the European *Sciomyza* species. Vala (1989) figured the male terminalia and provided a key to the three species dealt with here.

#### *SEPEDON*

Rozkošný and Elberg (1984) listed three European *Sepedon* species; *S. femorata* (Knutson & Orth, 1984) and *S. hecate* (Elberg *et al.*, 2009) have been added subsequently, the latter with an apparently widely disjunct distribution (Eastern Siberia and the German Alps), but this may be due to it only recently being recognised.

#### *Sepedon femorata* Knutson & Orth, 1984

**Macrohabitat:** wetland; marsh/reed beds, edging slightly brackish coastal lagoons. **Flight period:** May and July. **Immature stages:** unknown. **Range:** Spain and southern France,

where it reaches the Atlantic zone of Europe in the coastal zone of Les Landes; Italy (Liguria). **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Sepedon* species, except for *S. hecate*.

*Sepedon sphegea* (Fabricius, 1775)

**Macrohabitat:** wetland/freshwater; fen and marsh; beside pools in non-flooded, unimproved, lightly-grazed grassland and by temporary pools in lightly-grazed, seasonally-flooded, humid, unimproved grassland; beside permanently wet drainage ditches with slow-moving water.

**Flight period:** the species overwinters as the adult fly, derived from the generation that emerges from the puparium in the autumn. In this generation egg-laying is delayed for some months, the overwintering females starting to lay eggs toward the end of winter and continuing oviposition until they die the following spring. A succession of generations then follows, adults being present from April until the autumn. **Immature stages:** Neff and Berg (1966), who reared the species through its complete life cycle, described and figured all developmental stages. Eggs are laid on waterside vegetation. The larvae are aquatic predators, feeding at the water surface. In the laboratory they have been found to attack *Gyraulus*, *Helisoma* (Nearctic) and *Physa* species (Neff and Berg 1996). Mc Donnell *et al.* (2005) reported a third-instar larva found in the field, feeding on a *Radix* species, in Iran. The puparia are formed in the water and float at the water surface.

**Range:** Britain and Ireland; widespread in the Palaearctic Region, through most parts of the Atlantic and continental zones of Europe to southern parts of European Russia and on through Armenia, Turkey, Iran and Iraq to Afghanistan, Mongolia, India (Kashmir), the western edge of China (Sinkiang) and the northern Pacific coast of Russia. Also known from north Africa (Morocco). **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Sepedon* species, except for *S. hecate*.

*Sepedon spinipes* (Scopoli, 1763)

**Macrohabitat:** wetland/open ground; fen; beside pools in marsh, reed/tall sedge beds and in non-flooded, unimproved, lightly-grazed grassland and by temporary pools in lightly-grazed, seasonally-flooded, humid, unimproved grassland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** March to November. **Immature stages:** Neff and Berg (1966), who reared the species through its complete life cycle, described and figured the developmental stages. In the laboratory the larvae are aquatic predators of *Biomphalaria* (Afrotropical), *Helisoma* (Nearctic), *Physa* and *Planorbis*, and feed at the water surface.

Once mature, some crawl up, out of the water, to form the puparium firmly attached to the aerial parts of emergent vegetation. The species overwinters as an adult. **Range:** Britain and Ireland; widespread in Europe, from southern Fennoscandia to southern Spain, France, Italy and Greece; European parts of Russia and on through Siberia to the Pacific; Turkey, Armenia, Iran; North Africa (Morocco). **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Sepedon* species, except for *S. hecate*. Elberg *et al.* (2009) raised the Nearctic subspecies of *S. spinipes* to species level.

## TETANOCERA

Rozkošný and Elberg (1984) listed 16 European species of *Tetanocera* species, two of which have subsequently been recognised as synonyms, reducing the number of European species to 14.

*Tetanocera arrogans* Meigen, 1830

**Macrohabitat:** wetland/open ground/forest; transition mire and marsh; lightly-grazed, humid, seasonally-flooded, unimproved grassland; pool margins in lightly-grazed, non-flooded, humid, unimproved grassland; *Alnus* woodland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** April to October. **Immature stages:** Vala (1989) described and figured the developmental stages, and also provided information on larval biology. Apparently the eggs are laid along the edges of leaves. In the field the larva is a terrestrial parasitoid/predator of Succineidae and in the laboratory it has been found also to feed on *Cepaea nemoralis* and *Hygromia hispida*. The puparium is formed away from the host. **Range:** Britain and Ireland; widespread in Europe, from northern Fennoscandia (Lapland) to Spain and Greece; Turkey; European parts of Russia and on through Siberia to the Pacific and Japan. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species. Females of this species remain difficult to separate from those of *T. montana*. Differences between the terminalia can be used to separate the males. For recognition of females, an additional feature that can help is that in *T. arrogans* the brightly shining mid-frontal stripe is shorter than in *T. montana*. Also in both sexes of *T. arrogans* between one-fifth and one-third of the length of the frons is dull across its entire width anteriorly, whereas in *T. montana* this applies to at most one sixth of the frons. Unfortunately, this feature can be difficult to interpret in specimens preserved in alcohol (e.g. from Malaise trap catches).

#### *Tetanocera elata* (Fabricius, 1781)

**Macrohabitat:** wetland/open ground; fen and marsh and calcareous flushes in blanket bog and raised bog; most forms of lightly to moderately-grazed humid, unimproved grassland and improved grassland; humid silage grassland; field margins with associated hedges in humid grassland; wet woodland of *Alnus* and *Salix*. **Flight period:** end June to September. **Immature stages:** Rozkošný (1965) and Vala (1989) described and figured the developmental stages. Knutson *et al.* (1965) described the larval biology. The young larva is a parasitoid of various slugs, living under the mantle with its posterior spiracles exposed. The older larva is predatory, attacking the slug's nervous system to immobilise the animal and moving away from its prey after feeding. The species has been reared from *Arion circumscriptus*, *Deroceras laeve*, *D. reticulatum*, *Limax maximus* and *Milax gagetes* in the laboratory. It has been reared from *Deroceras reticulatum* collected in the wild. Puparium formation takes place on or just below the soil surface and the species probably overwinters in the puparium. **Range:** Britain and Ireland; widespread in Europe, from northern Fennoscandia (Lapland) to Spain and the Balkans; European parts of Russia and Siberia through to the Pacific and Japan; Mongolia, China. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species. Using existing keys, the female of this species cannot easily be separated from that of *T. phyllophora*.

#### *Tetanocera ferruginea* Fallén, 1820

**Macrohabitat:** wetland/open ground; transition mire, fen, tall-herb communities, marsh, reed and tall-sedge beds; lightly grazed, humid, seasonally flooded, unimproved grassland; pool margins and flushes in lightly grazed, non-flooded, humid, unimproved grassland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** April to September. **Immature stages:** Rozkošný (1965, 1967), Vala (1989) and Foote (in press) have provided descriptions and figures of all developmental stages. Foote (1999) described the complete life cycle. There are more records of larvae found in nature for this species than for

any other aquatic, predatory sciomyzid. In the field the larva is a generalised aquatic predator of many freshwater pulmonate gastropods, including the European genera *Bathyomphalus*, *Galba*, *Physella*, *Planorbis* and *Stagnicola*. It has also been found feeding in egg masses of *Stagnicola*. In the laboratory, Manguin *et al.* (1988) showed that, with some combinations of prey available, *T. ferruginea* larvae consume what is most abundant, irrespective of the prey species present, but that with other combinations preferences for particular prey species are exhibited. The puparium is formed away from the host and in the water. This polyvoltine species overwinters in the puparium. **Range:** Britain and Ireland; widespread in Europe, from northern Fennoscandia (Lapland) to Spain and Greece; European parts of Russia and Siberia through to the Pacific and Japan; Mongolia, China; transcontinental in the Nearctic Region. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species. Occasionally, a posterodorsal seta may be present on the hind femur in this species, leading to confusion with *T. arrogans*.

*Tetanocera freyi* Stackelberg, 1963

**Macrohabitat:** wetland/open ground; pool margins in raised bog, transition mire, fen and marsh; flushes and pool margins in lightly-grazed, humid, seasonally-flooded, unimproved grassland. **Flight period:** May to August. **Immature stages:** unknown. **Range:** Britain and Ireland; Fennoscandia south to northern France; the Baltic States; European parts of Russia; Nearctic Region (Alberta and Alaska). **Determination:** Rozkošný (2002), who figured the male terminalia and provided what is probably the most reliable key for separation of females from those of *T. silvatica*. Vala and Brunel (1987) also figured the male genitalia.

*Tetanocera fuscinervis* (Zetterstedt, 1838)

**Macrohabitat:** wetland/open ground; transition mire, fen, marsh; lightly-grazed, humid, seasonally-flooded, unimproved grassland; pool edges and flushes in non-flooded, lightly-grazed, humid, unimproved grassland. **Flight period:** end May to September. **Immature stages:** Rozkošný (1967), Vala (1989) and Foote (in press) have described and figured larval and puparial morphology. Foote (1996) provided some information on the biology of this species, but did not rear it through its entire life cycle. The larva is a water's edge predator of exposed individuals of various Lymnaeidae, Physidae and Planorbidae. This species is probably bivoltine and overwinters in the puparium. Knutson and Berg (1971) also recorded the terrestrial gastropods *Cochlicopa*, *Discus*, *Helix* and *Hygromia* as larval prey in the laboratory. The puparium is formed away from the host. **Range:** Britain and Ireland; widespread in Europe from northern Fennoscandia (Lapland) south to the Mediterranean coast of France and parts of the former Yugoslavia; the Baltic States and European Russia and on through Siberia to the Pacific; Mongolia; transcontinental in the Nearctic Region. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species. This species appears in some recent literature under the names *Tetanocera unicolor* and *Renocera fuscinervis*.

*Tetanocera hyalipennis* von Roser, 1840

**Macrohabitat:** wetland/open ground/forest; fen and marsh; flushes and pool margins in humid, seasonally-flooded, unimproved, lightly-grazed grassland; wet woodland of *Alnus* and *Salix*. **Flight period:** May to October. **Immature stages:** Knutson (1963) provided information on all developmental stages, but the species has not yet been reared through its entire life cycle. In the laboratory, the larva is a predator of aquatic gastropods: *Galba truncatula*, *Physa* species, *Planorbis planorbis*, *Stagnicola palustris* and the North American

*Helisoma trivolvis*. It is uncertain how many generations this species has per annum or in which developmental stage it overwinters. **Range:** Britain and Ireland; widespread in Europe from northern Fennoscandia (Lapland) south to Spain and parts of the former Yugoslavia; the Baltic States and European Russia and on through Siberia to the Pacific; Georgia, Kazakhstan. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species. This is the only *Tetanocera* species in which the frons is entirely shining.

*Tetanocera montana* Day, 1881

**Macrohabitat:** reed and tall sedge beds along marshy margins of standing-water bodies. **Flight period:** May to September. **Immature stages:** Foote (1999 and in press) reared this species through the complete life cycle. The aquatic larva was found in the field on decaying leaves and stems of a sedge floating in the standing water of a swamp. Once transferred to the laboratory these larvae predated *Galba*, *Gyraulus*, *Helisoma* (Nearctic), *Physa*, *Physella*, *Planorbis* and *Stagnicola* species, plus the Afrotropical *Biomphalaria*. Puparia are formed away from the host but in the water. In this univoltine species, overwintering occurs as either the egg or young larva. **Range:** Britain and Ireland; Lapland south to Belgium; the Czech Republic; Hungary; Turkey; Baltic States; European parts of Russia; Ukraine; Armenia; Asiatic parts of Russia; Mongolia; transcontinental in the Nearctic. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species.

*Tetanocera phyllophora* Melander, 1920

**Macrohabitat:** forest; humid deciduous forest of *Salix*, *Fraxinus* and *Fagus*; *Alnus incana* alluvial forest. **Flight period:** end May to August. **Immature stages:** Foote (in press) has described the developmental stages. Foote (1977, 2007) and Knutson (1970b) also provided information about larval biology. In the laboratory the larva is a predator of various, mostly terrestrial gastropods, the young larvae invading the host between the mantle and the overlying shell. It then feeds on the snail's tissues until the snail has been killed, after which it moves to another snail. Knutson and Berg (1971) recorded *Clausilia*, *Cochlicopa*, *Discus*, *Helix*, *Hygromia*, *Lymnaea*, *Succinea* and *Zonitoides* as larval prey. Available information suggests that puparial formation occurs away from the host and that overwintering occurs in the puparium. There are either one or two generations per year. Vala (1989) deduced the identity of a fly larva, found by Bhatia and Keilin (1937) feeding in a snail identified as *Vertigo genesii*, as *T. phyllophora*, but there are unresolved issues relating to this host record that suggest it requires verification. **Range:** Britain and Ireland; Atlantic parts of Europe south to northern France; through northern and central Europe to European parts of Russia and on through Siberia to the Pacific; Japan; widespread in North America. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species. The female of this species can be difficult to separate from the female of *T. elata*.

*Tetanocera punctifrons* Rondani, 1868

**Macrohabitat:** wetland/open ground; tall-herb open areas in *Alnus incana* alluvial forest; montane fen and stream-sides in seasonally-flooded, lightly-grazed, humid, unimproved grassland. **Flight period:** June to September. **Immature stages:** Knutson (1963) provided information on larval and puparial morphology and on developmental biology. The larva is a predator of aquatic gastropods, reared in the laboratory from *Biomphalaria* (Afrotropical),



*Gyraulus*, *Helisoma* (Nearctic), *Lymnaea* and *Physa*. The puparium is formed away from the host. **Range:** Britain and Ireland; widespread in Europe from Scandinavia south to Spain and parts of the former Yugoslavia; the Baltic States and European Russia; Bulgaria, Romania. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species.

*Tetanocera robusta* Loew, 1847

**Macrohabitat:** wetland/open ground; fen and marsh; edges of pools and streams in seasonally-flooded, lightly-grazed, unimproved, humid grassland; beside permanently wet drainage ditches with slow-moving water. **Flight period:** end April to September. **Immature stages:** Foote (in press) has described all developmental stages. Nielsen *et al.* (1954) also described and figured the third-instar larva. Foote (1999) gave biological information on the developmental stages. In the laboratory the larva is an aquatic predator that feeds on *Biomphalaria* (Afrotropical), *Gyraulus*, *Lymnaea* and *Physella* species. Knutson and Berg (1971) also recorded *Physa* and *Planorbis* as larval prey in the laboratory. Puparia may be formed either in the water or above the water surface on emergent plants. Overwintering is believed to occur in the puparial phase or as a mature larva. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) south to Belgium, and eastwards through to the Alps (Switzerland) and Hungary; the Baltic States and European Russia and on through Siberia to the Pacific; Mongolia; transcontinental in the Nearctic Region. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species.

*Tetanocera silvatica* Meigen, 1830

**Macrohabitat:** forest; along streams in humid *Fagus* forest; in alluvial softwood forest and brook floodplain forest. **Flight period:** May to September. **Immature stages:** Knutson (1963) and Rozkošný (1967) described and figured all developmental stages. These authors also described the complete life cycle, based on laboratory rearings. Foote (1996) recorded finding third-instar larvae among plant debris at the edge of partially shaded permanent pools in a floodplain marsh. In the laboratory, eggs are laid either on potential larval hosts or in their immediate vicinity. The young larvae tend to feed gregariously on aquatic gastropods (*Gyraulus*, *Lymnaea*, *Physa*, *Planorbis*), plus *Oxyloma* and *Succinea*, but are solitary predators of stranded individuals of the same snails during later development. The puparium is formed away from the host. Overwintering probably occurs in the puparial phase. **Range:** Britain and Ireland; northern Fennoscandia (Lapland) south to Spain; the Baltic States and European Russia and on through Siberia to the Pacific; through central and southern Europe to Italy and Romania; transcontinental in the Nearctic Region. **Determination:** Vala (1989), who figured the male terminalia and provided a key to adults of European *Tetanocera* species. Using existing keys, the female of this species cannot be reliably separated from that of *T. freyi*. The surstyli of *T. silvatica* and *T. freyi* are similar in shape and their shape is unusual for the genus. A molecular genetic study of these taxa would be helpful to clarify their relationship.

**TETANURA**

Rozkošný and Elberg (1984) listed two European species. However, Vikhrev (2011) has placed *T. fallenii* Hendel, known only from the Austrian type material, in synonymy with the other European species, *T. pallidiventris*.

*Tetanura pallidiventris* Fallén, 1820

**Macrohabitat:** partially-shaded, tall herb vegetation of flushes in acidophilous *Quercus* forest. **Flight period:** for a brief period during May to July, when the species may be abundant in very localised, small areas. **Immature stages:** Knutson (1970a), who reared the species through its complete life cycle, described and figured all developmental stages. This species is one of the few sciomyzids that is a truly internal parasitoid of terrestrial gastropods and has been found in the field in the snails *Cochlicopa lubrica* and *Aegopinella pura*. Eggs are laid directly onto the tissues of the host, the larva crawling deeply into the shell, between the mantle and the shell itself and thence into the snail's tissues. The snail may live for some months following infestation with a *Tetanura* larva, but eventually dies, the larva completing its development on the decaying tissues. The puparium is normally formed within the shell of the deceased host. There appears to be one generation per year, overwintering occurring in the puparium. **Range:** Britain and Ireland; Fennoscandia, Germany, Czech Republic; French Pyrenees; Alps (Switzerland, Austria, Italy); Baltic States and parts of European Russia; eastern Siberia; Japan. **Determination:** Knutson (1970a) and Vala (1989).

#### TRYPETOPTERA

Only one *Trypetoptera* species is known from the Palaearctic Region.

*Trypetoptera punctulata* (Scopoli, 1763)

**Macrohabitat:** open ground; humid, dry, and semi-xeric unimproved grassland, up to and including subalpine grassland; open, grassy areas in thermophilous *Quercus* forest; garrigue and Mediterranean scrub. **Flight period:** May to November, with a peak in June. **Immature stages:** Vala (1986), who reared the species through its complete life cycle in the laboratory, described and figured all developmental stages. As with many other univoltine sciomyzids, there is a prolonged pre-oviposition period in this species, of up to 2 months. The larva feeds on terrestrial gastropods and has been reared in the laboratory from *Candidula unifasciata*, *Cornu aspersum*, *Lauria cylindracea* and *Trochulus hispidus*. In the case of *Lauria*, which is viviparous, the first-instar larva of *T. punctulata* apparently feeds first on the developing young in the pallial cavity of its host. The first-instar larvae show preference for *Lauria* as host, but older larvae attack also other, larger gastropods and do not successfully complete development in *Lauria*. Pupariation usually occurs within the shell of the host, an almost unique phenomenon among Tetanocerini. Overwintering apparently occurs as a larva and the species is believed to be strictly univoltine. **Range:** Britain and Ireland; widespread throughout Europe from Fennoscandia to the Mediterranean and from Spain and Greece; Turkey, Iran and North Africa; the Baltic States and European parts of Russia and through Siberia to the Pacific; Mongolia. **Determination:** Vala (1989), who figured the male terminalia.

#### Discussion: practical application of coded species habitat association data

The macrohabitat association data given in the Atlantic zone phaeomyiid and sciomyzid species accounts can be transferred to a spreadsheet, using the fuzzy-coding system described in Castella and Speight (1996). It is then a simple matter to count how many of the species are associated with each habitat. Sorting the data set using the British species list then gives the British subset of Atlantic zone species associated with each habitat. Using the same technique with the Irish list shows how many Irish species are associated with each habitat. Table A shows the results derived for several broad habitat categories.

Habitat category	Number of sciomyzid and phaeomyiid species		
	Atlantic zone	Britain	Ireland
Deciduous forest	30	26	19
Wet forest	30	29	28
Coniferous forest	12	9	7
Dry unimproved grassland	7	6	5
Humid unimproved grassland	24	23	22
Fen	39	38	35
Marsh	28	27	26
Bog	12	12	12

**Table A: number of British and Irish sciomyzid species associated with various habitat categories.**

Habitat category	% of Atlantic fauna	
	Britain	Ireland
Deciduous forest	87	63
Wet forest	97	93
Coniferous forest	75	58
Dry unimproved grassland	86	71
Humid unimproved grassland	96	92
Fen	97	90
Marsh	96	93
Bog	100	100

**Table B: percentage representation in Britain and Ireland, of Atlantic zone sciomyzids associated with various habitat categories.**

Tables B and C use the data presented in Table A in different ways. In Table B the percentage represented, of the Atlantic zone fauna of each habitat category, is shown for Britain and Ireland. It indicates, for instance, that all of the bog-associated Atlantic zone sciomyzids are represented in both Britain and Ireland, whereas three quarters of the species associated with conifer forest are known in Britain, but only approximately half of them are known from Ireland. In Table C the species associated with each habitat category, in each list, are shown as percentages of each list. Thus 39% of the Atlantic zone species are associated with deciduous forest, but only 32% of the Irish species are associated with deciduous forest. It is noticeable that there are more than twice as many sciomyzid species associated with deciduous forest as with conifer forest, in each of the three lists, showing that, when an Atlantic zone deciduous woodland is cut down and replaced by a conifer plantation a marked decrease in sciomyzid biodiversity would be expected. The predictive capacity of species habitat association data is perhaps one of its most interesting attributes. Moreover,

coded into a database using generally available software like Excel this predictive capacity can be made available to someone who is not a sciomyzid specialist, making a sciomyzid species list a tool of potential value to anyone concerned with proposed changes to the use of a site, or other aspects of site management. Predictions made in this way are also open to testing (see Speight 2004a).

The number of possible ways in which digitised species habitat association data can be used increases when augmented by digitised data for other attributes, as has already been shown for the StN database of European syrphids, (see, for example, Biesmeijer *et al.* 2006, Burgio and Sommaggio 2007, Gittings *et al.* 2006, Ouin *et al.* 2006, Speight 2004b). Compilation of a database of Atlantic zone sciomyzids incorporating a range of species attributes, in addition to habitat association data, is now underway.

Habitat category	% of fauna		
	Atlantic zone	Britain	Ireland
Deciduous forest	39	37	32
Wet forest	39	41	48
Coniferous forest	15	13	12
Dry unimproved grassland.	9	9	9
Humid unimproved grassland	31	32	37
Fen	50	54	59
Marsh	36	38	44
Bog	15	17	20

**Table C: percentage of the sciomyzid fauna of the Atlantic zone in general, and of Britain and Ireland treated separately, associated with various habitat categories**

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### ***Rhagoletis meigenii* (Loew) (Diptera, Tephritidae) in East Anglia –**

For many years the occurrence of *Rhagoletis meigenii* (Loew, 1844) in Britain was restricted to two records, from Hampshire (1897) and Worcestershire (1908). In recent years it has been recorded from Battersea Park, Surrey (Jones, R.A. 2000. *Rhagoletis meigenii* (Loew, 1844) (Dip. Tephritidae) rediscovered in Britain. *Entomologist's Record and Journal of Variation* **112**, 253-256) and Welwyn, Hertfordshire (Uffen, R.W.J. 2005. BENHS Indoor Meetings. *British Journal of Entomology and Natural History* **18**, 123), in both cases associated with *Berberis thunbergii*. These records are regarded as recent establishments (Hill, M. *et al.* 2005. *Audit of non-native species in England*. English Nature Report No. 662). No further records have been published, or notified to the National Recording Scheme for Tephritidae (L. Clemons *pers. comm.*).

During the second half of July 2006, Colin Plant operated a Malaise trap at the Dunton Test Track, Basildon, Essex (TQ663898), and sent the Diptera catch to DAS, who identified two females of *Rhagoletis meigenii*.

From 22 to 29 May 2011, AGI operated a yellow bowl trap in his garden in Norwich (TG211082) and caught one male *Rhagoletis meigenii*. Many of the surrounding gardens have both *Berberis thunbergii* and *Mahonia aquifolium*. *Mahonia* is closely related to *Berberis*, and is known as a host of *R. meigenii* in Europe, where its invasive propensity has caused concern (Soldaat, L.L. and Auge, H. 1998. Interactions between an invasive plant, *Mahonia aquifolium*, and a native phytophagous insect, *Rhagoletis meigenii*. pp. 347-360. In Starfinger, U., Edwards, K., Kowarik, I. and Williamson, M. (Hrsg.). *Plant Invasions: Ecological Mechanisms and Human Responses*. Backhuys Publishers, Leiden).

With this in mind, AGI swept some *Mahonia x media* in the Castle Gardens, Norwich (TG232084) on 5 June 2011, and secured a female *R. meigenii*.

These records suggest that the species is much more widespread than previously supposed, and targeted collection around *Mahonia* could well reveal further records in Southern Britain.

An earlier occurrence of *R. meigenii* in Norfolk was discovered when Stuart Paston spotted the species in the K.C. Durrant collection in Norwich Museum. Three females had been found by Ken among the victims of an "Insectocutor" type fly trap from the cafe in Sheringham Park (TG139411), one in August 2005 and two in August 2006. *Berberis* is growing a few yards from this building.

We thank C.W. Plant for the opportunity to examine the samples from Basildon, and L. Clemons for information about previous records of *R. meigenii* – **A.G. IRWIN**, Norfolk Museums Service, Shirehall, Norwich NR1 3JQ and **D.A. SMITH**, Milltown of Dunnydeer, Insch, Aberdeenshire AB52 6XQ

## *Asyndetus latifrons* (Loew) (Diptera, Dolichopodidae) new to Britain

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### Summary

*Asyndetus latifrons* (Loew, 1857) is recorded for the first time in Britain from two large stony rivers, the Lune and Coquet, in northern England. The habitat is exposed riverine sediments consisting mainly of pebbles with a low cover of pioneer vegetation. The fly is illustrated and a modification of the standard British key to Dolichopodidae allows the species to be recognised.

### Records

An extensive survey of the flies of exposed riverine sediment was carried out in 2005-6 for Buglife, the Invertebrate Conservation Trust (Drake *et al.* 2007). Several species were discovered for the first time in Britain, highlighting the importance and under-recording of this habitat (Drake 2007a, b, c; Godfrey 2007; Haenni and Godfrey 2009). Here we report finding the dolichopodid *Asyndetus latifrons* (Loew, 1857) (Fig. 3), a genus and species new to Britain.

AG visited Higher and Lower Broomfield on the lower reaches of the River Lune, Lancashire, in 2005 and 2006. The river channel here is wide (20-35m) and has reached a broad floodplain at 25m OD. On both visits, he recorded *A. latifrons* (1♂ 2♀ vacuum sample, 2 August 2005, Higher Broomfield, SD59737268; 1♂ 1♀ swept and 1♂ vacuum sample, 18 July 2006, Lower Broomfield, SD598727; 1♀ vacuum sample, 18 July 2006, Lower Broomfield, SD596725). One site that was well removed from the water margin was dominated by pebbles with only small amounts of gravel, and no sand or silt. Pioneer vegetation (*Urtica*, *Rumex*, *Cirsium* and grasses) covered about only 1% of the sediments. The other site was close to the water but not wet, with equal proportions of pebbles and finer gravel, and almost devoid of vegetation. A photograph of the site was given by Haenni and Godfrey (2009).

In 2006, MD visited the River Coquet at Hepple, Northumberland, where the river is moderately fast-flowing and about 10-15m wide, having reached a floodplain at about 100m OD to the east of the Cheviot Hills where the river originates. *Asyndetus latifrons* was recorded here from a large expanse of exposed riverine sediment at least 100m wide (1♂ swept and 1♂ in vacuum sample, 14 July 2006, NH988003). The flies were obtained from dry stones about 3m from the water's edge where the sediment was nearly all pebbles with only small amounts of gravel and sand, and pioneer vegetation of *Cirsium vulgare* and *Urtica dioica* covered at most 20% of the area (Fig. 1).

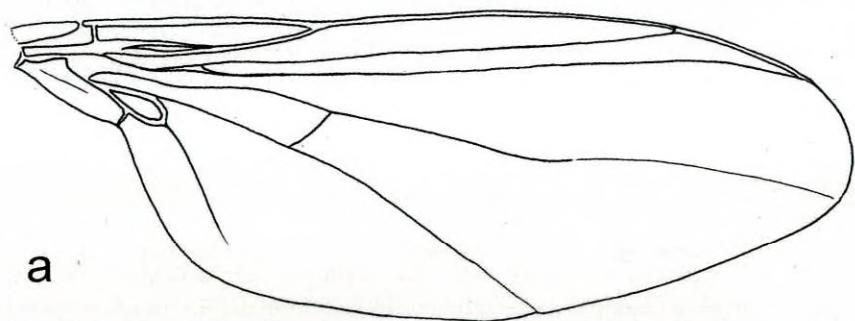
These sites had much in common. They were the floodplains of large upland rivers where the deposited sediments were coarse and contained little or no sand. Presumably floods had frequently scoured these deposits, since pioneer vegetation was not well developed, even 30m from the water's edge at one of the Broomfield sites. All sites were next to sheep-grazed pasture but the impact of these animals on the habitat was minimal. It is suggested that *A. latifrons* is a specialist of this barren habitat. Other dolichopodids recorded at the River Lune

site were *Campsicnemus curvipes* (Fallén), *Chrysotus gramineus* (Fallén), *Dolichopus plumipes* (Scopoli), *Hercostomus plagiatus* (Loew) and *Hydrophorus praecox* (Lehmann). Those from the area of dry stones with pioneer vegetation at the River Coquet site were *Chrysotus femoratus* Zetterstedt, *C. gramineus*, *C. obscuripes* Zetterstedt, *Dolichopus plumipes*, *D. vitripennis* Meigen, *Medetera truncorum* Meigen and *Sympycnus desoutteri* (Parent), and those additionally found at the wet water's edge were *Campsicnemus marginatus* Loew, *Chrysotus cilipes* Meigen and *Hydrophorus praecox*. Of these, only *Campsicnemus marginatus* has marked affinities with river margins and the remaining species have no special association with the harsh ERS habitat.

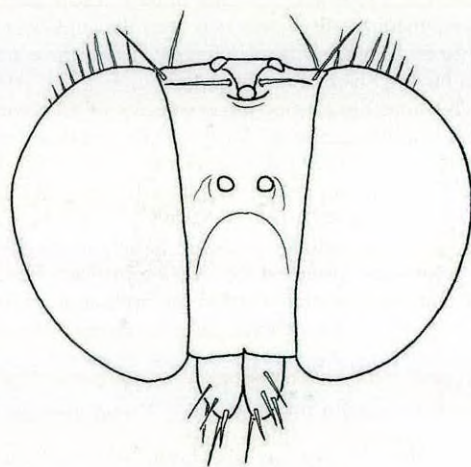


**Fig. 1.** River Coquet at Hepple, Northumberland, where *Asyndetus latifrons* was recorded.

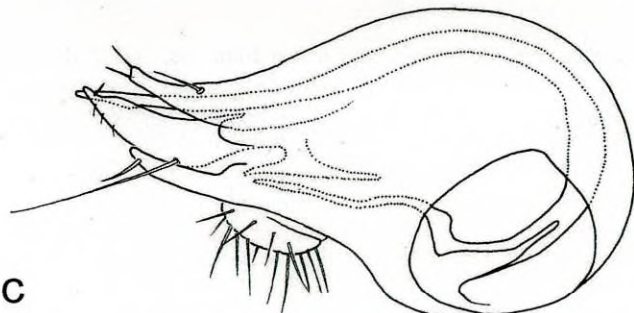
Flies in other families recorded from ERS at the Lune site included the scatopsid *Rhegmoclemina lunensis* Haenni & Godfrey and the therevid *Spiriverpa lunulata* (Zetterstedt). At the Coquet site were the hybotids *Tachydromia costalis* (von Roser), *T. edenensis* Hewitt & Chvála and *T. halidayi* (Collin), which was also found on the Lune. These species may be associated more closely with coarser than sandy ERS, and they may form an assemblage to which *A. latifrons* belongs. Bickel (1996) stated that the genus *Asyndetus* is associated with marine coastal habitats that include beaches and inland habitats that include the shores of lakes and river margins. In mainland Europe, *A. latifrons* is found in a wide range of habitats. Pollet (2000) stated that it is strongly associated with open biotopes with short grassy vegetation on moist sandy soil, but gave a list of habitats where it had been found in eastern Europe that suggests little specialism: woods, gardens, marshes, river banks and sand dunes.



a



b



c

Fig. 2. Male *Asyndetus latifrons* (Loew): a, wing; b, head from the front (without antennae); c, genitalia. Scale lines: a - 1mm, b - 0.5mm, c - 0.25mm.

## Identification

The genus *Asyndetus* belongs to the subfamily Diaphorinae, along with the British genera *Argyra*, *Chrysotus*, *Diaphorus* and *Melanostolus*. It becomes more species-rich in lower latitudes but in northern Europe only *A. latifrons* is known (Grichanov 2006) and another ten species occur in the Caucasus and East Mediterranean area – essentially the Mediterranean subregion of the Palaearctic (Grichanov 2007, Pollet 2011). Negrobov (1973) provided keys to the 18 Palaearctic species known at that time, since when *A. negrobovi* Pärvi has been described and that species is included in the key restricted to the species listed by Grichanov (2007).

The genus is readily identified using Parent (1938) and Grichanov (2006, 2007) as the shortened costa stops at the cubital vein ( $R_{4+5}$ ) rather than continuing to the discal vein ( $M_1$ ); in west Palaearctic dolichopodids, this character is unique to *Asyndetus* and the tiny non-British *Cyrtophleps* (Fig. 2a). Vein  $M_1$  is characterised by a tiny break about midway between the cross-vein and wing margin, beyond which the vein is faint (Bickel 1996). Within the Diaphorinae, *Asyndetus* shares with *Melanostolus* and *Argyra* the character of the eyes being distinctly separated on both the frons and the face (Fig. 2b), in comparison with most British *Chrysotus* species, in which the eyes almost touch near the mouth (clearly separated in *C. laesus* (Wiedemann) and *C. palustris* Verrall), and *Diaphorus* in which they touch, or almost so, on the frons. *Argyra* differs in having two or three setae on the hind coxa, and *Melanostolus* differs in having black (not pale) halteres.

*Asyndetus latifrons* is about the size of larger species of *Chrysotus* (wing length and body length about 3mm) but is more similar to *Diaphorus* in overall appearance. In the key to genera for males by d'Assis-Fonseca (1978), *A. latifrons* runs to couplet 44 where it fails to fit either genus, *Nematoproctus* and *Melanostolus*, which each have only one known species in Britain. Insertion of the following couplet into d'Assis-Fonseca's key will allow *Asyndetus latifrons* to be separated from known British species in these genera. No excuse is made for the completely artificial characters used since *Nematoproctus* has been moved from Diaphorinae to Rhaphiinae and the characters used in the original key consequently no longer relate to the taxonomic position of the genera. Fig. 2c shows the male genitalia of *A. latifrons*.

- |     |   |  |
|-----|---|--|
| 44  | Front and mid legs yellow, except for the distal tarsal segments. Genitalia with long conspicuous lamellae. | <i>Nematoproctus distendens</i> Meigen |
| -   | All legs black, except for the knees. Processes of genitalia scarcely visible.                              | 44a                                    |
| 44a | Halteres black.   | <i>Melanostolus melancholicus</i> Loew |
| -   | Halteres yellow.  | <i>Asyndetus latifrons</i>             |

Females key to couplet 42 in d'Assis-Fonseca's generic key to females, partly based on the biserial acrostichals, first antennal segment being dorsally bare, hind coxae with single strong basal bristle and antennae inserted above the middle of the eye. The halteres are pale (as in *Chrysotus* which forms the first half of couplet 42) but the arista is dorsal (as in *Melanostolus* which forms the second part of couplet 42). The shallow double bend on the discal vein and the sub-parallel radial ( $R_{2+3}$ ) and cubital veins, as in the male (Fig. 2a), help to confirm this genus.



**Fig. 3.** Male of *Asyndetus latifrons* (Loew) (Finland, Loviisa, collected 2 July 2011), identified by Stefan Naglis; photograph Jaris Flinck.

#### **Acknowledgements**

We thank Buglife, the Invertebrate Conservation Trust, for funding the Sandy River Flies project, Marc Pollet for helpful comments and Malcolm Smart for translating the relevant parts of Pollet (2000).

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## The occurrence of *Geranomyia bezzii* Alexander & Leonard (Diptera, Limoniidae) in England

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### Summary

The male genitalia of the holotype of *Geranomyia bezzii* Alexander & Leonard, 1912 were not illustrated or described in detail in the original 1912 paper, and there has not hitherto been any description of the female genitalia. The genitalia of the first British specimens to be identified, by F.W. Edwards in 1938, were similarly not described. This paper serves to fulfil that need and to describe recently found British specimens.

### Introduction

C.P. Alexander and M.D. Leonard (1912) first described *Geranomyia bezzii* from four males that were sent to them in alcohol by Prof. Mario Bezzi. These specimens were captured by a correspondent of Bezzi on the Ile Djerba, off the north coast of Africa. The holotype and one paratype are in the Museo Torino, Italy; two paratypes were retained in Alexander's collection at Cornell University, later transferred to the Smithsonian Institution, Washington D.C.

The first English record of *Geranomyia bezzii* was a tentative identification by F.W. Edwards of a single female specimen in the NHM collection, taken by F.H. Haines on Chesil Beach, Portland, 4.vi.1891. Edwards wrote (Edwards 1938) 'In the absence of the male, this specimen cannot be determined satisfactorily; if not an abnormal *unicolor*, it may be *G. bezzii* Alex., or an undescribed species.'

In August 1939 Edwards, following Haines, searched the saltmarsh vegetation on the inner side of the Chesil Bank, near the mouth of the Fleet for more specimens of this possible *Geranomyia bezzii*. Edwards (1939) described a hurried visit at sunset on 31 August when he took 6 males and 2 females. There are in fact 6 male and 3 female specimens in the collection of the NHM, London, labelled by Edwards as 'Dorset, Chesil Beach, Portland, 31.viii.1939, F.W. Edwards.' He wrote 'all of the specimens were taken at about high-water mark, where the shingle of the bank met the mud of the Fleet'. Edwards identified them as *Geranomyia bezzii*. He wrote: 'Comparison with a male of *bezzii* in the British Museum from Algeria,' shows that our species is undoubtedly the same as the Mediterranean form, ... ' and it is this specimen, drawn by Lackschewitz, which is illustrated below (Fig 1).

The key by Alexander and Leonard (1912) is detailed in its verbal description, although it omits any detailed descriptions of male and female genitalia. Edwards' own description also lacked any drawings of the genitalia. The only previously published drawings of the male genitalia of *G. bezzii* are those by P. Lackschewitz (Lackschewitz 1928) (reproduced here in Fig. 1), which also appear again in Plate X, no. 84 in Lackschewitz and Pagast (1942). In his earlier paper Lackschewitz (1928) wrote that 2 female specimens, one from Albania, one from Tripoli, are to be found in the collection at the Vienna Natural History Museum.

The male drawn by Lackschewitz (Fig. 1) was not the holotype, but a specimen from Algeria in the NHM (London) sent to him by Edwards for comparison (Lackschewitz 1928, pp 198-199). It is labelled as collected by Prof. Seurat on 9.iv.1923 and determined by Edwards in 1928, presumably by using Alexander and Leonard's 1912 key. The genitalia

preparation of this Algerian specimen is mounted on the same pin and below the adult but is now very indistinct since the Canada balsam has darkened.

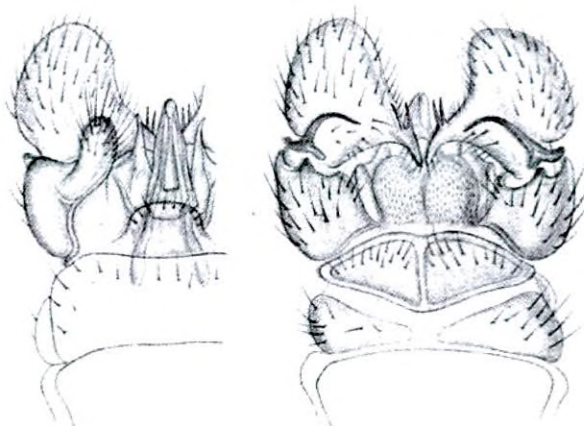


Fig. 1. *Geranomyia bezzii* Alexander & Leonard 1912 (from Lackschewitz 1928).

#### British distribution

Falk (1991) reported six British sites at which *Geranomyia bezzii* (as *Limonia bezzii*) had been recorded. These are Dawlish Warren, Devon (1981, 1982); Chesil Bank, Dorset (1891, 1939); Arne, Dorset (1979); Pagharn Harbour, West Sussex (1960s); Shingle Street, Suffolk (1970s); Stiffkey, Norfolk (1976). The larvae are believed to feed in the green alga *Enteromorpha* (Saunders 1930).

At Stiffkey, Norfolk the species was on the seaward facing section of saltmarsh, about the junction with gravel at the higher saltmarsh levels (Ian McLean *pers. comm.* to Alan Stubbs). At Arne, Alan Stubbs reported finding *G. bezzii* on the southern side of Poole Harbour; the insect was found sheltering at the landward fringe of the intertidal area, where upper tidal shingle had some *Enteromorpha* algae growing (submerged at high tide).

#### Material examined

Specimens of *Geranomyia bezzii* were collected on 3 and 4 July 2011 by some attendees of the Dipterists Forum Summer field meeting based at Exeter University. It was reported by them as common on sea purslane (*Halimione*) and Glasswort (*Salicornia*) on a saltmarsh near Dawlish, Devon (SX9080). On 3 July Chris Spilling captured at this site a pair of possibly newly emerged *G. bezzii* in copula. The very pale pleura of these specimens, with the even more contrasting characteristic black markings, looked striking and unusual. It was concluded that these were newly emerged specimens, which are paler, with wing and some other markings less conspicuous, although the pleural crescents contrasted strongly. Andy Grayson also swept *G. bezzii* in some numbers from the saltmarsh vegetation as by-catch, and gave the author 5 specimens. On the next day Mike Howe visited the same area and brought back specimens, 6 of which (5 males, 1 female) were carded by the author. The description given here is based on a well-marked male and female, collected by A. Grayson on 3 July 2011.

## Description

**Head.** Rather flattened dorsoventrally and tapering towards the rostrum. Eyes widely separated above, but close together beneath the head. Vertex pale grey brown, sometimes darker dorsally. Head attached to thorax by elongated cervical sclerites, forming a conspicuously long 'neck'.

Mouthparts about as long as thorax; upper proximal third (rostrum) broader than distal section; brown in colour, darkened at ends of proximal tubular section where very small maxillary palpi are inserted; rostrum projecting forward as a translucent pointed sheath to the pair of paraglossae, which project a small distance beyond end of rostrum; rostrum with a few macrotrichia on ventral surface. Antenna uniformly pale brown; flagellum 12-segmented in both sexes; flagellomeres 1-11 small and nearly spherical; terminal flagellomere narrower and more elongated.

**Thorax.** Shining with a pale yellowish-brown ground colour. Prescutum with four broad dark brown stripes, the central pair separated by a narrow pale line, and from lateral stripes by a broader pale stripe (this central pair of dark stripes is merged in some specimens - one male of the Dawlish specimens, and 6 (4 males, 2 females) of the 9 Edwards Chesil Beach specimens). Scutum dark brown laterally, with a broad pale brown stripe across about its central third. Dark macrotrichia sparsely distributed on prescutum and scutum. Scutellum pale yellow-brown. Postnotum dark brown (in one female, there is a thin pale median pale line.)



Fig. 2. Lateral view of thorax of *Geranomyia bezzii*.

Pleura (Fig. 2) with four characteristic markings: dark brown line on lateral edge of prescutum; semi-circular dark brown mark on dorsal edge of pleurite above anterior coxa; small, roughly sigmoid, mark above posterior spiracle; and conspicuous broad brown stripe on anepimeron, between coxa 1 and coxa 2, below the wing insertion.

**Wing.** Average length: male 7.5mm (n = 5), female 8.6mm (n = 2). Venation similar to that typical of the genus *Dicranomyia*. Dark markings of variable intensity (possibly dependent on length of time after emergence) at distal end of vein  $R_1$  and at base of vein  $R_s$

(at its junction with  $R_1$  and where Sc turns up to meet the costa); a further two fainter marks on costal margin.

**Legs.** Pale brown, each part other than coxae and trochanters darkened at tips in mature specimens; tarsal segments progressively diminish in size and darken so that metatarsus is long and pale brown, while fifth tarsal segment is short and dark; claws simple and smooth.

**Abdomen.** Tergites 1-5 dark and broadly paler on mid-line; tergites 6 and 7 dark; sternites 1-5 pale yellow and increasingly darker brown laterally; sternites 6 and 7 darker; terminal segments paler brown.

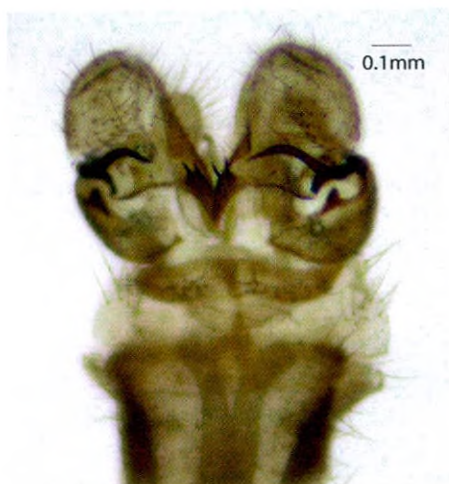


Fig. 3. Male genitalia, dorsal view.

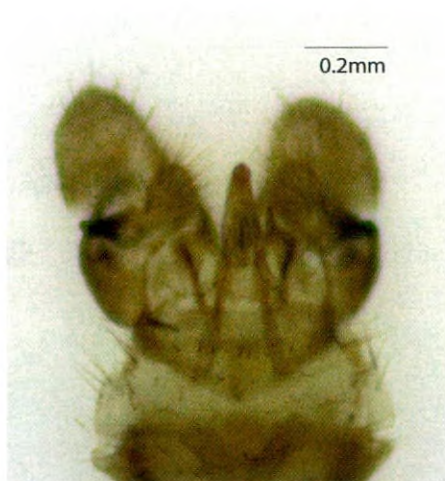


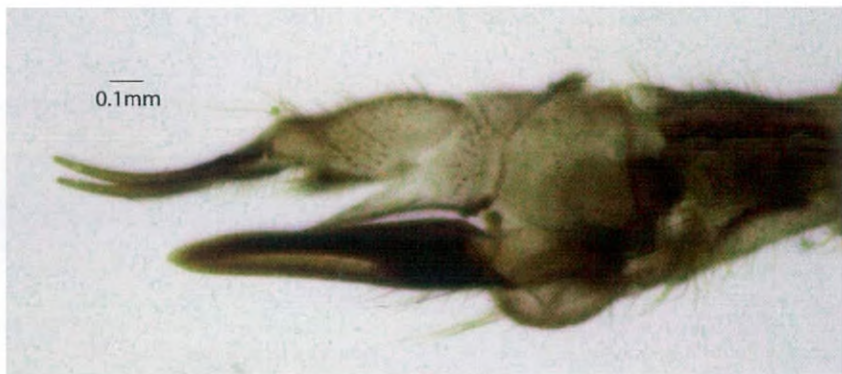
Fig. 4. Male genitalia, ventral view.



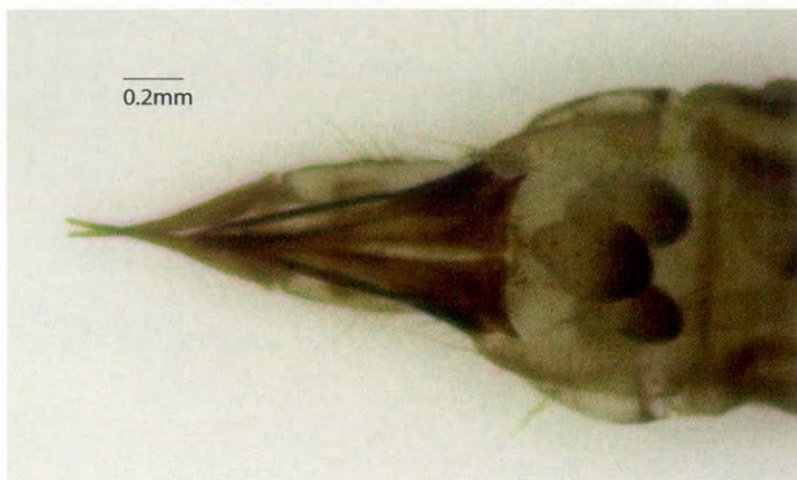
Fig. 5. Male genitalia, lateral view.

**Male genitalia** (Figs 3-5) similar in structure to most *Dicranomyia* species, comprising gonocoxites with a ventral lobe, and a pair of gonostyli; dorsal lobe of gonostylus (clasper) narrow, slightly sinuous and ending in a point; ventral lobe of gonostylus a swollen hollow sac with a dorsoventrally flattened wedge-shaped 'beak' or 'rostrum', with terminally a pair of spines, this 'rostrum' appearing pointed in lateral view, but narrow end appears more rounded when viewed from above [different viewing angles give different shapes of 'rostrum' and clasper and care is needed with interpretation, so it is necessary to use the same viewing angle when comparing different specimens].

**Female genitalia** (Figs 6-7) with paired sternal and tergal valves (cerci), which are dark in contrast to terminal abdominal segments.



**Fig. 6. Female genitalia, lateral view**



**Fig. 7. Female genitalia, ventral view**

## Discussion

The description above of the recently found specimens from Devon conforms to that given by Alexander and Leonard (1912). The holotype male described by them was 'light yellow' but perhaps it had recently emerged, or had become slightly discoloured in alcohol, especially if exposed to the sun. The brown pleural markings are the same.

## Acknowledgements

Thanks are due to Andy Grayson and Mike Howe, who provided me with the specimens. I am especially grateful to Jaroslav Starý, of the Palacký University, Olomouc, Czech Republic, who, through his discussions, alerted me to the need for illustrations of genitalia of British specimens, and set me off on this trail, also for his comments on a draft of this paper.

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## *Atylotus rusticus* (Linnaeus) (Diptera, Tabanidae) in the 'Dale Collection'

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### Summary

An investigation of the 'Dale Collection', held in Oxford Museum of Natural History, revealed three unreported 19th Century localities for *Atylotus rusticus* (Linnaeus, 1761) from the former fenlands of East Anglia. Notes are provided on the specimens, the manuscript catalogues of J.C. Dale and C.W. Dale, and the localities.

### Introduction

Duncan (1836-37) regarded *Atylotus rusticus* (Linnaeus, 1761) as being common in Cambridgeshire, but there have been no published records from the region, apart from two females taken at Monks Wood on 9.vi.1828 (Verrall, 1909). Consequently, Stubbs and Drake (2002) had to state: "Whilst Duncan's view must remain questionable (bearing in mind the primitive state of the taxonomy of horseflies and the absence of voucher specimens), it seems likely that *A. rusticus* was an early casualty of the drainage of the fenland of eastern England". Duncan's view can now be partly substantiated by the discovery, in the 'Dale Collection', of 19th Century specimens from Holme Fen and the adjacent Whittlesey Mere, plus an unlabelled specimen which is very probably synonymous with a record from Little Gransden.

### Specimens

The Dale family entomological collection and its associated catalogues and notebooks etc. are held in the Oxford University Museum of Natural History. The Dale collection of Tabanidae contains three specimens standing under the name *Tabanus rusticus*. These are indeed *Atylotus rusticus* (Linnaeus, 1761 – *Tabanus*) (teste A. Grayson 27.xi.2010), and comprise the following: 1♂, without data; 1♀, labelled "Aug.15, 1837"; and 1♀, labelled "Whittlesea".

### Discussion

There is no direct mention of *Tabanus rusticus* in James Charles Dale's (1792-1872) untitled catalogue for "*Insects in my Cab. only*" (Oxford University Dale Manuscript no. 40); however, this catalogue's *Tabanus* species no. 16 has the data "?Aug – 1837 – Whittlesea Mere Hunts", and could perhaps refer to the *Atylotus rusticus* specimen from "Whittlesea". J.C. Dale's son, Charles William Dale (1851-1906), compiled a manuscript entitled "*Catalogue of Diptera in collection of C.W. Dale 1886. Fresh leaves inserted in 1905.*" (Oxford Museum Dale Manuscript no. 69). This catalogue contains two entries under *Tabanus rusticus*, viz. "J.C. Dale Little Gransden July 18th 1819", and below that entry "Holme Fen Aug. 15th 1837".

It can be deduced, from the aforementioned, that the ♀ *A. rusticus* labelled "Aug.15, 1837" was taken at Holme Fen. It is also certain that the other ♀ *A. rusticus* was taken at Whittlesey Mere, which was adjacent to Holme Fen, before it was destroyed by drainage. The actual date of capture of the "Whittlesea" specimen will remain unknown, as will the name of the captor, but with reference to the Dale Manuscripts nos. 40 and 69, it was probably taken between 1818 and 1837 by either J.C. Dale or B. Standish [some specimens of other

invertebrates from this site were collected by Benjamin Standish and passed to J.C. Dale]. The remaining ♂ *A. rusticus* without data is probably synonymous with the catalogue entry "J.C. Dale Little Gransden July 18th 1819". At the very least, this record, even if it were not to refer to that specimen, can be accepted as being correct without any real misgivings.

### Localities

The aforementioned localities, viz. Holme Fen, Little Gransden, Monks Wood and Whittlesey Mere are all in the modern county of Cambridgeshire. Formerly, this was not so, as the village of Little Gransden lies just inside the border of Watsonian vice-county 29 (Cambridgeshire), but the other localities are in V.C. 31 (Huntingdonshire). *Atylotus rusticus* was presumably eradicated from all four localities when the character of their fenland habitats was completely transformed due to extensive drainage and subsequent conversion to agriculture during the mid 19th Century.

### Acknowledgements

Darren J. Mann and Zoë M. Simmons facilitated access to the 'Dale Collection' and 'Dale Manuscripts' at Oxford Museum of Natural History.

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***Taxigramma hilarella* (Zetterstedt) (Diptera, Sarcophagidae), a second British record** - A small miltogrammine taken from a dry sandy path on Witley Common (SU9240), south of Milford, Surrey, had successfully avoided identification since its capture on 16 August 2010. Peter Chandler kindly determined it as *Taxigramma hilarella* (Zetterstedt, 1844).

There is only one previous published record, of a single male taken by him on 22 July 1973 at Horsell Common, also in Surrey (Chandler, P.J. 1999. *Taxigramma hilarella* (Zetterstedt, 1844) (Diptera, Sarcophagidae), a genus and species new to Britain. *Dipterists Digest (Second Series)* **6**, 114-115). Three visits by Peter to Horsell Common in 1999, after recognition of the identity of this specimen, did not confirm it to be still present there, so its discovery at a second Surrey site is encouraging.

This species, which has been recorded in Finland as associated with the sand wasp *Ammophila sabulosa* (Linnaeus), may be expected to occur at other Surrey heathlands - **RICHARD DICKSON**, 39 Serpentine Road, Fareham, Hampshire PO16 7ED



## The Palaearctic species of *Neoalticomerus* Hendel (Diptera, Odiniidae)

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### Summary

A study of the Palaearctic species of *Neoalticomerus* Hendel, 1903 showed that *N. formosus* (Loew, 1844) was a complex and resulted in recognition of two new species, *N. fabricius* sp. n. and *N. mongolicus* sp. n.

### Introduction

As part of an evaluation of the Palaearctic Odiniidae, the authors have been studying the morphology of the principal genera with a view to better understanding the relationships of these extraordinary flies. In the course of dissecting material to prepare illustrations we discovered that *Neoalticomerus* Hendel, 1903, hitherto thought to be represented in Europe by only one species, *N. formosus* (Loew, 1844) is in reality a complex. In addition to *N. formosus* we have thus far identified two new species from material available to us, one from Europe and the other from Mongolia. The two new species are here described and a key with figures to separate these three species is provided.

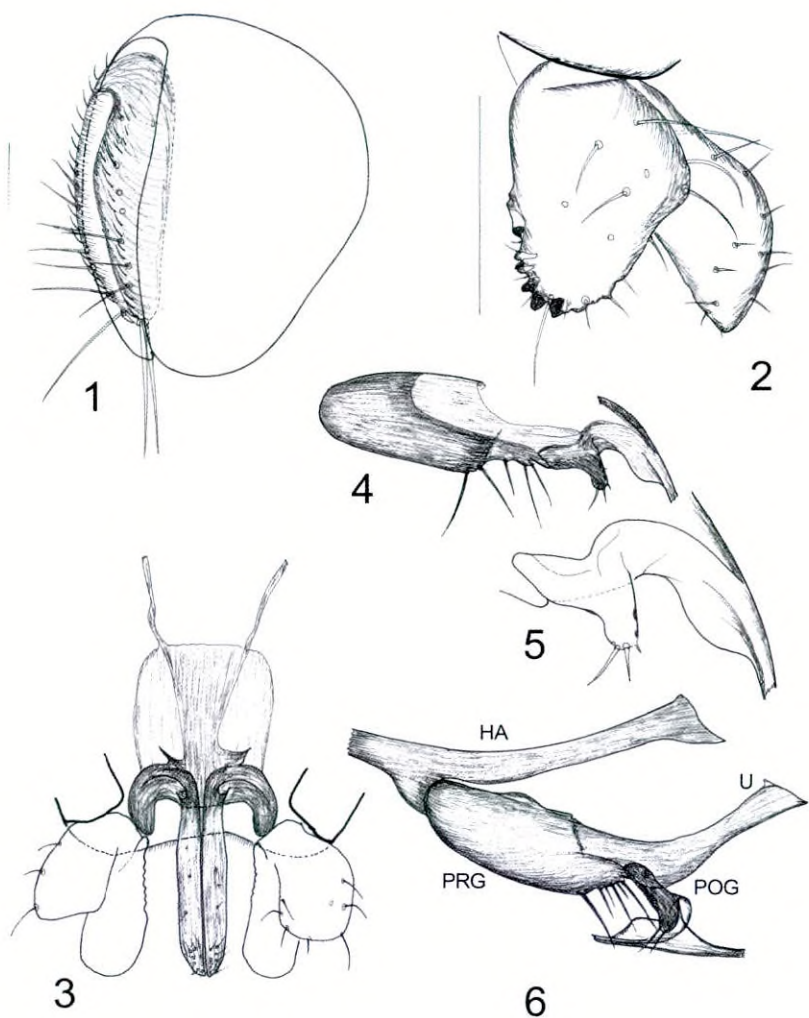
*Neoalticomerus* is distinguished from other Palaearctic odiniid genera as follows: four dorsocentral setae (1+3) and anepisternum setulose dorsally, with occasional strong setae posteriorly; hind legs normally formed, not excessively thickened or shortened, dorsal preapical setae on the tibiae well-developed. In *Odinia* Robineau-Desvoidy, 1830 and *Turanodinia* Stackelberg, 1944, the hind legs are markedly shortened and thickened, especially in males, there are 4 postsutural dorsocentral setae and the anepisternum is bare. The dorsal preapical setae on the tibiae are well-developed.

The larval habits of *Neoalticomerus* are unknown; adults seem to be attracted to similar media to *Odinia* and specimens from both genera have been found in alcohol traps suspended in trees.

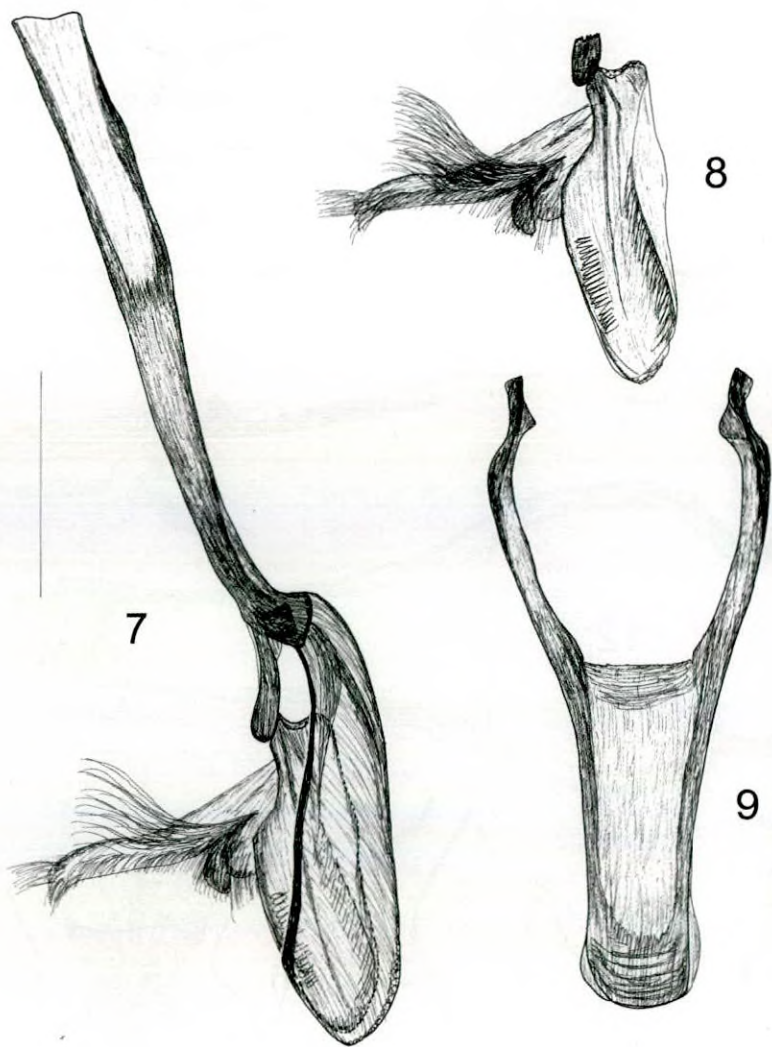
### Materials and methods

For studies on genitalia the whole abdomen of the male specimens was removed. After removal, the abdomens were softened by immersion in hot water and treated in c. 10 % sodium hydroxide (freshly made every time), washed in lukewarm water and neutralised in lactic acid for some minutes, washed in water again and studied (depicted), or preserved in plastic microvials with glycerol.

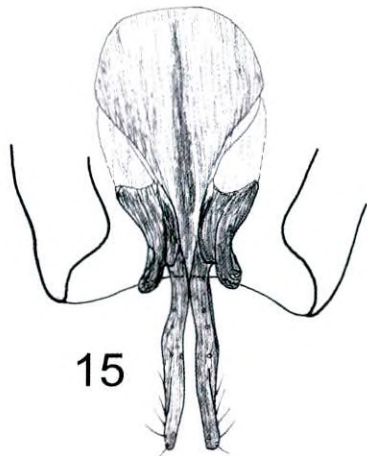
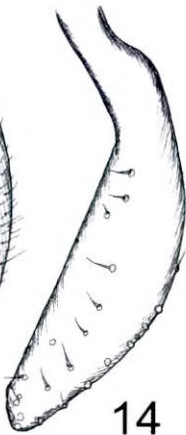
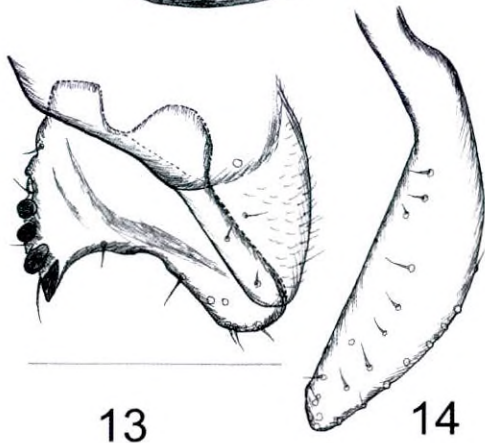
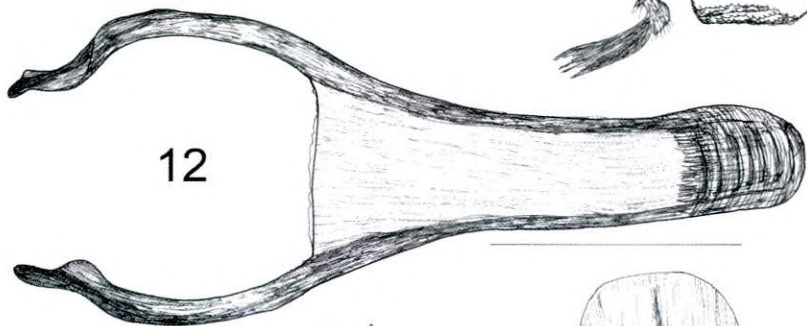
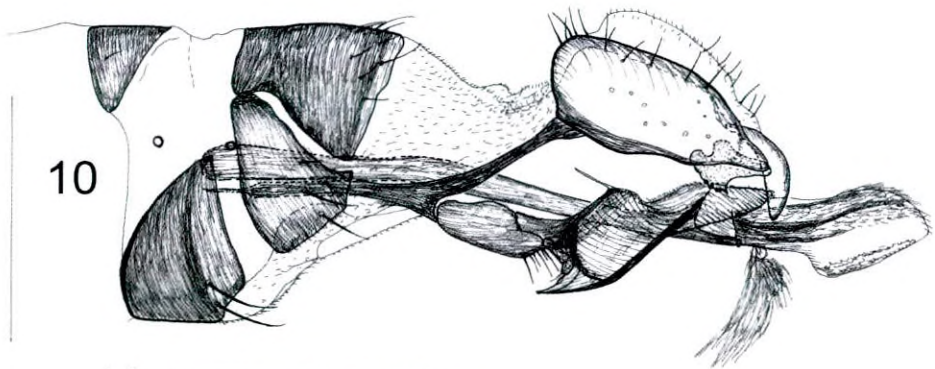
The postabdomen and genitalia were detached from the rest of the abdomen. Postabdominal and genital parts were studied and figures were made under a normal 1cm<sup>2</sup> cover glass put over glycerol on a slightly hollowed microscope slide. The preparations were placed under an Olympus SZ-ST stereomicroscope, usually at 100 x magnification; figures were made using an Olympus BX40 microscope with an Olympus U-DA device. Most of the figures were made at a 333 or 667 x magnification.



Figs 1-6. *Nealticomerus* species, male genitalia. 1-5, *N. formosus* (Loew, 1844): 1, epandrium and cerci, sublateral view; 2, surstylus, in true lateral view; 3, subepandrial sclerite with the ventral pair of processes and contours of surstyli, anterior (inner) view; 4, pre- and postgonite in an intermediate state between "in" and "out" positions, lateral view; 5, postgonite, in higher magnification. 6, *N. fabricius* sp. n., fork of hypandrium and gonopodal complex in the "out" position, lateral view (HA: hypandrium, prg: pregonite, pog: postgonite, U: U-shaped sclerite of postgonites). Scales: 0.2mm for Figs 1, 3-4 and 6; 0.1mm for Figs 2 and 5.



Figs 7-9. *Nealticomerus formosus* (Loew, 1844), male genitalia. 7, phallic complex and phallapodeme, lateral view; 8, phallus, lateral view; 9, hypandrium, ventral view. Scale: 0.2mm for all.



In odiniids the key point is to make preparations in sodium hydroxide and not in potassium hydroxide, which destroys membranes. Most of the studies on dipterous genitalia neglect membranous structures, which play an important role in the functional mechanism of the genitalia. Genital terminology follows that of Sinclair (2000).

### *Neoalticomerus* Hendel, 1903

Type species: *Milichia formosa* Loew, 1844: 328.

#### **Description of preabdomen and terminalia.**

Preabdomen of 5 normal segments, tergites 1 and 2 fused on a very short sublateral-dorsal section (at 2 places) only. Sternite 1 rather large, as broad as sternite 3, sternite 2 very short (transverse) but darker (more melanised) than sternite 1, which covers it ventrally.

Tergite 6 small, dorsal in position, the ventral and partly lateral sclerite below it (sternite 6 or ?sternite 6+7, cf. Papp 1998: fig. 18.7) large and not divided, with 2 strong setae laterally. Spiracle 7 free in the membrane, not far from spiracle 6. There are two other sclerites, touching each other only basally between the large ventral sclerite and epandrium. If Papp's interpretation (for *Odinia* species) was correct, then these are equivalent to the united TS7+8 of *Odinia* species. In *Odinia* sternite 6 is in the form of a very short dark semicircle, which joins sclerite(s) of segment 7 laterally only, where spiracle 7 is situated (spiracle 7 is free in *Neoalticomerus* (Fig. 10)). In *Odinia* sternite and tergite 7 are laterally fused, their fusion forming a thickened rod. Interpretation of the sclerites of segments 7 and 8 is not clear to us.

Epandrium spherical or much higher than long. Anal opening very large (comparatively small in *Odinia*). Anterior margin of epandrium normal but its rim is broadly involuted in *Odinia*. Cerci (Figs 1, 17) large, mostly membranous with several longer setae particularly long ventrally. Membrane between posterior margin of postabdomen and anterior margin of epandrium very strong and extremely long (extendable): up to 0.4mm (in comparison it is only 0.1mm in *Odinia czernyi* Collin, 1952, a larger bodied species). While in the "out" position the body cavity (with gut, covered at least by a thin membrane) of the parts posterior to hypandrial fork is restricted to a thin dorsal layer under membrane and dorsal wall of epandrium down to anus. Apical part of phallapodeme and at least central part of hypandrium inside the body cavity, although a large "hole" is formed posterior to the ventral and lateral sternite 6 (?6+7).

Hypandrium joins epandrium very high in a dorsal position and is joined to a strong pre-epandrial membrane (Fig. 10). Hypandrium connected not only to epandrium but also to subepandrial sclerite, this connection being formed by a pair of largely membranous ribbons in *Neoalticomerus*, whereas in *Odinia* this connection is broad with the subepandrial sclerite narrow but large, almost as high as epandrium. Medial part of hypandrium comparatively longer and its arms are broader than in *Odinia* species. In major contrast to *Odinia* species, subepandrial sclerite of *Neoalticomerus* has a pair of large well-sclerotised ventral processes (Figs 3, 10, 13, 19).

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**Figs 10-15.** *Neoalticomerus fabricius* sp. n., male genitalia. 10, postabdomen and genitalia in the "out" position, lateral view; 11, phallus and phallapodeme of another specimen; 12, hypandrium, ventral view; 13, surstylus and ventral process of epandrium, in true lateral view; 14, ventral process of subepandrial sclerite, lateral view; 15, subepandrial sclerite with the ventral pair of processes, anterior (inner) view. Scales: 0.4mm for Figs 10-11, 0.2mm for Figs 12 and 15, 0.1mm for Figs 13-14.

Surstylus single but bilobed (Figs 2, 13, 16), bearing several specific characters. In one species of *Neoalticomerus* (*N. fabricius*) there is a lateral epandrial lobe, which covers a part of surstylus laterally. All these seem to represent a plesiomorphic state compared to that of *Odinia* species, where 2 pairs of surstyli are present and they are almost completely covered laterally by the epandrial lobe.

Phallic complex composed of a very long, rod-like phallapodeme, whose posterior end is bifid: a pair of very short but broad dorsal apices and a rather long ventral fork. This double structure also plays a key role in the mechanism that articulates the phallus when taking up a copulatory position. The phallus consists of two parts: a well formed dorsal basiphallus (setulose on dorsal half) and a tripartite distiphallus, which mainly consists of long hair-like setulae (? very thin tubules). If there are parameres in *Neoalticomerus* (and in other odiniids) at all, then they are represented by the more sclerotised lateral walls of the basiphallus. We suspect that no parts of the phallus would function as an intromittent organ.

A peculiar and characteristic part of the genital complex is what we have termed the phallic hood. Its main component is a pair of extremely flexible rods that join to the most distal part of postgonite (Fig. 21) at one end, and to the dorsal structure of the phallapodeme apex. The large part of the hood is a membranous, rather elastic structure with minute setulae positioned obliquely to linear encrustations. A part of it becomes caudal to the rods when in the "out" position (Fig. 10). The pair of extremely flexible rods plays a key role in the copulatory process: in an intermediate phase the distal part of each rod is U-shaped. There are conspicuous changes also in the form of the posterior parts of the postgonite, including the "paramere" of Papp, e.g. Papp (1998: p. 235), compare our Fig. 21 with Figs 4-5, and 6, 10. In *Odinia* the phallic hood is short, with the posterior margin almost straight.

Gonopodal complex of an intricate form, particularly the postgonites. Pregonites rather convex laterally connected posteriorly through a sclerite (U-shaped in ventral view), which also joins through a membrane to the posterior end of hypandrium (Fig. 20). We consider this sclerite to be a phallic guide (cf. Sinclair 2000: 61). Postgonite composed of a more or less digitiform process and a flexible part connecting to the phallic hood (more precisely: to its rods). There is an additional U-shaped sclerite over the caudal part of pregonite and postgonite, which forms the anterior margin of the hood; this is not a complete sclerite in *Odinia*, but there is an equivalent thickening of the membrane.

The mechanism to extend into the "out" position before copulation is different in *Neoalticomerus* and in *Odinia*. In *Neoalticomerus* the movement of the genital parts is largely caudal (see Fig. 10). In *Odinia* the movement is partially caudal but the anterior apex of the phallapodeme moves dorsally at the same time (the gut must be ventral here while circumflexing).

### ***Neoalticomerus formosus* (Loew, 1844)**

(Figs 1-5, 7-9)

Type locality: POLAND "Pozen" [Poznań,].

Junior subjective synonym: *Milichia pulchra* Zetterstedt, 1848: 2724. Type locality: Gusum, Ostrogothia, Sweden.

Material studied: AUSTRIA: 1 male (HNHM): "Theresian ulc[?]eros Karta" – Coll. Pokorny – "Neoalticom. formosus Lw." det. Soós; 8 males 8 females (HNHM): Austria inf. Stadlau – "Stadlau 7.V.[18]88" – "Milichia formosa Lw." – Neoalticom. formosus Lw." det Soós. FINLAND: Loviisa Harmaakallio, 22.VI.2009, Malaise trap (leg. J. Flinck). FRANCE: Ain, Marais de Lavours, wine trap in *Populus* tree, 27.VI-20.VII.2001, leg. V. Marengo ; Loiret,

Forêt de Montargis, alcohol trap, 18.VII-17.VIII.2000. HUNGARY (all HNHM): 1 male: Kiskunsági N. P., Fülöpháza, homokbuckák [sand dunes], Malaise csapda [trap], 24.V.1970, leg. Papp L., 3 males: Budapest, Pestszentlőrinc, Péterhalmi-erdő, leg. L. Papp, nyárfá sebeitől [on wounds of a *Populus* tree]/nyárfák kicsorgó nedvén [on outflowing sap of poplar trees]/fehér nyár kicsorgó nedvén [on outflowing sap of a white poplar tree (*Populus alba*)], 10-13.V.1997/24.V.1998/26.VI.1994. 1 male, 2 females: Hortobágy N. P., Újszentmargita – Margitai erdő, lámpára, nádasnál/tölgyfa kicsorgó nedvéről/Malaise csapda [trap], 29.V.1974/8-11.VI.1976, leg. Mahunka S. et Vásárhelyi /Draskovits. 1 female: Martonvásár, arvideserta, 22.IV.1959, leg. Jermy. 1 female [damaged, without head]: Budapest Kertész [on the reverse side of the label] “907.VI.25.” – “*Neoalticomerus formosus* Lw.” det. Becker – “*Neoalticomerus formosus* Lw.” det. Soós.

**Note.** Two other specimens were examined, both loaned from the collections of the Zoological Museum in Berlin. Both are labelled with a series of small labels as follows: a white printed label “coll. H. Loew”; a red printed label “Paratype”, a white handwritten label “im Tausch (= in exchange) 14.XII.26”, a white handwritten label “*Neoalticomerus formosus* Lw. Det. Mart. Hering” and a white printed label “Zool. Mus. Berlin”. One of the two specimens is labelled additionally with a handwritten label, indicating male: it is in fact a female. The male has the genitalia dissected by PW and placed in a plastic vial below the specimen. It is not known who pinned paratype labels on these specimens and we are not certain whether these specimens are syntypes. In the absence of further data it is impossible to say where these specimens originated.

**Description** (based on the “paratypes” and specimens in the HNHM). Body length 2.85-3.96mm, wing length 2.67-3.85mm, wing width 1.25-1.60mm.

No setulae present between posterior fronto-orbital and outer vertical setae. Frontal triangle longer, extending beyond the mid frons. White part of prefrons (“facial plate”) wider than its dark part. Palpal setae thorn-like.

Mesonotum without intra-alar stripes.

Male epandrium semiglobular: short but less high (Fig. 1). No ventral lobe covering surstyli. Cercal setae somewhat shorter (Fig. 1) than in *N. mongolicus* sp. n. Both lobes of the surstylus broader in lateral view (Fig. 2) than those of *N. mongolicus*. Hypandrium less broad (Fig. 9). Laminar dorsal part of subepandrial sclerite not large, its ventral process longer and even broader in anterior or posterior view (Fig. 3). Lateral (setose) process of postgonite broad-based (Figs 4-5) with two medium-long setae and one short seta.

### Distribution

Recorded in Europe from Finland, Sweden and Poland to France and Italy and from the northern and central parts of European Russia, as well as from East Siberia, from the Far East (Vladivostok) (Hennig 1938, Krivosheina 1981, 1984) and also from Mongolia (Papp 1977, see also below). In Hungary it was formerly known from Martonvásár, Budapest, Csévharaszt and the Hortobágy N.P. (Újszentmargita) (Papp 1978).

### *Neoalticomerus fabricius* sp. n.

(Figs 6, 10-15)

**Holotype male:** FRANCE: Drôme, Montauban-sur-Ouvèze, aerial trap, VII.98, leg. J. Clary. In collection Musée des Confluences, Lyon. Genitalia dissected and mounted in DMHF on punched card with coverslip.

**Paratypes:** 1 male: FRANCE: Ain, Marais de Lavours, wine trap in *Populus* tree, 27.VI-20.VII.2001, leg. V. Marengo, in collection P. Withers; 1 male: HUNGARY [Somogy megye] Tarany, 9.VI.1982. [no further data] (HNHM); 3 males: Budapest, Pestszentlőrinc, Péterhalmi-erdő [forest], May 2009, leg. L. Papp, tölgyfa sebéen [on a wound of an oak (*Quercus*) tree]/erdei tisztások [forest clearings]/tölgyes [oak forest], 9-10./9./23. [days on labels]; 1 female: ibid., szilfák sebeiről [on wounds of *Ulmus* trees], 4.V.1997.

**Description.** Body length 2.42-3.57mm, wing length 2.60-3.78mm, wing width 1.16-1.53mm.

White part of prefrons not wider than its dark part. Frontal triangle reaching only to middle of frons. Palpal setae somewhat less strong than in *N. formosus*. Mesonotum with a distinct pair of intra-alar stripes.

Male epandrium short and high with a ventro-caudal process, which partly covers surstylus laterally (Figs 10, 13). Phallus and phallapodeme as in Fig. 11. Medial part of hypandrium relatively longer in comparison to its fork (Fig. 12). Lateral (setose) process of postgonite not broad-based (Figs 6, 10), with two medium-long apical setae.

**Etymology:** the new species is named in honour of Fabrice Darinot, reserve manager of the Marais de Lavours, and is a noun in apposition.

#### **Distribution**

Pestszentlőrinc is a suburb of Budapest (its XVIIIth District), and Péterhalmi-erdő is a locality where both the Hungarian species of *Neoalticomerus* have been captured; they have also both been taken in wine traps for collecting Coleoptera operated in the wooded margin of a marshland in France.

#### ***Neoalticomerus mongolicus* sp. n.**

(Figs 16-21)

**Holotype male:** MONGOLIA: Central aimak, ca 30km O von Somon Nalajch, 1530 m, Dr. Z. Kaszab, 1966 – Nr. 522, 14.VI.1966 – “*Neoalticomerus formosus* Lw. ♂, det. L. Papp 1976”; abdomen with genitalia in a plastic microvial with glycerol, in HNHM.

**Description.** Body length 3.16mm, wing length 3.40mm, wing width 1.32mm.

Head as in *N. formosus*; frontal setae broken off in the Holotype.

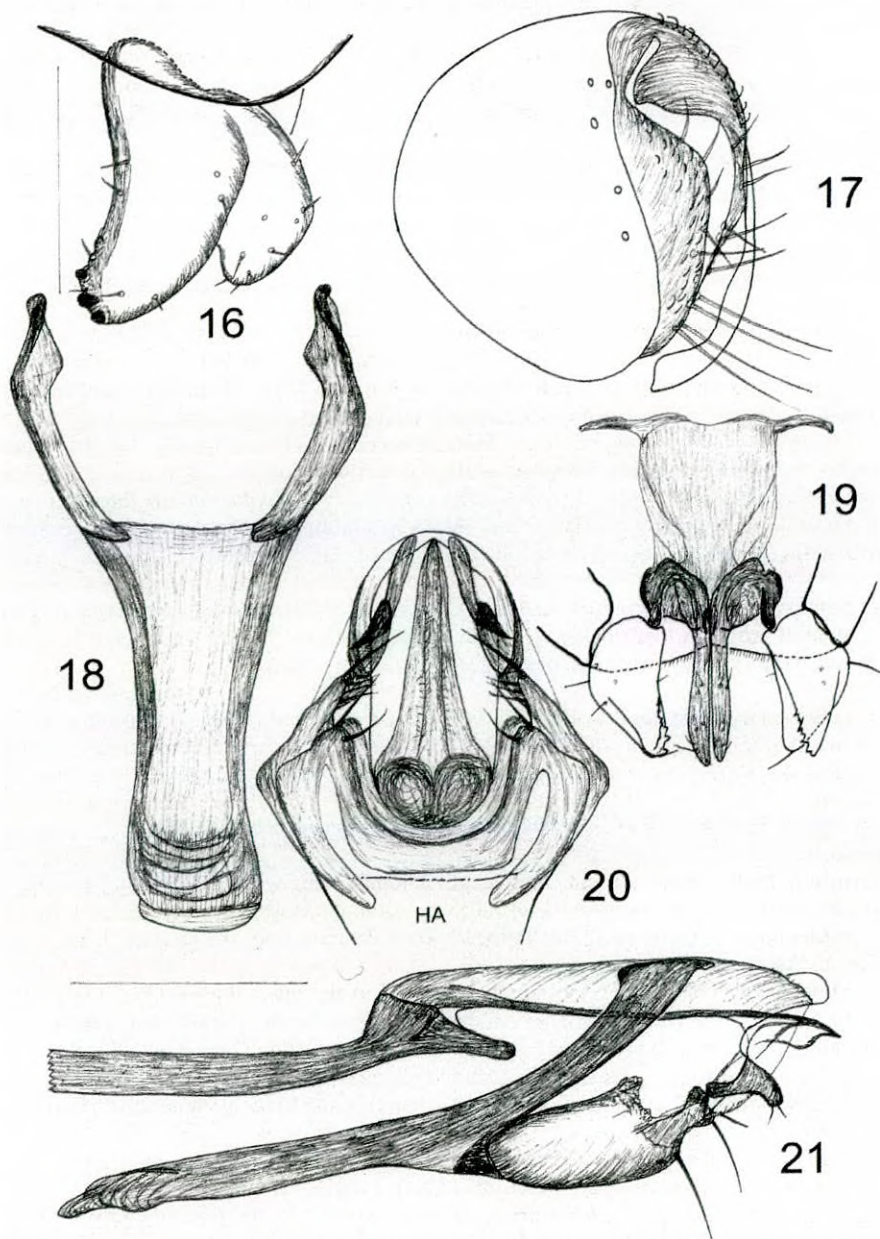
Mesonotum without intra-alar stripes. Dark lateral spots on tergites 4 and 5 not confluent. Sternite 6 very broad.

Male epandrium short and less high compared to the other species (Fig. 17), without posterior ventral lobes. Hypandrium broader (Fig. 18) than in *N. formosus*. Cercal setae slightly longer (Fig. 17) than in *N. formosus*.

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**Figs 16-21.** *Neoalticomerus mongolicus* sp. n., male holotype, genitalia. 16, surstylus, in true lateral view; 17, epandrium and cerci, sublateral view; 18, hypandrium, ventral view; 19, subepandrial sclerite with the ventral pair of processes and contours of surstyli, anterior (inner) view; 20, phallic complex, pre and postgonites, ventral view in the “in” state (HA: cranial margin of phallic guide, hypandrium joins here); 21, hypandrium, pre- and postgonites, phallic hood with proximal half of phallapodeme in the “in” position, lateral view (phallus omitted). Scales: 0.2mm for Figs 17-21, 0.1mm for Fig. 16.





Lobes of the surstylus less broad in lateral view (Fig. 16). Laminar part of subepandrial process not large, dorsal connections to hypandrium seem slightly stronger, ventral process

shorter and narrower in anterior or caudal view (Fig. 19). Lateral (setose) process of postgonite broad-based (Fig. 21).

**Etymology:** the name relates to the country of origin and is an adjective.

### Distribution

This specimen was actually misidentified by Papp (1977) as *N. formosus*. Though it is close to it, *N. mongolicus* is a distinct species. We cannot tell anything about the specimen(s) from Vladivostok mentioned above under *N. formosus*; these will need to be re-evaluated in the light of the current situation.

### Key to the Palaearctic species of *Neoalticomerus*

1. Mesonotum with a distinct pair of intra-alar stripes. Male epandrium short and high with a ventro-caudal process which partly covers the surstylus laterally (Figs 10, 13). Medial part of hypandrium longer when compared to its fork (Fig. 12). Lateral (setose) process of postgonite not broad-based (Figs 6, 10). Europe  
*Neoalticomerus fabricius* sp. n.
- Mesonotum without intra-alar stripes. Male epandrium short but less high (Figs 1, 17). Lateral (setose) process of postgonite broad-based (Figs 4-5, 21) ..... 2
2. Lobes of surstylus broad in lateral view (Fig. 2). Hypandrium less broad (Fig. 9). Ventral process of subepandrial sclerite longer and even broader in anterior or caudal view (Fig. 3). Cercal setae somewhat shorter (Fig. 1). Europe  
*N. formosus* (Loew)
- Lobes of the surstylus less broad in lateral view (Fig. 16). Hypandrium broader (Fig. 18). Ventral process of subepandrial sclerite shorter and narrower in anterior or caudal view (Fig. 19). Cercal setae slightly longer (Fig. 17). Mongolia  
*N. mongolicus* sp. n.

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## Dipterists Day Exhibits 2011 - compiled by Editor from exhibitors' notes

Apart from exhibits that also appeared at the Exhibition of the British Entomological and Natural History Society, notes were received for the following exhibits.

**DRAKE, C.M.** – *Dolichopus laticola* and *D. nigripes* (Dolichopodidae) in Norfolk fens. These two *Dolichopus* are listed as priority species in the UK Biodiversity Action Plan. They are almost confined to the Norfolk fens. A survey in 2010 showed that the more widespread *D. laticola* Verrall had relatively low habitat preference, being found in most fen vegetation types but slightly less often in managed sedge beds (*Cladium mariscus*), whereas *D. nigripes* Fallén was more often found on open tracks and grassy areas. Both were scarce in carr woodland. An ordination of larger species of dolichopodids caught in 2010 samples from six fens showed that both BAP *Dolichopus* were found with other fen-associated species, of which specimens of *D. picipes* Meigen, *Gymnopternus assimilis* (Staeger), *G. blankaartensis* Pollet, *Argyra elongata* (Zetterstedt) and *Thrypticus smaragdinus* Gerstäcker were exhibited. A distribution map of both species in fens in Norfolk, based on surveys undertaken in the last few years, showed that *D. laticola* was moderately widespread in the catchments of the River Bure and River Ant, and with outlying records from the Ormesby Broad area. *Dolichopus nigripes* was found not only in its known location in the Bure fens but also in two fens along the River Ant. This work was partly funded by DEFRA through a grant to Hymettus.

**GRAYSON, A.** – Some local and uncommon hoverflies (Syrphidae) collected in Beadale Wood, Wreton during 2011.

Beadale Wood is a small privately-owned coppiced woodland (SE7786) immediately north of the village of Wreton in V.C. 62 (North East Yorkshire). Gaps in the canopy allow a rich ground flora, and aided by its topography, parts of Beadale Wood are warmer and more

sheltered than most similar woodlands. It is mainly deciduous, predominantly sycamore and ash, which are often rotting and moss-covered around their bases. There is evidence of charcoal-burning and quarrying in many areas of the wood, and the recent history of management has generally been by coppicing. Diptera are fairly numerous in Beadale Wood, particularly Syrphidae, so this family was made the focus of an entomological study during 2011. The exhibitor thanked Mrs Nicky Blyth for permission to collect invertebrates in Beadale Wood.

The exhibit consisted of 10 species [12 specimens], representing some of the more local and uncommon hoverflies taken at Beadale Wood during 2011. All four British *Criorhina* species were taken on several occasions. The following were notably numerous: *Cheilosia pubera*, *Criorhina ranunculi* and *Ferdinandea cuprea*. Notes and span of dates during which each species was taken are given in brackets.

*Brachyopa scutellaris* Robineau-Desvoidy, ♂, 23.iv.2011 [4♂ were taken on 23.iv.2011]; *Brachypalpoides lentus* (Meigen), ♂, 5.vi.2011; *Cheilosia griseiventris* Loew, ♂, 23.iv.2011; *Cheilosia pubera* (Zetterstedt), ♂, 17.iv.2011 [apparently the most numerous *Cheilosia* between 16.iv and 10.v.2011]; *Criorhina asilica* (Fallén), ♂, 29.iv.2011 [2♂ were taken on 29.iv.2011]; *Criorhina berberina* (Fabricius), ♂, 23.iv.2011, ♂, 25.iv.2011; *Criorhina floccosa* (Meigen), ♂, 23.iv.2011 [♂ also taken on 29.iv.2011]; *Criorhina ranunculi* (Panzer), ♂, 17.iv.2011, ♂, 25.iv.2011 [recorded on all 6 visits made to Beadale Wood between 16.iv. and 29.iv.2011]; *Ferdinandea cuprea* (Scopoli), ♀, 5.vi.2011 [numerous between 17.iv and 20.vi.2011]; *Xylota florum* (Fabricius), ♂, 14.vii.2011.

**IKIN, H. and WOODWARD, S.** – An exhibit on the Grace Dieu wildlife survey, a Loughborough Naturalists' Club fieldwork project that aims to record all animal and plant groups. The survey area, located in Leicestershire between Loughborough and Coalville, has a remarkable diversity of habitats: Grace Dieu Priory ruins and fishpond, ancient woodland with both swampy and rocky areas, a stream that tumbles through a ravine, disused limestone quarries, moorland with sphagnum swamps and a disused railway viaduct. So far 245 species of Diptera had been identified. The exhibitors were confident of identifications of hoverflies and craneflies (thanks to help from Stuart Ball, Roger Morris and John Kramer) and help was sought for identification of the other families. The display included a box of specimens still to be confirmed and named, with which assistance was offered during the day.

After nearly four years of searching, the total of all species recorded from the site was approaching 3000 species in a wide range of groups, including many new county records; few other sites in the county had received this kind of attention. A full report was to be published by Loughborough Naturalists' Club.

**STUBBS, A.E.** – Seven miscellaneous species of uncommon Diptera found in 2011: *Geranomyia unicolor* Haliday (Limoniidae), 1♂, 6.vii.2011, Bantham, South Devon, a marine upper tidal species of rocky coasts; *Keroplatus testaceus* Dalman (Keroplastidae), 1♂, 8.viii.2011, Rowardennan, Loch Lomond, becoming more widespread in Scotland; *Odontomyia ornata* (Meigen) (Stratiomyidae), 1♀, 19.v.2011, Woodwalton Fen, Cambridgeshire, the first record from the Great Fen region; *Scaeva* species, cf. *S. dignota* Rondani (Syrphidae), 1♀, 12.vi.2011, Broadway, Peterborough, the identity of this species has yet to be firmly established but the specimen differs from *S. selenitica* in having a flat frons, of which 1♀ was exhibited for comparison; *Acanthiophilus helianthi* (Rossi) (Tephritidae), 1♀, 5.vii.2011, Andrew's Wood NR, S. Devon; *Hirtodrosophila trivittata* (Strobl) (Drosophilidae), 9.x.2011, Slindon Wood, W. Sussex, a recent addition to the British list that is becoming widespread in southern England; *Catharosia pygmaea* (Fallén), 1♂, Southorpe Paddock NR, near Peterborough, V.C. 32, another recent arrival in Britain.

## Piophilidae (Diptera) from Gibraltar and the puparium of *Piophila megastigmata* McAlpine

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### Summary

Immature stages of *Piophila megastigmata* McAlpine, 1978, a South African species recently discovered in Europe, are described and compared to those of *P. casei* (Linnaeus, 1758). First records of this and other species of Piophilidae from Gibraltar are included. This data extends what was known about *P. megastigmata* and its distribution in Iberia.

### Introduction

Dr Keith Bensusan sent me, via email, a photograph of a fly (Fig. 1) that he came across on a decomposing dolphin, washed ashore on one of Gibraltar's beaches. Although I immediately recognised it as a piophilid, a family of flies not hitherto known from Gibraltar, I could not identify it even to genus from the photograph. I asked for specimens to be forwarded for identification. Dr Bensusan succeeded in obtaining a pair of *P. megastigmata* McAlpine, 1978, the species in the photograph and two males of *P. casei*. Intrigued by the find and by my comments, he collected and forwarded more piophilids that he observed visiting an inflorescence of *Dracunculus vulgaris*, an arum (Araceae) growing in the Alameda Botanic Gardens. This plant has sapromyophilous flowers and attracts an abundance of necrophilous insects (Bensusan *et al.* 2009). All the species of Piophilidae are recorded below with their data.

*Piophila megastigmata* is easily overlooked because of its resemblance to *Piophila casei*. It was described from the Kruger National Park in South Africa, where it was found associated with the carcasses of impala. Martín-Vega *et al.* (2011) recorded it from Spain, where it was first found in June 2003 in baited traps at altitudes ranging from 610 to 1600 metres above sea level. Later, in 2007, it was again found in Spain in larger numbers associated with pig carcasses that were used in experimental work on faunal succession for forensic study. Prado e Castro *et al.* (2011) recorded it from Portugal, where it was found on two human corpses for the first time (one case was near Lisbon in March, 2007; the other case was in Portimão, Algarve in July, 2007). The available data from Spain indicates that *P. megastigmata* occurs throughout the year, but in smaller numbers than *P. casei*, and both species are less frequent in summer, whereas the data from Portugal suggests that it is more abundant than *P. casei* on cadavers and occurs with *Stearbia nigriceps* (Meigen, 1826); *P. megastigmata* was more abundant than *S. nigriceps* in autumn whereas in summer it was the reverse. These inconsistencies indicate a need for more research in order to understand the ecology of *P. megastigmata*.

The collections in the National Museum of Wales have a number of piophilids including *P. casei* from Britain, Spain, Malta, Egypt, Uganda and Nigeria. The three specimens from Spain were collected as puparia from under a dead cow by Ashley Kirk-Spriggs in the Sierra de Retin near Zahara de Los Atunes, Cadiz, 25-30 March 1987. All three have their puparia preserved with each specimen. One of these is *P. megastigmata* and

not *P. casei*. The description, given below, of the puparium and cephaloskeleton of this species is based upon this specimen. The illustrations of the immature stages of *P. casei* were drawn from one of 13 specimens from Malta, all reared from old goat's cheese that was stored submerged in vinegar (4♂♂, 9♀♀, Malta, Balzan, 4-15.vii.1987, M.J. Ebejer, MJE coll.).



**Fig. 1. Habitus of *Piophila megastigmata* McAlpine female (Gibraltar, Eastern Beach).**

Adult *P. megastigmata* can be separated from *P. casei* by the ocellar setae extending to the anterior margin of the frons or beyond, the more extensively yellow head with anterior margin of frons more protruding and gena more receding, the wholly yellow anterior femora, the absence of long, fine, shaggy hairs on the anteromedial aspect of the hind coxae in the male and the longer and slightly denser setulae on the abdomen. The large abdominal spiracles that give the species its name cannot easily be observed in dry specimens.

Piophilidae are scavengers on advanced decaying animal and plant material. They are important in forensic investigations because of their place in faunal succession on corpses and carcasses. *Piophila casei* is of significant economic importance because it so frequently attacks meat (especially dried), cheese, skins and hides in tanneries. However, it can also be beneficial. Martín-Vega *et al.* (2011) discuss the potential synanthropy and forensic value of *P. megastigmata*.

Smith (1989) gave an overview of the biology of Piophilidae, provided a key to larvae of the British species of *Piophila* (*sensu lato*) and illustrations of immatures of several species including *P. casei*. Ferrar (1986) also summarised the biology of this family and gave illustrations of several immature stages. Ozerov (2000) gave an account of the Palaearctic Piophilidae and included figures of several immature stages. However, none of these authors provided figures of the cephaloskeleton of *P. casei* and since the immature stages of *P. megastigmata* have not been described, both species are here figured in order to illustrate the differences. Terminology of the cephaloskeletal parts follows Courtney *et al.* (2000).

### Piophilidae in Gibraltar

The main habitats of Gibraltar have previously been described (Ebejer and Bensusan 2010). The Alameda Botanic Gardens have proved to support a diverse Diptera fauna, probably because of the management strategy of growing and preserving a range of indigenous flora, an avoidance of pesticides and the housing of a number of birds and animals, including macaques. Two species of Piophilidae were found on the flowers of *Dracunculus vulgaris* growing there. All species recorded below were collected by Dr Keith Bensusan and specimens are deposited in the collections of the Gibraltar Ornithological & Natural History Society at the Alameda Botanic Gardens with duplicates, where available, in the author's collection.

#### *Piophila casei* (Linnaeus, 1758)

2♂♂, Eastern Beach, on decomposing beached dolphin, 14.xii.2010.

Distribution: a cosmopolitan species which is synanthropic and of forensic and economic importance.

#### *Piophila megastigmata* McAlpine, 1978

1♂1♀, Eastern Beach, on decomposing beached dolphin, 7.xii.2010.

Distribution: South Africa and Iberia; of some forensic importance.

#### *Prochyliza nigrimana* (Meigen, 1826)

10♂♂, Alameda Botanic Gardens, on *Dracunculus vulgaris*, 20.v.2011.

Distribution: Holarctic, Neotropical.

#### *Stearibia nigriceps* (Meigen, 1826)

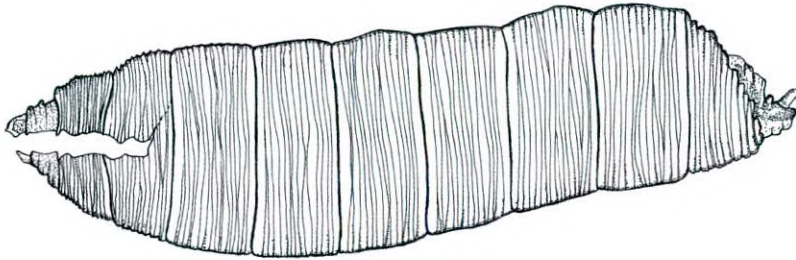
1♀, Alameda Botanic Gardens, on *Dracunculus vulgaris*, 20.v.2011.

Distribution: Holarctic, Neotropical.

### Description of the puparium and cephaloskeleton of *Piophila megastigmata*

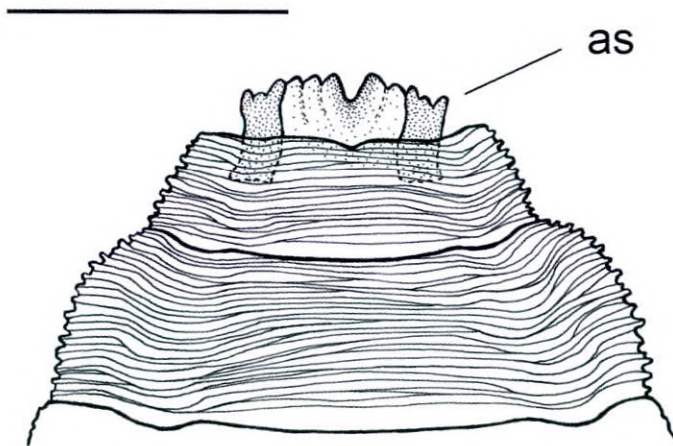
**Puparium** (Fig. 2): 3.7mm long and 0.9mm in maximum diameter; light brown, relatively elongate and very slightly dorsoventrally flattened; cuticle showing distinct, smooth striations or ridges encircling each segment; middle segments have 16-20 such ridges and segments at each end 10-16; ridges at each end tend to be coarser and intersegmental regions have fewer, less evident and more broadly spaced striations; whole puparium devoid of microscopic setulae or spinules; thoracic segments (Fig. 3) with shallow depression running along lateral border both dorsally and ventrally; anterior spiracles minute, each with 3 cylindrical papillae barely protruding from plane of segment, the more prominent papillae are those at each end of the row; pores not discernible at tip of each papilla (note that owing to some shrinkage into the cuticle, there may in fact be more papillae on each spiracle; this will need confirmation by

examining fresh larvae); posterior spiracles (Fig. 4) larger and borne on more or less flattened trapezoidal plates close to the mid line (in the dry cuticle these are folded medially); ventral to these are 2 elongate protuberances directed posterodorsally, widely spaced; dorsal to spiracular plates another pair of protuberances barely noticeable, broader than ventral pair, lying more medially and flat, partly overlapping spiracular plates; 3 minute pores more or less symmetrically placed at medial edge of each spiracle.



anterior

Fig. 2. Puparium of *P. megastigmata*, lateral view. Scale bar = 0.8mm.



as

Fig. 3. Thoracic segments of puparium of *P. megastigmata*, dorsal view; as = anterior spiracle. Scale bar = 0.3mm.

The puparium of *P. megastigmata* is very similar to that of *P. casei* in overall shape and colour. The circumferential ridges in *P. casei* number 12 -15 in each segment with little difference between the number of ridges in the middle segments compared to those on segments at each end of the puparium. The preanal segment in *P. casei* is distinctly smoother,



the perianal protuberances are longer and the dorsal pair as narrow as the ventral and almost equally apart from each other as the ventral are from one another. Zumpt (1965) described rows of denticles on the ventral surface of each segment in the third instar larva of *P. casei*. I cannot make these out in the puparia of either species. Presumably they are lost during maturation of the puparium.

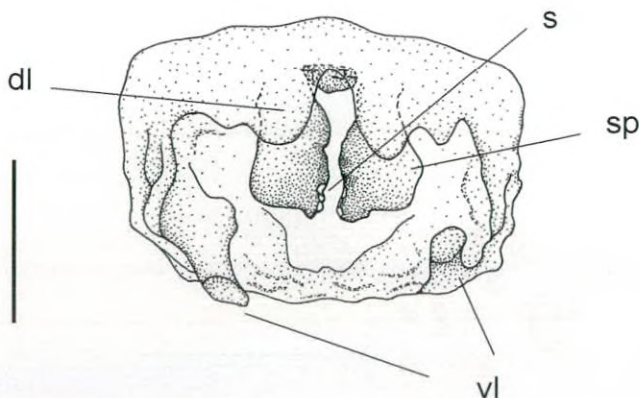


Fig. 4. Anal segments of puparium of *P. megastigmata*, posterior view; dl, dorsal lobe; s, spiracles; sp, spiracular plate; vl, ventral lobe. Scale bar = 0.2mm.

**Cephaloskeleton (Fig. 5):**

Mandibular hook stout at base with narrow sickle-shaped apex, intermediate sclerite more heavily built anteriorly, with relatively deep ventral bridge, labial sclerite small, parastomal bar long and distinct reaching almost anterior end of intermediate sclerite, epistomal sclerite almost as long as parastomal bar (not visible in lateral view in this specimen), dorsal and ventral cornua of almost equal length and of similar shape to each other, but ventral cornu more heavily sclerotised and pigmented anteriorly, dorsal cornua diverge posteriorly, dorsal bridge placed just posterior to anterior margins of dorsal cornua (visible as shadow in Fig. 5), vertical plate broad, cibarium without noticeable teeth or ridges.

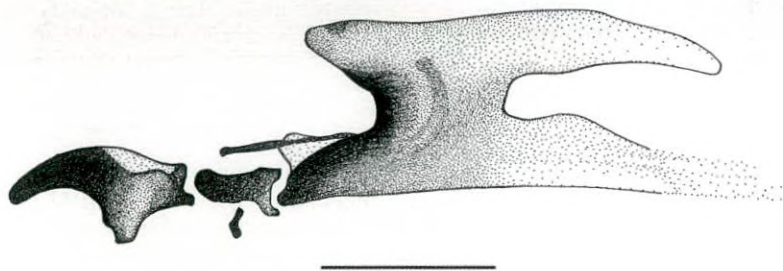
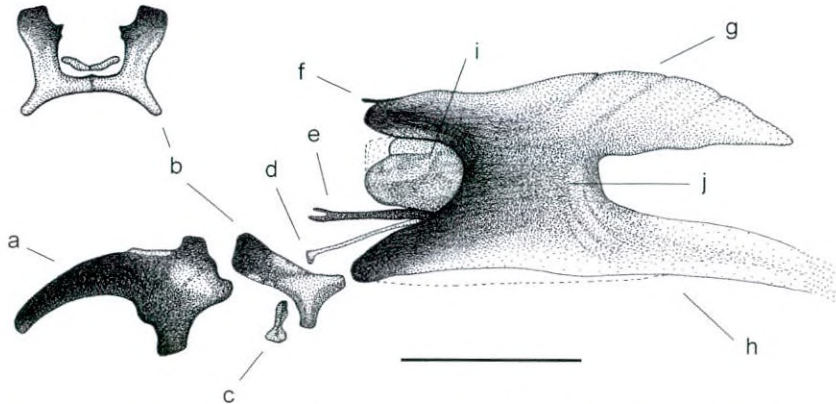


Fig. 5. Cephaloskeleton of *P. megastigmata*. Scale bar = 0.15mm.

In *P. casei* (Fig. 6), the mouth hook is a little longer and narrower, the dorsal bridge easily visible as it protrudes from anterior margin of cornu, dorsal cornu noticeably broader than ventral and optic depression more sclerotised and pigmented, hence visible in *P. casei* but not in *P. megastigmata*. In dorsal view, the intermediate sclerite of both species is very similar.



**Fig. 6.** Cephaloskeleton of *P. casei*: a, mouth hook; b, intermediate sclerite; c, dental sclerite; d, epistomal sclerite; e, parastomal bar; f, dorsal bridge; g, dorsal cornu; h, ventral cornu; i, vertical plate; j, optic depression. Scale bar = 0.15mm.

### Discussion

The data given above confirm that *P. megastigmata* has been present in Iberia for almost 25 years and support the current opinion that the species appears to be predominantly associated with mammalian carrion. It is also found at sea level with its range of habitats including the seashore and pabula including marine mammal carcasses. Its known spatial and temporal distribution in Iberia is extended (Fig. 7). The large port of Algeciras just south of Cadiz may well have been its portal of entry into Europe where it is probably more widespread, but easily overlooked or misidentified.

### Acknowledgements.

I am most grateful to Keith Bensusan for forwarding the specimens for study, for permission to use the photograph and for his unflinching enthusiasm, collegiality and keen eye in the field.

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Fig. 7. Spatial and temporal distribution of *P. megastigmata* in the Iberian peninsula.

Ozerov, A.L. 2000. Family A.9. Piophilidae. pp 355-365. In Papp, L. and Darvas, B. (Eds) *Contributions to a Manual of Palearctic Diptera*, Appendix. 604 pp. Science Herald, Budapest.

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Smith, K.G.V. 1989. An Introduction to the Immature Stages of British Flies. *Handbooks for the Identification of British Insects* 10(14), 280 pp. Royal Entomological Society, London.

Zumft, F. 1965. Families Piophilidae and Neottiophilidae pp 24-28. *Myiasis in Man and Animals in the Old World*. 267 pp. Butterworths, London.

**Recent records of *Dixa maculata* Meigen (Diptera, Dixidae)** – The meniscus midge *Dixa maculata* Meigen is nationally scarce, being sparsely but widely distributed mainly in western and northern England and Wales but with few post-1970 records (Goldie-Smith, E.K. 1990. Distribution maps for Dixidae in Great Britain and Ireland. *Dipterists Digest (First Series)* **3**, 8-26; Disney, R.H.L. 1999. British Dixidae (meniscus midges) and Thaumaleidae (trickle midges): keys with ecological notes. *Freshwater Biological Association Scientific Publication No 56*; Falk, S. and Chandler, P. 2005. A review of the scarce and threatened flies of Great Britain. Part 2. Nematocera and Aschiza. *Species Status No. 2*. Joint Nature Conservation Committee, Peterborough; National Biodiversity Gateway, accessed 2012).

I have recorded this species at several wet valley woodlands in vice-counties Dorset and South Somerset on Cretaceous Greensand, and at stony streams in Monmouthshire and Breconshire. These are unremarkable insofar as they are all within the known range but one site is noteworthy for supporting all six British species of *Dixa*. This is at Hook (V.C. 9, Dorset, although in the county of Devon; ST307054 and adjacent 100m squares), where a small stream known locally as the Hook Stream runs through valley alder woodland with calcareous seepages and runnels, often under *Oenanthe crocata* and *Equisetum telmateia*, at about 95m above sea level. *Dixa maculata* was swept on 21 May 2011 (2♂, 1♀) at different points in the wood and not all by the stream, in company with other *Dixa* (all British species except *D. nebulosa* Meigen), and again on 4 October 2011 (3♂) together with all other British species of *Dixa*.

*Dixa maculata* was not recorded further upstream along the Hook Stream in alder woodland, where the seepages were not obviously calcareous, during an intensive survey in 2005 and 2007 (Drake, C.M. 2011. The Diptera of a wet woodland in Devon. *Dipterists Digest (Second Series)* **18**, 9-26). Kick-net sampling for aquatic invertebrates at five points along the Hook Stream in March and October 2011 collected larvae of the inseparable pair *Dixa maculata* / *D. nubilipennis* Curtis from the headwater to its confluence with the River Kit, and it is possible that these included *D. maculata*. On 19 October 2011 both sexes were caught in similar wet alder woodland along the River Kit shortly upstream of the Hook Stream's confluence (ST302057), together with other *Dixa* apart from *D. nubilipennis*.

My other records from the same geological formation in the Blackdown Hills are Bickham Wood, V.C. 9, ST269084, 30.ix.2011 (♂♂ frequent at calcareous runnels in deciduous woodland) and Ruggin, V.C. 5, ST183180, 3.vi.2011 (1♂ by gravelly stream in deciduous woodland), and in west Dorset at Frome St Quintin SSSI, V.C. 9, ST587034, 10.vii.2006 (1♀ at calcareous seepage in deciduous woodland), Mapperton Vale SSSI, V.C. 9, SY510990, 15.viii.2008 (1♀ at seepage in deciduous woodland) and SY512991 (1♀ in fen next to a shaded stream). Published records from South Somerset were reported by W.J. Peach and J.A. Fowler (1985. Uncommon meniscus midges (Dipt., Dixidae) in the West Country. *Entomologist's monthly Magazine* **121**, 248) from two small shaded streams on or draining the Greensand of the Blackdown Hills and another unshaded stream draining the Devonian sandstone or limestone of the Quantock Hills. Disney's (*ibid.*) limited information on the ecology of *D. maculata* includes their occurrence in stony woodland streams. The recent records presented here suggest that woodland trickles are also used.

I thank Nick Fry for permission to collect in his 'garden' at Hook, and the Somerset Wildlife Trust for access permission to their Bickham Wood and Ruggin reserves – **C. MARTIN DRAKE**, Orchid House, Burrige, Axminster, Devon EX13 7DF

## A description of the male of *Lonchaea bukowskii* Czerny (Diptera, Lonchaeidae)

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### Summary

The male of *Lonchaea bukowskii* Czerny, 1934 is described fully for the first time and its separation from other similar species is discussed. This species is also recorded for the first time from France.

### Introduction

*Lonchaea bukowskii* Czerny, 1934 is one of the most enigmatic of the European Lonchaeidae, often only occurring as single female specimens. Although in the type description Czerny (1934) referred to "both sexes" and specifically to a male caught by W. Bukowski in the St Petersburg area of Russia there are no descriptions or illustrations of the male genitalia in the literature. *Lonchaea bukowskii* was added to the British fauna in 2001 (MacGowan 2001) on the basis of three female specimens and it was the only British species for which the male genitalia were not illustrated in MacGowan and Rotheray (2008). Indeed *L. bukowskii*, *Dasiops hellas* MacGowan, 2008 and *Earomyia laticeps* Czerny, 1934 are the only European lonchaeids with hitherto undescribed male genitalia. The capture of a male in Perthshire by Ivan Perry (Perry 2010) has allowed a more detailed description of the male to be made and the genitalia illustrated. Examination of additional material of this species from Britain and Europe has also allowed a more critical examination to be made of the key characters.

*Lonchaea bukowskii* is one of two members of the *L. ragnari* Kovalev, 1981 group within European *Lonchaea*. They are distinguished by the following characters: bare eyes, anterior genal setae in a single row, posterior metatarsus obscurely yellow / brown ventrally, calypters with pale fringes and with more than one stigmal seta on the proepimeron. In addition both *L. ragnari* and *L. bukowskii* tend to have a number of small spinules on the costa of the wing just beyond the stigmal cell.

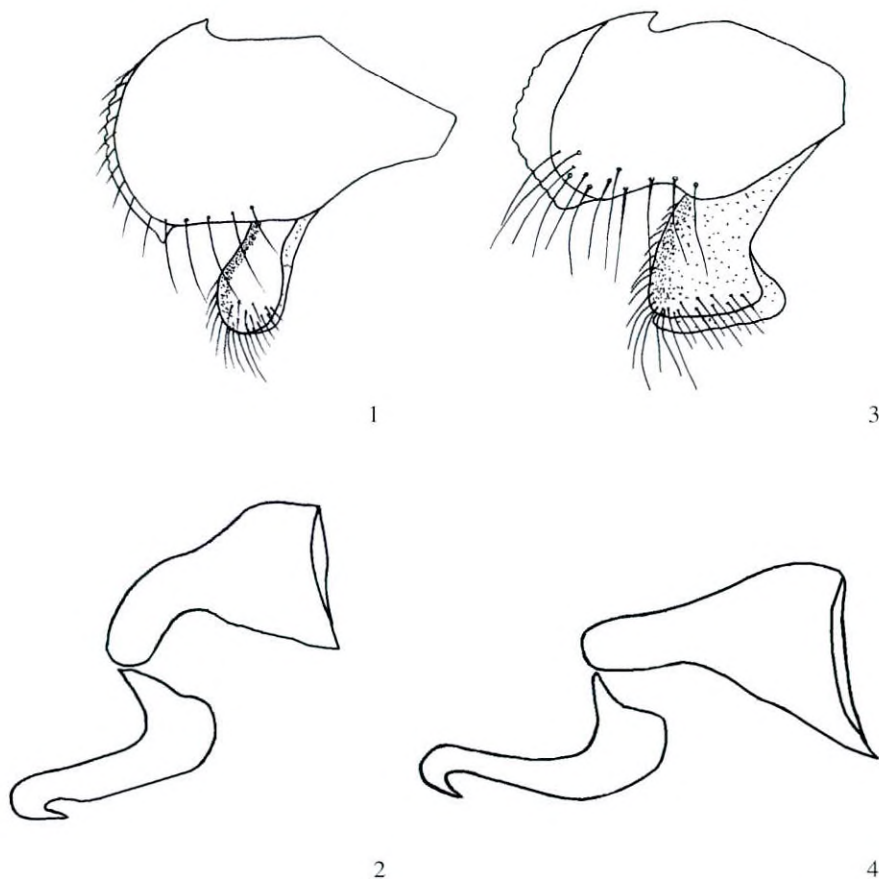
### Description.

*Lonchaea bukowskii* Czerny 1934

Male. *Head*: Eyes bare. Frons matt black with greyish dusting, parallel-sided on upper half but widening slightly towards the level of the antennal bases, at the mid point half the width of an eye, with a row of approximately ten frontal setulae along the lateral margins and only a scattering of relatively weak interfrontal setae on the central area, anterior frontal setulae approximately half as long as the orbital setae, the others weaker. Orbital plate subshining black and bare. Lunule matt black, bearing approximately ten short setulae. Face and parafacials subshining black. Anterior genal setulae in a single row of seven along the mouth margin, the three most anterior of these relatively short but the others longer and stronger - being the strongest setulae on the genae. Antenna entirely black, postpedicel just over 2.5 times longer than it is deep; arista slightly yellowish basally with microscopic hairing.

*Thorax*: disc shining black with some light dusting on the pleura. Setulae on disc almost half the length of the orbital setae. Notopleural depression bare apart from the two

setae. Anepisternum covered with long black setulae, with three anterior and four posterior setae. Katepisternum with setulae on the dorsal half, with the usual one strong seta near the dorsal margin, a few setulae present posterior to it. One propleural seta, two stigmal setae without accompanying hairs on the proepimeron. Prosternum bare. Anepimeron bare. Scutellum slightly more grey dusted than thoracic disc, margins with the usual four strong setae and with a multiserial row of eight or nine setulae between the lateral and apical setae, some of these extending slightly onto the disc, two short setulae between apical setae, no setulae present anterior to the lateral setae. Calypters yellowish with a long golden fringe. Wing length 5.0mm. Wings clear but slightly brownish basally, veins brownish, intercostal space twice as long as crossvein *ta*, costa distal to intercostal space with four spinules on the right wing, none on the left.



Figs 1-2. *Lonchaea bukowskii*: 1, epandrium and associated structures, lateral view; 2, aedeagus, lateral view. Figs 3-4. *Lonchaea ragnari*: 3, epandrium and associated structures, lateral view; 4, aedeagus, lateral view.

**Male genitalia:** (Figs.1–2) in lateral view epandrium twice as wide as it is high, rounded along ventral margin but rather tapering dorsally, bearing a row of strong setulae along the dorsal and ventral margins. Cercus rather club shaped, not sclerotised, bearing relatively long and numerous setulae apically. Surstylus only projecting slightly beyond the shell of the epandrium, with a small process at the posteroventral corner; inner margins of surstylus irregularly serrate, inner surface with an irregular row of rather weak brownish setulae. Aedeagus two-segmented, basal segment apically obviously curved towards the base of the apical segment, apical segment S-shaped, rather broad along most of its length.

### Material examined

1 male, **Scotland:** Loch Rannoch, Camghouran, Perthshire (NN536568), 20.vi.2009, leg. and det. Ivan Perry. Specimen deposited in the National Museums of Scotland.

### Discussion

From the examination of external characters and the more subtle characters of the male genitalia there is no doubt that *L. bukowskii* and *L. ragnari* are closely related but distinct species. In the male genitalia the cerci of *L. bukowskii* are rather more slender and club-shaped than the rather larger, rectangular shaped cerci of *L. ragnari*. The ventral part of the epandrium is rather more bulbous and produced in *L. ragnari* than in *L. bukowskii* and the surstylus is usually produced further from the shell of the epandrium.

The aedeagus of both species is also rather similar, but in *L. bukowskii* the basal segment is noticeably bent apically whilst in *L. ragnari* the basal portion is straight. In addition the apical section is slightly broader in *L. bukowskii* than in *L. ragnari*. There should, however, be little problem in distinguishing males of the two species on the relatively good adult characters which have been used to differentiate females of *L. bukowskii* from both sexes of *L. ragnari* and on the basis of the differences in the genitalia outlined here.

MacGowan and Rotheray (2008) distinguished *L. bukowskii* from *L. ragnari* by its lack of setulae on the orbital plate above the orbital seta, and by the presence of only two stigmatal setae on the proepimeron in contrast to several setae with accompanying setulae in *L. ragnari*. Examination of a wider range of specimens of *L. bukowskii* has shown that nearly half of those examined had setulae present on one or other of the orbital plates, indicating that this is not a good key character. Other variable features include the number of setulae on the margin of the scutellum (ranging between 9 and 20 in uniserial or multiserial rows) and the number of spinules on the costa of the wing (varying between 0 and 9). The number of setae on the proepimeron does, however, seem to be a constant as is the lack of any additional strong setae on the margin of the scutellum, in addition to the four usual setae, in *L. bukowskii*. The American species *Lonchaea albidala* McAlpine 1963, which seems to be widely spread across the northern Nearctic (McAlpine 1963), also shares the characters of *L. bukowskii* and may prove to be conspecific.

### Distribution

Kovalev and Morge (1984) only listed Yugoslavia and four areas of the then Soviet Union, including the Ukraine and the Crimea as areas in which *L. bukowskii* has been recorded. The Yugoslavia record presumably relates to a specimen in the Natural History Museum in London, also a female, taken by R.L. Coe at Plitvice, Croatia between 4 and 10 July 1955 and which was identified by Morge. MacGowan and Rotheray (2008) listed females from Perthshire, Buckinghamshire and Somerset in Britain and added European locations in Finland, Hungary and Sweden. There is a previously unpublished French record of three

females from a Malaise trap operated at AIN, Béon, Marais de Lavours, 18-25.v.2010 (Phil Withers *pers. comm.*). Perry (2010) also recorded this species from Perthshire and Hampshire. More recent records of *L. bukowskii* and *L. ragnari* from north-west Russia (MacGowan in press) suggest that both species occur, perhaps at greatest density, in a boreal woodland situation.

### Acknowledgements

I thank Ivan Perry for allowing me to examine the male specimen of *L. bukowskii* and to deposit it in the national collections, and Phil Withers for information on the French record.

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## Changes to the Irish Diptera List (17) – Editor

This section appears as necessary to keep up to date the initial update of the Irish list in Vol. **10**, 135-146 and the recent checklist of Irish Diptera (Chandler *et al.* 2008). Species are listed under families, but with references listed separately. The addition cited below was overlooked in the Irish checklist and brings the total Irish list to **3353** species.

### Chironomidae

*Limnophyes platystylus* Murray, 2007 (added by Murray 2007)

### References

- Murray, D.A. 2007. *Limnophyes platystylus* n. sp. (Diptera: Chironomidae, Orthocladiinae) from Ireland. pp 215-218. In Andersen, T. (Ed) *Contributions to the systematics and ecology of aquatic Diptera – a tribute to Ole Sæther*. Caddis Press, Columbus, Ohio.



## The puparium of *Meoneura lamellata* Collin (Diptera, Carnidae) and records of three other carnids from bird and mammal nests

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### Summary

Rearing data for four species of Carnidae (Diptera) are presented from material obtained in the 1930s by E.B. Basden. 387 specimens of *Meoneura lamellata* Collin, 1930 were reared, almost exclusively from nests of the sand martin, *Riparia riparia*. 533 specimens of *Meoneura neottiophila* Collin, 1930 came from nests of 14 bird species and the grey squirrel, *Sciurus carolinensis*. 344 specimens of *Carnus hemapterus* Nitzsch, 1818 came from 3 bird species and 2 specimens of *Meoneura vagans* (Fallén, 1823) were reared from dung of the pheasant, *Phasianus colchicus*. The puparium of *M. lamellata* is described and compared with that of *M. neottiophila* and *C. hemapterus*.

### Introduction

The Carnidae is an acalypterate family (Diptera) of 88 species in 5 genera (Brake 2012). In the Palaearctic Region there are 50 + species in 3 genera (Papp 1998) and in the British Isles 13 species in 2 genera (Chandler 1998a). If the family is small then so are the flies themselves. Collin (1930), writing in an uncharacteristic lyrical fashion about the carnid genus *Meoneura* Rondani, 1856, stated that: "Flies of this genus rank among some of the smallest of the Acalypterate Muscids, and have received but scanty attention from Entomologists. Little is known of the particular function performed by them in that wonderfully orderly arrangement of interwoven forces and processes of the material world called Nature." Since the 1930s knowledge has improved, but few species have been studied (Brake 1997, Papp 1998).

Biologically, the best known is *Carnus hemapterus* Nitzsch, 1818 which lives in bird nests. Larvae are saprophagous and develop within nests but, following emergence, adults find an occupied nest, shed their wings and attach themselves to the base of feathers of adult birds or their nestlings where they feed on secretions, skin and blood and can affect growth rates of nestlings (Engel 1930, Hennig 1937, Capelle and Whitworth 1973, Grimaldi 1997, Papp 1998).

Carnids of the genus *Meoneura*, are described as facultatively or obligatorily necrophagous and/or coprophagous by Gregor and Papp (1981). *Meoneura lamellata* Collin, 1930 and *Meoneura neottiophila* Collin, 1930 develop in bird nests (Nordberg 1936, Hennig 1937) and the former species has also been reared from fungi (Hackman and Meinander 1979), bird pellets and faeces (Brake 1997) and mammal dung (Pridantseva 1967). Other *Meoneura* species are known from a varied range of development sites including decaying vegetation, bird and mammal dung, carrion, plant stems, flowers and fungi (Ferrari 1987, Brake 1997, 2012, Papp 1998).

Morphological descriptions of early stages have been provided, in varying levels of detail, only for *C. hemapterus* (Engel 1930, Hennig 1937, Capelle and Whitworth 1973, Papp 1998), *Meoneura obscurella* (Fallén, 1823) (Engel 1930, Hennig 1937) and *M. neottiophila* (Papp 1998).

The rearing records and puparia described in this paper were obtained by the late E.B. Basden as part of his 1930s investigation of Diptera from bird and mammal nests, runs and

burrows in southern England, about which he published very little. The collection is housed in the National Museums of Scotland (Rotheray 1989). Labels associated with pinned specimens provide key data but additionally, Basden maintained a set of data sheets. For each Diptera species reared, these sheets provide details such as geographical locality of each nest, nest position, height, composition, etc., and details of the specimens reared from each nest, their number, sex and emergence periods.

### Materials and methods

Specimens of Carnidae, reared by E.B. Basden, in the collections of the National Museums of Scotland, were examined. Forty-seven adults with puparia of three species were found: *C. hemapterus* = 18; *M. lamellata* = 18 and *M. neottiophila* = 11. Their identity was checked using keys in Collin (1930) and Papp (1998) and nest details were extracted from data sheets. Most puparia were encrusted with dirt and debris. At least one specimen per species was cleaned by soaking in warm water or a solution of KOH and picking debris off with pins or a paintbrush. Head skeletons were examined by detaching the ventral plate of the puparium containing the head skeleton and soaking it in a solution of potassium hydroxide (KOH) at room temperature for about 30 minutes. Due to their small size and delicate structure, head skeletons were not further dissected. Puparia and head skeletons were examined using binocular and compound microscopy. Following examination, puparia and head skeletons were stored dry in gelatin capsules. Illustrations were made using a drawing tube attached to the binocular microscope and measurements made using a measuring eyepiece. Terminology for head skeletons follows Courtney *et al.* (2000) and Rotheray and Gilbert (2008).

### Results

#### Rearing data

##### *Meoneura lamellata*

Basden reared 387 specimens of *M. lamellata* from 7 nests of two host species (Table 1). However, all but one specimen came from sand martin nests in burrows. The other host was the grey squirrel, in a nest over 6m high in a tree (Table 1). Five sand martin nests were collected on 14.x.1933 from a gravel pit at East Burnham, Buckinghamshire. The other nest came from a clay pit at Collum Green, Slough, Berkshire, collected on 1.vii.1932. For sand martin nests, a mean of 55.2 specimens, range 4-157, were obtained per nest. Adults emerged in the same year or the year following collection, during the period 30 April to 16 July with a peak between 15 May and 21 June.

##### *Meoneura neottiophila*

Basden reared 533 specimens of *M. neottiophila* from 27 nests of 15 host species (Table 1). A mean of 19.7 specimens, range 1-133, were obtained per nest, of which the highest number per nest, 133, came from a kestrel nest. This is almost twice that of the number obtained from the next most productive nest, 68, from a grey squirrel (Table 1). Nests varied from 0.6 to 12.1m above ground and nests were present in hedgerows, tree hollows and tree branches. Adults emerged in the same year or in the year following collection, during the period 30 March to 9 August.

##### *Carnus hemapterus*

344 specimens of *C. hemapterus* were reared from 4 nests of 3 host species (Table 1). A mean of 86 specimens, range 1-195, were obtained per nest and nests varied in height, from

0.8 to 4.5m. Adult *C. hemapterus* emerged in the same year or in the year following collection, during the period 19 May to 4 July.

### ***Meoneura vagans* Fallén 1823**

The two adult *M. vagans* emerged on 27 and 28.vi.1934 from pheasant droppings collected on East Burnham Common, Buckinghamshire but the date of collection was not recorded (Table 1).

### **Description of puparia**

#### ***Meoneura lamellata***

**Shape and size:** length 2.3mm ( $n = 6$ ); tapered anteriorly; truncate posteriorly (Fig. 2); dark red-brown in colour; subcylindrical in cross section, except thoracic segments which are dorsoventrally compressed; apparent boundaries between segments indicated by deep, indented annulations, more so on abdominal than thoracic segments; dorsum of abdominal segments 1-7 with anterior and posterior halves of each segment raised up in the form of rounded, transverse ridges between the annulations; lateral margins pinched, i.e. bulging out laterally (Fig. 2); ventrally, middle of each abdominal segment with a transverse ridge similar to the annulations dividing segments; anal segment with a deep, longitudinal groove from the anterior margin to the base of the posterior spiracles; anal segment infolded or indented below posterior spiracles and with a rounded apex; anterior end split by eclosion of the adult, from just anterior of the anterior spiracles on the prothorax to the posterior half of the first abdominal segment.

**Anterior spiracles:** small and inconspicuous comprising a fan of 3 respiratory bulbs or openings, located on the upper, posterolateral margin of the prothorax, but due to the way in which the puparium has formed, this position is the anterior margin of the puparium.

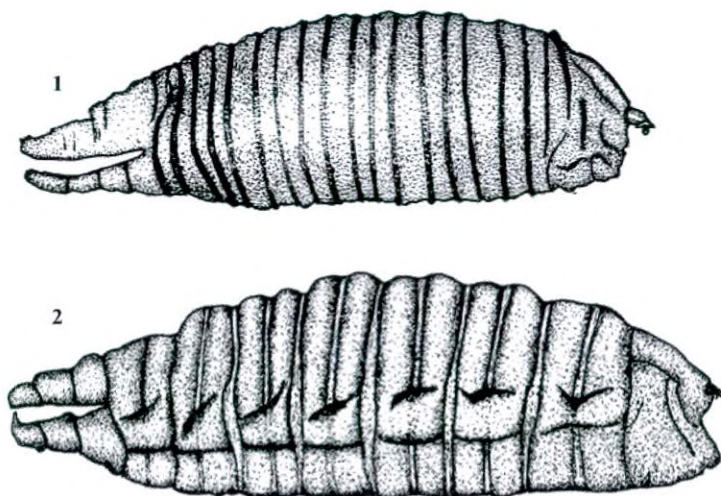
**Head skeleton** (Figs 3-4): length measured from tip of mandible to apex of ventral cornu of the basal sclerite 0.4mm; highest point in lateral view 0.1mm; mandible and apical half of intermediate sclerite sclerotised red brown, rest of head skeleton translucent, without pigmentation; ventrally, mandible with elongate apodeme, the adductor muscle attachment point; mandible with a down-curved apical mouthhook; intermediate sclerite bar-shaped in lateral view; ventral bridge just behind apex; floor of atrium with labial sclerites apparently fused and projecting just beyond ventral bridge of the intermediate sclerite (Fig. 3); basal sclerite with parastomal bars, dorsal bridge and cibarial ridges; vertical plate about as long as ventral cornu; dorsal cornu slightly shorter and about half as wide as ventral cornu; dorsal and ventral cornu parallel.

**Vestiture:** integument smooth, lacking vestiture.

**Locomotory spicules:** spicules apparently infrequent on anterior half of abdominal segments 1-7 (Fig. 5); 6-8 rows of interrupted transverse striae present, thorax apparently lacking spicules; anus surrounded by spicules.

**Posterior spiracles:** borne on tapering projections on upper, apical margin, about as long as basally wide (Fig. 1); spiracular plate (Fig. 8) spherical in shape with three, approximately equidistant, projections with spiracles; ecdysial scar on dorsal margin; peristigmatal setae apparently absent, but may have broken off.

**Puparia examined:** 6 specimens, England, Buckinghamshire, East Burnham, ex nest of sand martin *Riparia riparia* Linnaeus, nest in 1m long tunnel in a gravel pit with decomposing leaves and grass, collected 14.x.1933, adults emerged 5-11.v.1934, E.B. Basden.



Figs 1-2. Carnidae, puparia, lateral views, anterior end to the left: 1, *Meoneura neottiophila*, length 2.1mm; 2, *Meoneura lamellata*, length 2.3mm.

*Meoneura neottiophila*

Puparium similar to *M. lamellata* except slightly smaller, 2-2.1mm long and annulated across the middle of the metathorax and abdominal segments 1-7 (Fig. 1). Abdominal segments smoothly rounded, not ridged dorsally or laterally pinched (Fig. 1), mid-dorsal longitudinal groove and apical indentation on anal segment, shallow, not as deep. Annulations red-brown and contrasting with yellow-brown ground colour. Locomotory spicules extensive, forming 6-8 interrupted rows and rows tapering towards lateral margins, spicules mostly even-sized, slightly larger mid-ventrally (Fig. 6).

**Puparia examined:** 7 specimens, England, Berkshire, nr Temple, ex nest of hedge sparrow, *Prunella modularis* (Linnaeus), nest 1.5m high in a hedge, pieces of eggshell and mouse droppings present, collected 6.i.1934, adults emerged 14-21.iv.1934, E.B. Basden.

*Carnus hemapterus*

In shape and pattern of annulations and grooves, puparium similar to *M. neottiophila*, as in Fig. 1. Differs from the *Meoneura* species, including *M. obscurella* (Engel 1930), in having anterior spiracles with 5 or more, not 3 openings or respiratory bulbs (Papp 1998). Locomotory spicules are similar to *M. neottiophila* (Figs 7-8).

**Puparia examined:** 6 specimens, England, Farnham Royal, Berkshire, ex nest of starling, *Sturnus vulgaris* (Linnaeus), nest 4.5m high in ivy growing over a garden shed, with straw,

twigs, plant stems, grass, pine needles, moss, feathers and other host derived material also present, collected 1.vi.1934, adults emerged 8-14.vi.1934, E.B. Basden.



Figs 3-4. *Meoneura lamellata*, head skeleton: 3, mandibles and intermediate sclerite, ventral view; 4, whole head skeleton, lateral view, length 0.4mm.

## Discussion

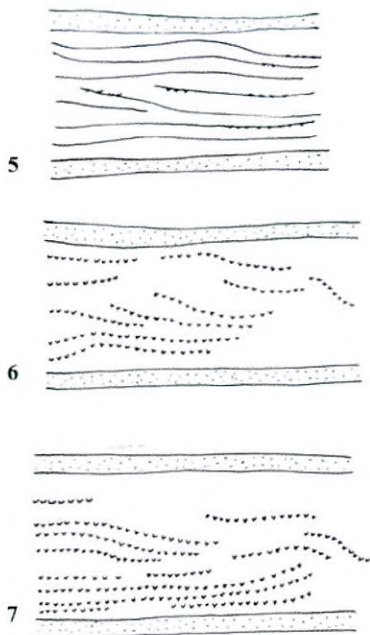
### Rearing data

From bird and mammal nests, E.B. Basden reared 1266 specimens of three carnid species (Table 1). About half are present in the NMS collection but only 47 have associated puparia. These three carnids were known previously from bird nests (Nordberg 1936, Hennig 1937, Papp 1998) but, apparently, mammalian hosts have not previously been reported. Mammalian hosts were confined to the *Meoneura* species. *Meoneura neottiophila* has also been reared from the fungus *Leccinum scabrum* Gray (Boletaceae) (Hackman and Meinander 1979) and Chandler (1998b, 2002) found assemblages of males on various fungi. The fourth carnid species reared by Basden, *M. vagans*, developed on pheasant droppings (Table 1). This species does not seem to have been reared previously although Gregor and Papp (1981) stated, on the basis of adult data, that this species prefers carrion to dung. From bird and mammal nests Basden reared only 3 of the 13 British carnids. This suggests that those species not reared by Basden are like *M. vagans* and develop in other situations.

Collin (1930) reported that various workers apart from himself, such as F.W Edwards and O.W. Richards had observed adults of *M. lamellata* close to sand martin nests and similar observations were recorded by Nuorteva and Järvinen (1961). Brake (1997) recorded *M. lamellata* in unusually high numbers on the German Island of Mellum in the North Sea where adults were associated with ground level, seabird colonies, being found on their dung, pellets and carrion. Summarising from adult records, Brake (1997) stated that *M. lamellata* is a species of dunes and sandy banks. However, Hennig (1937) reported it from arboreal bird nests. Some of the bird species involved, such as the blackbird, chaffinch and starling, were surveyed by Basden yet no *M. lamellata* were obtained. Except for a single specimen from a grey squirrel nest, the rearing records obtained by Basden, support an association between *M. lamellata* and ground nesting birds. The record from the nest of a grey squirrel appears to be unusual. Unfortunately, the specimen is not included in the NMS collection and the record cannot be verified.

Both *C. hemapterus* and *M. neottiophila* have wider host ranges than *M. lamellata* (Table 1, Hennig 1937). From a survey of hosts of *C. hemapterus* in North America, Grimaldi (1997) found that *C. hemapterus* prefers bird nests in tree hollows or those that are roofed or shaded, rather than nests on the ground, in the open or in wet conditions. The rearing records obtained by Basden are consistent with this finding: about half of the specimens reared came from barn owl nests in tree hollows and the remainder came from nests that were shaded: a starling nest in ivy and a blackbird nest in a hedge. *Meoneura*

*neottiophila* possibly shares such a preference as indicated by the rearing data in Table 1 and from the list of hosts given by Hennig (1937).



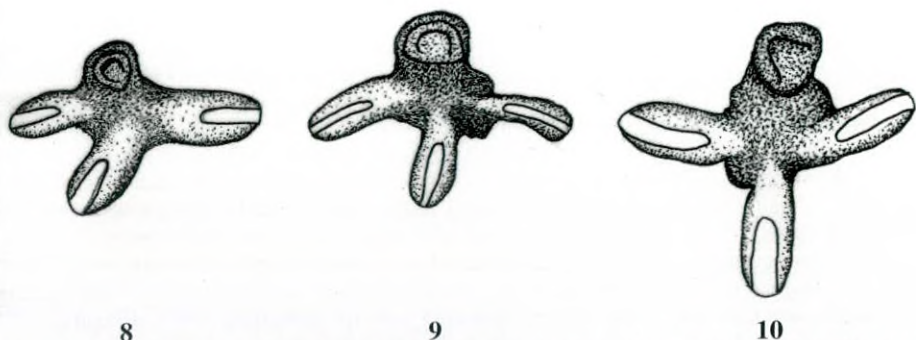
**Figs 5-7. Carnidae, locomotory spicules from third abdominal segment, right hand side, mid-ventral line to the left; 5, *Meoneura lamellata*; 6, *Meoneura neottiophila*; 7, *Carnus hemapterus*.**

Apart from shade, the abundance of *C. hemapterus* and *M. neottiophila* may be positively related to nest size. Large nests, such as those of the barn owl, carrion crow, grey squirrel and kestrel, had relatively large numbers of specimens compared to smaller nests (Table 1), although small nests sometimes had large numbers, such as that of a chaffinch for *M. neottiophila* and the starling for *C. hemapterus*. Only 3 of the 39 nests, from which carnids were reared by Basden, had both *C. hemapterus* and *M. neottiophila*: a barn owl nest from which 6 *M. neottiophila* and 103 *C. hemapterus* were reared; a blackbird nest with 12 *M. neottiophila* and 1 *C. hemapterus* and a starling nest with 15 *M. neottiophila* and 195 *C. hemapterus*. But whether these species compete or avoid one another is unclear from these data.

#### **Comparison of puparia**

The puparia of *M. lamellata*, *M. neottiophila* and *C. hemapterus* share several characters, such as annulations, posterior spiracles borne on projections, head skeletons with translucent basal sclerites and anal segments with a mid-dorsal longitudinal groove and an indented apex. The only other carnid for which early stage morphological data appears to be available is *M. obscurella* (Engel 1930, Hennig 1937), which also has spiracular openings on projections and

a translucent basal sclerite. However, from the figure of the puparium given by Engel (1930) and reproduced by Ferrar (1987), which is a dorsal view, annulations and a mid-dorsal groove on the anal segment are not shown. However, as Ferrar (1987) commented, around the margin of the puparium are shown a series of small projections. Annulations project above the surface of the integument and, by comparison with the puparia studied here, these projections are annulations and they are probably present in *M. obscurella*.



Figs 8-10. Carnidae, posterior spiracles, apical view: 8, *Meoneura lamellata*; 9, *Meoneura neottiophila*; 10, *Carnus hemapterus*.

In the larva of *C. hemapterus*, annulations were not mentioned or figured by Papp (1998), although in the puparium they were described and figured. Perhaps they are inconspicuous in the larva, rather than absent. Within the Carnoidea *sensu* McAlpine 1989, some Chloropidae have posterior spiracular openings on projections (Ferrar 1987) and the head skeleton of the milichiid *Neophyllomyza acyglossa* (Villeneuve) (Milichiidae) lacks sclerotisation (Rotheray and Robertson 1998). Hence, it is unclear whether any of these characters in isolation or in combination, distinguish the Carnidae.

Between the puparia of the three species considered here, the particular states of the annulations and locomotory spicules vary and are more similar between *C. hemapterus* and *M. neottiophila* than between *M. lamellata* and *M. neottiophila*. On the other hand, as Papp (1998) pointed out, puparia of *Carnus* and *Meoneura* are distinguishable by the anterior spiracles, which have 5-7 openings in *Carnus* and 3 openings in *Meoneura*. Papp (1998) also suggested that the puparium of *Carnus* can be separated from that of *Meoneura* by the caudal position of the posterior spiracles in the former genus and dorsal position in the latter, but this character was not uniform in specimens examined here and seems to depend on the extent to which the anal segment is indented during the process of pupariation. Hence, the anterior spiracles with 5 or more openings distinguishes the puparium of *C. hemapterus* from those of the *Meoneura* species considered here. The puparium of *M. lamellata* is easily separated from that of *M. neottiophila* by rounded ridges either side of the dorsal abdominal annulations and the pinched lateral margin (Figs 1 and 2).

#### Functional morphology

The larval feeding mode in Carnidae is presumed to be saprophagy (Hennig 1937, Ferrar 1987, Papp 1998) and their head skeletons possess cibarial ridges, which supports this interpretation. These ridges separate and concentrate microbes, such as bacteria and yeasts

found in decay, from a liquid medium (Dowding 1967). No information was provided by Basden about larval feeding modes or diets although decomposing vegetation and dung is frequently mentioned in the data sheets. Such material was presumably damp not just from secretions and excretions from nestlings, although the latter are often removed by parent birds, but from metabolic water produced by microbial and fungal decay. Basden often referred to the 'mouldy' smell of nests, supporting this possibility.

Compared to the head skeletons of other saprophagous, higher cyclorrhaphan larvae, those of the carnids are remarkable for their lack of sclerotisation. Other saprophagous taxa with a similar lack of sclerotisation in the head skeleton are the Clusiidae (Ferrar 1987 and unpublished data) and the milichiid *N. acyglossa*. Like carnids, these dipterans are relatively small in size and size *per se* may be a factor in determining the extent of sclerotisation. Head skeletons gain structural strength through sclerotisation and large head skeletons probably require greater strength, i.e. sclerotisation, than small ones. However, the degree of sclerotisation does not always correlate to body size. For example, many head skeletons of the carnoid family, Chloropidae, are sclerotised (Ferrar 1987). Extra strength in the case of chloropids, is probably a response to the strains and stresses of rasping plant tissues.

Another influence on the degree of sclerotisation is the power of the pump in the head skeleton. The more powerful the pump, the more strength is required to support the muscles and distortions that take place during pumping actions (Dowding 1967, Roberts 1971, Rotheray 2011). Small, poorly sclerotised head skeletons suggest weak pumps. A weak pump may be an adaptation for food that is in a watery as opposed to an oily, pasty or firmer state. This suggests that carnids and clusiids are adapted to imbibe food of a watery nature.

From the larval figures of *C. hemapterus* (Papp 1998), the thorax is elongate and narrow. Such a shape and an elongate mouthhook, facilitates raking watery food towards the mouth ready for it to be sucked up by the pump in the basal sclerite. Such features and feeding mechanisms are known in saprophagous Lauxaniidae that similarly rake the surfaces of decaying vegetation (Rotheray and Wilkinson 2010), although their head skeletons are more sclerotised, but they are larger flies. Critical to the effectiveness of raking, is a firm grip of the substrate by the abdomen. Otherwise, when the thorax is stretched forward to begin raking, the abdomen would tend to slide towards it, and food could not be gathered. This may explain the extensive distribution of locomotory spicules in carnid and lauxaniid larvae. These coat half the lengths of the first seven segments of the abdomen (Figs 5-7, Rotheray and Wilkinson 2010). Hence, locomotion only partially explains the appearance of spicules on the ventral surface of cyclorrhaphan larvae. Their size, shape, number and distribution may also be influenced by the requirements of feeding.

By comparison with the figures given by Ferrar (1987), the form of the posterior spiracles with the openings at the end of short projections appears to be unusual, as is an apical indentation of the anal segment, just below the spiracles (Fig. 2). In higher cyclorrhaphan larvae, protecting these spiracles from becoming blocked is frequently a requirement. The projections in carnids are oriented ventrally and together with the indentation may in some, as yet unclear, way, help protect them. Observations of live larvae are required to further analyse these structure/function interpretations.

### Acknowledgements

I am grateful to Keith Bland, Bob MacGowan and Geoff Wilkinson for discussion of bird nest ecology. I am also grateful to Laszlo Papp and Irina Brake for helpful comments on the manuscript.



**Table 1. Bird and mammal nests from which *Meoneura lamellata*, *Meoneura neottiophila* *Meoneura vagans* and *Carnus hemapterus* (Carnidae) were reared by E.B. Basden**

\* each figure represents a separate nest; \*\*heights above ground of nests in left to right order corresponding to those in the 'number reared' column; ? = no datum recorded

<i>Meoneura lamellata</i>			
host		number reared*	height (m)**
sand martin	<i>Riparia riparia</i>	4/11/42/82/90/157	burrows 0.7-1 m long
grey squirrel	<i>Sciurus carolinensis</i>	1	6.7
<i>Meoneura neottiophila</i>			
kestrel	<i>Falco tinnunculus</i>	133	10.6
moorhen	<i>Gallinula chloropus</i>	2	1
wood pigeon	<i>Columba palumbus</i>	2	10.3
barn owl	<i>Tyto alba</i>	6	3
wren	<i>Troglodytes troglodytes</i>	1	1.8
hedge sparrow	<i>Prunella modularis</i>	76	1.5
blackbird	<i>Turdus merula</i>	6/12/18	5.4/0.8/3.6
song thrush	<i>Turdus philomelos</i>	1/24	0.6/1.7
chaffinch	<i>Fringilla coelebs</i>	1/36	?/2.6
greenfinch	<i>Carduelis chloris</i>	1/3/4	2.4/6/2
linnet	<i>Carduelis cannabina</i>	9	1.4
house sparrow	<i>Passer domesticus</i>	1/4	4.2/4.5
starling	<i>Sturnus vulgaris</i>	15	4.5
carrion crow	<i>Corvus corone</i>	4/7/10/37/43	1.5/ 2/9.1/12.1/6
grey squirrel	<i>Sciurus carolinensis</i>	7/68	8.2/0.7
<i>Carnus hemapterus</i>			
barn owl	<i>Tyto alba</i>	45/103	3/3
blackbird	<i>Turdus merula</i>	1	0.8
starling	<i>Sturnus vulgaris</i>	195	4.5
<i>Meoneura vagans</i>			
pheasant	<i>Phasianus colchicus</i>	2	droppings on ground

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**First records from France of *Eumerus obliquus* (Fabricius), *E. subornatus* Claussen, *Ferdinandea fumipennis* Kassebeer and *Platycheirus transfugus* (Zetterstedt) (Diptera, Syrphidae): notes on separation of females of *E. subornatus* and *E. ornatus* (Meigen)**

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**Summary**

The species *Eumerus obliquus*, *E. subornatus*, *Ferdinandea fumipennis* and *Platycheirus transfugus* (Diptera: Syrphidae) are recorded for the first time from continental France. Morphological features to aid in distinguishing the females of *Eumerus ornatus* and *E. subornatus* are identified.

The most recent list of the Syrphidae of France was given by Speight *et al.* (2010). The species *Merodon confusus* Marcos-Garcia *et al.*, *Microdon major* Andries, *Neoscasia unifasciata* (Strobl), *Orthonевра plumbago* (Loew), *Pelecocera caledonica* (Collin) and *Xanthogramma stackelbergi* Violovitch are also now known from France (Dussaix *et al.* 2007, Lair 2007, Marcos-Garcia *et al.* 2011, Speight and Castella 2011, Vallet 2010). The present note adds a further four species, *Eumerus obliquus* (Fabricius), *E. subornatus* Claussen, *Ferdinandea fumipennis* Kassebeer and *Platycheirus transfugus* (Zetterstedt), bringing to 524 the number of syrphid species known from France. This note also provides characters that can be used in the separation of *E. ornatus* and *E. subornatus* females and supplementary information on the separation of the males of these two species. Species accounts for all of these species were provided by Speight (2011).

Different systems of co-ordinates have been employed by collectors in the records cited here. Latitude/longitude is self-evident. Where a grid reference is given on the Lambert grid (the French National Grid) it is preceded here by the letters LG. Universal Transverse Mercator grid references are preceded by the letters UTM.

***Eumerus obliquus* (Fabricius, 1805)**

Pyrenées-Orientales: Sorède Village, 42°31'46,17" N, 2°57'23,54" E, male, 26 October 2009, on *Hedera helix* flowers, coll. J. Garrigue, det. MS, in coll. MS.

*Eumerus obliquus* is known from various Mediterranean islands, Italy, the Canaries and N. Africa, but has not previously been recorded from continental France. It is not known on the Iberian peninsula. It is a distinctive species in the male, with tufts of long, black, bristly hair on the tarsal segments of the hind leg. Both male and female can be identified using Stackelberg's (1961) key. It is a species of open, semi-arid/arid grassland, where it may be found in the vicinity of the channels of seasonal rivers and streams. What the indigenous European plant host of its larvae might be is unknown, but it is now developing successfully in the decaying fruit and platyclades of the introduced cactus *Opuntia ficus-indica* (Ricarte *et al.* 2008), and can be expected to occur where the cactus is found i.e. not necessarily in association with dry watercourses. Given the increasing frequency of *Opuntia* in southern Spain it would be surprising if *E. obliquus* remains unrecorded there. It has a highly

Mediterranean-type flight period, the adults only being found in September /October, although it flies from mid January through to mid November in Malta, where it is probably bivoltine (Martin Ebejer *pers. comm.*).

***Eumerus subornatus*** Claussen, 1989

Pyrenées-Orientales: Font Rovillada, UTM 31T 0645 1718, close to D 71, L'Albère, nr. Le Perthus; females, 8-11 July 1999; 400m; drinking at edge of spring in *Quercus ilex/Q. pubescens* forest; coll. and det. MS.

*Eumerus subornatus* was described by Claussen from a single male originating in Morocco. Its presence in Europe ("Pyrenees") was subsequently indicated by Schmid (1995), and more recently it has been found abundantly in the Cabañeros National Park, in central Spain (Ricarte and Marcos-García 2008). Carles-Tolrà and Rosado (2009) and Van Eck (2011) provided records from Portugal. To date, these are the only published records of the species. The female has never been described.

It is extremely similar in appearance to *E. ornatus*. Indeed, the two species can be almost indistinguishable in the field and may be found in flight together. Claussen (1989) figured differences in the male terminalia and the male frons. Differences between these two species are listed below, other than differences in the male terminalia, for which reference should be made to Claussen (1989).

***E. ornatus***

Male and female

Eye hairs: moderately dense and long, in the vicinity of the vertex nearly 2x as long as the length of the anterior ocellus.

Haltere: capitulum (and most of stalk) entirely lemon yellow.

Abdominal tergite 2: entirely without orange markings.

Male

Eyes: meeting above antennae for a distance almost 3x the median length of the frons.

Female

Lunule: in the form of an almost parallel-sided, raised bar, usually with a shallow, rounded, medio-dorsal projection (see Fig. 1A).

Scutellum: usually metallic bronze, contrasting in colour with the anterior part of the mesoscutum, which is almost black; hairs on posterior margin outstanding, longer than one third the median length of the scutellum.

***E. subornatus***

Male and female

Eye hairs: sparse and short, in the vicinity of the vertex shorter than the length of the anterior ocellus.

Haltere: parts of capitulum much darkened (dark grey/black), the rest of the haltere greyish-yellow.

Abdominal tergite 2: often narrowly orange along the anterior margin of the two transverse bars of silver-grey dusting, but otherwise as in *E. ornatus*.

Male

Eyes: meeting above antennae for a distance only slightly greater than the median length of the frons.

Female

Lunule: boomerang-shaped, much wider in centre than laterally, not elevated and with dorsal edge smoothly rounded, without any medio-dorsal projection (see Fig. 1B).

Scutellum: almost black, hardly metallic, mesoscutum and scutellum of uniform colour throughout; hairs on posterior margin curved around the edge of the scutellum and shorter than one third the median length of the scutellum.

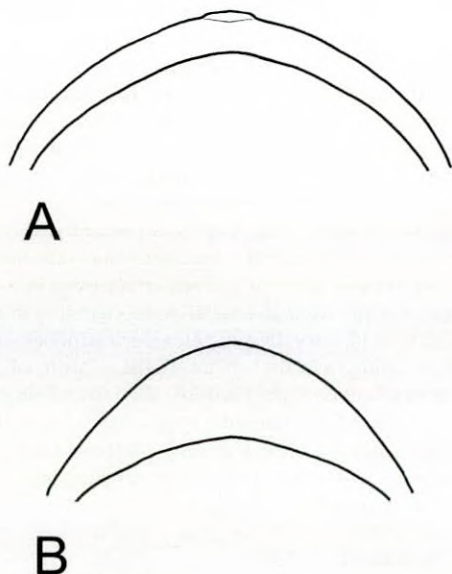


Fig. 1. Shape of lunule in female *Eumerus*, A = *E. ornatus*; B = *E. subornatus*.

The most comprehensive key to European *Eumerus* species is still that of Stackelberg (1961). When Claussen described *E. subornatus* only a single male was available to him and its tergites were without any orange markings. Both males and females of *E. subornatus* in which orange marks are absent from tergite two would run to *E. ornatus* in Stackelberg's (1961) key. But specimens in which orange marks are visible on tergite 2 (as is the case in nearly all Spanish *E. subornatus*) would run to a completely different part of the key. Orange-marked males of *E. subornatus* do not run convincingly to any species covered by Stackelberg. Orange-marked females run to *E. persarum* Stackelberg, a species described only from the female and still seemingly known only from the type material. The description Stackelberg (1961) provided of the abdominal markings in *E. persarum* does not coincide very well with the appearance of the markings observed in Spanish and French females of *E. subornatus*, but without checking the type material of *E. persarum* some doubt must remain as to how distinct these taxa are from one another.

The French record of *E. subornatus* extends the known European range of the species to the Massif des Albères, on the south-eastern flanks of the Pyrenees, in the Mediterranean zone of the Roussillon. In the Cabañeros National Park *E. subornatus* has been found in forest of *Quercus faginea*, *Q. pyrenaica* and *Q. suber* (Ricarte and Marcos-García 2008). The French record is from *Q. ilex/Q. pubescens* forest, which would also fall within the

thermophilous oak/evergreen oak forest habitat categories. At the Font Rovillada locality, females of *E. subornatus* were found in flight with females of *E. ornatus*.

***Ferdinandea fumipennis*** Kassebeer, 1999

Pyrenées-Orientales: Thuir, male, 21 March 2004, on sap-run on ancient *Quercus humilis*, coll. J. Garrigue, det. MS.

Var: island of Porquerolles, male, 22 February 2007, white trap; male 10 October 2007, yellow trap; collector unknown, det. MS, in coll. J.-P. Sarthou.

This syrphid was described from North Africa. Its presence in Europe was first noted by Ricarte and Marcos-Garcia (2007), who discovered that it is widely distributed in Spain, where it had previously been confused with the closely-related *F. cuprea* (Scopoli). All four European *Ferdinandea* species are now known from Spain (Ricarte *et al.* 2010). Ricarte *et al.* (2007) described the developmental stages of *F. fumipennis*. In Spain *F. fumipennis* is a species of *Quercus pyrenaica* forest and riparian *Fraxinus angustifolia* forest (Ricarte and Marcos-Garcia 2007). Neither of these tree species is present at the Thuir locality where *F. fumipennis* was found in France, the record suggesting that this hoverfly may under some circumstances develop in sap runs on trees of *Quercus pubescens* agg. The flight period of *F. fumipennis* is characteristic of many Mediterranean-zone syrphids, in that it is both very early in the year (February/March) and very late (September/October), with very few recorded occurrences from the intervening months. The flight season of another Mediterranean *Ferdinandea* species, *F. aurea*, is even more extreme, the insect being found on the wing only in September/October. *Ferdinandea fumipennis* may be separated from other European species using the keys provided by Speight and Sarthou (2011). Re-examination of *Ferdinandea cuprea* material collected in Mediterranean parts of France would be worthwhile, to check whether it includes *F. fumipennis*.

***Platycheirus transfugus*** (Zetterstedt, 1838)

Alpes-Maritimes: Val de Haute Boréon, 1800-2000m, LG 999.1915, PN de Mercantour, male, 2 June 2000, coll. P. Withers, det. T.R. Nielsen, in coll. P. Withers.

In Europe, this is essentially a Scandinavian species, though there is also a record from southern Germany. Outside Europe it is known from Kazakhstan, Kirgizistan, Mongolia and the Altai mountains (SE Siberia). In Scandinavia it is a denizen of *Pinus/Picea* forest and the Mercantour record is from a high valley with *Abies/Picea* forest (P. Withers *pers. comm.*). It is a member of the *Platycheirus ambiguus* group, best identified using Nielsen (2004) and Bartsch (2009). Its larval biology remains unknown.

**Acknowledgements**

Tore Nielsen kindly confirmed the identity of the *Platycheirus transfugus* specimen. We are also grateful to Henri-Pierre Aberlenc, Joseph Garrigue, Jean-Pierre Sarthou and Phil Withers, for the opportunity to examine material collected by them, and/or in their collections. We thank Martin Ebejer and Axel Ssymank for their helpful comments on an earlier version of the text.

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### Some new records of *Phaonia latipalpis* Schnabl (Diptera, Muscidae) from Wales and Devon –

During 2011 two specimens of a shining grey muscid with yellow legs and scutellum were swept in damp woodland, one male at a site in Wales and a female in Devon. These were identified as *Phaonia latipalpis* Schnabl using the key by d'Assis-Fonseca (1968). Diptera Cyclorrhapha. Calypttrata. Section (b) Muscidae. *Handbooks for the Identification of British Insects* **10**(4b), 1-119), in which the name *P. umbraticola* d'Assis-Fonseca is used for this species. A male was found on 14 May 2011 at Cwm Coed y Cerrig Nature Reserve (SO2921), Monmouthshire, a mixed broad-leaved woodland at the south end of the Black Mountains with alder (*Alnus glutinosa*) woodland in the valley bottom. Then a female was caught on 4 July 2011 at Water Cleave and Wansford Woods (SX7680) in the Bovey Valley Woodlands Nature Reserve, Devon, mixed broad-leaved woodland with streams.

This species was first recorded in Britain by E.C.M. d'Assis-Fonseca (1957). Some interesting and uncommon Diptera from East Kent, including a new species of *Phaonia* (Muscidae). *Entomologist's Record & Journal of Variation* **69**, 14-18), who described it as *P. umbraticola*. He found it at Woolwich Wood in East Kent from 1955 to 1958 and again in 1968, and also included a 1933 record from Farley Down, Hampshire. It has since been recorded at Wychwood Forest NNR, Oxfordshire in 1965, 1970 and 1973 (Pont, A.C. 1990. A list of Fanniidae and Muscidae (Insecta: Diptera) from the Wychwood Forest and Cothill Reserve, Oxfordshire. *Oxford Invertebrate Group* **3**, 19-25). There are a small number of other British records (Falk *et al.* in preparation) from Wiltshire, Norfolk, Yorkshire and the Isle of Mull, the last in 1991 being the only previous record more recent than those mentioned above. Most of the sites are broad-leaved woodland but the Mull site was on a south-facing cliff with calcareous flushes.

The Welsh male has a pair of long presutural acrostichal bristles, while these bristles are entirely lacking in the Devon female. The infraspecific variation in this character is taken into account in the handbook to the British species by d'Assis-Fonseca (1968), where the species is included in both sections of the key. The black palpi are broader in the female than in the male, but not significantly broader than in most species of the genus, so it is unclear why the name *latipalpis* was selected for the species.

The biology is unknown but adults have sometimes been found on butterbur (*Petasites hybridus*). The name *umbraticola* referred to its occurrence in shady woodland, perhaps a more appropriate name – **PETER J. CHANDLER**, 606B Berryfield Lane, Melksham, Wilts SN12 6EL



## A new species of the genus *Syntormon* Loew from Bulgaria (Diptera, Dolichopodidae)

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### Summary

A new species close to *Syntormon sulcipes* (Meigen), *S. bulgariensis* sp. n., is described from Bulgaria.

### Introduction

Species of the genus *Syntormon* Loew, 1857 are spread through all zoogeographical regions of the world, but are poorly known outside the Palaearctic Region. According to Grichanov (2011) and Yang *et al.* (2006) they are distributed as follows: Afrotropical 17, Oriental 15, Australasian 7, Nearctic 20, Neotropical 3 and Palaearctic 50 species and 2 subspecies.

Keys to the species of *Syntormon* have been published for the Palaearctic Region by Becker (1918), Parent (1938) and Negrobov (1975). Becker's key (1918) included 16 species and 1 subspecies, Parent (1938) included 21 species and 1 subspecies and Negrobov (1975) provided a key for 36 species and 2 subspecies, including 7 new species and 1 new subspecies. Subsequently the following new species have been described: *Syntormon dobrogicum* Parvu, 1985 from Romania; *Syntormon pseudopalmarae* Negrobov & Shamshev in Negrobov, 1985 from Russia; *Syntormon valae* Negrobov & Zhilina, 1986 from Mongolia; *Syntormon beijingense* Yang, 1998, *Syntormon zhengi* Yang, 1998, *Syntormon xinjiangense* Yang, 1999 and *Syntormon xizangense* Yang, 1999 from China.

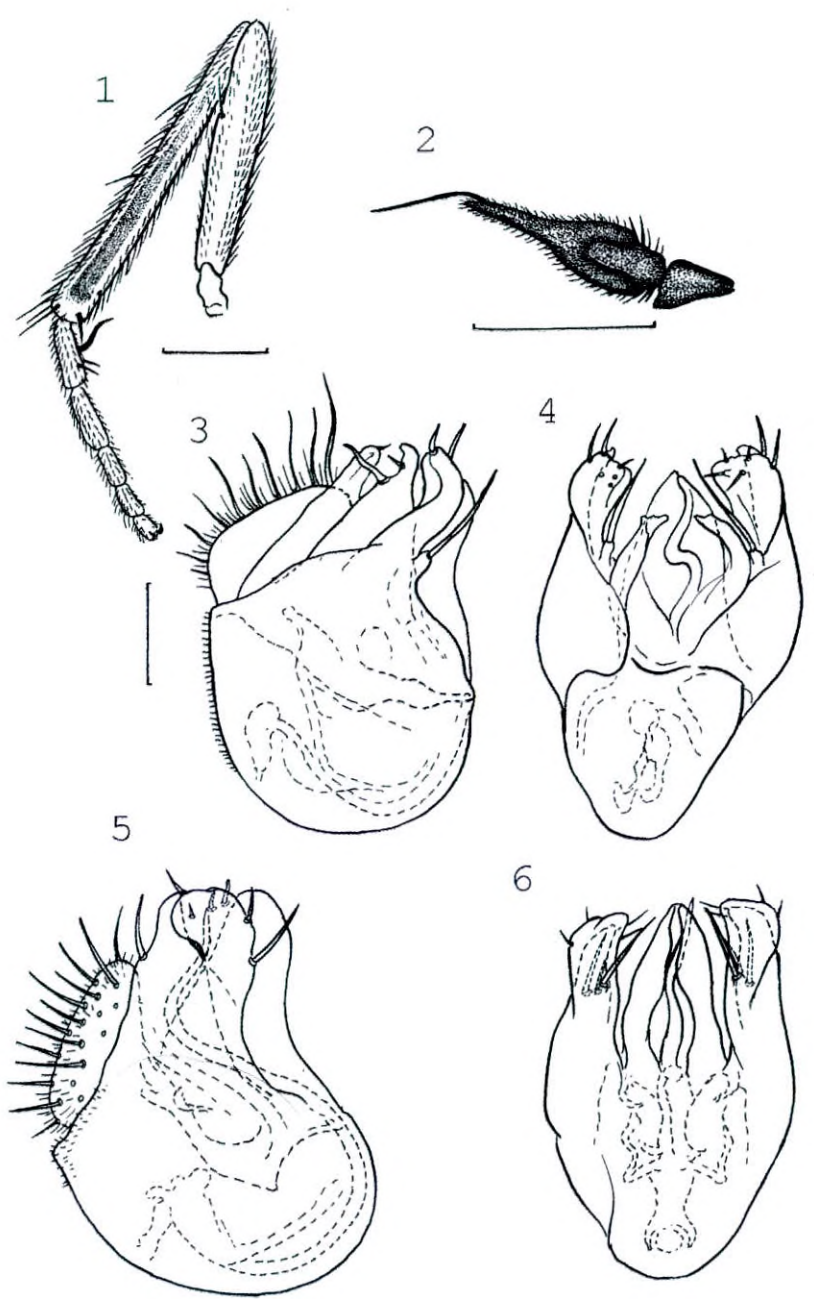
Parent (1938) included, in his key to the females of *Syntormon* species, a new subspecies of *S. sulcipes* (Meigen) as *Syntormon sulcipes obscurior* Parent, while this name is only otherwise mentioned in the description of the male of *S. sulcipes*; its geographical distribution and designation of a typical specimen were not indicated.

Among material collected by MK in Bulgaria a male specimen has been found, which is considered to be a species distinct from *S. sulcipes*, and to possibly correspond to Parent's subspecies *obscurior*. It has not, however, been possible to study the specimens to which Parent applied this name and enquiries at the Paris Museum have found that there are no specimens labelled *obscurior* in Parent's collection, and no dark legged specimens under the name *sulcipes* (Christophe Daugeron *pers. comm.*). As it cannot be confirmed that it is conspecific with *obscurior*, it has therefore been decided to describe the Bulgarian specimen as a new species.

*Syntormon bulgariensis* sp. n. (Figs 1-4)

### Material

Holotype male, BULGARIA, Pamporovo, Rhodopes Mts, 7.vii.2005, leg. M. Kechev. Type in collection Department of Agrotechnology, Higher School "Agricultural College".



**Description. Male.** Length of body 3.3mm, length of wing 3.3mm.

**Head.** Face silver-white, epistoma below antennae with a greenish shade, its median width less than half width of first flagellomere. Proboscis dark brown. Palpus brown with white hairs. Frons shining green without pollen. Antenna (Fig. 2) black; first flagellomere long, approximately 2.5 times longer than wide, with a pointed tip and clothed in small white hairs; arista subapical; relative length of first flagellomere, its width and length of arista: 8.2: 3.0: 4.2. Postocular bristles on the lower part of head are white.

**Thorax** green with a bronze shade. Mesonotum shining metallic green, pleuron bearing grey pollen. Anepisternum and katepisternum with small white hairs. Six strong dorsocentral bristles. Acrostichal bristles are well developed (15-16 bristles) and irregularly uniserial, occupying  $\frac{3}{4}$  length of mesonotum. Notopleuron and metepimeron with white hairs posteriorly. Scutellum with 2 strong marginal bristles and a small hair in front of and behind each bristle

**Legs** mainly black, with the following parts yellow: a narrow strip at tip of fore and mid femora, fore and mid trochanter, fore and mid tibia and the base of fore tarsomere; pulvilli white. Coxa with white hairs; mid coxa with a ventral bunch of black bristles, which almost form a thorn; hind coxa with 1 strong black external bristle. Fore femur without strong bristles and long hairs. Fore tibia with a number of short anterodorsal bristles developed on apical  $\frac{3}{4}$ , which are hardly shorter in length than the diameter of the tibia. Fifth tarsomere of fore leg a little expanded, with long black hairs. Relative lengths of tibia and the five tarsomeres of fore leg: 6.0: 3.5: 1.4: 0.9: 0.7: 0.7. Mid femur with 1 strong internal preapical bristle. Mid tibia without long bristles. Relative lengths of tibia and first and third tarsomeres of mid leg: 2.7: 2.5: 1.8. Hind tibia laterally compressed; lateral surfaces lacking hairs and bristles, but with short dense dorsal and ventral bristling, 3 longer anterodorsal and 12-13 posterodorsal bristles. First tarsomere of hind leg with a strong ventral bristle bent towards the base and 2-3 short anteroventral bristles (Fig. 1). First to fourth tarsomeres of hind leg on each side with short erect bristles of which length is almost equal to diameter of tarsomeres. Relative lengths of tibia and the five tarsomeres of hind leg: 12.5: 4.7: 3.0: 2.2: 1.3 1.2.

**Wing** transparent. Costal vein without any thickening.  $R_{4+5}$  and  $M_{1+2}$  parallel at tips.  $M_{1+2}$  hardly bent apically. Ratio of costal sector between  $R_{2+3}$  and  $R_{4+5}$  and that between  $R_{4+5}$  and  $M_{1+2}$  is 2.8:1.4. Apical part of  $M_{3+4}$  almost 1.5 times as long as tp: 2.0:2.9. Squamae yellow with white hairs. Halteres yellow.

**Abdomen** green with a bronze shade. Bristles on dorsal part of abdomen black. First and second segments of abdomen with long white hairs laterally. Sternites with long white hairs. The length of lateral and ventral hairs on first segment of abdomen almost equal to width of that segment.

### Diagnosis

In the Palaearctic key to the genus *Syntormon* (Negrobov 1975) the species approaches *Syntormon sulcipes* (Meigen, 1824) but differs in morphology of parts of the hypopygium (Figs 3-6) and in the following respects:

- Femora yellow, apical part of hind femur dark, fore femur dark dorsally. Hind tibia variable, dark at least at tip dorsally (may be entirely dark in British specimens). First flagellomere approximately twice as long as wide ..... *Syntormon sulcipes* (Meigen)

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**Figs 1-4. *Syntormon bulgariensis* sp. n. 5-6. *Syntormon sulcipes*. 1, hind leg; 2, antenna, 3-6, hypopygium. 1, 3, 5 lateral view; 4, 6 ventral view. Scale: 1-2 0.05mm, 3-6 0.01mm.**

- Femora black. Hind tibia black. First flagellomere approximately 2.5 times as long as wide ..... *Syntormon bulgariensis* sp. n.

### Acknowledgements

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**The Gloucestershire population of Downland Villa *Villa cingulata* (Meigen) (Diptera, Bombyliidae)** – A.E. Stubbs and C.M. Drake (2001). *British Soldierflies and their allies*. 512 pp. British Entomological and Natural History Society, Reading) include a report of the discovery of *Villa cingulata* (Meigen) in two places in the Cotswolds in 2000 and comment that very little is known about this rare species; one of these

two places was in Gloucestershire, the other south of Bath. As Diptera Recorder for the Gloucestershire Naturalists Society, records have been accumulating in my files since then and Martin Drake suggested that details of these should be published.

The species has primarily been found along the valley of the River Frome. This is a very unusual Cotswold river in that it originates on the dip slope of the Cotswold escarpment and would be expected to drain into the upper Thames, like the otherwise similar rivers of the Churn, Coln, Windrush and Evenlode. However, the Frome abruptly turns westwards near the village of Sapperton and cuts deeply through the underlying Oolitic Limestone of the escarpment, to flow into the river Severn. It is a classic example of river capture. A consequence for wildlife is that the open pastures along the north side of the valley are steeply south-facing, more so than elsewhere in the region. The valley between Sapperton and Stroud is known as the Golden Valley, presumably reflecting the warm and sunny aspect.

Up until 2000, the species has had no history in Gloucestershire. It was first noticed by Matthew Oates, 23.vi.2000, on Daneway Banks (SO9303), a large expanse of Cotswold pasture managed as a nature reserve by the Gloucestershire Wildlife Trust. It has been seen there regularly since then by a range of different recorders, and in varying numbers. Andy Foster noted it as 'common' in 2003 and John Phillips reported at least two females, apparently ovipositing by "flicking" in c.10cm tall turf on 6.vii.2009. It continues to be seen here e.g. on 24.vi.2011 by Martin Matthews. With attention focused on Daneway Banks, recorders began to report sightings close by in neighbouring grasslands, along the disused section of the Thames & Severn Canal downstream of the Banks and in neighbouring fields, often where tall and ungrazed: three seen in field opposite Daneway Banks (SO937033), 1.vii.2001, David Iliff; one taken by sweep-netting rank grassland in fields below Sapperton Common (SO933030), 17.vii.2002, Ingrid Twissell; along the canal banks below Siccaridge Wood Reserve (SO9203), 2.vii.2007, 6.vii.2010 and 24.vi.2011, Martin Matthews.

Farther afield, Matthew Oates has seen the species on Rodborough Common (SO80), at the west end of the Golden Valley in 2003 and other years, where the valley turns north-west and finally emerges from the Limestone escarpment. It has also been seen part way between Rodborough and Daneway, at Swellshill (SO859020), 1.vii.2011 by Guy Meredith, and Strawberry Banks Reserve (SO910032), 23.vi.2005 by Martin Matthews. The only reports from the valley above Daneway have been from 2007, from Caudle Green (SO9410), 4.vii.2007, Colin Twissell, and Miserden Park (SO9408), 16.vii.2007, Martin Matthews.

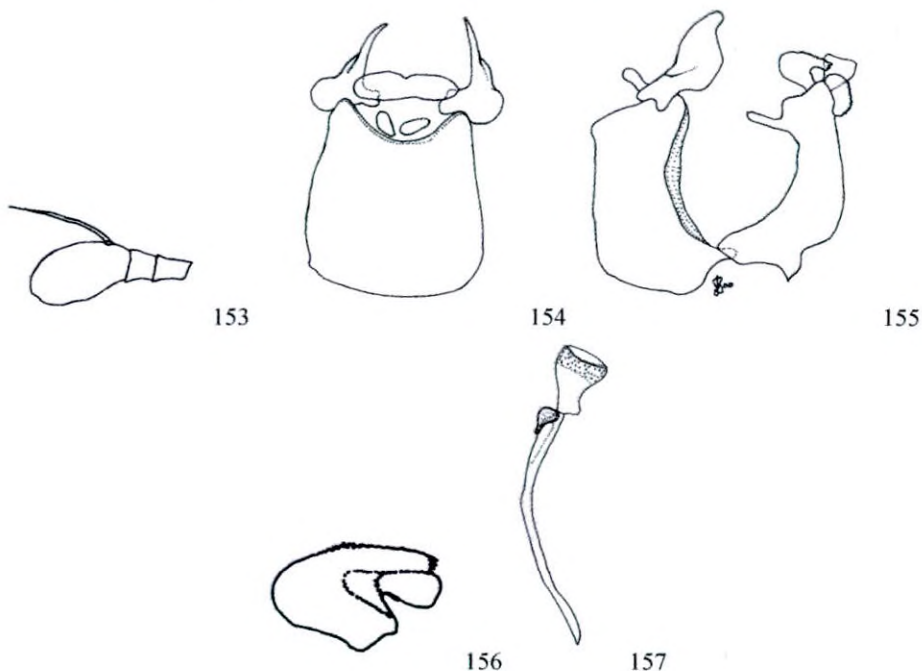
It has also been reported in the neighbouring Nailsworth Valley, which joins the Frome just west of Rodborough Common. Dave Gibbs saw a female at Scotland Bank, in the Woodchester side-valley (SO8300), 2.viii.2002. Matthew Oates has also seen the species deeper along the main valley at Nailsworth (ST858996).

The impression gained is of a population becoming noticed suddenly at Daneway Banks – still its main stronghold locally – and perhaps spreading along the main valley and into the adjoining Nailsworth valley as numbers have increased seasonally. This begs the question of how it got to Daneway in the first place. Could such a noticeable fly have been overlooked locally for so long? This does seem very unlikely as Daneway has been a 'hot-spot' for entomologists for a long time, as has Rodborough Common. It seems much more likely that it is a recent arrival to the valley, although how it colonised remains a mystery.

I would like to record my thanks to Dave Gibbs, David Iliff, Martin Matthews, Guy Meredith and John Phillips for copying their records to me, to Matthew Oates for miscellaneous data, and to Martin Drake for encouraging me to write this note and supplying further information – **KEITH N.A. ALEXANDER**, 59 Sweetbrier Lane, Heavitree, Exeter EX1 3AQ

**Revision of the West-Palaeartic species of *Pipizella* Rondani, 1856 (Diptera, Syrphidae) by JEROEN VAN STEENIS and JAN A.W. LUCAS *Dipterists Digest (Second Series)* 18, 127-180 - Correction**

A set of figures in this paper that appeared in the previous issue was unfortunately duplicated. Figs 153-157 of *Pipizella thapsiana* Kassebeer were missing and replaced by a duplicate of Figs 146-152, representing *Pipizella speighti* Verlinden. The figures of *Pipizella thapsiana* appear correctly below and should replace the figures on page 166 of volume 18.



**Figs 153-157. *Pipizella thapsiana* ♂: 153, left antenna, lateral view (paratype); 154-157, genitalia (Portugal): 154, dorsal view; 155, lateral view; 156, upper gonocercus; 157, aedeagus, lateral view.**

Also on page 165 in the list of material cited for *P. thapsiana* the abbreviation MRS should be MRA. A pdf of the paper with these corrections included is available from the author Jeroen van Steenis (j.van.steenis@xmsnet.nl).

**The hoverfly *Platynochaetus setosus* (Fabricius) (Diptera, Syrphidae) found alive in Britain** -

In March 1996, I was given a live female of *Platynochaetus setosus* (Fabricius, 1794), which had been found in a pack of broccoli purchased at a Tesco supermarket in Norwich. The pack was marked as being of Italian origin. This species is widespread in southern and central Europe, being known from Germany, France, Spain, Portugal, Italy, Mediterranean islands and North Africa. The larva is unknown.

*Platynochaetus* is a bee-mimic, which at first sight looks like a *Merodon* or *Criorhina*. It can be recognised by eumerine wing venation, and the presence, in the male, of a swollen tip to the arista. The eye is bare and the pedicel of the antenna is elongate, longer than the first flagellomere. P. Sack (1931 *Syrphidae*. 4(6), pp. 292-295. In Lindner, E. (Ed.) *Die Fliegen der Palaearktischen Region*) gave the best account of the Palaearctic species of the genus, among which *P. setosus* can be distinguished by the characteristic shape of the hind leg and presence of black hairs among the white or red ones on the abdomen.

Whether this fly is capable of establishing itself in the British climate is unknown, but it is evidently capable of arriving here alive and dipterists should examine any odd-looking bee mimic closely. The photograph (Fig. 1) gives a good idea of the general appearance of the species, and there are many photographs of live specimens available on-line.



Fig.1. *Platynochaetus setosus* (Fabricius), female, Norwich, 1996

I thank J.A. Folkes for donating the specimen to the Norwich Museum collections (no. NWHCM: 2010.159), and John Ismay and Zoe Simmons (Hope Entomological Collections, Oxford) for help in accessing literature – **A.G. IRWIN**, Norfolk Museums Service, Shirehall, Market Avenue, Norwich NR1 3JQ

**A female of *Coenosia tigrina* (Fabricius) (Diptera, Muscidae) preying on a male *Haematopota pluvialis* (Linnaeus) (Diptera, Tabanidae) -** On 7 August 2011 at Rosspanel Farm, St. Buryan, Penzance, Cornwall (SW390262), I observed a small grey muscid fly riding on the back of a male of the cleg *Haematopota pluvialis* (Linnaeus) (Tabanidae), which alighted on the ground in front of me. No struggling was observed, but once on the ground the smaller fly moved around to the eyes of the cleg and inserted its proboscis between the head and body of the tabanid (photograph on left). These flies were taken indoors and examined under the microscope. During a period of 45 minutes the muscid inserted its proboscis at five different points on the fly's body, between the tergites and at the junction of the legs with the body, working its way to the tip of the abdomen (as in the photograph on right). During this process it appeared to have sucked out its contents.



This observation, illustrated by the second photograph included here, has already been reported in the newsletter of the Cornwall and Isles of Scilly Federation of Biological Recorders (CISFBR). Keith Alexander forwarded the latter publication to Peter Chandler, who recognised that the muscid fly was *Coenosia tigrina* (Fabricius), well known to be predaceous on other Diptera, and later confirmed this identification when the two flies involved were sent to him.

*Coenosia tigrina*, like other predaceous muscids, usually takes prey smaller than itself but previous records indicate that this is not invariably the case. A note by B.M. Hobby (1931). The prey of *Coenosia tigrina* F. and other species of the genus. *Proceedings of the entomological Society of London* **6**,13-15) listed prey records made by A.H. Hamm that were mostly small or fragile but some were more robust, e.g. *Pollenia rudis* Fabricius (Calliphoridae), *Helina reversio* (Harris) (as *communis* Robineau-Desvoidy) and *Poliates domitor* (Harris) (as *albolineata* Fallén) (Muscidae). A.C. Pont and D. Werner (2006). The



feeding and reproductive behaviour of the Limnophorini (Diptera: Muscidae). *Studia dipterologica, Supplement 14*, 79-114) also reported robust prey for some muscids belonging to the genus *Lispe*.

I am grateful to Keith Alexander for his interest in this observation, to Peter Chandler for identifying the predator and to Adrian Pont for information on previous prey records of predaceous Muscidae - **BERNARD HOCKING**, Rosspanel Farm, St. Buryan, Penzance, Cornwall, TR19 6HS

## Corrections and changes to the Diptera Checklist (27) – Editor

It is intended to publish here any corrections to the text of the latest Diptera checklist (publication date was 13 November 1998; the final 'cut-off' date for included information was 17 June 1998) and to draw attention to any subsequent changes. All readers are asked to inform me of errors or changes and I thank all those who have already brought these to my attention. Changes are listed under families; names new to the British Isles list are in bold type. The notes below refer to addition of 4 species, resulting in a new total of **7055** species (of which 37 are recorded only from Ireland), and the addition of 1 imported species.

An updated version of the checklist, incorporating all corrections and changes that have been reported in *Dipterists Digest*, is now available for download from the Dipterists Forum web site. It is intended to update this regularly. This presently excludes the original introduction, but a revised version of that will also soon be placed on the web site.

**Correction** p. 98. *Megaselia scalaris*. This imported species, which is established as a breeding species only within buildings, was first recorded in Britain by Disney (1981a), not as stated by McCrae (1967). The volume number of the latter reference was also given wrongly and should be 102.

### Changes

**Chironomidae.** See Changes to the Irish Diptera List (17) (p. 76 above)

*Limnophyes platystylus* Murray, 2007 ++

**Dolichopodidae.** The following genus and species are added in the present issue:

**ASYNDETUS** Loew, 1869

*Asyndetus latifrons* (Loew, 1859 – *Diaphorus*)

**Phoridae.** The following species was added by R.H.L. DISNEY (2011. *Megaselia nigriceps* (Loew) variety *funesta* Schmitz (Diptera: Phoridae) now recognised as a distinct species. *Entomologist's Gazette* **62**, 277-281):

*Megaselia funesta* Schmitz, 1935

**Syrphidae.** The following genus and species are recorded in the present issue as an "Imported species" that has not become established:

**PLATYNOCOAETUS** Wiedemann, 1830

*Platynochaetus setosus* (Fabricius, 1794 - *Syrphus*)

The following species is added in the present issue:

*Xanthogramma stackelbergi* Violovitsch, 1975

## *Xanthogramma stackelbergi* Violovitsch (Diptera, Syrphidae) in Britain

- For more than a decade it has been known that *Xanthogramma pedissequum* (Harris) is a species complex that includes two cryptic species in Europe, and that at least one of the extra species occurs in Britain. The limits of variation in the three taxa and whether these extra species corresponded to described taxa awaited resolution. For example *flavipleura* Coe from Plitvice, Croatia, was described as a variety of *X. pedissequum*. Both the type specimen and a British specimen labelled by Coe as *flavipleura* have disappeared from the Natural History Museum collection. Meanwhile, I have been accumulating records.

H. Bartsch (2009. *Diptera: Syrphidae: Syrphinae*. 406 pp. Nationalnyckeln till Sveriges Flora och Fauna) identified as *X. stackelbergi* Violovitsch, 1975 (described from Russia) the taxon that had been segregated among British material. A key by M.C.D. Speight (2011. Is *Xanthogramma stackelbergi* present in Britain? *Hoverfly Newsletter* 50, 7- 8) included three taxa that have been confused under *X. pedissequum*. That key was complex, so a more pragmatic approach was proposed (Stubbs, A.E. 2012. *Xanthogramma pedissequum* group. *Hoverfly Newsletter* 52, 14-15). The third species *X. dives* (Rondani) is mainly Mediterranean, but with a range that could extend to Britain; its identity was established by M.C.D. Speight and D. Sommaggio (2010. On the presence in Switzerland of *Microdon myrmicae* Schönrogge *et al.*, 2002, *Xanthogramma dives* (Rondani, 1857) and *X. stackelbergi* Violovitsh, 1975 (Diptera, Syrphidae). *Entomo Helvetica* 3, 139-145), who designated a lectotype. In ideal specimens of *X. dives* the darkened wing apex makes it recognisable, but as yet no such specimens have come to my attention.

The following *X. stackelbergi* records are from my collection: one male, [? date] 2001, Fineshade Wood, Duddington, Northamptonshire and four females, 31.vii.1980, Orlestone Forest, Ham Street, Kent; 27.vii.1989, Windsor Forest, Berkshire; 21.vii.2004, a garden in Guildford, Surrey; 27.vii.2011, Pewley Down, Guildford, Surrey. There is further material in the Hope Department, Oxford and the Natural History Museum, London which indicates that *X. stackelbergi* is widely distributed across southern England. The above male and characters that separate females from *X. pedissequum* are illustrated in photographs on the front cover.

*Xanthogramma stackelbergi* is a woodland species, judging from most of the data labels on museum specimens. Speight and Sommaggio (*op. cit.*) and Speight (2011. Species accounts of European Syrphidae (Diptera), Glasgow 2011. *Syrph the Net, the database of European Syrphidae*, Vol. 65, 285 pp. Syrph the Net publications, Dublin) regarded it as a wood edge species, so woodland rides may be the best place to look. I swept the Duddington male from grasses (false brome, *Brachypodium sylvaticum*) far under the tree canopy on a sunny day, at least raising the possibility that it may develop in shaded habitats. Many years ago I saw a group of about six male *Xanthogramma* 'pedissequum' hovering in dappled shade only about 30cm above the ground where the ground flora was very short. This situation seemed odd, so perhaps I was unknowingly observing *X. stackelbergi*?

By contrast, the true *X. pedissequum* is an open grassland species, but the two species could co-exist where grassland extends up to wood edge or in wider and more open woodland rides. On rare occasions it has appeared in my garden in central Peterborough (and in the nearby garden of Stuart Ball *pers. comm.*), which suggests that it can disperse quite well. As yet it is unknown whether lawns might provide larval habitat; indeed the larvae have rarely been found but are believed to feed on root aphids; the role of ants may be significant. In my experience *Xanthogramma* species always occur in very low numbers (apart from the concentration described above) - **ALAN E. STUBBS**, 181 Broadway, Peterborough PE1 4DS

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