Dipterists Digest

2011 Vol. 18 No. 1

Cover illustration: A mating pair of the hoverfly *Microdon myrmicae* (Schonrögge *et al.*) (Syrphidae) from Locks Park Farm, Hatherleigh, Devon, 9 June 2009 (see article on this species by Robert Wolton on pages 55-67).

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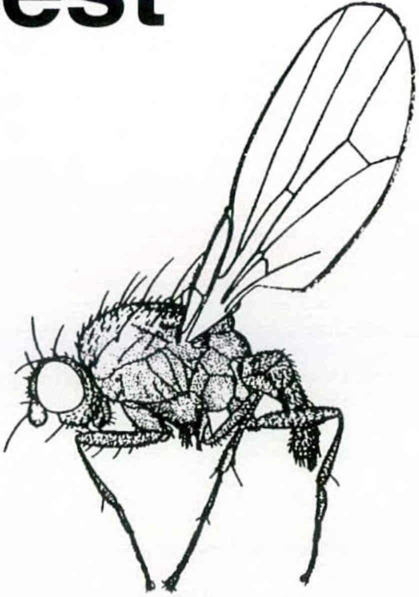

Vol. 18 No. 1

Second Series

2011

Published 30th June 2011

Published by

Dipterists
Forum

ISSN 0953-7260

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;
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- 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.

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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.

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Additional records of *Actenoptera hilarella* (Zetterstedt) (Diptera, Piophilidae, Neottiophilinae) from Scotland, and notes on the J.J.F.X. King Collection

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Summary

New records of *Actenoptera hilarella* (Zetterstedt, 1847) are presented, with a summary of existing data on its distribution. The species appears to be rarely recorded and its biology remains unknown. The specimens were part of extensive unsorted material from the collection of J.J.F.X. King.

Introduction

On the basis of a female example Collin (1927) introduced *Actenoptera hilarella* (Zetterstedt, 1847) as new to the British Isles. The record was based on a specimen from Sudbury, Suffolk collected in 1925 and found in the collection of B. Harwood. The description by Collin (1927) confirms the identity of two specimens found in the Hunterian Museum, University of Glasgow, as this species. These were collected by J.J.F.X. King at Aviemore on 3 August and 12 August 1903; the latter example has lost its abdomen. They were tentatively labelled 'near *Eccoptomera*' by King but various characters, the most obvious of which is the setose radial vein, key them directly to subfamily Neottiophilinae.

British records of *Actenoptera hilarella*

The short note by Collin (1927) had been missed by Kloet and Hincks (1945) and so *A. hilarella* was re-introduced to British dipterists by Cogan and Dear (1975) after they had found two more museum specimens. These were from Kinrara, Strathspey, 9 July 1936 and Culbin Sands, Moray, 14 July 1938. Since the acquisition in 1982 of the C.H. Andrewes collection by the Natural History Museum, London, another Scottish specimen was known to exist, from Loch Garten, 23 June 1959 (Nigel Wyatt *pers. comm.*). Skidmore (2009) added a further record from Kinloch Castle grounds on the island of Rum and the specimen, which is in the Manchester Museum collection, was collected by Alan Brindle on 3 June 1960. So the total number of British records of *A. hilarella* now includes six sites, four in north-eastern Scotland and one in East Anglia, all at least 50 years ago.

Nothing has been recorded concerning the biology of *Actenoptera*, although it has been considered possible that it develops in nests like the allied genus *Neottiophilum* von Frauenfeld and this has been stated to be the biology by several authors.

Non-British records of *Actenoptera hilarella*

The type description (Zetterstedt 1847, vol. 6 pp. 2467-2468) provided the earliest record, from an alpine inn or lodging in Suulstua, in the province of Nord-Trøndelag, Norway. Other records are a wooded gorge ('Waldschlucht') in Admont, Styria, Austria and from Tatra, an area south of Krakow on the border between Poland and Slovakia (Czerny 1930). Barták (2009) lists it from both the Czech Republic and Slovakia. It is also known from Lithuania

(Pakalniškis *et al.* 2000). *Actenoptera hilarella* has also been found recently in a number of sites in mountain areas of Norway with a presumably old undated record from Oslo (Greve 2005), and in Switzerland (Merz 1996). There is a specimen dated 1980 from Jämtland, Sweden in the Natural History Museum, London (Nigel Wyatt *pers. comm.*). McAlpine (1977) reported *A. hilarella* from North America, where it is widespread in both Canada and U.S.A., thus establishing that the species is Holarctic; he described a second species of the genus from Canada.

The King Collection

The above specimens of *A. hilarella* were found amongst unsorted Heleomyzidae in the collection of James Joseph Francis Xavier King (1855-1933). King bequeathed the biggest collection of insects to arrive in the Hunterian Museum during the twentieth century (Ross 1936). He was such a prolific collector that a considerable quantity of his material is a resource yet to be fully realised. Specimens date from about 1877 to 1930. King collected mainly in Scotland but had a particular interest in Ireland and visited there several times (e.g. King and Halbert 1910). He also paid many visits to the south of England, mainly in the New Forest and as far west as Cornwall. King operated on a scale that is quite unusual. Apparently common and widespread species were collected in large numbers in each place. This is an excellent way of finding the rare or cryptic species, which he did particularly in many groups of freshwater insects and was responsible for discovering many species new to Britain. Nothing was too obscure and there are large numbers of Psocoptera, quite a few Thysanoptera and even fleas and free-living mites, all either pinned or carded and labelled. There are huge numbers of the smaller parasitic Hymenoptera, regarding which one of his obituarists recounted how impressed King's contemporaries were with his ability to set such small insects so perfectly (Anonymous 1933). A considerable quantity of material collected by him can be found in other museums such as Edinburgh (National Museums of Scotland), London (the Natural History Museum) and Dublin (National Museum of Ireland). However, the great bulk of his collection is in Glasgow.

Acknowledgements

David Horsfield put aside the specimens after going through the King collection looking for Heleomyzidae; on the basis of a conversation with Peter Chandler it was concluded that they were of the genus *Actenoptera*. Nigel Wyatt provided information from the Natural History Museum, London and Peter Chandler confirmed the identity of Andrewes' specimen there. Dmitri Logunov (Manchester Museum) provided information on the Rum specimen.

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An unusual rearing of *Chloromyia formosa* (Scopoli) (Diptera, Stratiomyidae) – One of us (LS) was rearing a number of Duke of Burgundy Fritillary butterflies, *Hamearis lucina* (Linnaeus), on cowslip *Primula veris* of which several plants were grown in compost (an equal-parts mix of peat-free potting compost and John Innes no 2, made and potted up about a year previously) in a 25cm diameter flower pot protected by netting, at Lancaster from the summer of 2010 onwards. When the caterpillars, obtained in South Cumbria, pupated (late summer) they were left *in situ*, either on withered leaves or on the compost, under sheltered but otherwise open outdoor conditions and still under netting through the winter, to replicate natural conditions as far as practicable. They were inspected for health every 3 weeks or so; on 11.iv.2011 one of the pupae that had previously appeared healthy was seen to have been consumed and a fly larva, lying next to it on the soil surface, was considered to be the culprit. Because it was at first presumed to be a parasitoid, within a day or two it was sent to MRS, along with the *H. lucina* pupal remains, for comment.

The *H. lucina* pupa had been virtually completely excavated and had been torn and deformed inwards more or less along the anteroventral ecdysial lines. It was left slightly darkened. The larva that had apparently eaten it was evidently a stratiomyid, and it was placed onto a small piece of damp pre-searched moss beside a healthy pupa of the Large White butterfly, *Pieris brassicae* (Linnaeus), in a covered 5 cm diameter Petri dish. However, it did not feed on that, but instead entered the moss to pupate. An adult male *Chloromyia formosa* (Scopoli) emerged on 16.v.2011 (the vacated puparium was recovered).

The larva of the stratiomyid *Chloromyia formosa* (Scopoli) is generally regarded as a compost-feeder and has been reared from cowpats (Stubbs, A.E. and Drake, M. 2001. *British Soldierflies and their Allies.* British Entomological and Natural History Society). The circumstances of the present rearing very strongly indicate that it had fed on a pupa of *H. lucina*, although how it had accessed it is unclear. Because earlier inspection of the butterfly pupa had suggested that it was fully healthy, it appeared that the *C. formosa* larva might even have been a predator rather than a saprophage, though this is less easy to believe from its known habits, the structure of its mouthparts not resembling that of a predator and the lethargic progression characteristic of terrestrial stratiomyid larvae. The specimen has been deposited in the National Museums of Scotland – **MARK R. SHAW,** Honorary Research Associate, National Museums of Scotland, Chambers Street, Edinburgh EH1 1JF and **LAURA SIVELL,** 22 Beaumont Place, Lancaster, LA1 2EY

Phytomyza astrantiae (Hendel) (Diptera, Agromyzidae), an update

– Given that *Phytomyza astrantiae* (Hendel, 1924) is but a recent addition to the British list (Homan, R. 2009. *Phytomyza astrantiae* (Hendel, 1924) (Diptera, Agromyzidae) new to Britain. *Dipterists Digest* (*Second Series*) **16,** 183-184) it is not surprising that more information about this agromyzid has recently come to light. H.C.J. Godfray (2010. Further British records of *Phytomyza astrantiae* (Hendel, 1924) (Diptera, Agromyzidae) and its parasitoids. *Dipterists Digest* (*Second Series*) **17,** 60) has shown that the distribution pattern extends into Oxfordshire and I have recorded mines in recently created gardens at Croome Park in Worcestershire in July 2010 and in Kendal, Cumbria in September 2010. Both of these records lend weight to the argument that the purchase and movement of *Astrantia* plants is a vector for the spread of the fly. In view of previous comments about the potential widespread distribution of the species, these are not especially surprising records. However, observations of larvae feeding in the autumn suggest that we may not yet fully understand the phenology of the species.

The initial British records of this leaf miner were based on larvae found in late May with adult flies emerging in mid-June. E.M. Hering (1957. *Bestimmungstabellen der Blattminen von Europa: einschliesslich des Mittelmeerbeckens und der Kanarischen Inseln* **1,** 144. Junk, 's Gravenhage) indicated that the species is bivoltine with larvae found in April-June and August. However, tentative evidence of an additional generation came to light in October-November 2010. While tidying a herbaceous border containing many *Astrantia* plants on 28 October, I noticed a leaf mine which was much paler than would be expected at that time of year, when the late summer mines tend to be heavily discoloured brown. On close examination it was apparent that a larva was actively feeding in the mine. This larva had pupated by 1 November. Looking at the bed again on 2 November produced another tenanted mine, and three examples where the larvae had died before pupating. The viable larva emerged from the mine in the morning of 9 November and had pupated by the afternoon. A third example of a larva feeding outside in the garden was found on 10 November, in a mine just 7mm in length.

For there to be a third generation of *P. astrantiae,* two sets of conditions must be met: the state of the weather in the late summer and early autumn must ensure that an abundance of fresh foliage is produced; *Astrantia* is not drought tolerant and the crowns produce very little growth in a British "Indian Summer". In addition, the weather conditions must favour the emergence of adult flies, so that eggs can be laid to produce the third generation, and also ensure the survival of the larvae. Whether the conditions in my Cheltenham garden in 2010 were a one-off and the records represent an opportunistic response to favourable events or whether *Phytomyza astrantiae* can be described as a trivoltine species will need further evidence from a wider geographical sample – **ROBERT HOMAN,** The Apiary, Swindon Lane, Cheltenham, Glos., GL50 4PD

Dipterists Digest 2011 **18,** 5-6

Sciomyza dryomyzina (Zetterstedt) (Diptera, Sciomyzidae) from Oxfordshire

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Summary

A record of *Sciomyza dryomyzina* (Zetterstedt), a scarce snail-killing fly, is reported from Oxfordshire. Its distribution and reasons for its scarcity are discussed.

A female sciomyzid fly was captured on 21.v.2010 near Kidlington, Oxfordshire (V.C. 23, SP4915) and was identified as *Sciomyza dryomyzina* using the keys of Rozkošný (1984). The identification was confirmed from photographs of the pinned specimen by Steven Falk (Warwickshire Museum). The site includes meadow, scrub and open woodland and is on a floodplain adjacent to the River Cherwell. This area regularly floods in winter, and includes seasonal ponds, which dry out by mid-summer, as well as wide drainage ditches leading back into the main river. Whilst this paper was in preparation a further record was reported to me (Roy Crossley *pers. comm.*): 1 male, 9.v.2011, Fulford Ings, Yorkshire (SE610487), a site bordering the River Ouse, which also regularly floods.

Falk (1991) stated that this fly is known from only eight British sites, and assigned Vulnerable status. By adding data from the NBN Gateway, two sites reported by Steven Falk and Fulford Ings, this fly has been observed from 1898 to 2011 from 16 sites (not all verified): North West Wales – 2 (1920s, 1969), Yorkshire – 2 (1925, 2011), Suffolk – 3 (1898, 1921), Surrey – 1 (1968), Norfolk – 1 (1988), Cambridgeshire – 1 (1989), Sussex – 2 (1989, 1990), Watsonian Warwickshire – 2 (2009, 2010), and Watsonian Oxfordshire – 2 (1962 and 2010). The two Oxfordshire sites are on floodplains, those sites on the NBN Gateway are immediately adjacent to waterways, and may represent floodplains.

It would appear that potentially suitable habitat is floodplain meadows, and other marshy ground, which has not been drained for arable agriculture (but may be grazed in summer). On the basis of habitat extent this fly should be more widespread than the paucity of records would suggest; *S. dryomyzina* is Holarctic in distribution (Knutson 1988), being widespread in the Palaearctic from Ireland to Western Siberia, but is relatively uncommon. It might be thought that the absence of its larval host/prey on otherwise suitable sites is the limiting factor. In larvae reared under laboratory conditions, from flies collected in Sweden (Knutson 1988), it was reported that they were selectively predaceous on living *Oxyloma elegans* (Risso) (listed as *Succinea pfeifferi* Rössmässler in the paper), killing more than one snail before pupating, although they were not offered alternative species of succineid snail prey. However, Foote *et al.* (1999) reported that in Alaska the larvae are parasitoid on the hygrophilous terrestrial succineid snail *Oxyloma decampi gouldi* Pilsbry, completing their larval life in one snail. Thus it appears that the larvae of this fly have a narrow diversity of life cycles, being either predaceous or parasitoid on at least two different, but closely related, species of snail. In Britain there are two succineid snails of the genus *Oxyloma*: *O. elegans* (Risso) and *O. sarsii* (Esmark); *O. elegans* is widely distributed throughout England and Wales (NBN Gateway), whereas *O. sarsii* is local and its distribution appears to be similar to that of *S. dryomyzina* (NBN Gateway). There are also two other inland succineid snails in

Britain: *Succinea oblonga* Draparnaud, which is local (but its distribution is different to that of *S. dryomyzina*) and *S. putris* (Linnaeus), which is widely distributed throughout England and Wales. Succineid snails of both genera, *Oxyloma* and *Succinea*, are present at the Kidlington site on the undergrowth at the edge of the thin woodland adjacent to temporary ponds and drainage ditches. These snails have not been identified to species as they can only be distinguished by dissection.

The apparent restriction in distribution of *S. dryomyzina* to only part of the distribution of its snail prey is also shown by *S. aristalis* Coquillett (Foote 1959). *Sciomyza aristalis* is found in the Nearctic region where it shows a distinct preference locally for rather open floodplain woods with luxurious herbaceous undergrowth. The fly habitat preferences parallel those of the host snail *Succinea ovalis* Say, but the snail occupies a greater breadth of habitats, being also present in drier habitats. It seems likely that *S. dryomyzina* may also only inhabit part of the range of habitats occupied by its larval host/prey, also avoiding drier habitats and it may prefer sites where water level fluctuations result in hosts becoming vulnerable and more available (Martin Speight *pers. comm.*). However, it is also likely that *S. dryomyzina* like other Sciomyzidae, and other Diptera, are also remarkably under-recorded, hence its true distribution may be more extensive.

Acknowledgements

I am grateful to Steven Falk and Roy Crossley for supplying information on this species, and to Ian McLean and Martin Speight for comments on the manuscript.

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Dipterists Digest 2011 **18**, 7-8

Liriomyza puella (Meigen) (Diptera, Agromyzidae) new to Britain

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Summary

Liriomyza puella (Meigen, 1830) is added to the British list, based on specimens reared from *Lapsana communis* in Oxfordshire. Details are given of how it can be separated from other British species of *Liriomyza* and of four parasitoid species that attack it in Britain.

For the last five years I have observed blotch leaf mines of an agromyzid on *Lapsana communis* growing in my garden and surrounding woodland near Goring Heath, south Oxfordshire (SU6779). The only agromyzids recorded on this host plant by Spencer (1972) are *Liriomyza strigata* (Meigen, 1830), *L. eupatorii* (Kaltenbach, 1873) (rarely) and *Phytomyza marginella* (Fallén, 1823), all of which have distinctive mines that are not blotches. In continental Europe Hering (1957), Spencer (1990) and Ellis (http://www.bladmineerders.nl/index.htm) record a single agromyzid blotch miner on *Lapsana*, *Liriomyza puella*.

From a collection of mines made on 1 August 2010, 13 (11 females, 2 male) specimens of a *Liriomyza* species emerged between 20 and 28 August. The specimens keyed to *L. puella* in Spencer (1976) and matched his description of the species. The male genitalia were compared to the illustration of *L. puella* in Spencer (1976) and in Spencer (1990) who also illustrated the genitalia of *Liriomyza* species feeding on related food plants. Compared to other agromyzids, the genitalia of this group are rather little differentiated but the relatively bulbous shape of the distal aedeagus with a pronounced central process matches the characteristics of this species.

In Fauna Europaea (Martinez 2010) there are records of *L. puella* from Austria, the Czech Republic, Denmark, France, Germany, Holland, Lithuania, Poland, Slovakia, Spain and Sweden, and Spencer (1976) also listed a record from Russia (Karelia). In addition to *L. communis,* Hering (1957) gave *Prenanthes purpurea*, which is not recorded in the wild from Britain, as a food plant, and Ellis (*loc. cit.*) adds *Mycelis muralis* and *Cichorium intybus*. Spencer (1976) stated that the species is local in Scandinavia and the same is probably true in Britain. Mines, almost certainly of this species, have also been seen at the Hartslock Nature Reserve near Goring, Oxfordshire (SU6179)

In Spencer's (1972) key to British species of *Liriomyza* this species runs to couplet 10, which includes *L. orbona* (Meigen, 1830) and *L. infuscata* Hering, 1926 (= *L. portentosa* Spencer, 1971). It is distinguished from both these species by the mesopleura being largely yellow (black only along lower margin) rather than three quarters dark, and by both vertical bristles being on a yellow ground. *Liriomyza puella* can be separated from other *Liriomyza* species forming blotch mines on Cichorieae (= Lactuceae: Asteraceae with white latex) such as *L. sonchi* Hendel, 1931 and *L. taraxaci* Hering 1927 by it having a brown third antennal segment (darker after death than in fresh specimens) and in having predominantly black femora.

The egg is laid on the upper surface of the leaf and the initial mine is a short, rapidly broadening corridor that quickly becomes a blotch. The blotch is at first roughly circular or slightly elongate, and appears dark with white borders; the mature mine becomes more irregular. Hering (1957; reproduced in Spencer 1976) illustrated the mine of this species on *Prenanthes purpurea*, though the conspicuous feeding lines on this plant are a little less apparent in *Lapsana*. Pupation takes place outside the mine and the puparium has three bulbs around the posterior spiracles. A collection of mines made in early July 2009 were largely vacated and produced only a single parasitoid, suggesting that the species is bivoltine in Britain as Hering (1957) stated it is on the continent. *Liriomyza strigata* and *Phytomyza marginella* also mined *Lapsana* at the same locality.

In addition to the 13 flies, 23 parasitoids emerged from the collection of mines made in 2010. Twenty were specimens of the endoparasitoid *Chorebus daimenes* (Nixon, 1945) (Hymenoptera, Braconidae, Alysiinae). Griffiths (1968) recorded this species as a specialist on *Liriomyza* attacking a variety of species though *L. puella* appears to be a new host record. The other parasitoids were two specimens of *Pnigalio soemius* (Walker, 1839) and one of *Hemiptarsenus unguicellus* (Zetterstedt, 1838) (both Hymenoptera, Eulophidae, Eulophinae), both common and polyphagous ectoparasitoids of leaf miners, especially those feeding on low-growing plants. A single parasitoid which was reared from a *L. puella* mine collected on 5 July 2009 was a male *Chrysocharis entedonoides* (Walker 1872) (Hymenoptera, Eulophidae, Entedontinae), which Hansson (1985) recorded from various agromyzids in different genera feeding on herbs, including *L. sonchi* which has a similar biology to *L. puella*. The only parasitoid previously recorded from *L. puella* that I am aware of is *Chorebus testaceipes* Griffiths, 1968. This species, which has not been recorded from Britain, is very similar to *C. daimenes* although it has darker legs.

All specimens are currently in my collection, which has been formally gifted to the National Museum of Scotland (NMSZ 2007.008).

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Dipterists Digest 2011 **18,** 9-26

The Diptera of a wet woodland in Devon

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Summary

Diptera were recorded at a wet alder wood, using a Malaise trap, from April to December 2005 and by sweep-netting from June to November 2007. The most species-rich families were Mycetophilidae, Limoniidae, Dolichopodidae, Empididae and Muscidae, and these also included many individuals. Ephydridae, Sciomyzidae and Syrphidae were poorly represented, in contrast to their importance in unshaded wetlands. Similar results are presented for other wet woods in south-west England. Eighteen species of conservation concern were present, and some were recorded several times, suggesting that they were residents. Seasonal variation in species-richness of different families was illustrated. The probable size of the resident wetland and woodland fauna was obtained using the Chao 1 estimator, which appeared to give an unrealistically high value of twice that observed. Species of the ISIS wetland and woodland assemblage types were most frequent in the first part of the year, and may not be so well represented after July. It was therefore suggested that monitoring wet woodland assemblages for ISIS purposes is better undertaken earlier rather than later in the year until fungus gnats and all muscids are included in ISIS.

Introduction

Wet woodlands have a reputation among dipterists for their rich fauna (Boyce 2002, Kirby 1992, Fowles 1994). This appears to be based almost entirely on unpublished evidence, although the foundation is not only reliable but also repeatedly confirmed during the Dipterists Forum's field meetings. The Diptera of wet or damp woodlands are included as part of wider studies (e.g. Stubbs 1974, Pollet and Grootaert 1987, Olechowicz 1988, Tayoub *et al.* 1990, Salmela *et al.* 2007, Salmela 2008) but few (e.g. Va•hara 1986) appear to focus exclusively on this habitat. A few studies have investigated individual species of this habitat, for example craneflies in the genus *Lipsothrix* following their inclusion on the Biodiversity Action Plan (BAP) (Godfrey 2000, 2001). However, wet woodlands are an EU Habitats Directive interest feature (Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*) and a priority habitat in the UK BAP. The paucity of evidence to support their value for invertebrates could lead to an aspect of their conservation importance being overlooked. The first stage is therefore to provide a basic ecological description that would include representation of families, species, assemblages and species richness. This information can be used to help refine monitoring, which is a requirement on sites of special scientific interest (SSSIs). The recent development of a system for formally monitoring invertebrates on SSSIs (Webb and Lott 2006) and, far more importantly, its actual implementation, gives an impetus to basic descriptive ecology that has been so often ignored as out-moded. This paper reports the results of sampling from a small wet woodland in Devon which was selected because it conveniently lies alongside the author's rural garden, and was undertaken for the author's amusement.

Methods

Burridge Common is a mosaic of woodland and grassland in an incised valley in east Devon (ST311059) (V.C. 9, West Dorset). It lies entirely on Upper Greensand at 120-170m OD. Seepages arise near the bottom of the valley and permanent springs issue about 400m upstream of the study site. These feed a small stony stream that runs eventually into the River Axe which discharges into Lyme Bay. Wet woodland dominated by alders (*Alnus glutinosa*) and grey sallow (*Salix cinerea*) lies at the bottom of the valley, and is replaced on drier slopes by hazel-ash woodland (*Corylus avellana*, *Fraxinus excelsior*). The wet organic silt is circum-neutral to very slightly acid, and supports a vegetation of nettles (*Urtica dioica*), golden saxifrage (*Chrysosplenium oppositifolium*), iris (*Iris pseudacorus*), giant horsetail (*Equisetum telmateia*), creeping buttercup (*Ranunculus repens*) and, in the runnels, fool's watercress (*Apium nodiflorum*). The wet woodland falls into the National Vegetation Classification type *Alnus glutinosa - Fraxinus excelsior - Lysimachia nemorum* woodland, *Urtica* subcommunity (W7a) (Rodwell 1991). The site has not been managed for several decades, although it is has changed in the last few years as a result of alders dying from *Phytophthora* and severe spates removing much organic silt close to the stream. The stream is stony as a result of Greensand chert and flint derived from the once-overlying Chalk, but there is little sign of base-rich influence in the woodland apart from stands of dog's mercury (*Mercurialis perennis*) in drier areas. The woodland is a typical example in the valleys of the Axe catchment.

A Malaise trap was run from 2 April to 3 December 2005 and emptied fortnightly except for one 3 week period in June. Ethylene glycol was used as the preservative. It was sited in shade 3m from the stream and on a small island of damp soil adjacent to permanent seepages. Two years later between 10 June and 4 November 2007, samples were taken approximately monthly by sweep-netting for about 15 minutes within the same area.

The families identified included larger flies but not anthomyiids, agromyzids or sphaerocerids. Muscids were identified in the 2005 Malaise trap samples but they were not targeted during sweep-net sampling and were nearly absent in these collections. The bulk of unidentified smaller flies consisted of cecidomyiids, ceratopogonids, phorids, psychodids and sciarids (some of which were identified). The number of each identified species was counted. Females of some groups were ignored if they were time-consuming or impossible to identify. Fungus gnats in several families were identified by Peter Chandler but were not included in some of the analyses because the identifications were lumped for each month and the numbers of individuals were not counted. All species with their authority names are listed in the Appendix. Rarity statuses were obtained from Falk (1991) and Falk and Chandler (2005). Data have been submitted to national recording schemes.

Species were allocated to assemblage types using a classification (ISIS) developed by Natural England (Webb and Lott 2006). This system allocates invertebrate species to assemblages that are in the form of a four-tier hierarchy representing increasing fidelity to a particular type. For instance, a fastidious species may be placed in the assemblage 'calcareous seepages', a less particular species in 'slow flowing water and seepages', a widespread wetland species in 'wetlands' and generalists are not placed in any group. This system was used to establish the time of year when species of wet woodlands were most likely to be encountered, and for this purpose only the second level of the hierarchy was used. Species that had not yet been included in ISIS were allocated a habitat type based on available information.

As well as using the ISIS system, species were also classified as resident or non-residents of the wet woodland. This overcame the anomaly of excluding eurytopic wetland species that were classed as generalists in ISIS but which were clearly dependent upon this particular wet woodland since there is no other significant type of wetland in the immediate area. Residents were defined as those in the ISIS assemblage types for woodland, shaded ground layer or wetland, and other species classed in ISIS as generalist or which had yet to be included in the ISIS dictionary but which are known to live mainly in woodland or wetlands.

Sampling can record only part of the total fauna of a site but there are several methods for estimating the likely maximum that a site holds. Of several methods available for the type of data recorded in the Malaise trap in this study, Magurran (2004) regarded the non-parametric Chao 1 estimator as one of the most promising. It is based on the observation that the shape of the 'tail' of the species frequency distribution (species represented by just a few individuals) is related to the total number of species. It is a simple function of the number of singletons (F_1) and doubletons (F_2) in a sample and the observed number of all species (S_{obs}):

$$S_{Chao\ 1} = S_{obs} + F_1^2 / 2\,F_2$$

Standard deviation is estimated using the same set of observations (Chao 1987). No estimate was calculated for sweep-net samples as the numbers of individuals were not always noted.

Results

Species composition

In all samples from both years, 486 species of Diptera were identified. In the families identified by the author, 352 species in 49 families were identified in the Malaise trap material, and 169 species in the monthly sweep-net samples in 2007; of these, 41 species and two families (Culicidae, Hippoboscidae) were not caught by the trap. Fungus gnats in the Malaise trap samples included 82 species in five families (72 species in Mycetophilidae alone) and 11 species of Sciaridae. As the numbers of these gnats were not counted, they have not been used in further analysis but they clearly formed the dominant group in the samples. Limoniid craneflies were the next most speciose family, followed closely by Muscidae and then by Dolichopodidae and Empididae (Table 1). These five largest families accounted for half (52%) of all species. Numbers of species in a family did not necessarily reflect the abundance of individuals. At one end of this spectrum were the limoniid craneflies and dolichopodids, which were both species-rich and numerically abundant, and included several species represented by many individuals. This suggested that a number of these two families were among the ecologically dominant species. At the other extreme were syrphids which were moderately speciose but represented by few individuals, so this family appeared to have low ecological importance in the wet woodland. Empids and muscids had intermediate distribution of individuals per species, with just two common species and the others represented by far fewer individuals. Some of the smaller families also had one or two abundant species, of which some examples are listed in Table 1.

Sixty species (about one fifth of those counted) accounted for almost 75% of the total numbers of individuals counted in the Malaise trap, excluding fungus gnats. They included mainly common flies, most of which were likely to have been resident in the woodland (bold text in Table 2). Several generalists may also be resident but were as likely to have developed in nearby grasslands, for example, the dung-feeding *Scathophaga* (Scathophagidae) and grass-mining *Geomyza tripunctata* (Opomyzidae). Among the frequent species were the nationally scarce limoniid *Thaumastoptera calceata* and the moderately uncommon species *Ptychoptera lacustris* (Ptychopteridae), *Thaumalea testacea* (Thaumaleidae), *Ormosia depilata* (Limoniidae) and *Sybistroma crinipes* (Dolichopodidae).

In the whole collection, 18 nationally scarce and rare species were found (Table 3). All were recorded in the Malaise trap with the exceptions of the limoniids *Atypophthalmus inustus* and *Paradelphomyia ecalcarata* and the dixid *Dixella filicornis*, which were found only in sweep-net samples. Several of the scarce or rare species occurred on several occasions, which suggested that they were residents and dependent upon the conditions found here. This agrees with the limited information available for several of these species, for example that given for *D. filicornis* by Disney (1999) and for the craneflies *Molophilus* *corniger*, *Pilaria fuscipennis* and *Thaumastoptera calceata* by Stubbs (1994, 1997, 1998). *Thaumastoptera calceata* was frequent, reaching a peak in late May to early June and was the most abundant of the scarce species. Conflicting conditions of pH were indicated by the presence of *M. corniger*, which is regarded by Stubbs (1998) as typical of calcareous carr and seepage, and the trickle-midge *Thaumalea truncata*, which was present in low numbers from mid May to late June and is restricted to more acid water than the two common species of *Thaumalea* (Disney 1999). Such apparently different elements in the fauna probably reflect local variation in the underlying Jurassic rocks. The stratiomyid *Beris fuscipes* is a widespread species in south-western wet woodlands, so its frequent occurrence here was expected.

A few species deserve mention. The cranefly *Lipsothrix nervosa* is moderately widespread in southern Britain but was until recently regarded as endemic, and for this reason it is included as a priority species in the UK Biodiversity Action Plan (www.ukbap.org.uk). It showed a short peak from mid May to late June in the Malaise trap material, and clearly had a good population here. The fungus gnat *Mycetophila sigmoides* was recently added to the British list by Gibbs (2009) who included the record from this woodland. A male of the saltmarsh cranefly *Dicranomyia sera* was genuinely this species; it is present at saltmarsh at the Axe estuary about 15km to the south. The cranefly *Gonomyia abscondita* was identified using the test key of Stubbs (2001) and it agreed with the description in Starý (2010). This species was previously treated as a synonym of *G. lucidula* de Meijere (Chandler, 1998) but the species agreeing with *G. abscondita* is the commonest species of the *lucidula* group in Britain (Alan Stubbs *pers. comm.*).

Table 1. Number of species and individuals in the Malaise trap in 2005 for the top-ranking families and, below the line, some examples of species-poor families with numerous individuals.

Family	Species	Individuals
Mycetophilidae	72	not counted
Limoniidae	47	1031
Muscidae	43	464
Dolichopodidae	37	1056
Empididae	32	262
Syrphidae	25	83
Hybotidae	21	147
Heleomyzidae	11	134
Drosophilidae	10	57
Lauxaniidae	9	54
Ephydridae	8	96
Scathophagidae	8	239
Tipulidae	8	22
Clusiidae	4	170
Pediciidae	4	174
Ptychopteridae	2	65

Table 2. Most frequent species (represented by at least 20 individuals), with the number counted in brackets, in the Malaise trap in 2005. Species in bold type are woodland or wetland species; the others may not have been resident.

Bibionidae: *Bibio leucopterus* (49), *Bibio marci* (91)
Clusiidae: ***Clusiodes albimanus*** (153)
Diastatidae: ***Diastata fuscula*** (35)
Dolichopodidae: ***Anepsiomyia flaviventris*** (183), ***Argyra argentina*** (26), ***A. diaphana*** (29), *Chrysotus gramineus* (36), ***Dolichopus popularis*** (31), ***D. ungulatus*** (110), ***D. urbanus*** (83), ***Gymnopternus cupreus*** (144), ***Hercostomus nanus*** (48), ***Sciapus platypterus*** (113), ***Sybistroma crinipes*** (48), ***S. obscurellum*** (67), ***Teuchophorus calcaratus*** (25)
Drosophilidae: *Scaptomyza pallida* (21)
Dryomyzidae: ***Neuroctena anilis*** (32)
Empididae: *Empis lutea* (35), ***Hilara cornicula*** (119)
Ephydridae: ***Ditrichophora fuscella*** (73)
Fanniidae: ***Fannia sociella*** (47)
Heleomyzidae: ***Heteromyza rotundicornis*** (25), ***Suillia atricornis*** (44), ***S. bicolor*** (25),
Hybotidae: *Bicellaria vana* (25), *Tachypeza nubila* (21)
Limoniidae: ***Austrolimnophila ochracea*** (41), ***Ilisia occoecata*** (49), ***Limonia macrostigma*** (57), ***L. phragmitidis*** (21), ***Lipsothrix nervosa*** (34), ***Molophilus appendiculatus*** (30), ***M. cinereifrons*** (24), ***M. serpentiger*** (238), ***Dicranophragma nemorale*** (109), ***Ormosia depilata*** (92), ***Tasiocera murina*** (88), ***Thaumastoptera calceata*** (60)
Lonchopteridae: *Lonchoptera lutea* (28)
Muscidae: *Azelia nebulosa* (20), ***Hydrotaea cyrtoneurina*** (22), *Mydaea nebulosa* (34), *M. urbana* (36), *Phaonia errans* (23), ***P. palpata*** (21), ***P. subventa*** (63), *Polietes lardarius* (108)
Opomyzidae: *Geomyza tripunctata* (27)
Pediciidae: ***Pedicia rivosa*** (38), ***Tricyphona immaculata*** (134)
Ptychopteridae: ***Ptychoptera albimana*** (44), ***P. lacustris*** (21)
Scathophagidae: *Nanna fasciata* (21), *Norellisoma spinimanum* (25), *Scathophaga furcata* (101), *S. inquinata* (44), *S. stercoraria* (45)
Thaumaleidae: ***Thaumalea testacea*** (20)

Seasonal abundance

The numbers of both species and individuals recorded in the Malaise trap showed a rapid rise in spring, peaking in late June to early July, then fell away rapidly to a level that stayed unexpectedly constant from August to October (Fig. 1). The high peak in late June to mid July was reached on the one occasion that the trap could not be emptied at the usual two-week interval (three weeks in this case), so the count was probably slightly higher than would otherwise have been found. Species richness in November was similar to that in early April. In contrast to the pattern of seasonal emergence in the Malaise trap, sweep-net samples taken in 2007 showed a far less precipitous decline after midsummer (Fig. 1). The number of individuals of resident species was half or less of all species in the first few weeks in spring but after mid May residents dominated the catches.

Table 3. Nationally scarce and rare species at Burridge, with the number of occasions and, in brackets, the number of individuals recorded.

Family	Species	Status	Numbers
Limoniidae	*Atypophthalmus inustus*	Scarce	1 (1)
	Molophilus corniger	Scarce	4 (8)
	Paradelphomyia ecalcarata	pRDB2	2 (8)
	Pilaria fuscipennis	Scarce	4 (6)
	Thaumastoptera calceata	Scarce	4 (61)
Mycetophilidae	*Grzegorzekia collaris*	Scarce	-
	Leia bilineata	Scarce	-
	Mycetophila deflexa	Data deficient	-
	Mycetophila scotica	Data deficient	-
	Mycetophila uliginosa	Scarce	-
	Mycomya pectinifera	Scarce	-
	Rymosia britteni	Scarce	-
Dixidae	*Dixella filicornis*	Scarce	2 (3)
Thaumaleidae	*Thaumalea truncata*	Scarce	3 (7)
Stratiomyidae	*Beris fuscipes*	Scarce	3 (5)
Syrphidae	*Cheilosia soror*	Scarce	1 (1)
	Orthonevra brevicornis	Scarce	1 (2)
Muscidae	*Helina vicina*	Scarce	3 (5)

The Chao 1 estimate of the total number of species caught in the Malaise trap in each sampling period was on average twice the observed number, although it varied between 1.4 and 3 times. The high projected figure included non-residents, so the calculation was repeated for just residents, which formed about 70% of all species across the year, varying between 57 and 81% in separate catches. The variance was greater for residents alone and the estimated number of species varied more erratically (Fig. 1). On average the estimate was about 2.3 times the observed value over the year.

The Chao estimator is clearly sensitive to small variations in the numbers of species represented by only one or two individuals. If these crucial counts are over-estimated then the Chao value will be inaccurately large. A source of such error in the present survey was that females of some species, for example *Molophilus*, cannot be reliably identified so were ignored. Of the 239 resident species, only males were identified of 45. A correction was therefore applied to the Chao estimates by assuming that each male of these 45 species was actually accompanied by a female, and so for each occasion that such a male was recorded as a singleton it become a doubleton (reducing the original singleton count by this number), and every original doubleton no longer counted since it was now more than two individuals. This correction was applied to each date. The correction represented a larger reduction than would have been produced by genuine counts of these hypothetical females since not every sole male would have been accompanied by a female. However, the change in resulting Chao estimates was small, and varied between no change and, at the most extreme, 43% smaller than the uncorrected estimate, with an average reduction over the year's catches of 16%. Over the year, the estimate was reduced from 2.3 times to 2 times the observed value. It was concluded that the number of undetected residents was therefore about the same as those recorded.

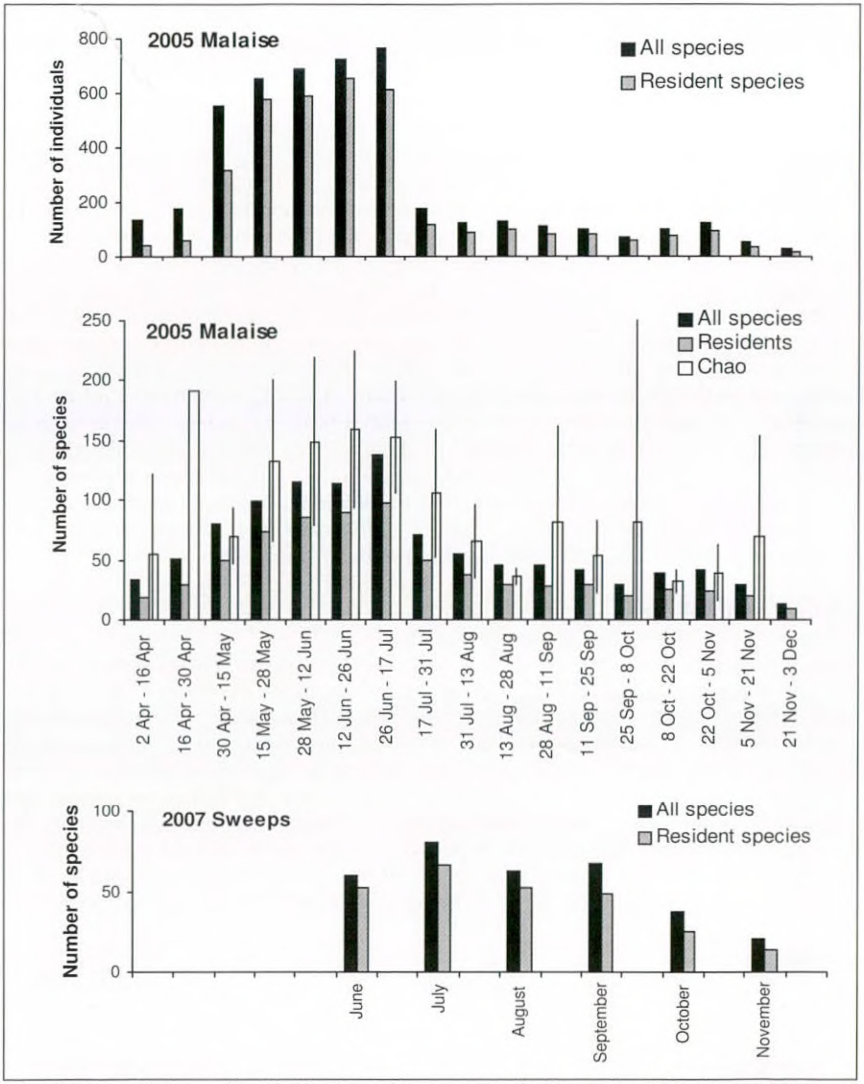

Fig. 1. Total number of individuals and number of all species (black), resident species (grey) and Chao 1 estimate with standard deviation of resident species (white) in each collection period of the Malaise trap in 2005, and in sweep-net samples in 2007. Very large error bars for the Chao estimate on 16-30 April have been omitted.

A breakdown of the contribution made by each family to species richness showed seasonal peaks for some families (Fig. 2). The season started and finished with Scathophagidae and Heleomyzidae dominating the catches, although with low numbers of species. Fungus gnats, dominated by Mycetophilidae, showed spring and autumn peaks but were still moderately species-rich through the summer months too. There followed the sequence of families familiar to British dipterists: Empididae and Limoniidae in early summer, Hybotidae and Dolichopodidae in midsummer, and a 'background' throughout the warmer months of Syrphidae, Muscidae and Lauxaniidae (not shown) that showed no marked peak when compared with the trend for all families together (as shown in Fig. 1). Several less well-represented families also showed clear peaks, notably Tipulidae in spring (mirroring Empididae) and Micropezidae in early summer (mirroring Dolichopodidae).

Flight periods of some of the more frequent species fell into three types. Dolichopodids were typical among the many species that clearly had only one generation per year, indicated by one discrete flight period, usually with a clear peak. Only rarely were there gaps in the flight period, almost certainly due to 'sampling error' when a species was scarce. Limoniids and pediciids showed either a single generation (e.g. *Erioptera griseipennis*, *Ilisia occeocata*, *Lipsothrix nervosa*, *Ormosia depilata*, *Thaumastoptera calceata*) or two distinct flight periods in spring and autumn within which there were rarely gaps (e.g. *Limonia macrostigma*, *Pedicia rivosa*, *Tricyphona immaculata*). A few species in other lower dipteran (nematoceran) families showed two distinct emergence peaks (*Thaumalea testacea*, possibly *Ptychoptera lacustris*). Acalyptrates tended to show rather long flight periods which could not be divided into cohorts, although often had breaks unlike the continuous but shorter flight periods of the Lower Diptera (Nematocera) and Empidoidea. Species showing this long but often interrupted flight pattern were *Clusiodes albimanus* (Clusiidae), *Diastata fuscula* (Diastatidae), *Drosophila phalerata* and *Lordiphosa andalusiaca* (Drosophilidae).

Assemblage composition

Three broad ISIS assemblage types included the majority of 'wet woodland' species, for which no separate assemblage is recognised in ISIS. These were 'fast-flowing water' (code W11) 'slow water & seepage' (W12) and 'permanent mire' (W31). Some of the species in these assemblages prefer open habitat but were not excluded here to avoid confusing the analysis. Species in these three assemblages were most abundant from the beginning of May to late July and comparatively scarce in the rest of the year when there was usually less than half of the peak numbers in early summer (Fig. 3). However, the proportion they comprised of all species fluctuated within fairly narrow limits of 33-46%, and indicated that there was no marked seasonal change in the relative importance of the wet woodland assemblage group, even though its component species peaked in early summer. Sweep-net samples in 2007 showed a steadier number of such species into September, and a decline in October.

Discussion

This study of a small wet woodland confirmed the importance of the habitat for flies, and especially for families of Lower Diptera (Nematocera), Empidoidea and Muscidae that contributed most species. Some families that are usually well represented in wetlands were scarce in the shaded woodland, notably sciomyzids, chloropids and ephydrids which comprise a far greater proportion of wetland faunas in unshaded habitats. Syrphids appeared superficially to be quite speciose but nearly all species were represented by only one to three individuals in the entire Malaise trap collection.

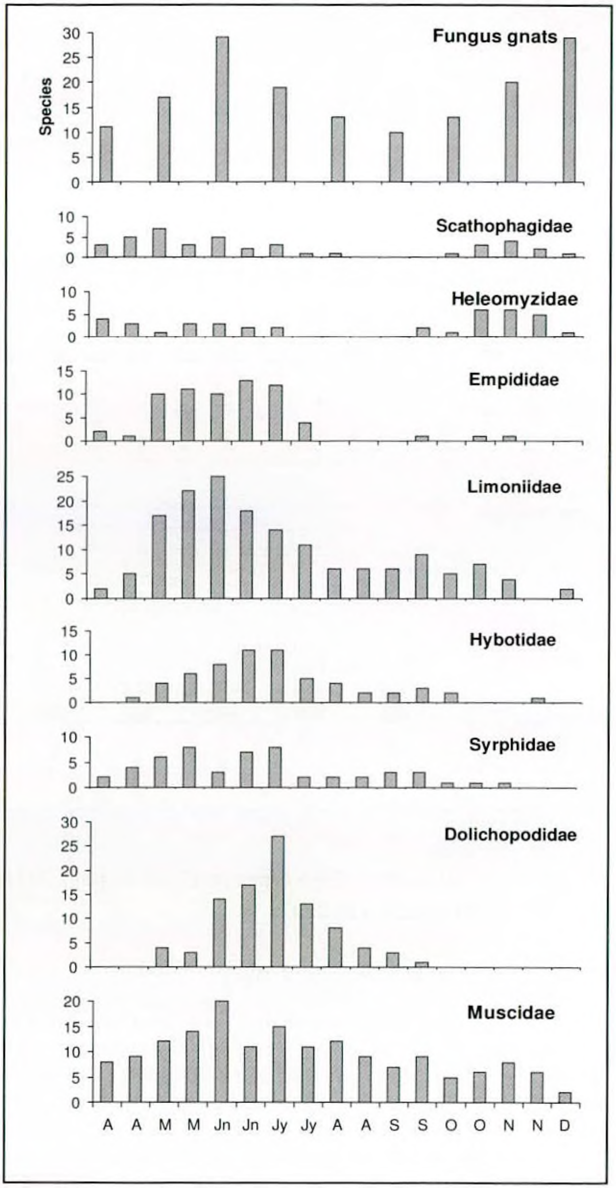

Fig. 2. Seasonal occurrence of well represented families in 2005. Fungus gnats include Bolitophilidae, Diadocidiidae, Ditomyiidae, Keroplatidae and Mycetophilidae, and are shown for entire months. Other families are shown for fortnightly periods as in Fig. 1.

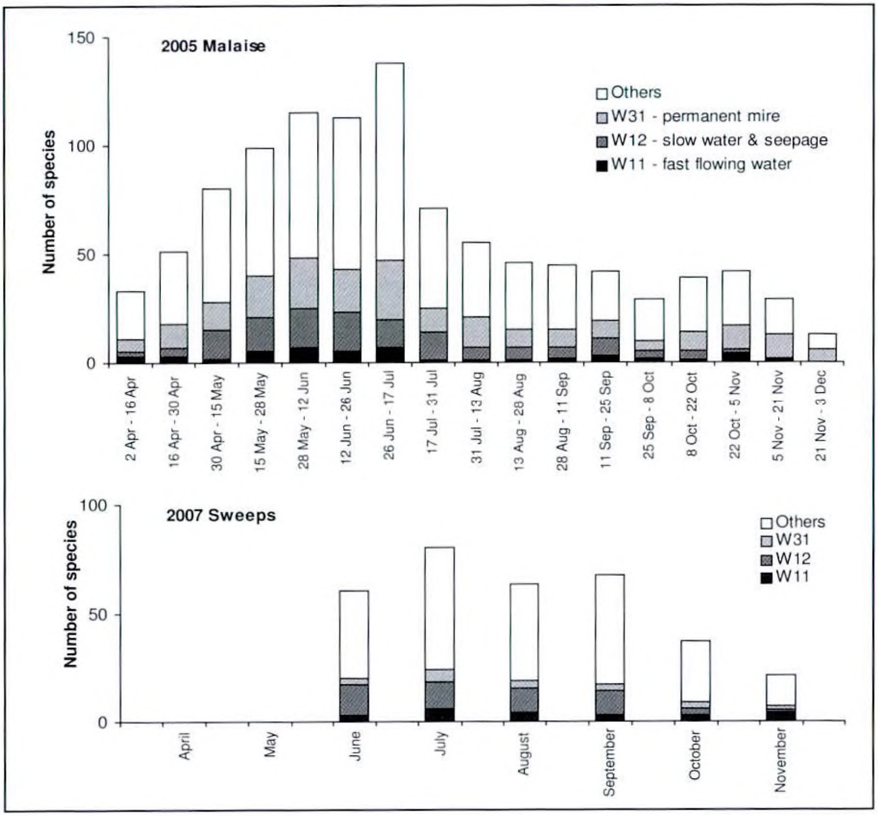

Fig. 3. Number of species in ISIS assemblage types (defined on page 24) in Malaise trap samples in 2005 and sweep-net samples in 2007.

There appear to be few published studies of wet woodlands with which the present results may be compared. Tayoub *et al.* (1990), investigating just dolichopodids, found more species in wet alder woodland beside a lake than in the drier oak-birch woodland further inland. A taxonomically more complete study by Olechowicz (1988) found more species and many more individuals in a Polish alder carr than in nearby pine-oak and pine forest, but the samples were dominated by culicids, chironomids and chaoborids (not covered in the present study), and with only a tiny proportion of the species that were dominant at Burridge Common. Using Malaise traps and sweep-netting, Salmela (2008) and Salmela *et al.* (2007) sampled Lower Diptera (Nematocera) in Finnish wetlands, many within woodlands. Limoniidae and Tipulidae were very well represented although analysis of the community structure did not distinguish a suite of species associated with more wooded sites. Va•hara (1986) compared the brachyceran Diptera of floodplain woodland before and after flood defence was installed along a small river in the Czech Republic. Before the ground table was strongly lowered and annual floods stopped, the most species-rich families were 'empids' (including Hybotidae), dolichopodids and muscids, whereas syrphids were notably scarce; this was similar to the results for Burridge. One notable difference between the studies was a large number of species of sciomyzids at the Czech site, which were scarce at Burridge. Once the woodland had dried out, the number of species of dolichopodids halved whereas those of other large families increased. Two drier English woodlands with species lists, Monks Wood in Cambridgeshire and Felsham Hall Wood (Bradfield Woods) in Suffolk, also had relatively few dolichopodids and craneflies, and many more syrphids (Cole *et al.* 1973, Laurence 1997). Fungus gnats were clearly speciose at Monks Wood where 153 species were recorded in a series of suction traps operated in a moderately damp area of the wood over four summer months (Cole and Chandler 1979). This total is over twice that recorded at Burridge but the radically different collecting method, the use of 8 traps and differences in surrounding habitats may be responsible for the greater numbers.

Unpublished results from a similar wet woodland about 25km to the east in west Dorset on similar underlying geology show the same importance of Limoniidae and Dolichopodidae, the intermediate position of empids and hybotids, and the low representation of three families that are far more speciose in open wetlands, i.e. ephydrids, sciomyzids and syrphids (Table 4). These results were selected from just the wet woodland samples taken at these sites in June 2005 (Aunt Mary's Bottom SSSI) and August 2008 (Frome St Quintin SSSI, Mapperton & Poorton Vale SSSI). The scarcity of syrphids and absence of sarcophagids in the wet wood at Burridge Common was therefore predictable, and mirrors the results of Laurence (1997) who recorded far fewer syrphids, calliphorids and sarcophagids in old coppice and mature woodland than in recent coppice.

Table 4. Number of species (with percentage of all species recorded in brackets) in selected families at three wet woodland SSSIs in Dorset.

Family	Aunt Mary's Bottom		Frome St Quintin		Mapperton & Poorton Vale	
Total species	188		137		202	
Limoniidae	31	(16)	27	(20)	33	(16)
Dolichopodidae	32	(17)	19	(14)	23	(11)
Empididae	15	(8)	9	(7)	10	(5)
Hybotidae	13	(7)	10	(7)	10	(5)
Ephydridae	9	(5)	5	(4)	8	(4)
Sciomyzidae	7	(4)	4	(3)	11	(5)
Syrphidae	5	(3)	4	(3)	18	(9)

Estimates of the number of species missed by sampling are likely to be imprecise. Using the simple Chao 1 estimator, it appeared that only about half the species were recorded in most two-week periods of Malaise trapping. Even when probable vagrants were removed from the analysis, the number of missed species was still about the same as those caught. The estimated total was higher than seemed probable, given that recording using sweep-netting in other years added less than 20% to the total recorded by both methods. However, if too many species are inadequately sampled, the Chao estimate will be high. For example, in this study, common woodland lauxaniids were poorly represented in the trap, and Salmela (2008) noted differences in the susceptibility of different lower dipteran (nematoceran) species to Malaise trapping and sweep-netting.

Phenologies at family level agreed broadly with published information. The discrete and short flight period of dolichopodids that were common at Burridge Common agreed with that found for most species by other workers. Meuffels *et al.* (1989) used Malaise trapping at a river-side garden in Belgium, Meyer and Filipinski (1998) used emergence traps on a small stream in northern Germany, and Pollet *et al.* (1986) used pitfall trapping in a Dutch wood; all showed that most dolichopodids had short flight periods. Exceptions were species of *Campsicnemus*, which were scarce in the Burridge study, and *Sybistroma* species, which had a longer flight period than most. Craneflies showed greater variety in their phenology, as has been documented for American species (LeSage and Harrison 1981). Low catches may have obscured some apparent patterns, for instance, *Ptychoptera lacustris* showed two peaks of abundance but Stubbs (1972) thought that two broods were unlikely. A predominance of heleomyzids in spring and autumn was found by Bährmann and Adaschkiewitz (2003), and a relatively long flight period of lauxaniids was also found by Bährmann (2002) and Stuke and Merz (2007); Merz (2002) suggested that adult lauxaniids live a long time, even though they may have only one generation each year.

The study gave two snap-shots of one woodland in 2005 and 2007. The finer detail of which species were dominant and the duration of their flight period are likely to vary yearly, as illustrated by Owen (1991) for syrphids over a 15 year period of Malaise-trapping. She recorded large yearly variation in the relative abundance of many common species and pointed out that her conclusion on seasonality, based on 15 years' results, would not have been true for a large proportion of the commoner species had she based it on only three years' data; the short Burridge Common study therefore gave only a rough indication of seasonality, as indicated by different patterns obtained by Malaise trapping and by sweep-netting two years later.

With the welcome inclusion of invertebrates in condition monitoring of SSSIs, there comes the need for better understanding when and what to sample to give a reasonable evaluation of the quality of a fauna. This short study at Burridge Common indicated that only some families are probably worth including: mycetophilids and related gnats, limoniids and other craneflies, dolichopodids, empidids, hybotids and muscids. At the time of publication of this paper fungus gnats and many muscids had not been included in ISIS, and if these families were ignored, the window for sampling the wet woodland fly fauna is likely to extend from early May to the end of July, and that sampling from August onwards may give less useful results. However, both these families were an important part of the fauna late in the year, so there is a need to include them in ISIS to extend the monitoring season.

Acknowledgements

I thank Edward and Janet Eames for permission to run the Malaise trap in their woodland, Peter Chandler for identifying the fungus gnats and commenting on the early draft, and Jon Cole for his comments. The data from the west Dorset woods was obtained during contracts to English Nature.

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Appendix. Species recorded at Burridge Common in Malaise trap samples in 2005 (m) or sweep-net samples in 2007 (s). All fungus gnat families were recorded only in the Malaise trap samples.

Anisopodidae: *Sylvicola cinctus* (Fabricius) ms, *Sylvicola punctatus* (Fabricius) ms, **Anthomyzidae:** *Anthomyza dissors* Collin ms, *Paranthomyza nitida* (Meigen) ms, **Asilidae:** *Machimus atricapillus* (Fallén) ms, **Asteiidae:** *Asteia amoena* Meigen ms, **Bibionidae:** *Bibio johannis* (Linnaeus) ms, *Bibio lepidus* Loew ms, *Bibio leucopterus* (Meigen) ms, *Bibio marci* (Linnaeus) ms, *Bibio varipes* Meigen ms, *Dilophus febrilis* (Linnaeus) ms, *Dilophus femoratus* Meigen ms, **Bolitophilidae:** *Bolitophila saundersii* (Curtis), **Calliphoridae:** *Calliphora vomitoria* (Linnaeus) ms, *Lucilia caesar* (Linnaeus) ms, *Lucilia illustris* (Meigen) ms, *Melinda gentilis* Robineau-Desvoidy ms, *Pollenia rudis* (Fabricius) ms, **Campichoetidae:** *Campichoeta obscuripennis* (Meigen) m, *Campichoeta punctum* Meigen ms, **Chloropidae:** *Cetema simile* Ismay ms, *Elachiptera cornuta* (Fallén) ms, *Elachiptera megaspis* (Loew) m, **Clusiidae:** *Clusia flava* (Meigen) ms, *Clusiodes albimanus* (Meigen) ms, *Clusiodes gentilis* (Collin) ms, *Clusiodes verticalis* (Collin) ms, **Culicidae:** *Anopheles claviger* (Meigen) m, *Culex pipiens* Linnaeus m, **Cylindrotomidae:** *Cylindrotoma distinctissima* (Meigen) ms, **Diadocidiidae:** *Diadocidia ferruginosa* (Meigen), **Diastatidae:** *Diastata fuscula* (Fallén) ms, *Diastata nebulosa* (Fallén) ms, **Dixidae:** *Dixa dilatata* Strobl ms, *Dixa nubilipennis* Curtis ms, *Dixa puberula* Loew m, *Dixa submaculata* Edwards ms, *Dixella filicornis* Edwards m, **Dolichopodidae:** *Anepsiomyia flaviventris* (Meigen) ms, *Argyra argyria* (Meigen) ms, *Argyra diaphana* (Fabricius) ms, *Argyra ilonae* Gosseries ms, *Argyra perplexa* Becker ms, *Campsicnemus curvipes* (Fallén) ms, *Campsicnemus loripes* (Haliday) m, *Chrysotimus molliculus* (Fallén) ms, *Chrysotus gramineus* (Fallén) ms, *Dolichopus festivus* Haliday ms, *Dolichopus griseipennis* Stannius ms, *Dolichopus pennatus* Meigen ms, *Dolichopus picipes* Meigen ms, *Dolichopus plumipes* (Scopoli) ms, *Dolichopus popularis* Wiedemann ms, *Dolichopus subpennatus* Fonseca ms, *Dolichopus trivialis* Haliday ms, *Dolichopus ungulatus* (Linnaeus) ms, *Dolichopus urbanus* Meigen ms, *Dolichopus wahlbergi* Zetterstedt ms, *Gymnopternus aerosus* (Fallén) m, *Gymnopternus cupreus* (Fallén) ms, *Hercostomus nanus* (Macquart) ms, *Lamprochromus bifasciatus* (Meigen) m, *Medetera muralis* Meigen m, *Medetera truncorum* Meigen ms, *Microphor holosericeus* (Meigen) ms, *Neurigona quadrifasciata* (Fabricius) ms, *Poecilobothrus nobilitatus* (Linnaeus) ms, *Rhaphium appendiculatum* (Zetterstedt) ms, *Rhaphium auctum* (Loew) ms, *Rhaphium crassipes* (Meigen) ms, *Rhaphium monotrichum* Loew ms, *Sciapus platypterus* (Fabricius) ms, *Sybistroma crinipes* Staeger ms, *Sybistroma discipes* (Germar) ms, *Sybistroma obscurellum* (Fallén) ms, *Sympycnus desoutteri* Parent ms, *Syntormon bicolorellum* (Zetterstedt) ms, *Syntormon denticulatum* (Zetterstedt) m, *Teuchophorus calcaratus* (Macquart) ms, *Teuchophorus simplex* Mik ms, **Drosophilidae:** *Drosophila phalerata* Meigen ms, *Drosophila subobscura* Collin ms, *Drosophila tristis* Fallén ms, *Hirtodrosophila cameraria* (Haliday) m, *Hirtodrosophila confusa* (Staeger) ms, *Leucophenga maculata* (Dufour) ms, *Lordiphosa andalusiaca* (Strobl) ms, *Lordiphosa fenestrarum* (Fallén) ms, *Scaptomyza graminum* (Fallén) ms, *Scaptomyza pallida* (Zetterstedt) ms, *Stegana similis* Laštovka & Máca ms, **Dryomyzidae:** *Dryomyza flaveola* (Fabricius) ms, *Neuroctena anilis* (Fallén) ms, **Ditomyiidae:** *Symmerus annulatus* (Meigen), **Empididae:** *Chelifera pectinicauda* Collin ms, *Chelifera precatoria* (Fallén) ms, *Chelifera stigmatica* Schiner ms, *Clinocera fontinalis* (Haliday) ms, *Dolichocephala irrorata* (Fallén) ms, *Dolichocephala oblongoguttata* (Dale) ms, *Empis aemula* Loew ms, *Empis aestiva* Loew ms, *Empis chioptera* Meigen ms, *Empis livida* Linnaeus ms, *Empis lutea* Meigen ms, *Empis nigripes* Fabricius ms, *Empis nuntia* Meigen ms, *Empis pennipes* Linnaeus ms, *Empis planetica* Collin ms, *Empis* *stercorea* Linnaeus ms, *Empis trigramma* Meigen ms, *Hilara anglodanica* Lundbeck ms, *Hilara cornicula* Loew ms, *Hilara litorea* (Fallén) ms, *Hilara lurida* (Fallén) ms, *Hilara maura* (Fabricius) ms, *Hilara nigrina* (Fallén) m, *Hilara quadrifasciata* Chvála ms, *Hilara rejecta* Collin ms, *Kowarzia bipunctata* (Haliday) ms, *Phyllodromia melanocephala* (Fabricius) ms, *Rhamphomyia albohirta* Collin ms, *Rhamphomyia crassirostris* (Fallén) ms, *Rhamphomyia flava* (Fallén) ms, *Rhamphomyia longipes* (Meigen) ms, *Rhamphomyia nigripennis* (Fabricius) ms, *Rhamphomyia umbripennis* Meigen ms, **Ephydridae:** *Coenia palustris* (Fallén) m, *Ditrichophora calceata* (Meigen) ms, *Ditrichophora fuscella* (Stenhammar) ms, *Hydrellia griseola* (Fallén) ms, *Hydrellia maura* Meigen ms, *Limnellia quadrata* (Fallén) ms, *Parydra coarctata* (Fallén) ms, *Parydra littoralis* (Meigen) ms, *Parydra quadripunctata* (Meigen) ms, **Fanniidae:** *Fannia canicularis* (Linnaeus) ms, *Fannia lepida* Wiedemann ms, *Fannia mollissima* (Haliday) ms, *Fannia serena* (Fallén) ms, *Fannia sociella* (Zetterstedt) ms, **Heleomyzidae:** *Eccoptomera longiseta* (Meigen) ms, *Heteromyza oculata* Fallén ms, *Heteromyza rotundicornis* (Zetterstedt) ms, *Scoliocentra villosa* Czerny ms, *Suillia affinis* Meigen ms, *Suillia atricornis* (Meigen) ms, *Suillia bicolor* (Zetterstedt) ms, *Suillia ustulata* (Meigen) ms, *Suillia variegata* (Loew) ms, *Tephrochlamys flavipes* (Zetterstedt) ms, *Tephrochlamys rufiventris* (Meigen) ms, **Hippoboscidae:** *Lipoptena cervi* (Linnaeus) m, **Hybotidae:** *Bicellaria vana* Collin ms, *Euthyneura halidayi* Collin ms, *Euthyneura myrtilli* Macquart ms, *Hybos femoratus* (Muller) ms, *Leptopeza flavipes* (Meigen) ms, *Ocydromia glabricula* (Fallén) ms, *Oedalea flavipes* Zetterstedt ms, *Oedalea holmgreni* Zetterstedt ms, *Oedalea stigmatella* Zetterstedt ms, *Oedalea tibialis* Macquart ms, *Oropezella sphenoptera* (Loew) ms, *Platypalpus annulipes* (Meigen) m, *Platypalpus calceatus* (Meigen) m, *Platypalpus candicans* (Fallén) ms, *Platypalpus optivus* (Collin) ms, *Platypalpus pallidiventris* (Meigen) ms, *Platypalpus pallipes* (Fallén) ms, *Platypalpus pseudofulvipes* (Frey) m, *Platypalpus rapidoides* Chvála ms, *Tachydromia aemula* (Loew) ms, *Tachydromia arrogans* (Linnaeus) ms, *Tachypeza nubila* (Meigen) ms, *Trichina clavipes* Meigen ms, *Trichina elongata* Haliday ms, **Keroplatidae:** *Antlemon servulum* (Walker), *Isoneuromyia semirufa* (Meigen), *Macrocera stigma* Curtis, *Neoplatyura modesta* (Winnertz), *Orfelia nemoralis* (Meigen), *Orfelia pallida* (Staeger), *Platyura marginata* Meigen, **Lauxaniidae:** *Calliopum simillimum* (Collin) ms, *Meiosimyza decempunctata* (Fallén) ms, *Meiosimyza decipiens* (Loew) ms, *Meiosimyza rorida* (Fallén) ms, *Minettia longipennis* (Fabricius) ms, *Peplomyza litura* (Meigen) ms, *Pseudolyciella pallidiventris* (Fallén) ms, *Sapromyza halidayi* Haliday ms, *Sapromyza sexpunctata* Meigen m, *Tricholauxania praeusta* (Fallén) ms, **Limoniidae:** *Achyrolimonia decemmaculata* (Loew) ms, *Atypophthalmus inustus* (Meigen) m, *Austrolimnophila ochracea* (Meigen) ms, *Cheilotrichia cinerascens* (Meigen) ms, *Dicranomyia chorea* (Meigen) m, *Dicranomyia fusca* (Meigen) ms, *Dicranomyia modesta* (Meigen) ms, *Dicranomyia sera* (Walker) ms, *Dicranophragma adjunctum* (Walker) ms, *Dicranophragma nemorale* (Meigen) ms, *Eloeophila maculata* (Meigen) ms, *Eloeophila submarmorata* (Verrall) ms, *Epiphragma ocellare* (Linnaeus) ms, *Erioptera fuscipennis* Meigen ms, *Erioptera griseipennis* Meigen ms, *Erioptera lutea* Meigen ms, *Euphylidorea aperta* (Verrall) m, *Gonempeda flava* (Schummel) ms, *Gonomyia abscondita* Lackschewitz ms, *Gonomyia recta* Tonnoir m, *Ilisia maculata* (Meigen) ms, *Ilisia occoecata* Edwards ms, *Limonia macrostigma* (Schummel) ms, *Limonia nubeculosa* Meigen ms, *Limonia phragmitidis* (Schrank) ms, *Lipsothrix nervosa* Edwards ms, *Lipsothrix remota* (Walker) ms, *Molophilus appendiculatus* (Staeger) ms, *Molophilus bifidus* Goetghebuer ms, *Molophilus cinereifrons* de Meijere ms, *Molophilus corniger* de Meijere ms, *Molophilus flavus* Goetghebuer ms, *Molophilus griseus* (Meigen) ms, *Molophilus medius* de Meijere ms, *Molophilus ochraceus* (Meigen) ms, *Molophilus pusillus* Edwards ms, *Molophilus serpentiger*

Edwards ms, *Molophilus undulatus* Tonnoir m, *Neolimnomyia batava* (Edwards) m, *Neolimnomyia filata* (Walker) m, *Neolimonia dumetorum* (Meigen) ms, *Ormosia depilata* Edwards ms, *Ormosia hederae* (Curtis) ms, *Ormosia nodulosa* (Macquart) ms, *Paradelphomyia dalei* (Edwards) ms, *Paradelphomyia ecalcarata* (Edwards) m, *Paradelphomyia senilis* (Haliday) ms, *Phylidorea fulvonervosa* (Schummel) ms, *Pilaria discicollis* (Meigen) m, *Pilaria fuscipennis* (Meigen) ms, *Pseudolimnophila sepium* (Verrall) ms, *Rhipidia maculata* (Meigen) ms, *Rhypholophus bifurcatus* (Goetghebuer) ms, *Rhypholophus varius* (Meigen) ms, *Tasiocera murina* (Meigen) ms, *Thaumastoptera calceata* Mik ms, **Lonchopteridae:** *Lonchoptera bifurcata* (Fallén) ms, *Lonchoptera lutea* Panzer ms, **Micropezidae:** *Calobata petronella* (Linnaeus) ms, *Cnodacophora sellata* Meigen ms, *Neria cibaria* (Linnaeus) ms, *Neria commutata* (Czerny) ms, **Muscidae:** *Achanthiptera rohrelliformis* (Robineau-Desvoidy) m, *Azelia cilipes* (Haliday) m, *Azelia nebulosa* Robineau-Desvoidy m, *Coenosia agromyzina* (Fallén) m, *Coenosia infantula* Rondani ms, *Eudasyphora cyanella* (Meigen) ms, *Eudasyphora cyanicolor* (Zetterstedt) ms, *Hebecnema nigra* (Robineau-Desvoidy) m, *Hebecnema nigricolor* (Fallén) m, *Hebecnema vespertina* (Fallén) m, *Helina depuncta* (Fallén) m, *Helina impuncta* (Fallén) m, *Helina vicina* (Czerny) m, *Hydrotaea cyrtoneurina* (Zetterstedt) m, *Hydrotaea irritans* (Fallén) m, *Limnophora olympiae* Lyneborg m, *Lophosceles cinereiventris* (Zetterstedt) m, *Lophosceles mutatus* (Fallén) m, *Mesembrina meridiana* (Linnaeus) ms, *Muscina levida* (Harris) m, *Mydaea ancilla* (Meigen) m, *Mydaea humeralis* Robineau-Desvoidy m, *Mydaea nebulosa* (Stein) m, *Mydaea setifemur* Ringdahl m, *Mydaea urbana* (Meigen) m, *Phaonia angelicae* (Scopoli) m, *Phaonia errans* (Meigen) m, *Phaonia erronea* (Schnabl) m, *Phaonia fuscata* (Fallén) m, *Phaonia gobertii* (Mik) m, *Phaonia incana* (Wiedemann) m, *Phaonia mystica* (Meigen) m, *Phaonia pallida* (Fabricius) m, *Phaonia palpata* (Stein) m, *Phaonia rufiventris* (Scopoli) m, *Phaonia subventa* (Harris) ms, *Phaonia trimaculata* (Bouché) m, *Phaonia tuguriorum* (Scopoli) m, *Phaonia valida* (Harris) m, *Phaonia villana* Robineau-Desvoidy m, *Polietes lardarius* (Fabricius) ms, *Thricops diaphanus* (Wiedemann) m, *Thricops semicinereus* (Wiedemann) m, **Mycetophilidae:** *Acnemia nitidicollis* (Meigen), *Allocotocera pulchella* (Curtis), *Allodia truncata* Edwards, *Anatella flavomaculata* Edwards, *Anatella longisetosa* Dziedzicki, *Anatella simpatica* Dziedzicki, *Apolephthisa subincana* (Curtis), *Boletina basalis* (Meigen), *Boletina bidenticulata* Sasakawa & Kimura, *Boletina gripha* Dziedzicki, *Boletina nitida* Grzegorzek, *Boletina rejecta* Edwards, *Boletina sciarina* Staeger, *Boletina trivittata* (Meigen), *Brevicornu griseicolle* (Staeger), *Brevicornu proximum* (Staeger), *Brevicornu sericoma* (Meigen), *Coelosia flava* (Staeger), *Cordyla crassicornis* Meigen, *Cordyla flaviceps* (Staeger), *Docosia gilvipes* (Haliday in Walker), *Dynatosoma fuscicorne* (Meigen), *Exechia cincta* Winnertz, *Exechia fusca* (Meigen), *Exechia parva* Lundström, *Grzegorzekia collaris* (Meigen), *Leia bilineata* (Winnertz), *Leia bimaculata* (Meigen), *Megalopelma nigroclavatum* (Strobl), *Monoclona rufilatera* (Walker), *Mycetophila adumbrata* Mik, *Mycetophila blanda* Winnertz, *Mycetophila curviseta* Lundström, *Mycetophila deflexa* Chandler, *Mycetophila fraterna* Winnertz, *Mycetophila fungorum* (De Geer), *Mycetophila hetschkoi* Landrock, *Mycetophila ornata* Stephens, *Mycetophila perpallida* Chandler, *Mycetophila ruficollis* Meigen, *Mycetophila scotica* Edwards, *Mycetophila sigmoides* Loew, *Mycetophila stolida* Walker, *Mycetophila strigata* Staeger, *Mycetophila trinotata* Staeger, *Mycetophila uliginosa* Chandler, *Mycetophila unipunctata* Meigen, *Mycomya annulata* (Meigen), *Mycomya circumdata* (Staeger), *Mycomya fimbriata* (Meigen), *Mycomya flavicollis* (Zetterstedt), *Mycomya maura* (Walker), *Mycomya pectinifera* Edwards, *Mycomya winnertzi* (Dziedzicki), *Palaeodocosia vittata* (Coquillett), *Phronia forcipata* Winnertz, *Phronia humeralis* Winnertz, *Phronia nitidiventris* (van der Wulp), *Phronia tenuis* Winnertz, *Platurocypta testata*

(Edwards), *Rymosia britteni* Edwards, *Rymosia fasciata* (Meigen), *Saigusaia flaviventris* (Strobl), *Sceptonia costata* (van der Wulp), *Sceptonia fumipes* Edwards, *Sceptonia nigra* (Meigen), *Synapha fasciata* Meigen, *Synapha vitripennis* (Meigen), *Tetragoneura sylvatica* (Curtis), *Trichonta submaculata* (Staeger), *Trichonta vitta* (Meigen), *Zygomyia vara* (Staeger), **Opomyzidae:** *Geomyza tripunctata* Fallén ms, *Opomyza florum* (Fabricius) m, *Opomyza germinationis* (Linnaeus) ms, **Pallopteridae:** *Palloptera saltuum* (Linnaeus) ms, *Palloptera scutellata* Macquart ms, *Palloptera umbellatarum* (Fabricius) ms, *Palloptera ustulata* Fallén m, **Pediciidae:** *Dicranota claripennis* (Verrall) m, *Pedicia littoralis* (Meigen) ms, *Pedicia occulta* (Meigen) ms, *Pedicia rivosa* (Linnaeus) ms, *Tricyphona immaculata* (Meigen) ms, *Ula sylvatica* (Meigen) m, **Phaeomyiidae:** *Pelidnoptera fuscipennis* (Meigen) ms, **Piophilidae:** *Allopiophila luteata* (Haliday) ms, **Psilidae:** *Chamaepsila rosae* (Fabricius) ms, *Psila fimetaria* (Linnaeus) ms, **Psychodidae:** *Sycorax silacea* Curtis ms, **Ptychopteridae:** *Ptychoptera albimana* (Fabricius) ms, *Ptychoptera lacustris* Meigen ms, **Rhagionidae:** *Chrysopilus asiliformis* (Meigen) m, *Chrysopilus cristatus* (Fabricius) ms, *Rhagio lineola* Fabricius ms, *Rhagio scolopaceus* (Linnaeus) ms, *Rhagio tringarius* (Linnaeus) ms, **Scathophagidae:** *Leptopa filiformis* Zetterstedt ms, *Nanna fasciata* (Meigen) ms, *Norellisoma spinimanum* (Fallén) ms, *Scathophaga furcata* (Say) ms, *Scathophaga inquinata* Meigen ms, *Scathophaga stercoraria* (Linnaeus) ms, *Scathophaga suilla* (Fabricius) ms, **Sciaridae:** *Bradysia placida* (Winnertz), *Leptosciarella fuscipalpa* (Mohrig & Mamaev), *Leptosciarella rejecta* (Winnertz), *Leptosciarella scutellata* (Staeger), *Leptosciarella subpilosa* (Edwards), *Phytosciara flavipes* (Meigen), *Schwenckfeldina carbonaria* (Meigen), *Sciara hemerobioides* (Scopoli), *Scythropochroa radialis* Lengersdorf, *Trichosia splendens* Winnertz, *Zygoneura sciarina* Meigen, **Sciomyzidae:** *Hydromya dorsalis* (Fabricius) m, *Pherbellia ventralis* (Fallén) ms, *Renocera pallida* (Fallén) ms, *Tetanocera ferruginea* Fallén m, *Tetanocera silvatica* Meigen m, *Tetanura pallidiventris* Fallén ms, **Sepsidae:** *Sepsis cynipsea* (Linnaeus) ms, *Sepsis fulgens* Meigen ms, *Sepsis punctum* (Fabricius) m, **Stratiomyidae:** *Beris chalybata* (Forster) ms, *Beris fuscipes* Meigen ms, *Beris morrisii* Dale m, *Beris vallata* (Forster) ms, *Microchrysa cyaneiventris* (Zetterstedt) ms, *Oxycera nigricornis* Olivier ms, *Pachygaster leachii* (Curtis) ms, **Syrphidae:** *Baccha elongata* (Fabricius) m, *Chalcosyrphus nemorum* (Fabricius) ms, *Cheilosia albitarsis* Meigen ms, *Cheilosia soror* (Zetterstedt) ms, *Chrysogaster solstitialis* (Fallén) ms, *Criorhina berberina* (Fabricius) ms, *Episyrphus balteatus* (De Geer) ms, *Eristalis pertinax* (Scopoli) ms, *Ferdinandea cuprea* (Scopoli) ms, *Helophilus hybridus* Loew ms, *Helophilus pendulus* (Linnaeus) ms, *Leucozona lucorum* (Linnaeus) ms, *Melangyna lasiophthalma* (Zetterstedt) ms, *Melanostoma mellinum* (Linnaeus) ms, *Melanostoma scalare* (Fabricius) ms, *Myathropa florea* (Linnaeus) ms, *Neoascia podagrica* (Fabricius) ms, *Orthonevra brevicornis* Loew ms, *Platycheirus albimanus* (Fabricius) ms, *Platycheirus nielseni* Vockeroth ms, *Platycheirus scutatus* (Meigen) ms, *Rhingia campestris* Meigen ms, *Sericomyia silentis* (Harris) ms, *Sphegina clunipes* (Fallén) ms, *Sphegina elegans* Schummel m, *Volucella bombylans* (Linnaeus) ms, *Xylota segnis* (Linnaeus) ms, **Tabanidae:** *Hybomitra distinguenda* (Verrall) ms, *Tabanus bromius* Linnaeus ms, **Tachinidae:** *Eurithia anthophila* (Robineau-Desvoidy) ms, *Gymnocheta viridis* (Fallén) ms, *Phryxe nemea* (Meigen) ms, **Tephritidae:** *Philophylla caesio* (Harris) ms, **Thaumaleidae:** *Thaumalea testacea* Ruthe ms, *Thaumalea truncata* Edwards ms, **Tipulidae:** *Nephrotoma appendiculata* (Pierre) ms, *Nephrotoma quadrifaria* (Meigen) ms, *Tipula fulvipennis* De Geer m, *Tipula luna* Westhoff ms, *Tipula maxima* Poda ms, *Tipula pagana* Meigen ms, *Tipula paludosa* Meigen m, *Tipula variicornis* Schummel ms, *Tipula varipennis* Meigen ms, *Tipula vittata* Meigen ms, **Trichoceridae:** *Trichocera annulata* Meigen ms, **Xylophagidae:** *Xylophagus ater* Meigen ms.

Dipterists Digest 2011 **18,** 27-42

A notable assemblage of fungus gnats (Diptera, Sciaroidea) from St John's Wood, County Roscommon, Ireland

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Summary

A survey of a large ancient woodland in the Irish Midlands produced 66 species of fungus gnat of a total of 233 species of Diptera recorded. These include four species that have not previously been found in Ireland of which one, *Docosia morionella* Mik, 1884 is rare throughout its European range. Parts of the woodland have been returned to active coppice-with-standards management and the greatest variety of species found was associated with one of the more recently cut-over coppices. The implications for conservation management in gnat-rich woodlands and whether small-scale coppice-cutting may be beneficial to species-richness are discussed.

Introduction

KNAA was contracted to carry out an invertebrate survey of St John's Wood by the National Parks and Wildlife Service (NPWS) during 2010 (Alexander 2010). This is one of the most important woodlands in Ireland and is the largest area of ancient woodland in the Irish Midlands. Rackham (1995) stated that St John's Wood and neighbouring Rindoon Wood (1½ km to the south) are the best preserved ancient woods known to him in Ireland, and may well be to Ireland what the classic coppice-wood of the Bradfield Woods (Suffolk) is to England. He refers to them as a coppiced version of a rain forest, with their moss-festooned tree trunks and boughs, noting the inclusion of both woods in the Civil Survey of 1656. The wood is included within the Lough Ree candidate Special Area of Conservation, which is also a Special Protection Area and a proposed National Heritage Area. Perrin and Daly (2010) recognise it as an ancient woodland, defined as having woodland cover since at least 1660, but they noted that John Brown's 1584 map of Connaught, which shows extensive woodland in the south of County Roscommon, does not show this area as wooded.

The woodland occupies 110ha on a peninsula of the western shore of Lough Ree and has developed over Carboniferous Limestone overlain by sandy clay, with acid soils in places (Rackham 1995). The underlying limestone means that the wood is actually a relatively very dry site, with no streams or seepages, and a lakeshore of very variable height and with a long draw-down zone. Ownership history has been complex, with compartments – 26 are currently recognised – having been in separate ownership for many years, and with consequent very different management histories – the cutting of trees and shrubs appears to have been *ad hoc*. The north-western half of the wood (cpts 14-26) is believed to have been much less managed than the south-eastern half (cpts 1-13). Up until the recent NPWS initiative to restore active woodland management, the wood was last coppiced in about 1920 (Rackham 1995). There were originally grazing rights within half of the woodland area, although grazing by cattle has apparently at times been more extensive than this (Martin Speight *pers. comm.*). Bleasdale and Conaghan (1998) compared the vegetation with that of Rindoon Wood, suggesting that reduction in grazing at St John's Wood since a survey by M. Sheehy-Skeffington in 1986 had led to an increase in bryophytes in the ground cover and corresponding reduction in woodland herbs. On the other hand Rindoon Wood, which occupies 12ha of a promontory at the tip of another peninsula of Lough Ree and had a single ownership, was heavily overgrazed (by sheep and cattle) leading to the presence of ruderal herbs and lack of tree regeneration, although its canopy of hazel was still almost complete (other trees including ash and oak were present but only ash in significant numbers) and it was considered that it could recover with a reduction in grazing. No equivalent survey of the invertebrates of Rindoon Wood has been carried out, although Good (2002) investigated selected Coleoptera including fungus-associated Staphylinidae.

The structure of St John's Wood is typical coppice with standards. Oak *Quercus robur* is the predominant standard tree but there are also ash *Fraxinus excelsior*, crab apple *Malus sylvatica* and yew *Taxus baccata* standards. Most of the standards are mature trees, of 1 - 2.5m girth at breast height, with few rot-holes evident; a few larger trees are also present, the largest with a girth of 3.32m, suggesting an age of around 175 years (based on data held by John White). These trees are at the upper size range typical for such a woodland situation. Very few of these trees could be considered to be veteran trees, in the sense that decaying wood was very much a minor feature. The old coppice is dominated by hazel *Corylus avellana*, but also includes a notably wide variety of other species. The ground flora is species-rich and there is a luxuriant bryophyte cover over the soil, rocks, trees and shrubs. The fringing flood-prone woodland zone is dominated by young ash poles with occasional old alders *Alnus glutinosa* in the pockets of wet woodland which penetrate into the main woodland area. Drier fringes have thorn thicket of blackthorn *Prunus spinosa* with buckthorn *Rhamnus cathartica* and hawthorn *Crataegus*. Non-native tree and shrub species are virtually absent.

An active management regime resumed in 2005. Two one acre coppice plots have been cut over each year, in Cpts 7, 8 and 9. The cut stems were processed on site – including some charcoal-making – and the products mostly removed. The standard trees have not been cut and are to be retained in perpetuity, with new generations selected from the coppice stools. The sections of the ride network which provides access to the cut-over compartments have also received cutting either side, to increase light levels and to link with the outside of the wood to provide access for bees and butterflies. The north-western half of the woodland is being considered for non-intervention management.

Methods

Two of the main requirements from the survey were: i) information on the impacts of active coppice management, and ii) to identify any differences in the fauna between the less managed NW half and the more intensively managed SE half. A full scientific investigation was not feasible and so eight trapping stations were set up across the wood in order to generate comparable data sets – four in each half, with the SE area having two within recently cut-over coppice (Cpts 7 & 9) and two in long un-cut coppice. The cutting in the Cpt 7 sampling station had been carried out towards the end of 2007 while that in Cpt 9 had been in 2008. Diptera were sampled in each of the eight trapping stations using a standardised flight interception trap – see Fig 1. Each trap comprised four 2 litre plastic drinks bottles, mounted upside-down and screwed into a wooden base, with windows cut in the outer sides to give access to a mixture of antifreeze and soapy water held in the lower section of the bottles. The traps were hung at between 0.5 and 1.5m mainly on hazel stems. In Cpt 7 the trap was placed against the trunk of a standard oak out in the centre of the cut coppice, while the trap in Cpt 9 was hung from a holly stem at the edge of the cut-over area to keep it out of view – this is a more visited area and interference with the trap was judged more likely. The other six traps were all sited in structurally very similar, more-or-less closed canopy woodland. All traps were sited within the central core of the wood, well above flood levels, since deep water at the time prevented siting any closer to the lough shore – water levels receded dramatically over the field season – 2010 was reported to have been an unusually relatively dry and sunny summer (for Ireland). The traps were operated from 13 April and were emptied and the preservative renewed on 10 May, 7 June, 6 August and 8 October. All Diptera specimens were identified by PJC.

Results

A total of 66 species of fungus gnat were taken, including four not previously reported from Ireland and three others that are notable in Ireland; 65 of these (except *Brevicornu griseicolle*, included in the Table for completeness) were caught in the flight interception traps, from which a total of 179 species of Diptera was identified. The full list is provided in Table 1. The records are broken down by Compartment (Cpt) number in order to show the pattern of distribution across the wood. The total of all Diptera species given for each Cpt relates only to the traps so excludes species caught by suction sampling and netting.

Notable species

The most significant record is of *Docosia morionella* (Mycetophilidae), of which a single male was taken in the flight trap in Cpt 15, 8.x.2010. There is only one previous record from the British Isles region, a female found on 23 September 1904 by Francis Jenkinson on a window at Logie House, on the River Findhorn, Morayshire, Scotland. It is rare in Europe and was only otherwise known from the type localities in Austria (also on windows) until a male was found in a survey of the Monegros region in central Spain in 1991. The location in Spain is quite different. The Monegros is a steppe-like region in the Ebro valley east of Zaragoza and the area studied by Javier Blasco-Zumeta (Chandler and Blasco-Zumeta 2001), who collected all groups of insects, was *Juniperus thurifera* woodland at Retuerta de Pína. It produced 53 species of fungus gnat, six newly described and *D. morionella* was collected in a Malaise trap. The biology is not known but its habitat is assumed to be native woodland; other *Docosia* species have been reared from fungi or bird nests (Falk and Chandler 2005).

The other three fungus gnat species new to Ireland are *Allodia* (subgenus *Brachycampta*) *pistillata* (a male in the flight trap in Cpt 17, 7.vi.2010), *Brevicornu nigrofuscum* (in all except one of the flight traps and present throughout the season) and *Exechia cincta* (numerous in the flight trap in Cpt 7, 8.x.2010). The first two species are widespread throughout Britain while *E. cincta* is recorded increasingly widely in southern England and Wales. The only rearing record for *A. pistillata* is from a cup fungus *Peziza* species; it belongs to a group of the subgenus *Brachycampta* that develop mainly in cup fungi, so is probably specific to this type of fungus. *Exechia cincta* has been reared only from the agaric *Hygrophoropsis aurantiaca*, which is common in conifer woodland on acidic soils, but also occurs rarely in broad-leaved woodland on calcareous soils, where it is associated with elder *Sambucus nigra*. It is likely that other terrestrial agarics are also hosts of *E. cincta*. The few rearing records of *Brevicornu* species are also from soft terrestrial fungi.

Anatella ankeli has few previous Irish records (two in the ancient woods of Co. Wicklow plus a site in Co. Cork) and only two British records – an ancient wood on the Mendip Limestone in Somerset and a wooded gully in East Ross (Falk and Chandler 2005). The biology is unknown but the few confirmed rearing records for *Anatella* are from soft encrusting fungi on decaying wood, with some from terrestrial agarics requiring confirmation. Single males of *A. ankeli* were found in the flight traps in Cpts 7, 15 and 17, 8.x.2010. It seems to be another case of a species that is doing better in Ireland than in Britain.

Table 1. Distribution of fungus gnats in compartments surveyed within St John's Wood: where larval biology is known S = saproxylic, i.e. developing in rotten wood or (in most cases) fungi growing on wood, T = terrestrial, developing in fungi growing on the ground, including mycorrhizal species. ** species new to the Irish list; *other notable finds. Compartments were situated in the following 1km squares: 2, 3, 7 N0055; 9, 15, 17 M9956; 21, 26 M9856.

Species			**2**	**3**	**7**	**9**	**15**	**17**	**21**	**26**
Bolitophilidae										
Bolitophila occlusa Edwards	S							1m		
Ditomyiidae										
Symmerus annulatus (Meigen) *	S			1m						
Keroplatidae										
Cerotelion striatum (Gmelin) *	S			1m						
Isoneuromyia semirufa (Meigen)				1m					2m	
Macrocera stigma Curtis	S				4m					
Macrocera stigmoides Edwards					1f					
Macrorrhyncha flava Winnertz					1m					
Neoplatyura nigricauda (Strobl)					1m					
Orfelia fasciata (Meigen)	S			1f						
Pyratula zonata (Zetterstedt)					1f					
Mycetophilidae										
Acnemia nitidicollis (Meigen)		T	1m		6m2f	2m		1m		1m
Allodia (A.) truncata Edwards		T	1m							
Allodia (Brachycampta) grata (Meigen)	S	T			5m1f					
Allodia (B.) pistillata (Lundström) **		T						1m		
Anatella ankeli Plassmann *					1m		1m	1m		

Species			**2**	**3**	**7**	**9**	**15**	**17**	**21**	**26**
Brevicornu auriculatum (Edwards)					1m					
Brevicornu griseicolle (Staeger)		T				1m				
Brevicornu nigrofuscum (Lundström) **			5m1f	1m	1m	5m		1m	5m6f	6m
Brevicornu spp indet. females				1f					1f	2f
Cordyla crassicornis Meigen		T	1m	1m	many mf			1m1f		
Cordyla fasciata Meigen		T		1m			1m			
Cordyla fissa Edwards		T			1m					
Cordyla flaviceps (Staeger)		T								1m
Cordyla murina Winnertz		T		1m1f	4m					
Cordyla semiflava (Staeger)					7m		1m			
Cordyla unnamed sp. near *murina*					1m					
Docosia morionella Mik **							1m			
Ectrepesthoneura hirta (Winnertz)	S				1m	1f				
Exechia cincta Winnertz **		T			11m12f					
Exechia fusca (Meigen)	S	T			1m					
Exechia nigroscutellata Landrock		T			4m3f					
Exechia parva Lundström	S	T			1m					
Exechia parvula (Zetterstedt)		T					1m			
Exechia spinuligera Lundstrom	S	T		1m						
Exechia sp. indet. females								3f		
Exechiopsis (*E.*) *clypeata* (Lundström)		T						2m		
Exechiopsis (*E.*) *subulata* (Winnertz)		T			2f					

Species			**2**	**3**	**7**	**9**	**15**	**17**	**21**	**26**
Exechiopsis (*Xenexechia*) *leptura* (Meigen)									1m	
Exechiopsis (Xenexechia) sp. indet. female							1f			
Leia winthemii Lehmann	S	T			5m	1m			1f	
Monoclona rufilatera (Walker)	S							1m		
Mycetophila alea (Laffoon)		T							1m	
Mycetophila cingulum Meigen	S				3f					
Mycetophila curviseta Lundström					1m			1m		
Mycetophila edwardsi Lundström					1m	1m				
Mycetophila fungorum (De Geer)	S	T						2m		
Mycetophila fungorum group indet. females				1f				2f	1f	
Mycetophila ichneumonea Say	S	T						3f	2f	3f
Mycetophila ornata Stephens	S					1m				
Mycetophila signatoides Dziedzicki		T			6m10f					
Mycetophila sordida van der Wulp					1f					
Mycetophila subsigillata Zaitzev										1m
Mycomya annulata (Meigen)	S				1m1f		1m	9m2f		2m1f
Mycomya cinerascens (Macquart)	S			3m	3m2f	1m		1m4f		
Mycomya nitida (Zetterstedt)								1f		
Phronia braueri Dziedzicki	S									1m
Phronia conformis (Walker)	S				2m					
Phronia nitidiventris (van der Wulp)								1m		
Phronia notata Dziedzicki					1m					

Species			**2**	**3**	**7**	**9**	**15**	**17**	**21**	**26**
Phronia signata Winnertz					2m					
Phronia tenuis Winnertz	S		1m		1m			1m		
Phronia sp. indet. female						1f				
Phthinia sp. indet. females	S				1f	1f		1f		
Polylepta guttiventris (Zetterstedt)					1m1f	1m			2m1f	
Rymosia bifida Edwards		T				1m				
Rymosia fasciata (Meigen)		T			1m					
Rymosia sp. indet. female					1f					
Saigusaia flaviventris (Strobl)	S					1m				
Sciophila fenestella Curtis					1m					
Sciophila sp. indet. female					1f					
Stigmatomeria crassicornis (Stannius)	S	T			1m1f					
Synapha vitripennis (Meigen)							1m1f			
Tetragoneura sylvatica (Curtis)	S				1f		2m			
Total saproxylic species	**25**		**1**	**4**	**12**	**6**	**2**	**7**	**1**	**3**
Total terrestrial species		**26**	**3**	**4**	**14**	**4**	**2**	**6**	**3**	**2**
Total species			**5**	**11**	**39**	**13**	**9**	**18**	**8**	**7**
Notable species			**1**	**3**	**3**	**1**	**2**	**3**	**1**	**1**
Other fungus associated Diptera			**6**	**1**	**8**	**5**	**3**	**5**	**4**	**3**
Other saproxylic Diptera			**1**	**4**	**13**	**8**	**5**	**6**	**3**	**3**
Total Diptera species recorded per Cpt			**23**	**26**	**106**	**45**	**24**	**52**	**24**	**26**

Most of the fungus gnats recorded are, however, common and widespread species, although some, particularly some of the saproxylic species, are of local occurrence in Ireland. The more significant species of the latter are *Cerotelion striatum* and *Symmerus annulatus* which both had few previous Irish records (7 and 5 respectively) – both in traps emptied on 6.viii.2010. The former has larvae associated with fungi fruiting from the underside of lying decaying wood while larvae of the latter develop in rotten wood, with one association recorded with the fungus *Hypoxylon* on decayed wood. Both are widespread in Britain.

The more notable fungus gnat species were fairly evenly spread across the wood, with from 1 to 3 in each trapping station. The rarest species *Docosia morionella* was found in the less managed half of the wood (Cpt 15) and one other previously unrecorded species, *Allodia pistillata*, was also only found there (Cpt 17). The third new species, *Exechia cincta* was only found in Cpt 7, while the fourth species *Brevicornu nigrofuscum* was found in all the trapping stations with Cpt 15 the only exception. Overall, the less disturbed half of the wood produced three out of four of the new species, while the more disturbed half produced only two of the four. Given the small sample sizes, this difference is almost certainly not significant.

The Irish context

The latest checklist (Chandler *et al.* 2008) listed 275 species of fungus gnats as occurring in Ireland, constituting 50% of the British total of around 550 species, a little more than the average for Diptera as a whole, which was 48.5%. Fungus gnats may be less well represented in Ireland than some families associated with wetland habitats (e.g. Chironomidae and Sciomyzidae with around 80% of British species recorded in Ireland) but they have been given less attention by resident dipterists and many additions to the Irish list can be expected.

Most recording of fungus gnats in Ireland has been casual and there have been few specific surveys. There has been little previous recording in County Roscommon with only 37 species recorded by PJC from two mixed woodland sites, Lough Key Forest Park (G8403, 19 spp, 11.v.1970, 28.ix.1977) and west of Castlerea (M6780, 25 spp, 28.ix.1977), of which 12 occurred at St John's Wood, bringing the county total to 91 species. Another Midlands ancient woodland where some recording has been done is Charleville Wood (M3222/3), Co. Offaly where PJC recorded 56 species from six visits (1.v.1981, 27.v.1984, 15.vi.1985, 26.vi.1987, 19.ix.1999, 29.ix.2000), of which only 23 including *Symmerus annulatus* were in common with St John's Wood; however, a visit in July 2006 after extensive cutting had taken place produced only 2 species of fungus gnats. The best recorded site in Ireland is the oakwood at Glendalough (T1396), Co. Wicklow where PJC recorded 126 species from 14 visits in 1968-1986, with 32 including *C. striatum* in common with St John's Wood. There are records of 110 species from Killarney, Co. Kerry but these are from a larger more diverse area. Another promising site is Virginia Wood (N5987), Co. Cavan, where two visits by PJC (18.ix.2000, 21.vii.2006) produced 65 species, to which 8 are added from visits by J.P. O'Connor in 1988/1989. The above records were all from netting of adults. Flight interception traps have been used at some demesne sites in Northern Ireland (Alexander and Chandler 2010a), with The Misk, Drenagh (C6823), County Derry, producing the largest total of 60 species (19 in common with St John's Wood). Malaise trapping has been done at some sites, such as by M. Boston at Moy (H8756), County Tyrone where 62 species including *S. annulatus* were recorded in 1984/1985; information on the habitat and location of the trap is not available. During 2010 80 species were obtained using emergence traps over brash (fine woody debris) resulting from the systematic thinning and clearfell activity in conifer plantations at four sites, including further additions to the Irish list (R. Deady in press and unpublished); 18 species were in common with St John's Wood.

Biology of the fungus gnat species recorded at St John's Wood
In Table 1 the known larval association of the species recorded is indicated in broad terms as saproxylic or terrestrial. Of the 66 species recorded the biology is known for 43 of which 17 are only known to develop in rotten wood or fungi growing on wood while 18 are restricted to terrestrial fungi, with 8 species placed in both categories. The latter include the common polyphagous species *Exechia fusca* and *Mycetophila fungorum*, but also *Stigmatomeria crassicornis* of which there were two rearing records from the subterranean truffles *Tuber* species, but also a recent record from a wood encrusting fungus (Jakovlev in press); other such species are mainly in terrestrial agarics but also occur in some lignicolous genera. Of the species with unrecorded biology the *Mycomya* and *Phronia* species probably, like others of these genera, develop in wood encrusting fungi while *Brevicornu*, *Cordyla* and *Exechiopsis* species are likely to associate with terrestrial agarics. The genus *Mycetophila* includes species with both types of biology so the likely hosts of species that have not been reared is less predictable, except that *M. subsigillata* has till recently been confused with *M. sigillata* and some of the rearing records of the latter (all terrestrial agarics and boletes) may apply to it.

The biology of Keroplatidae is less well known with web-spinning larvae including surface and spore feeders on bracket and encrusting fungi and predaceous species on various substrates. A number of species occur in more open habitats than other fungus gnats, which may account for the greater diversity of this family in Cpt 7 but curiously *Isoneuromyia semirufa*, commonly found in herb-rich grassland, fen and open woodland, was in this survey only recorded in Cpts 3 and 21.

Other fungus associated and saproxylic Diptera recorded
Remarkably few fungus associated Diptera in other families were recorded, altogether only 21 species (17 of them in the flight traps). The numbers of these from each compartment are indicated in Table 1 and the Cpt numbers in which each was recorded are indicated below (except for some from general catches). Some of these are generalists with diverse larval feeding sites, such as the moth flies *Psychoda cinerea* Banks (9) and *P. phalaenoides* (Linnaeus) (7, 9) (Psychodidae), the winter gnat *Trichocera annulata* Meigen (Trichoceridae) and the predaceous larvae of the muscids *Phaonia pallida* (Fabricius) (9), *P. rufiventris* (Scopoli) (7) and *P. subventa* (Harris) (2, 7, 17, 21). The cranefly *Limonia nubeculosa* Meigen (Limoniidae) (2, 7, 8, 17, 21) is casual in fungi and this probably applies to the Sciaridae recorded: *Bradysia nitidicollis* (Meigen) (7, 21, 26), *B. pectoralis* (Staeger) (15), *Corynoptera forcipata* (Winnertz) (2, 3, 7, 17, 26), *Zygoneura sciarina* (Meigen) (26), each with a single fungus host record, although little is known of the biology of the species concerned except that *Z. sciarina* has also been reared from rotten wood. *Tephrochlamys flavipes* (Zetterstedt) (2) (Heleomyzidae) and *Crumomyia fimetaria* (Meigen) (15) (Sphaeroceridae) also develop in other substrates, and *Sylvicola cinctus* (2, 9, 15, 17, 21) (Anisopodidae) is more often associated with sap runs. The species recorded that are more specific to fungi were *Apiloscatopse scutellata* (Loew) (7) (Scatopsidae), *Tricimba cincta* (Meigen) (7) (Chloropidae), *Suillia pallida* (Fallén), *S. parva* (Loew) (2) (Heleomyzidae), *Drosophila phalerata* Meigen, *Hirtodrosophila cameraria* (Haliday) (9) (Drosophilidae) and *Pegomya pulchripes* (Loew) (9, 17) (Anthomyiidae).

Saproxylic Diptera other than fungus associated species were also relatively sparse in numbers with 27 species recorded, 19 of them in the flight traps. Most of these are generally common in woodland, two more local species found being *Oedalea tibialis* Macquart (17) (Hybotidae) and *Phaonia mystica* (Meigen) (9) (Muscidae). Although the latter is proposed for Nationally Scarce status in Britain (Falk *et al*. in preparation) it is possibly more frequent in Ireland. Four species were generally distributed on the site (6 or more Cpts): *Tipula scripta* Meigen (Tipulidae), *Austrolimnophila ochracea* (Meigen), *Epiphragma ocellare* (Linnaeus) (Limoniidae) and *Sciapus platypterus* (Fabricius) (Dolichopodidae). The other trapped species were rarely recorded: *Tipula irrorata* Macquart (7) (Tipulidae), *Neolimonia dumetorum* (Meigen) (7) (Limoniidae), *Trichosia confusa* Menzel & Mohrig (17) (Sciaridae), *Mycetobia pallipes* Meigen (15) (Mycetobiidae), *Tachypeza nubila* (Meigen) (7, 9, 21) (Hybotidae), *Medetera abstrusa* Thuneberg (7) (Dolichopodidae), *Opetia nigra* Meigen (17, 21) (Opetiidae), *Ferdinandea cuprea* (Scopoli) (9) (Syrphidae), *Palloptera ustulata* Fallén (7) (Pallopteridae), *Pseudolyciella stylata* (Papp) (7) (Lauxaniidae), *Clusia flava* (Meigen) (7) and *Clusiodes* sp. (7) (Clusiidae), and *Helina pertusa* (Meigen) (7, 9) (Muscidae).

Further saproxylic Diptera were found by casual sampling, at rest on tree trunks and foliage in sunny areas, as well as by rearing larvae found in decaying wood. Two *Dictenidia bimaculata* (Linnaeus) (Tipulidae) were reared from larvae found amongst moist debris beneath loose bark on a fallen oak branch beneath an oak standard (8); this species has only been found in 11 other Irish sites. *Trichosia morio* (Fabricius) (Sciaridae) was reared from rotten alder wood. *Ferdinandea cuprea* was actually plentiful throughout the cut-over coppices; other saproxylic Syrphidae noted were *Criorhina berberina* (Fabricius) and *Myathropa florea* (Linnaeus). Three further *Medetera* species were found on the standing tree trunks in the same areas: *M. muralis* Meigen and two species as yet unconfirmed; *M. impigra* Collin was also taken by hand collection in the south-east section.

Distribution pattern of fungus gnats across the wood

In Table 2, the species totals are broken down by grouped Compartments, to illustrate differences within and between the less managed half of the wood and more managed half, as well as between the two recently cut-over coppices (Cpts 7 and 9) and the rest of the wood. The distribution of the fungus gnat species is strongly skewed by the catch of 39 species in the flight trap in the cutover area of Cpt 7 (Table 1). The other flight traps only caught between 5 and 18 species. It is quite striking that the most open area sampled – opened up towards the end of 2007 and therefore in its third season of regrowth - was the most productive in fungus gnats.

Cpts 2 & 3	Cpts 7 & 9	Cpts 15 & 17	Cpts 21 & 26
14	43	23	13
51		31	

Table 2. Distribution of fungus gnats (species totals) for grouped Compartments.

The least disturbed half of the wood thus produced 31 of the fungus gnat species in comparison with the more disturbed half, which produced 51 species – although heavily biased by the catches from the cut-over coppices (Cpts 7 & 9). The traps situated within uncut coppice but within the more disturbed half of the wood produced species totals more comparable with those in the relatively undisturbed half. This suggested that the longer term management history is having less of an impact than the current management. However, Cpt 17 produced more species of fungus gnats and a little more of Diptera overall than the most recently coppiced area of Cpt 9, so other factors must also be considered.

Fungus associated and other saproxylic Diptera combined for all Cpts amounted to 50% or more of the total Diptera recorded in each case, from exactly 50% in Cpt 26 to 56% in Cpt 7. Fungus gnats comprised more than a quarter of the total Diptera species in all Cpts except 2; in Cpt 9 they were 30%, in Cpt 17 34.5% and in Cpt 7 36%. The number of fungus gnat species recorded in each area was thus roughly proportional to the total catch, with a higher proportion in Cpts 7 and 17. Fungus gnats constituted 36% of the total Diptera species identified from the traps, indicating that more of the species in other families were recorded more widely in the wood. The trap in Cpt 7, of which the location is shown in Fig.1, was more successful in catching Diptera generally than other traps with those in Cpts 9 and 17 about equally successful but with catches only about half that of Cpt 7. The catch of other fungus associated Diptera in Cpt 7 was comparatively low, with only 40% of such species recorded in the wood while that of other saproxylic species was relatively higher with 65% of the species recorded. Cpts 9 and 17 were also in closer proximity to each other, which may account for the similar species totals. Other traps had low overall catches and their siting presumably contributed to this result.

Fig. 1. Flight interception trap on oak standard in Cpt 7 of St John's Wood

Discussion

Flight trapping at St John's Wood showed the opposite result to that expected from conventional sampling with a sweep net, which typically shows closed canopy areas as most productive of fungus gnats. As sweep netting was not carried out to a significant extent at this site a direct comparison could not be made to determine whether there was a possibility of bias from the collecting method. The type of flight interception trap used in the present study has also been used to sample some parkland and orchard sites, with some success for fungus gnats as described by Alexander and Chandler (2010a, b). The vane flight interception trap designed by Darren Mann (Schulten *et al.* 2005, McLean 2010) has also proved effective for recording fungus gnats (determined by PJC) at some sites in England, e.g. Chigwell Row

Wood, Essex (Schulten *et al.* 2005) and Langley Park, Buckinghamshire (J.W. and B. Ismay unpublished). Three traps placed in Chigwell Row Wood in 2002 produced 205 species of Diptera including 98 species of fungus gnats, of which the largest catch (75 species of fungus gnats) was from a trap placed 10m high close to a rot hole in a veteran oak within a high density of such trees. At Langley Park ten traps operated by A. McVeigh were sited on veteran trees in situations varying from open parkland to closed canopy; catches from May and October 2007 included 144 species of fungus gnats, with the largest catches of 95 species each in the two traps placed in the most shaded situations, 57 species in a trap sited by a stream adjacent to woodland, intermediate numbers (37-43) in three traps in partial shade and lower numbers (2-18) per trap in the four traps placed in open parkland. Thus the flight trapping at that site produced results more in line with conventional collecting than with the results obtained at St John's Wood.

Malaise traps and water traps have proved effective at recording fungus gnats at many woodland and wetland sites in Britain but the results, other than reports of species newly recorded for the British Isles, largely remain unpublished. Comparative studies of the effects of forest management on fungus gnat faunas have not been carried out in the British Isles. Many fungus gnat species are very widespread and in Europe fungus gnats reach their greatest diversity in the boreal forests of Northern Europe and in the montane forests of Central Europe. A number of recent studies in Scandinavia have demonstrated that there is a significantly greater diversity in less managed forests than in those subject to forestry practices. Økland (1996) sampled fungus gnats using one Malaise trap at each of 17 sites in SE Norway, comparing the results against 30 ecological variables, in the broad categories of forest density, tree species composition, quality and quantity of saproxylic substrates, continuity and disturbance, geography and climate. A total of 262 species was recorded, with the numbers per site ranging from 34 to 136. The results confirmed his previous (1994) findings from a more limited study of the effect of different management of sites within a spruce *Picea abies* forest in Norway, that continuity of habitat (based on indicator species of saproxylic fungi and lichens) was the most significant factor in fungus gnat diversity. It was concluded that continuity was more influential than the present amount of decaying wood at a site and degree of spatial isolation from other species-rich sites was also important, diversity increasing with greater proximity to other such sites. Økland *et al.* (2005) did a similar study using Malaise and window traps at 15 sites in oak-dominated forests in S Sweden, including wood pastures abandoned 40-80 years ago that had been invaded by other trees including conifers. A total of 227 species was recorded, with the numbers per site ranging from 27 to 109; level of rainfall and elevation were found to be important factors in this drier region.

Kjærandsen and Jordal (2007) also used Malaise and window traps in surveys of oceanic broad-leaved forests, occupying steep slopes with high rainfall between fjords and treeless mountains in W Norway, and described as temperate rain forests. The most productive site Jordalsgrend (23,000 specimens of 315 species) was an old-growth forest dominated by downy birch *Betula pubescens* and aspen *Populus tremula*; 47 species including *Brevicornu nigrofuscum* were in common with St John's Wood. A site of interest in relation to the present study was an old grazed mixed broad-leaved forest at Øvre-Vike dominated by hazel and silver birch *Betula pendula* (as *B. verrucosa*), with some large pollarded wych elms *Ulmus glabra*; the hazel had previously been intensively cultivated for nuts and barrel hoops. The trap at this site produced 438 specimens of 82 species, of which 24 were not found at the first site; perhaps surprisingly a smaller proportion, 14 species including *Symmerus annulatus*, were in common with St John's Wood.

As St John's Wood is a relatively isolated site it is probable that recent colonisation from outside has not significantly influenced the present composition of the Diptera fauna. Although there is no previous survey evidence, it is likely that the majority of fungus gnats and other Diptera recorded in 2010 have survived there in the 85 years that elapsed since previous coppicing activity ceased, as well as during previous changes in management when coppicing was practised. Any insects that may have been dependent on coppicing will have disappeared during that period. However, some fungus gnats are very mobile as suggested by the rapid spread of some species that appear to be recent arrivals in Britain (Chandler 2008, Gibbs 2009). The suggestion by Hutson *et al.* (1980) that the adults of most species are probably crepuscular, resting during the daylight period, may be true to some extent; a few species (e.g. *Monocentrota lundstroemi* Edwards, *Paratinia sciarina* Mik, both with unknown biology) are regularly and some common fungivorous species more casually found at light traps, but there is little data available on diurnal patterns of activity. Sweep netting often samples gnats that are at rest amongst vegetation or in humid refuges. Gnat activity is largely dependent on humidity and temperature, and humidity is often greater once the sun has set.

During dry spells gnats tend to congregate in the most humid situations, the vicinity of woodland streams, around accumulations of rotten wood, under overhangs and in hollows, animal burrows and caves – features not available in St John's Wood. Økland (1996) linked this behaviour with the longevity of adults in the absence of suitable fungus hosts for oviposition; aestivation and hibernation also require such sheltered locations. However, in warm conditions they become active and multi-species aerial 'swarms' may be observed where diffuse sunlight reaches these refuges and some species may be found actively flying around colonies of fungus fruiting bodies. While more humid conditions prevail they will disperse and range more widely and active gnats may then favour the more open areas of a wood. Climatic conditions are thus an important consideration in distribution within a site.

Various other factors may account for the greater numbers of fungus gnats and of Diptera in general trapped in the 3 year old coppiced area. Regrowth since coppicing may have provided more shelter for resting gnats than other parts of the wood. It may also be that large oak standards opened up from the surrounding coppice act as foci for assembling fungus gnats – and maybe other insects too. It is notable that the flight traps tended to capture male gnats in greater numbers (about 60% of the total catch) than female gnats. Cpt 7 was the only trapping station where the trap was placed up against the trunk of a large tree; the others were all attached to smaller trees, mostly hazel, and within or on the edge of the uncut coppices.

The species composition of the catch in Cpt 7 with respect to known biology does not significantly differ from those in other areas except in including the majority of Keroplatidae recorded, which as discussed are more associated with open areas and less tied to fungi or dead wood for development. Among them *Macrorrhyncha flava*, with unknown larval biology, is usually seen feeding at umbel flowers such as *Heracleum* in woodland rides. Coppiced woodland is usually poor in saproxylic insects as dead wood is often not retained, although decay in old coppice stools may provide a habitat for them. The saproxylic species of fungus gnats recorded may have been associated with such situations or with habitats provided by the tree on which the trap was suspended or by adjacent trees. This might also explain the presence of several saproxylic species in other families, which were only recorded at this trap.

It is possible that production of honeydew by the oak to which the trap was attached in Cpt 7 may account for the larger number of Diptera species trapped there – although no honeydew was apparent from ground level during visits by KNAA. Sap flows from trees in the vicinity might also have attracted some species, although of the three species of Diptera recorded in the wood that are known to develop in sap runs only *Ferdinandea cuprea* occurred widely in the coppiced areas while *Sylvicola cinctus* and *Mycetobia pallipes* were only found in other Cpts; no sap runs were noted during the site investigation. However, the observation by Waterhouse (1998) may be significant in explaining an attraction of very recent coppice for fungus gnats. He noted swarms of small flies around a cut sycamore *Acer pseudoplatanus* stump at Coombes Valley RSPB Reserve, Staffordshire and on closer examination found that the attraction was sap exuding from thin stems of regrowth from the stump which had been damaged by grazing cattle. The 39 species of Diptera in these 'swarms' at Coombes Valley included 32 common species of Mycetophilidae, including both saproxylic and terrestrial species, with a larger proportion of the latter. Among them were 12 species recorded at St John's Wood, of which 8 occurred in Cpt 7. However, Cpt 7 had been cut-over 3 years previously and any such sap exudations had long since disappeared.

In the absence of any survey of the fungi of St John's Wood it is not possible to speculate on how the distribution of fungus gnats within the site might be affected by availability of hosts. As indicated in Table 1 at least 14 (possibly about 20) of the species recorded in Cpt 7 develop in terrestrial agarics or boletes. Of these 7 species develop mainly in fungi of the genera *Russula* and *Lactarius*, which have a mycorrhizal association with trees, in particular with oak. The latter include *Cordyla crassicornis* and *Mycetophila signatoides*, of which the numbers found in the trap suggest an emergence nearby. Several other species found in the wood are also associated with fungi that may be mycorrhizal, e.g. species of *Boletus*, *Leccinum*, *Tricholoma* and *Inocybe*. All of the recorded species known to have terrestrial hosts are associated with some mycorrhizal fungi, with the exception of *Allodia pistillata* (only found in Cpt 17) on cup fungi. It is unclear whether coppicing would stimulate or enhance the fruiting of mycorrhizal fungi during the seasons immediately following. It is also unknown how the past management of the site has affected the diversity and distribution of fungi; grazing may have had a significant effect as both disturbance by cattle and the nutrient enrichment by dung are known to be damaging to mycorrhizal fungi – although such nutrient enrichment is not apparent in St John's Wood. Økland (1996) suggested that the amount of dead wood at a site also had an effect on terrestrial fungi as its removal reduced the substrate provided by its disintegration for soil-living saprophytic species; previous work by mycologists that had established the reduction in diversity of mycorrhizal fungi resulting from clear felling was also cited.

A direct comparison with other coppiced woodlands is difficult in the absence of comparable surveys. Bradfield Woods in Suffolk has been mentioned as a classic coppiced woodland in England. Laurence (1997) studied the Diptera of this site in 1990/1991, using water and pitfall traps at 36 locations in coppices of different ages (1-38 years), demonstrating some differences in faunal composition according to age of coppice. However, of the 303 species of Diptera identified only 12 were fungus gnats, all identifiable from Hutson *et al.* (1980) and none with conservation status; 6 of these occurred at St John's Wood. Ivan Perry (*pers. comm.*) has been recording Diptera at Bradfield Woods by netting in all years from 2004 to 2010, on dates between 17 April and 29 October. He has recorded 141 species of fungus gnats (determined by PJC) from 36 visits, but only seven of these have conservation status, and only one of those *Mycomya parva* (Dziedzicki) is recorded from Ireland; 38 species are in common with St John's Wood including *Symmerus annulatus* and *Exechia cincta*. Six of the species recorded by Laurence (three of these including the open ground species *Isoneuromyia semirufa* also found at St John's Wood) were not re-found by Perry, which may be due to different collecting techniques and different areas sampled. Perry's recording has only been from areas of neglected coppice and unmanaged woodland, due to the difficulties of access to recently coppiced areas resulting from the initial installation of deer fences around them and the subsequent regrowth, particularly by brambles *Rubus* species.

Both sites are dominated by oak and ash standards with hazel coppice and a variety of other trees and rich ground flora, but the most significant difference between Bradfield Woods and St John's Wood is climatic. In the drier East Anglian climate, opening up of woodland results in rapid drying of the ground surface and dead wood, which become unsuitable for growth of fungal fruiting bodies (Perry *pers. comm.*). In the wetter Irish climate this may not be significant and dead wood left on the ground in newly coppiced areas may thus provide a resource for development of fungi and associated insects. The predominantly wet climate at St John's Wood, as indicated by the luxuriant bryophytes, will also be favourable to the fruiting of mycorrhizal and other terrestrial fungi. Fungal fruiting, however, varies considerably from year to year, with a resulting effect on abundance of fungus feeding insects and assessment of the diversity of fungus gnats at a site cannot be achieved from a single year's recording.

There are evidently many factors affecting diversity of fungus gnats, the species composition in different habitat types and their distribution within a given habitat. The effect of coppicing on diversity of fungus gnats and other Diptera requires further study using a variety of recording methods, both at the present site and by comparable studies elsewhere. Whether small-scale coppice-cutting is beneficial to species-richness and has any implications for conservation management in gnat-rich woodlands requires further evaluation.

Acknowledgements

KNAA would like to thank Judit Kelemen, NPWS Regional Manager, and Niall Cribbon, Conservation Ranger. We are grateful to Ivan Perry, Martin Speight and Judy Webb for valuable comments on an earlier draft, also to all of them and to Rob Deady, Jim O'Connor and Brian Nelson for information on various aspects.

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Dipterists Digest 2011 **18,** 43-50

A new species of *Macrorrhyncha* Winnertz from NW Europe, (Diptera, Keroplatidae)

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Summary

Closer examination of material of *Macrorrhyncha rostrata* Zetterstedt, 1851 from Sweden revealed a mixture of two closely related species of which one, *M. hugoi* sp. n. is described based on type material from Southern Sweden, Southern England and the Channel Islands. The new species includes all known records of *M. rostrata* from England and the Channel Islands. Records of *M. rostrata* from continental Europe need to be verified.

Introduction

Fungus gnats of the genus *Macrorrhyncha* Winnertz (Keroplatidae) belong to the *Cloeophoromyia-Asindulum* genus group, including 10 genera (Uesugi 2005), characterised mainly by the enlarged aedeagal apparatus with long, sclerotised anterior apodemes, as defined by Matile (1978). Within this group species of *Macrorrhyncha* and *Asindulum* Latreille also have a prolonged proboscis but of length differing between species. *Macrorrhyncha* is widespread in the Palaearctic Region (25 species), while another two species are known respectively from the Nearctic (Canada and USA) and the Oriental (China) Regions (Evenhuis 2006, Bechev 2010b).

Partial keys to the Palaearctic species were presented by Zaitzev (1994), Uesugi (2005) and Chandler *et al.* (2006). The latter work keyed 16 species and one subspecies then known from the western Palaearctic, including both sexes where known. Bechev (2010b) described two new species from Asiatic Turkey and raised to specific rank *M. thracica* Bechev, 1997, described as a subspecies of *M. geranias* (Loew, 1869). He provided a key to males of 18 western Palaearctic species, omitting *M. italica* (Costa, 1857), which had been known only from the female. Papp (2009) determined a male from Hungary as *M. italica*, although he concluded that the female characters used by Matile (1975) to distinguish *M. italica* from *M. flava* Winnertz, 1846 were subject to variation in *M. flava* and not diagnostic at the specific level. Although this cast doubt on the validity of *M. italica* the male so identified was clearly distinct from *M. flava* in structure of its genitalia, for which he provided figures.

In Europe most species in the genus are concentrated in the Mediterranean region (Chandler *et al.* 2006) while only a few species were known from Northern and Western Europe. The fairly common and widespread *M. flava* Winnertz, 1846, which is equipped with a long proboscis and is known to feed at flowers of umbelliferous plants (Apiaceae) (Bechev 2010a), occurs in this region as well as elsewhere in Europe. A rather similar species, *M. ancae* Matile, 1975, is recorded from France, Switzerland, the Czech Republic and Hungary (Papp 2009), while *M. collarti* (Tollet, 1953) is widespread in central and northern Europe including France, Belgium, Germany and Denmark but neither of these species is recorded from the British Isles or Fennoscandia. The larger and little known *M. rostrata* Zetterstedt, 1851 with a much shorter proboscis, which was described from Sweden (Zetterstedt 1851), is rarely recorded from broad-leaved woodlands in Northern Europe and was recorded as new to Britain from southern England by Chandler (1992).

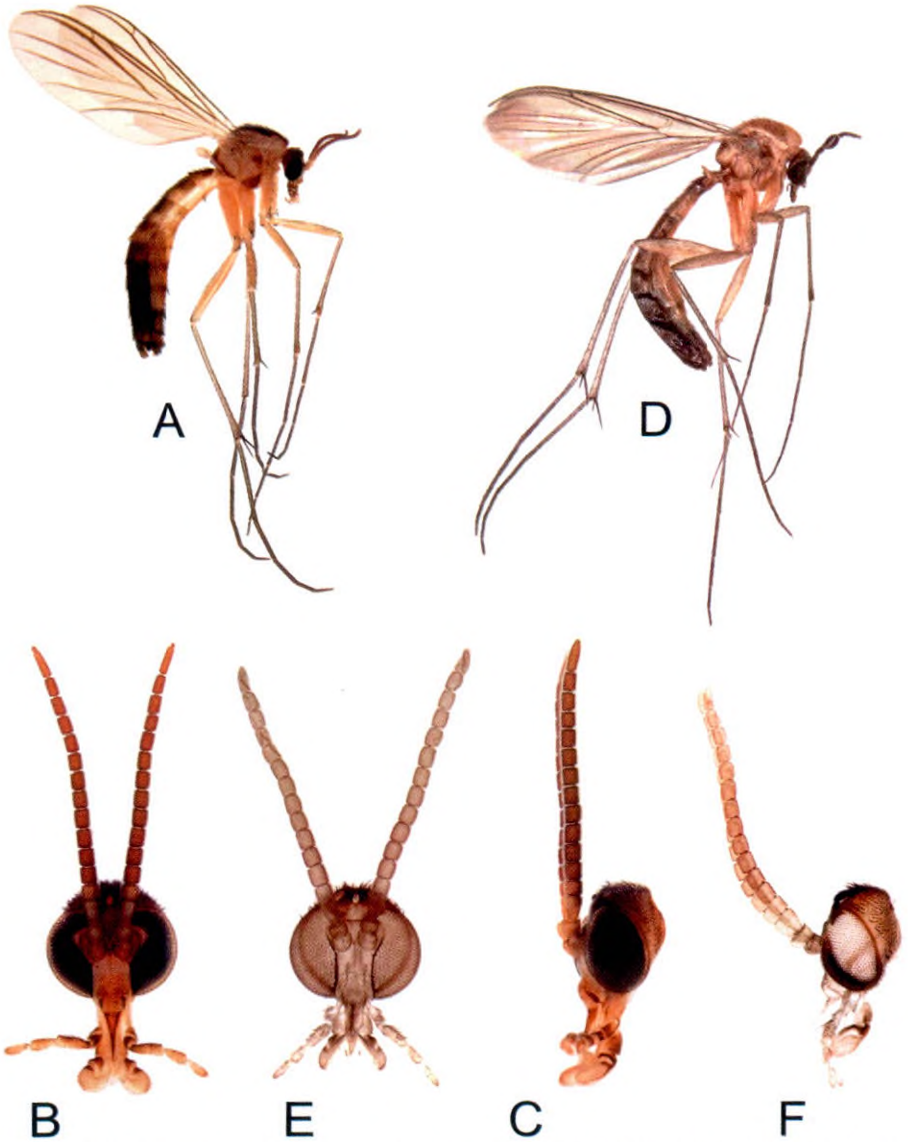

Fig. 1. **Habitus and head of *Macrorrhyncha* species: A-C, *M. rostrata* Zetterstedt, 1851 (non-types); D-F, *M. hugoi* sp. n. (D = holotype, E-F = paratype). A, D = habitus; B, E = head in frontal view; C, F = head in lateral view). Note that A-C, *M. rostrata* images are based on an uncleared specimen in alcohol while D-F, *M. hugoi* sp. n., images are based on a dry pinned specimen (D) and cleared head (E-F) in glycerine.**

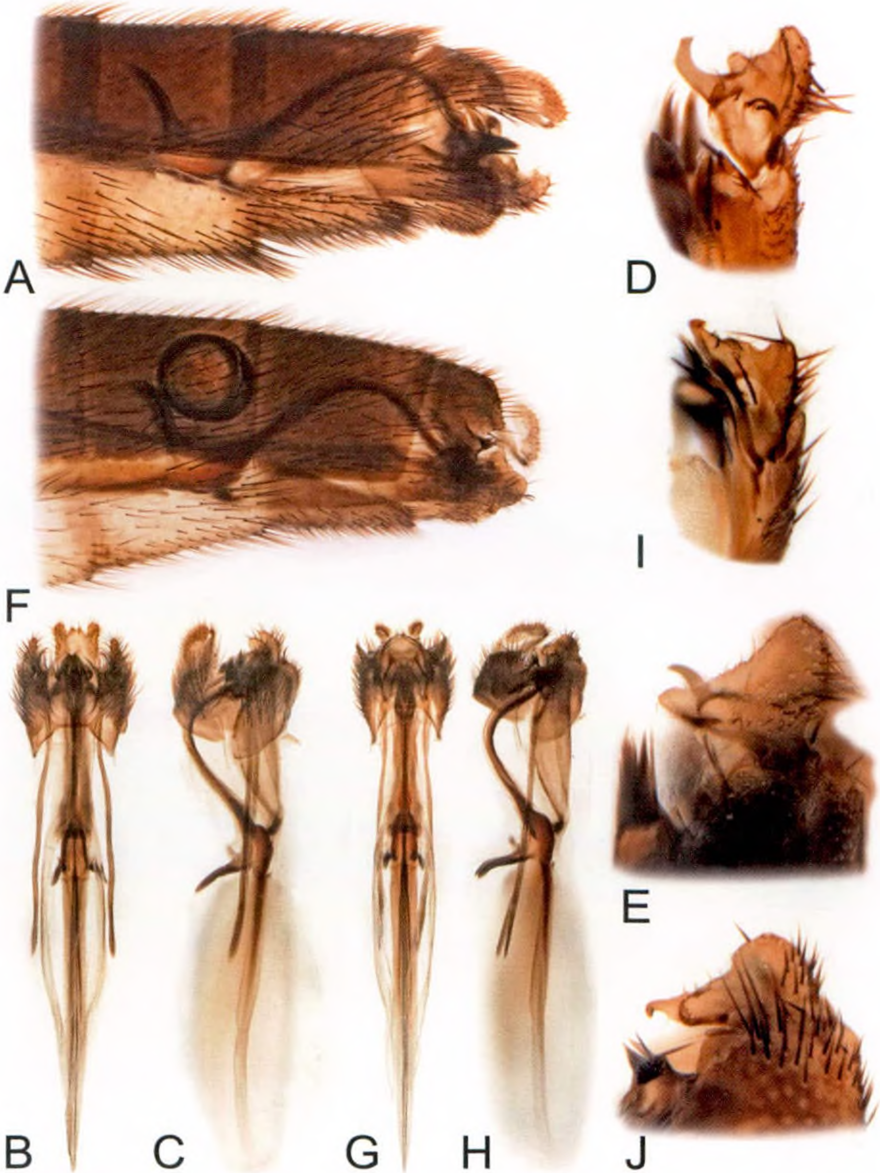

Fig. 2. Abdomen and terminalia of *Macrorrhyncha* species: A-E. *M. rostrata* Zetterstedt, 1851 (D, E = holotype); F-J. *M. hugoi* sp. n. (all holotype). A, F = apical half of abdomen with terminalia in lateral view; B, G = whole terminalia in ventral view (pre-terminal segments removed); C, H = whole terminalia in lateral view (pre-terminal segments removed); D, I = gonostylus in caudoventral view; E, J = gonostylus in lateral view.

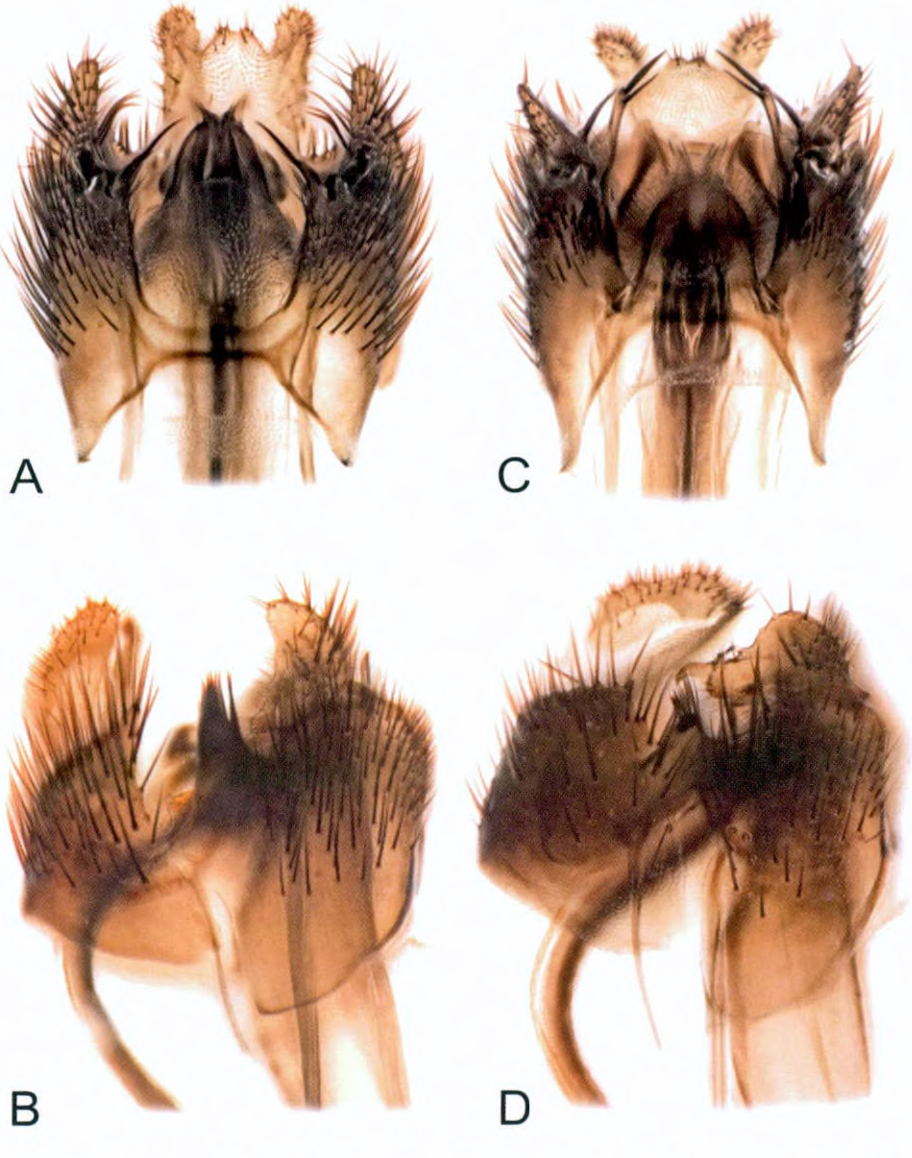

Fig. 3. **Terminalia of *Macrorrhyncha* species: A-B, *M. rostrata* Zetterstedt, 1851 (non-type); C-D, *M. hugoi* sp. n. (holotype). A, C = ventral view; B, D = lateral view.**

Fig. 4. Habitus of *Macrorrhyncha rostrata* Zetterstedt, 1851 female.

When going through the rich collection of pinned fungus gnats assembled by the late Hugo Andersson (1927-2008) JK noticed a male *Macrorrhyncha* with an unusual short proboscis and a yellow scutum with indistinct thoracic stripes. This specimen deviated in several respects when compared with the holotype of *M. rostrata* and other Swedish material as well as the description provided by Matile (1975). It became apparent, however, that it fitted the description and illustrations of *M. rostrata* given by Chandler (1992). Further material from England confirmed its identity as a new species, which is described here as *M. hugoi* sp. n.

The larval biology of the genus remains largely unknown. Chandler (1992) stated that a female of *M. hugoi* (as *M. rostrata*) had been found around a standing dead beech *Fagus sylvatica* trunk and the Hampshire sites where this species was recorded were ancient woodland with many old and decaying trees. Alexander (2002) included the species in his list of saproxylic Diptera based only on this information. Falk and Chandler (2005) accorded Vulnerable status in Britain, based on its very restricted distribution and association with this habitat, and stated that larvae of Keroplatidae spin webs on various substrates and are either carnivorous or feed on fungal spores. Jakovlev *et al.* (2008) referred to occurrence of *M. rostrata* in Sweden inside a hollow oak trunk.

Material and methods

Both alcohol material and dry pinned specimens were studied. Material of both species (including the holotype of *M. rostrata*) in the collection of Lund University, Sweden (MZLU) and the holotype of *M. hugoi* were studied by JK. Additional material (paratypes) of *M. hugoi* is in the private collection of PJC. For imaging the abdomen was detached, macerated in potassium hydroxide, neutralized, and then dissected and photographed in glycerine. Series of z-stack photos were taken with a Nikon Digital Sight DS-M5 microscope camera mounted on a Nikon SMZ1500 stereomicroscope, and combined for extended focus using Helicon Focus. The images were digitally edited in Adobe Photoshop. One paratype of the new species was slide-mounted in Canada balsam as outlined by Kjærandsen (2006).

Systematics

Macrorrhyncha rostrata (Zetterstedt, 1851) (Figs 1A-C, 2A-E, 3A-B, 4)

Both sexes of the species were described and details of terminalia illustrated by Matile (1975: 512, see http://sciaroidea.info/node/45919). Cederberg *et al.* (2010) accorded Near Threatened status (criteria B2ab(iii)) in Sweden based on the records below.

Specimens examined:

Holotype male: **SWEDEN**: **ÖG**, Vadstena, 58°26'55"N, 014°53'25"E, leg. J. W. Zetterstedt (MZLU-JKJ-SPM-012130, pinned with cleared terminalia in glycerine).

Additional material: **SWEDEN**: 2♂♂, **SÖ**, Haninge, Tyresta National Park, 59°11'11"N, 018°18'19"E, 26 May-30 July 2001, leg. B. Viklund, L.O. Wikars & H. Ahnlund; 3♀♀, **UP**, Nacka, Ormingelandet N Kihls Farm, 59°20'37"N, 018°23'48"E, 6 June-6 July 2004, leg. B. Viklund; 1♀, Hållnäs, Lerorna, 9 June-19 July 200, leg. J. Hansson; 3♂♂, **VS**, Kärrbo sokn, Solbacken, 59°31'02"N, 016°44'24"E, 29 June-3 July 1987, leg. G.E. Nilsson; 1♂, same data, 6-8 July 1987, leg. G.E. Nilsson.

Macrorrhyncha hugoi Kjærandsen & Chandler sp. n. (Figs 1D-F, 2F-J, 3C-D)

Male. Head dark brown. Antenna short, about twice as long as head, with flagellomeres about as long as broad; basal segments yellowish brown, flagellum brown. Proboscis relatively short, less than eye height in length, brown with slender brown palpi. Palp sessile and originating close to lower margin of eye, a little longer than proboscis. **Thorax** brownish yellow, with scutum bearing three indistinct slightly darker narrowly separated shining brownish stripes, the median reaching the anterior margin, the two laterals rounded in front behind the humeral areas. Scutum bears short dark bristling, median stripe including irregularly biserial acrostichals medially and similar irregular series of dorsocentrals laterally, the humeral areas and side margins bear more scattered bristles with denser longer bristling above the wing base. Scutellum yellow, with irregular dark marginal bristles about as long as its medial width. Pronotum and proepisternum with long irregular bristling. A group of short postspiracular bristles behind prothoracic spiracle. Pleura, laterotergite and mediotergite otherwise bare; yellow, mediotergite more or less brownish dorsally. **Legs** long, slender, yellow, with short dark bristling. Tibiae with irregular series of short bristles about half tibial diameter in length. Tibial spurs 1:2:2, brown, with posterior spurs on mid and hind tibiae longer. **Wing** yellowish with brown veins, with slight dark shade below tip of R_5. Vein Sc ends a little before level of base of Rs. Vein R_4 ends in costa about its length beyond tip of R_1. Costa extends about 0.4 distance from tip of R_5 to that of M_1. **Abdomen** yellow except for tergites 2-4 narrowly dark basally, tergite 5 dark dorsally and all of tergites 6-8 dark brown to black, sternites all yellow. **Terminalia** (Fig. 2F-J, Fig. 3C-D; Chandler 1992, figs 6-8) dark brown. Gonocoxite H-shaped, connected ventrally by a narrow bridge, inner process (of gc III) long, digitate with one or two apical setae, dorsal lobe with small apical brush consisting of short setae. Gonostylus wide triangular in lateral view, dorsally with a small hook, inner surface with two strong un-curved setae. Aedeagal apparatus long, with laterally compressed plate extending anteriorly into segment IV, with a dorsal arc and long associated apodemes. Tergite IX with transverse caudal margin and convex lateral margin forming obtuse to angular corner in lateral view. Cercus short digitiform, proctiger distinct, rhomboid with two small brushes of setae caudally. **Wing length** 4.7-5.2mm.

Female. Very similar to male in most respects. Thorax with median scutal stripe paler medially, with darker lateral margins on which dorsocentral series are set. Abdomen mainly yellow with tergites 4-6 dark basally, 7 dark brown to black. Ovipositor (Chandler 1992, fig. 9) short, brownish yellow. Wing length: one small example (Brinken Wood) 4.2mm, others 5.9-6.3mm.

Holotype male: **ENGLAND**: Hampshire, New Forest NP, woods by Beaulieu River (SU3806), 13 July 1990, leg. P.J. Chandler, deposited in Natural History Museum, London (BMNH-JKJ-SPM-054786, pinned with cleared terminalia in glycerine).

Paratypes: **SWEDEN**: 1♂, **ÖG**, Sturefors Nature Reserve, 58°19'43"N, 015°46'08"E, 15 June 1990, leg. M. Wadstein (MZLU-JKJ-SPM-034557, mounted on slide in Canada balsam). **ENGLAND** (Hampshire): 1♂, Whitmoor Vale (SU8536), broad-leaved woods, 12.vii.1990, leg. A.E. Stubbs; 1♀, same data, leg. P.J. Chandler; 1♀, New Forest, Brinken Wood (SU2705), 5.vi.1988, leg. P.J. Chandler; 1♀, New Forest, Mark Ash Wood (SU2407), 19.vi.1998; 1♀, Hampshire, New Forest, The Knowles (SU2608), 16.vii.1995, leg. I. Perry; 1♂, New Forest, Denny Wood (SU3306), 18.vi.2000, leg. I. Perry. **CHANNEL ISLANDS**: 2♂♂, Jersey, St Lawrence, Waterworks Valley, <28.viii.1994, Malaise trap, leg. A. Warne.

Discussion

In the key by Chandler *et al.* (2005) both sexes of *M. hugoi* and females of *M. rostrata* run to *M. rostrata* while, because of the darker thoracic stripes, males of *M. rostrata* run to *M. ardea* Chandler, 1994 which differs in having the pleura and mediotergite dark. Both species run to *M. rostrata* in the key to males only by Bechev (2010b), based on structure of the genitalia.

A species group within *Macrorrhyncha* may be defined for those species having a brush of setae on the dorsal lobe of the gonocoxite. This group includes *M. rostrata* (Zetterstedt, 1851) (N Europe), *M. hugoi* sp.n. (NW Europe), *M. brevirostris* (Lundström, 1911) (central Europe and Mediterranean region) and *M. uncinata* Uesugi, 2005 (Japan). It is interesting to note that the brush in these species has a corresponding hook dorsally on the gonostylus suggesting a gripping function around the brush.

Macrorrhyncha hugoi differs from *M. rostrata* in having the proboscis shorter than the height of an eye and sessile palps (Figs 1E-F), while *M. rostrata* has a stouter proboscis (longer than eye height) with palps originating distinctly distal to the base (Figs 1B-C). The yellow scutum with indistinct thoracic stripes (Fig. 1D) seems to contrast the dark brown thoracic stripes found in the male of *M. rostrata* (Fig. 1A), although females of both species have a yellow scutum. The male terminalia of *M. hugoi* differ from *M. rostrata* in the following details: inner process of gonocoxite long digitate with two apical setae (as opposed to short, sessile); apical brush on dorsal lobe of gonocoxite smaller (less than half size) and with shorter setae; gonostylus wide triangular in lateral view (as opposed to triangular), with considerably smaller dorsal hook (Fig. 2I) (quite large in *M. rostrata*, Fig. 2D); inner surface of gonostylus with two un-curved setae (as opposed to three or more with bent tip); caudal corner of tergite IX angular to obtuse in lateral view (as opposed to distinctly pointed with concave ventral margin). *Macrorrhyncha brevirostris* differs from both species in having a loosely defined brush on the dorsal lobe of the gonocoxite, a broader intercoxal bridge and details of the gonostyli (Chandler *et al.* 2006); *M. uncinata* differs from all three European species in having a subquadratic gonostylus and a brush situated subapically on a differently shaped gonocoxite.

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Dipterists Digest 2011 **18,** 51-52

First record of *Synthesiomyia nudiseta* (van der Wulp) (Diptera, Muscidae) from Italy

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Summary

Synthesiomyia nudiseta (van der Wulp, 1883) (Muscidae) is recorded for the first time from Italy.

In the family Muscidae, *Synthesiomyia nudiseta* (van der Wulp, 1883) (Figs 1-2) can be immediately recognised by its *Muscina*-like appearance, but it differs from this latter genus by a bare arista, wholly reddish antenna and an orange-tipped abdomen. Other significant differences from the genus *Muscina* are: the haired prosternum and meron (bare in *Muscina*), a broader lower calypter (of the *Musca*-type) and the lack of cruciate interfrontal setae in females (usually present in females of *Muscina*). Both genera belong to the tribe Reinwardtiini (subfamily Azeliinae).

Fig. 1. ***Synthesiomyia nudiseta* (van der Wulp), male © G. Mayer**

Fig. 2. ***Synthesiomyia nudiseta*** **(van der Wulp), female © G. Mayer**

Sythesiomyia nudiseta is widely distributed mainly in the tropical and subtropical regions of the world. From Europe, it has been recorded from the Canary Islands, Madeira Islands, Azores, Malta and the Spanish mainland (Pont 2004).

Four specimens of *Synthesiomyia nudiseta* were found by GM in Naples, Italy. Collecting data for these specimens are as follows: Italy, Campania, Napoli (40°50'07"N 14°13'25"E), 7.xi.2009 (G. Mayer), 2 males and 2 females in alcohol. After the flies were collected and sent to SL, their identity as *Synthesiomyia nudiseta* (van der Wulp, 1883) was confirmed. The specimens were found in the town centre, in a rather dirty place with dog excrement and urban waste.

These flies seemed to share the habitat with *Muscina levida* (Harris), many males of which were found at the same place. During October and November, other specimens were observed, always sunning themselves on wooden or metal posts, with temperatures about 25 °C and 60/80 % of humidity.

Acknowledgements

We are very grateful to Adrian Pont for his help and for the revision of this note, and to Nikita Vikhrev for his help and valuable advice.

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Dipterists Digest 2011 **18,** 53-54

Another record of *Sciara militaris* Nowicki (Diptera, Sciaridae) from Scotland

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Summary

Sciara militaris Nowicki is shown to have been resident in Britain for at least 15 years.

Sciara militaris Nowicki was first recorded in the British Isles at Barcaldine, Argyllshire in 2004 (Craik *et al.* 2005, 2006) and there have been subsequent records from a second locality in the west of Scotland at Kilmelford (Craik *et al.* 2007, Craik and van den Kraan 2009) and from a site at Redesdale Forest in Northumberland (Crossley 2009). The larvae are well known to form columns of many individuals and are consequently known as armyworms.

A third Scottish population of *S. militaris* has now been found at Leadhills, South Lanarkshire. For at least the past fifteen years in early July they have been seen in a local garden, usually moving along gravel paths. This was reported to a member of the local council's planning department. Photographs were taken in 2009 when the moving columns reached one to two metres in length. A small sample of larvae was collected from a column in the following year, on 27 July 2010. These were placed in a small plastic box with a muslin cover to allow air circulation along with quantities of the substrate: gravel mixed with needles from a yew tree (*Taxus baccata*). Some damp paper tissue covered the box base to maintain humidity. Several larvae pupated in small clusters, mainly in the corners of the box and adults began to appear on 10 August. Altogether 5 males and 8 females emerged, which allowed the species to be confirmed as *S. militaris* Nowicki.

Substantial areas of moorland around Leadhills, in the western part of the Southern Uplands of Scotland, have been extensively planted with coniferous trees over many decades and possible occurrence of armyworms elsewhere locally should be investigated. Many of the earlier forestry blocks are now mature and being harvested by clear-felling. There is a similarity of location with respect to the other recent discovery of *S. militaris* in England (Crossley 2009) as well as that described by Craik *et al.* (2005). Crossley (2009) commented that there had been no very recent planting in the Redesdale Forest area, but it is afforested with spruce *Picea abies*.

As the adults are weak-flying and the known sites lie within a north-south distance of 140km it would appear that the four populations are independent of each other; however, they may be linked by undiscovered populations. It was a surprise to realise that this insect has been in the British Isles for at least fifteen years and that this extraordinary phenomenon (Fig. 1) was unknown beyond the confines of a small Scottish settlement for so long. It seems often to be the case that introduced species remain at low population levels for a considerable time. Due to some change in their immediate environment a sudden expansion in their range or 'population explosion' can occur. Perhaps a pattern will emerge over the next few years.

Fig. 1. Army worms on garden path, Leadhills, South Lanarkshire, July 2010; two pence coin (26mm diameter) for scale.

Acknowledgements

Charlie and Greta Clark kindly provided access to their garden and allowed the gathering of a sample. Peter Chandler confirmed the identity of *S. militaris*. Clive Craik made useful comments on the first draft, which have been incorporated here.

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Observations on the ecology and behaviour of *Microdon myrmicae* Schönrogge *et al.* (Diptera, Syrphidae), with a description of egg and early instar morphology

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Summary

Observations of the scarce hoverfly *Microdon myrmicae* Schönrogge *et al.,* 2002 in Devon, England, are reported. Most larvae were found in nests of the ant *Myrmica scabrinodis* Nylander, the most frequent host across the fly's range; however, sufficient numbers were found in nests of *M. ruginodis* Nylander to suggest that this may at least be a secondary host. Adults conserve energy by spending most of their time stationary, only flying in periods of sunshine or light cloud cover. They roost on site at night and do not appear to feed. Males can live for up to 18 days in the field, and females for 20 days in captivity. Females mate soon after emerging, typically being caught when flying by males perched on vegetation. Mating lasts for 20 to 25 minutes. Females enter the nests of the ants to lay their eggs. Eggs are probably laid in batches of up to three. Captive females can lay up to 120 eggs, so have the potential to lay eggs in many ant nests. The food of the first instar larvae is not known, but may not include ant eggs, larvae or pupae. Second and third instar larvae feed on ant larvae. Observations suggest that a proportion of larvae develop over two years. Ants do not exhibit any behavioural interaction with eggs or larvae, whether protective or offensive. The morphology of eggs and of first and second instar larvae is described. The chorion of the oval white egg is structured, with numerous stellate conical processes arranged in regular spiral patterns. The first instar larva is very different from later instars, being flatter and much more mobile. The second instar stage resembles the third, but has a conspicuous protruding marginal band.

Introduction

Microdon myrmicae Schönrogge *et al.*, 2002 is a scarce hoverfly in the British Isles, which was first recognised as a separate species from *M. mutabilis* (Linnaeus) by Schönrogge *et al.* (2002). Like other temperate *Microdon* species at least later larvae of *M. myrmicae* are myrmecophilous, feeding on the juvenile stages of ants. Third and probably second instar larvae of *M. myrmicae* and *M. mutabilis* are known to feed on immature ant stages (Barr 1995, Elmes *et al.* 1999; Schönrogge *et al.* 2002), but the food of first instars is unknown.

In south-west Britain the species occurs within species-rich *Molinia caerulea* and *Juncus* species grasslands, known locally in Devon as Culm grasslands and in Wales as Rhôs pastures. It also occurs on other poorly-drained acidic habitats, such as the mire systems of Dartmoor and Bodmin Moor, and the wet lowland heaths of south Wales, east Devon and Dorset. In contrast *M. mutabilis* occurs on freely-draining, well-grazed and usually calcareous grassland. *Microdon myrmicae* is widely distributed in suitable habitat patches across Europe, while *M. mutabilis* appears to be restricted to Ireland, Scotland and Scandinavia (Bonelli *et al.* in press).

The author found a colony of *M. myrmicae* on a patch of Culm grassland at his farm in north-west Devon in June 2009 and was able to make detailed observations of the fly that summer and in 2010. Observations were also made at sites elsewhere in Devon and on captive individuals. The results of the observations made are compared and contrasted with previously published observations for temperate *Microdon* species, especially *M. mutabilis.*

Material and methods

The site where most observations were made is in a small (0.36 ha) field at Locks Park Farm, Hatherleigh, north Devon, England (NGR SS516024). Here the *Microdon* colony inhabits the tops of the vegetated spoil banks above a pond, which was excavated in 1997, where the area occupied by the core of the colony is c. 90 m². The soil is heavy acidic clay with shale and has very poor drainage – even the spoil banks are waterlogged for much of the year. In 2009 and 2010 the dominant vegetation on the bank tops was velvet bent *Agrostis canina* (Poaceae) with soft-rush *Juncus effusus* and jointed rush *J. articulatus* (Juncaceae); also frequent were bugle *Ajuga reptans* (Lamiaceae), wild angelica *Angelica sylvestris* (Apiaceae), marsh thistle *Cirsium palustre* (Asteraceae), ribwort plantain *Plantago lanceolata* (Plantaginaceae) and the moss *Kindbergia praelonga* (Brachytheciaceae). The host ant species at this site is *Myrmica scabrinodis* Nylander, colonies of which are frequent throughout the core area, usually nesting in *Juncus effusus* tussocks.

Between mid-May and mid-June the main study site was checked at intervals of between one and two days (depending on weather conditions) for the presence of adult *M. myrmicae*.

On 5 June 2010 20 adults of both sexes were captured by sweep netting at dusk and marked (with a dot of acrylic paint on the thorax) and released on site to determine longevity and in an (unsuccessful) attempt to estimate population size.

The egg and first and second instar stages of *M. myrmicae* are described and illustrated, based on observations of living material using a stereo microscope with up to 45x magnification. To obtain eggs, freshly mated females were taken from the field and kept in a 0.5 l plastic pot with 5mm of soil taken from a *M. scabrinodis* nest. Eggs and larvae were kept and observed in clear plastic containers (base 75mm by 45mm, height 25mm). They were provided with soil crumbs and other debris taken from the top layers of *M. scabrinodis* nests. *Microdon* larvae were usually kept in same instar groups of up to c. 20 first instar larvae and 5 later instars. Ant eggs, larvae, pupae and adults were added as appropriate to the experiment. The containers were kept in the dark at room temperature, and damp with moistened tissue paper. All fly and ant material came from the main study site. Observations on larvae were made at various times throughout day and night, although the need for illumination meant that all observations were done under strong light conditions.

Observations on adults

Activity patterns, feeding and roosting behaviour

In 2009 adults were seen between 24 May and 4 July, and in 2010 between 25 May and 30 June. On a sunny day during the peak flight season, the first two weeks of June, between 15 and 24 adults could typically be seen during the course of a 5 minute slowly-walked transect through the core area.

During daylight hours adults spend much of their time perching upon herbaceous stems and leaves in exposed positions, apparently conserving energy (Stubbs and Falk 2002). Since they do not fly much they are generally inconspicuous but when spotted can be often be approached closely and their behaviour observed from a metre or so away without disturbance. They are strongly thermophilic, flying only during warm periods when there is no or little cloud cover, becoming inactive long before most other hoverflies (e.g. *Eristalis* and *Platycheirus* species). *Microdon myrmicae* rarely flies more than 1 m off the ground, and was seldom seen perched on surrounding bramble *Rubus fruticosus* agg. bushes or nearby scrub. Few flights covered more than a few metres, although they must move further when dispersing – adults were occasionally seen elsewhere in the field and a male was swept from an adjacent field of unsuitable habitat.

Adults were never seen to feed even though there were plenty of flowering plants on site. They were observed on occasion to apparently test leaf surfaces with their mouthparts, and may drink from sources such as dew or rain drops from time to time.

On 6 June 2010 two males were found at 18.00 BST, one sitting on the top of a young flowering spike of bugle *Ajuga reptans* and the other on the lead shoot of a 20cm high oak *Quercus robur* sapling. At 21.40 BST, just as night was falling, both adults were in exactly the same position, and they were still there at 07.30 BST on the following morning. On several occasions vegetation was lightly swept with a hand net in the evening, and on each occasion adults were readily caught, confirming that they roost on site without apparently seeking cover and do not fly into surrounding woodland as has been suggested by some continental researchers (Schönrogge *pers. comm.*) (the study site field joins a 1 ha woodland).

Of the 20 individuals caught and marked on 5 June 2010 two males were still alive on 23 June, both with the wings much frayed, showing that they can survive for at least 18 days. No marked females were re-seen, but in captivity a freshly-mated female survived for 20 days.

Mating behaviour

Mating pairs were seen on about 30 occasions (Fig. 1). Females mate soon after emerging, as is exemplified by the following observation. On 5 June 2010, at 11.20 BST a female was observed emerging from a rush tussock (which was later found to contain an ant nest). Her ovipositor was withdrawn into her abdomen but she was unable as yet to fly. For the first 30 minutes she spent most of the time resting in the warmth of the weak sun, but twice went down back into the base of the rush clump, the second time spending at least 5 minutes there. After 1 hour 15 minutes she made a few short flights, each about 10cm, apparently testing her wings, walking a short distance in between each flight. At 13.05 BST she finally flew away from the rush clump. After going just 1.5m, a male rose up, grabbed her and they mated.

Typically males lie in wait for females passing overhead. Observation of marked males suggested that they have preferred patches but no evidence of aggression to other males was seen, arguing against territorial behaviour. When a female enters a male's patch he flies up, grapples with her, and they land together on a convenient nearby piece of vegetation. Most females are quickly released. However, if the female is receptive, the male commences a brief courtship as described below. Occasionally, males pounced upon resting females but on each occasion where the female was seen beforehand she had just landed, presumably being located by the male while she was in flight.

In *M. myrmicae* courtship the male, while holding on to the female from above, strokes the sides of her abdomen with his forelegs, occasionally flapping his wings rapidly, each burst lasting about a second. No sound audible to the ear of the observer was made. Although on occasion females were seen trying to dislodge the male during this courtship, they were never observed to be successful in this. It was not obvious that there was any female selection of mating partner. At the peak of the flight period, during the courtship phase one or sometimes two other males occasionally attempted to dislodge the first male, so there might be three males in a row behind the female. These late arrivals were never seen to be successful at displacing the original male.

Following the brief courtship, lasting no more than a minute, the *M. myrmicae* pair sexually join and remain so for 20-25 minutes. Occasionally during this period the coupled pair may crawl or fly to a more sunny or shady spot but normally remain still, apart from occasional fidgeting by the female followed by the male making a few placatory wing bursts and abdominal strokes. During the last 3-5 minutes, the female attempts to dislodge the male by wriggling her abdomen, these attempts becoming increasingly vigorous. However, the male doggedly stays attached, making more and more frequent wing bursts. Eventually, though, the pair separate and fly off.

Fig. 1. ***Microdon myrmicae*** **midway through mating. Male on right. Locks Park Farm, Hatherleigh, Devon, 9 June 2009**

Oviposition

Adult females were observed entering ant nests on five occasions, with detailed observations being possible on two of them. On the first occasion a female was observed flying low down among the vegetation, occasionally settling for brief periods before selecting a small *Juncus effusus* tussock for more detailed attention. She could be glimpsed walking around just beneath the loose mosses that covered the surface of the underlying ant nest before disappearing deeper into the nest for about 5 minutes. A series of short, high pitched, staccato buzzes were heard. There was no sign of any agitation from the ants. After she emerged she flew 50cm and rested on a stem. After about 5 minutes she exuded a drop of liquid from the tip of her abdomen, returned briefly to the clump and then flew away. When the nest was carefully excavated, ant tunnels of about the same width as adult *Microdon* were found leading down from the surface towards the brood chambers. Three *Microdon* eggs were found in a cluster, loosely adhering to the base of a rush stem, on the edge of a brood chamber containing ant eggs. As the ants hurried to remove their eggs and larvae, they took no notice of the *Microdon* eggs. The nest was very moist.

On the second occasion, a female was observed entering an ant nest at the base of a *Juncus effusus* clump. She briefly walked over the top of and around the nest before apparently attempting to find an entrance at a place where the soil surface was exposed. She failed to find a hole of adequate size and instead inserted her abdomen into a small hole for perhaps 10 seconds. After emitting a short high-pitched burst she flew a few cm to rest on a rush stem. Here she stayed for 5 minutes before flying to the other side of the nest, which was covered by leaf litter. Ants present on the surface here were not agitated by the presence of the *Microdon* female. She was lost to view for about 5 minutes, when it is assumed she had entered the nest: on two or three occasions a brief high-pitched buzz was heard. When she re-appeared she flew away from the nest. The nest was then opened. No eggs were found where the female had inserted her abdomen into a hole on the surface. However, deeper within the nest three *Microdon* eggs were found. Due to the dry friable nature of the soil the nest rapidly disintegrated when opened and it was not possible to determine whether the eggs were close to an ant brood.

A freshly-mated female taken from the field laid 120 eggs over a 20 day period, initially laying on average 12 a day. Another female laid 99 eggs.

Observations on larvae

Larvae were usually found in nests of the ant *Myrmica scabrinodis* Nylander, but at three out of the ten separate sites where the host ant was identified, larvae were found in nests of *Myrmica ruginodis* Nylander.

Ant nests were frequently found to contain *M. myrmicae* larvae of different sizes. For example, a nest opened on 29 July 2009 had eight *Microdon* larvae, of which two were 3-4mm long second instars, four were 5mm long third instar larvae and two were 7mm long, again third instars. Some larvae in late April were only three quarters grown or less and on 30 July 2009 a single very large (10mm) third instar larva was found in a nest of *M. scabrinodis*.

Eggs laid by captive females hatched readily and about 40 newly emerged first instars were observed. Although some grew and accumulations of food or faecal matter could be seen as brown masses in their guts, despite careful observation it was not clear what these first instars ate. When they moved into contact with *M. scabrinodis* eggs, larvae or pupae they displayed no interest in them. Indeed, several continued to grow in a container that had no ant immature stages in it. Neither did they take any particular notice of other first instar larvae, fungal bodies, roots, green vegetative matter or dead ant larvae or pupae. At times the dark sclerotised larval mouthparts could be seen moving back and forth. Mortality of larvae was high, but it was thought this was primarily due to desiccation or fungal attack (getting the moisture content of the container right was difficult) than to lack of food. One larva was successfully raised to second instar stage.

In the field, on 5 July 2010, a half grown first instar larva was found on a small flat-sided crumb of earth near the top of an ant nest, at the same level as some ant larvae. It did not appear to be within a brood chamber, although the friable nature of the nest and rapidity with which ants remove their larvae to safety means that this observation should be treated with caution. No ant eggs were found in the top layers of the nest.

Microdon myrmicae third instar larvae placed in containers with *M. scabrinodis* eggs, larvae and pupae were found only to deplete larval numbers, suggesting that they do not normally feed on the other two pre-adult stages. In the field second and third instar larvae were often found entirely within ant brood chambers, surrounded by ant larvae, suggesting that this is their normal resting location.

Ant behaviour towards *M. myrmicae* eggs and larvae

Observations of the ant *M. scabrinodis* towards *M. myrmicae* eggs, both in captivity and in the field, revealed that the ants take no notice of the eggs, at least when ant and hoverfly are from the same site. Likewise, ants take no notice of any larval stage of *M. myrmicae,* as far as the human observer can discern. Adult ants often rest on top of third instar larvae – there is no sign that they recognise them as predators. The ants neither carry the *Microdon* eggs away with their own eggs or larvae when their nests are disturbed nor attack them. The ants also do not pay any regard to *Microdon* larvae when their nests are disturbed.

Morphology of immature stages

Egg morphology

Microdon myrmicae eggs are white, ovoid, circular in transverse section and c. 0.8mm long. Their chorion is structured, with hundreds of stellate conical processes. These are arranged in a very regular pattern over the surface of the egg, so they appear to run in spiral rows around the egg, whether considered clockwise or counter-clockwise. As such the eggs are broadly similar to those described for four North American species, *M. albicomatus* Novak, *M. cothurnatus* Bigot, *M. piperi* Knab and *M. xanthopilis* Townsend (Garnett *et al.* 1990).

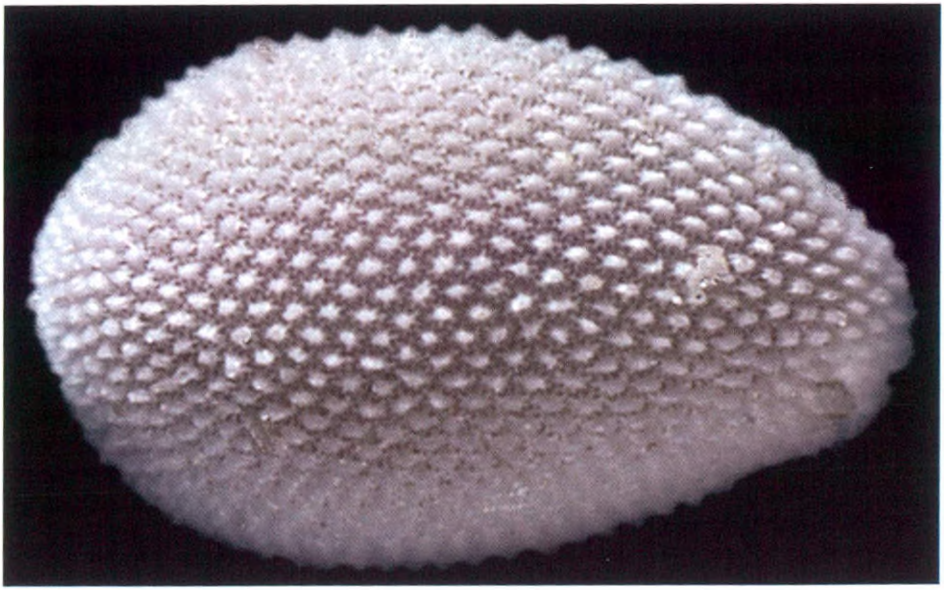

Fig. 2. ***Microdon myrmicae*** **egg (c. 1mm long). Egg laid by female captured at Locks Park Farm, Hatherleigh, Devon. Photograph by Chris Spilling.**

Larval morphology

The third instar larvae and puparia of *M. myrmicae* have been well described by Schönrogge *et al.* (2002). However, the earlier instars do not appear to have been described before.

Fig. 3. ***Microdon myrmicae*** **young first instar larva (c. 1mm long). Dorsal view, head on right hand side, paired posterior spiracles to left. Reared from egg laid by female taken at Locks Park Farm, Hatherleigh, Devon, in late May 2010.**

The first instar is very different in appearance from the two later instars. It is much flatter, lacking any dome-shaped appearance, and translucent. This instar is also much more mobile and flexible, capable of marked elongation, being on the move for much of the time. One of its two most prominent features is a pair of perpendicular posterior spiracular tubes which, although joined for most of their length, are clearly visible as separate tubes. They separate and diverge close to the distal end. Being brown they contrast with the white cuticle covering the rest of the larva. When newly-hatched the spiracular tubes are about one fifth the length of the larva, but do not grow so are much smaller in proportion to the fully grown instar. The other prominent feature is a frill of membranous flaps projecting from the marginal band between dorsal and ventral surfaces, again most obvious when newly-hatched. The head normally projects beyond the main body but is retractable. In the newly hatched larva, when fully extended the head is one sixth of the body length. When active, deeply forked mobile maxillary antennae extend forward the same length again as the head. The cuticle of the main body is not marked with any projections, although there is a suggestion of weak longitudinal ridges.

The second instar is similar in appearance to the third, being distinguished by the smaller size and a considerably thicker marginal band forming a distinct ring.

Fig. 4. *Microdon myrmicae* second instar larva (c. 3mm long). Dorsal view, head on right hand side, posterior spiracle to left. Collected from Luckroft Farm, Beaworthy, Devon, 2 August 2010.

Discussion

Adult behaviour

Adult *M. myrmicae* emerging from their puparia may gain some protection by doing so in the early hours of the morning when the ants are least active, as suggested by van Pelt and van Pelt (1972) for *Microdon baliopterus*. However, *M. myrmicae* females oviposit in the heat of the day when the ants are most active so must have some sort of protection. Barbero *et al.* (2009) found that the pupae and larvae of *Maculinea rebeli* Hirschke (Lycaenidae), a butterfly that is another social parasite of *Myrmica* ants, produce distinctive sounds that mimic those of *Myrmica schencki* Viereck queens and elicit benevolent responses from workers. They concluded that acoustic mimicry provides a route for social parasites to infiltrate ant societies. The buzzing sounds heard when *M. myrmicae* females are in ant nests suggest that they too may use sound to reduce the risk of attack: in captivity; similar sounds are made by females when they are disturbed.

At 18 to 20 days, the longevity of *M. myrmicae* adults reported here contrasts with that of adult *M. mutabilis*, which live just 3 to 7 days in the field and 10 days in captivity (Schönrogge *et al.* 2006, 2008 - it is not clear whether these figures relate to both sexes). Weather may, though, have a considerable influence on life expectancy – in Devon, June days with rain and heavy cloud are frequent and on such days the flies remain inactive, using up little of their energy reserves. By way of comparison, Ball and Morris (2004) found that some individuals of both *Volucella pellucens* (Linnaeus) and *V. inflata* (Fabricius) can survive for 24 days in the field: these hoverflies are very active as adults and feed regularly on nectar, so are very different from *Microdon*.

Do female *M. myrmicae* have multiple mates? Observations to date suggest that females mate only once, surprising given the apparent lack of sexual selection. Following marked females would answer this question, and also provide information on life expectancy for this sex outside the laboratory. Perhaps the male plugs the female towards the end of the period during which they are sexually joined, when she is attempting to free herself? Observing the Nearctic species *M. xanthopilis* in containers, Akre *et al.* (1973) noted that females mated with several males, while Duffield (1981) found that in captivity males and females of another Nearctic species *Microdon fuscipennis* (Macquart) readily mated more than once.

And how do adult male *M. myrmicae* recognise females as such when they are flying overhead? Although males were seen on occasion to accost other insects and no doubt occasionally mistake males of their own species for females, usually they flew only in response to passing females, a good strategy to conserve energy. The few occasions when males were observed to pounce upon resting females, as described by Bridgen (1997) for *M. mutabilis sensu lato*, were interpreted as being where the female had just landed. As it is concluded that stationary unmated females do not attract males, the use of chemical signals seems unlikely. Sound cues are more probable. The mate seeking behaviour of *M. myrmicae* differs from that of the Nearctic species *M. xanthopilis* and *M. piperi* where the normal sequence of events is for a patrolling male to spot and mount a freshly-emerged female, copulating only after she has expanded her wings (Akre *et al.* 1973). Akre *et al.* (1973, 1988) did not observe any courtship prior to copulation in *M. xanthopilis* or *M. piperi,* but did observe male competition for females similar to that observed in *M. myrmicae*.

As may be expected given their very different habitats and the different subfamilies of their host ants, the sibling species *M. myrmicae* and *M. mutabilis* show marked behavioural differences. For example, *M. myrmicae* lays its eggs actually within ant nests, probably close to brood chambers, while *Microdon mutabilis*, which is a brood parasite of *Formica lemani* Bondroit, an ant which typically builds its nests beneath stones, deposits its eggs on the ground surface above the ant nest (reported by Elmes 1999). Like *M. mutabilis*, however, *M. myrmicae* appears to lay its eggs in batches of about three to six. It is also likely that as with *M. mutabilis*, *M. myrmicae* females recognise host ant nests from specific volatile compounds arising from them: Schönrogge *et al.* (2008) showed that in the laboratory *M. mutabilis* females react to volatiles from *Formica lemani* (but not *M. scabrinodis*) colonies by extending their ovipositors. It was concluded from the finding of larvae of different sizes within a given nest that over the flight season several *M. myrmicae* females may lay batches of eggs in the same ant nest.

Larval biology

Can *Myrmica ruginodis* be safely added to the list of *M. myrmicae* host species, and if so should it be regarded as a primary host or just a secondary one where larval survival and growth rates are reduced? It is possible that nests of *M. ruginodis* in which larvae were found had been occupied by *M. scabrinodis* when the hoverfly eggs were laid, but the number of records suggests that *M. ruginodis* may be at least a secondary host species. Schönrogge *et al.* (2002) reported that of 71 nests in southern England occupied by presumed *M. myrmicae* larvae three belonged to ant species other than *M. scabrinodis*, including *Myrmica ruginodis* and *M. sabuleti* Meinert. In line with previous authors, they suggested that these three cases were the result of *M. scabrinodis* nests being vacated, probably as a result of predation by the *Microdon* larvae, and taken over by other ant species. Bonelli *et al.* (in press) did not find *M. myrmicae* in nests of *M. ruginodis* in any of the 31 populations investigated across Europe. However, in Poland they found *M. myrmicae* associated with *Myrmica gallienii* Bondroit and to a lesser extent *M. rubra* (Linnaeus). Since they could not detect any significant morphological differences in puparia, they regarded *M. myrmicae* as a generalist parasite of *Myrmica* ants. In 2010 a single *Microdon* larva was found (by Roger Morris) in a nest of *Lasius niger* (Linnaeus) at a heathland site in East Devon. An externally identical larva at the same developmental stage was found in a nearby nest of *M. scabrinodis*, suggesting that this was a case of a *M. scabrinodis* nest being taken over by another ant species. Further work in Devon is proposed by the current author to give a better estimation of the frequency with which *M. ruginodis* nests are occupied.

A behavioural difference between *M. myrmicae* and *M. mutabilis* lies in their larval food. Schönrogge *et al.* (2006, supplementary appendix 2) found that in the laboratory 67% of prey items taken by *M. mutabilis* were *F. lemani* eggs, 30% small larvae and 2% large larvae. They noted that at these proportions an adult hoverfly puparium is equivalent in weight to as many as 2007 ant eggs, 98 small ant larvae and one large ant larva. By contrast, this study suggests that *M. myrmicae* larvae feed, preferentially at least, only on ant larvae. Neither species appears to take ant pupae: Schönrogge *et al.* (2006) offered ant pupae to *M. mutabilis* larvae but did not record any as being taken, although Boyd Barr (reported by Rotheray 1993), stated that *M. mutabilis* preyed on pupae. Larvae of *Microdon analis* (Macquart), which is predatory on *Lasius* and perhaps *Formica* ants, behave differently: Boyd Barr (reported by Stubbs and Falk 2002), observed that they rest away from brood chambers, only visiting them to feed briefly in the very early hours of the morning when the ants are less vigilant

The food ingested by first instar larvae is an area where research is required. Since this instar is not apparently predatory on ants, what are they eating? Perhaps, especially if saprophagous, their feeding habits may reflect their phylogenetic origin (Alan Stubbs *pers. comm.*). It is intriguing that Donisthorpe (1927), reported by Stubbs and Falk (2002), suggested that *Microdon* larvae (unspecified species or instars) feed on the minute food particles discarded by ants as buccal pellets – although this has been disproved for second and third instar larvae, perhaps it could hold true to the first instars? Duffield (1981) found that in artificial nests of the ant *Iridomyrmex pruinosus* (Roger) first instar larvae of *Microdon fuscipennis* congregated on moist fungus-covered cottonwool plugs, although he hypothesised that they might feed on liquids secreted by ant larvae. Garnett *et al.* (1985) described the first and second instars of three Nearctic boreal species, *Microdon albicomatus*, *M. cothurnatus* and *M. piperi*, cutting slits in the cocoons of their ant hosts (species of *Camponotus* and *Formica*), entering the cocoons and then almost certainly feeding on their contents. However, since the *Myrmica* ant hosts of *M. myrmicae* do not form cocoons, this is not an option for this *Microdon* species.

From observations of the first instar larvae it is suspected that they ingest microscopic particles – this would be consistent with their movement patterns which involved moving rapidly over and around particles of soil and organic matter, often moving their heads from side to side, occasionally stopping in one place while continuing to make head movements. As noted above, they could be saprophagous or ingest buccal pellets. Other possibilities are that they feed on ant faecal material (Martin Speight *pers. comm.*) or that they are cannibalistic on other larvae (Graham Rotheray *pers. comm.*). Although first instar larvae were not observed to take any notice of each other, it is possible that they are cannibalistic (feeding on ant eggs, larvae or pupae remains improbable because some grew in the absence of any of these ant immature stages). Examination of the larval mouthparts may give further clues as to the food of the first instar larvae (Alan Stubbs *pers. comm.*).

The finding of a very large (10mm) third instar larva in a nest of *M. scabrinodis* in July and the observation that some larvae in late April are only three quarters grown or less, suggests that a proportion of larvae develop over two years as contended by Schönrogge *et al.* (2000). Working with material from *M. scabrinodis* nests in Devon and Dorset between 1996 and 1999, they found that weights of larvae collected just before the time when pupation occurs (April to May) showed a clear bimodal distribution, and from this they concluded that, as with *M. mutabilis sensu stricto* where the same bimodal distribution was observed, at least some larvae live for two years. The excavation of further ant nests in early July, when any third instars present are likely to have already over-wintered once, will assist further understanding on the proportion of *M. myrmicae* larvae which develop over two years. It may be easier for *M. myrmicae* to complete its life cycle in one year than for *M. mutabilis* since its *Myrmica* host ants appear to be multiple-brooded (ant larvae have been found in Devon as early as 13 March and late as 10 October (pers. obs.)), while *Formica* species are single-brooded (Schönrogge *et al.* 2006, supplementary annex 2). Schönrogge *et al.* (2000) postulated that a life cycle over two years is necessary because an average sized *Myrmica* nest could not produce enough ant larvae to sustain a typical burden of 3 to 6 *Microdon* larvae, let alone those nests which host many more – the current author found a single nest with 17 occupied puparia, four vacated puparia and four larvae in late May 2009.

To understand population dynamics, research into the relationship between host numbers, hoverfly numbers and the proportion of *Microdon* larvae that develop over two years will be critical. It may be expected that the greater the number of hoverflies in proportion to the number of ants, the more larvae will require two years to reach optimal weight for pupation. For a full review of the interactions between ants and their many insect social parasites, see Thomas *et al.* (2005).

The manner in which *M. myrmicae* avoid being recognised by ants as predators or prey is intriguing. Although their outer covering is structured, eggs are not sufficiently strong to withstand the powerful jaws of an ant. First instar larvae are particularly vulnerable to attack and it is difficult to believe that later instars would be safe either without some non-physical defence mechanism: their soft ventral surface is often exposed when the larva moves between soil crumbs. Since the ants do not attend to the eggs or larvae, or rescue them along with their own juvenile stages, chemical mimicry seems improbable. Rather, it may be surmised that *M. myrmicae* eggs and larvae have a chemical signature which the ants detect as entirely neutral, so they are effectively camouflaged even when moving, merging into the background (for further discussion on this see Elmes *et al.* 1999, Gardner *et al.* 2007). If first instar larvae eat ant buccal or faecal pellets, this could be a way by which the larvae gain the camouflaging odour of their host colony (Martin Speight, *pers. comm.*).

Elmes *et al.* (1999), investigating *M. mutabilis*, found that new-laid eggs had >95% survival when introduced to the individual *Formica lemani* colony that reared the mother fly, but survival declined markedly with increasing distance from the mother nest, with ant colonies from 2 km and 30 km away killing 80% and >99% of eggs respectively. They suggested that eggs may be coated with a mimetic chemical disguise that lasts for three to four days after oviposition. Do *M. myrmicae* eggs suffer increasing mortality from ants the further they are removed from their source, or is the host–parasite relationship less specific in this species?

Barr (1995) observed that *Myrmica ruginodis* attempted to grab their larvae back from feeding *Microdon mutabilis*. However, since the *Microdon* larvae were taken from a *Formica lemani* nest, the only known natural host for *M. mutabilis*, this may not represent typical behaviour. The cuticular hydrocarbons of the larvae of *Microdon albicomatus* and *M. piperi* have been found to be the same as those of their host ant species (Howard *et al.* 1990), but as yet searches for such mimetic chemicals have not been successful in *M. myrmicae* or *M. mutabilis* (Karsten Schönrogge *pers. comm.*). However, Nearctic *Microdon* species may have different chemical protection strategies from western Palaearctic species as suggested by differences in ant-fly relationships: van Pelt and van Pelt (1972), working in Texas, noted that larvae of *Microdon baliopterus* Loew were constantly kept clean of debris by *Monomorium minimum* Buckley worker ants, while Garnett *et al.* (1985) observed that *Camponotus modoc* Wheeler, *Formica subnuda* Emery and *F. neoclara* Emery workers transported first and second instar *Microdon cothurnatus* from one brood chamber to another in the laboratory. The survival of *M. myrmicae* in nests of ants that are clearly not host species, such as *Lasius niger*, even if they do not feed, is a further mystery.

Acknowledgements

I am most grateful to Karsten Schönrogge for his help and providing me with references. Both he and Alan Stubbs kindly gave me constructive comments on a first draft of this paper, while Graham Rotheray, Martin Speight and Peter Chandler, as reviewers and editor, provided further helpful suggestions for improvement. Graham Elmes kindly helped me with the identification of *Myrmica* ants and Chris Spilling helpfully took the photograph of the *Microdon* egg for me. My thanks too to landowners who have permitted me to look for *Microdon*, especially to Marcus and Sally Vergette at Coombe Farm. Finally, I would like to record my debt to Alan Stubbs and Roger Morris for introducing me to hoverflies and for their encouragement.

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Dipterists Digest 2011 **18,** 68-70

Corrections and changes to the Diptera Checklist (25) – 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 therefore asked to inform me of any errors or changes and I would like to 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 10 species and deletion of one due to synonymy, resulting with the adjustment indicated by P. CHANDLER (2011. Checklist of British Isles Diptera updated. *Bulletin of the Dipterists Forum* No. **71,** 10-11) in a new total of **7044** species (of which 34 including one addition are recorded only from Ireland).

Limoniidae. J. STARÝ (2011. *Gonomyia* (*Gonomyia*) *lucidula* de Meijere and allies (Diptera: Limoniidae). *Entomologica Fennica* **21,** 232-242) has recognised that *G. abscondita*, queried as a synonym of *G. lucidula* in the checklist but recognised as distinct in a manuscript key by Alan Stubbs, is a good species (also see C.M. DRAKE in present issue):
Gonomyia (*Gonomyia*) ***abscondita*** Lackschewitz, 1935

Keroplatidae. The following new species is described in the present issue, replacing *Macrorrhyncha rostrata* on the British list:
Macrorrhyncha ***hugoi*** Kjærandsen & Chandler, 2011 [= *M. rostrata*: Chandler, 1992, misident., not (Zetterstedt, 1851)]

Sciaridae. The following changes result from H. HIPPA, P. VILKAMAA and K. HELLER (2010. Review of the Holarctic *Corynoptera* Winnertz, 1867, s.str. (Diptera: Sciaridae) *Zootaxa* **2695,** 1-177), who included 30 of the 55 British species assigned to this genus in the checklist in their concept of CORYNOPTERA sensu stricto (*bicuspidata*, *bistrispina*, *curvispinosa*, *flavicauda*, *flavosignata*, *furcifera*, *grothae*, *hypopygialis*, *inexspectata*, *irmgardis*, *levis*, *luteofusca*, *macricula*, *membranigera*, *minima*, *perpusilla*, *saccata*, *saetistyla*, *semisaccata*, *setosa*, *sphenoptera*, *subfurcifera*, *subtilis*, *tetrachaeta*, *trepida*, *uncata*, *waltraudis* and the species listed below):

Corynoptera consumpta (Freeman, 1987) sp. restit. = *C. sedula*: Menzel & Mohrig, 2000, not Mohrig & Krivosheina, 1985

Corynoptera ***patula*** Hippa, Vilkamaa & Heller, 2010 = *C. hemiacantha*: Menzel *et al.* 2006, not Mohrig & Mamaev, 1992

Corynoptera peronata Mohrig & Röschmann, 1993 (restored to this genus from *Cratyna* subgenus *Diversicratyna*)

Corynoptera ***triacantha*** Tuomikoski, 1960 = *C. fritzi* Mohrig & Rulik, 2001, new synonymy

Cecidomyiidae. The generic assignment of the following species was changed by K. HARRIS (2009. *Dasineura helianthemi* (Hardy): a new generic assignation for *Contarinia helianthemi* (Hardy). *Cecidology* **24,** 50-53):
Dasineura helianthemi (Hardy, 1850 - *Cecidomyia*)

The following species, listed under 'Excluded species' in the checklist, was confirmed as British by A. HALSTEAD and K. HARRIS (2011. The Aquilegia flower bud gall midge

Macrolabis aquilegiae (Kieffer) (Diptera: Cecidomyiidae) confirmed as being present in Britain. *Cecidology* **26,** 2-3, Plate 1):
Macrolabis ***aquilegiae*** (Kieffer, 1909 - *Perrisia*)

Chironomidae. The following changes result from D.A. MURRAY (2010. Records of Chironomidae (Diptera) in Ireland – twenty additions and notes on four morphotypes. *Bulletin of the Irish Biogeographical Society* **34,** 85-96):

Metriocnemus (*Metriocnemus*) ***inopinatus*** Strenzke, 1950 ++ new to the British Isles from Ireland

Micropsectra roseiventris (Kieffer, 1909 - *Tanytarsus*) = *M. fusca* of the British list, following E. STUR and T. EKREM (2006. a revision of West Palaearctic species of the *Micropsectra atrofasciata* species group (Diptera: Chironomidae). *Zoological Journal of the Linnean Society* **146,** 165-225) [*M. fusca* Meigen was based only on a female, which cannot be confirmed as conspecific].

Neozavrelia cuneipennis (Edwards, 1929) = *N. longappendiculata* Albu, 1980, transfer from *Stempellinella* and synonymy following T. EKREM (2006. A redescription of *Neozavrelia cuneipennis* (Edwards) comb. nov., with a checklist of *Neozavrelia* species of the world (Diptera: Chironomidae). *Zootaxa* **1153,** 1-16).

Rhagionidae. The family Spaniidae, recognised in recent literature including the Irish checklist (2008) and the Dipterist's Handbook (2010) was found in a phylogenetic study by P. KERR (2010. Phylogeny and classification of Rhagionidae, with implications for Tabanomorpha (Diptera: Brachycera). *Zootaxa* **2592,** 1-133) to nest within the Rhagionidae so it is concluded that it should be recognised only as a subfamily of Rhagionidae.

British genera are assigned to the following subfamilies: CHRYSOPILINAE (*Chrysopilus*), RHAGIONINAE (*Rhagio*) and SPANIINAE (*Ptiolina*, *Spania*, *Symphoromyia*).

Hybotidae. In the world catalogue (YANG, D., ZHANG, K., YAO, G. and ZHANG, J. 2007. *World Catalog of Empididae*. vi + 599 pp. China Agricultural University Press) the following new name was proposed for a secondary homonym:
Platypalpus ***excavatus*** Yang & Yao, 2007 [= *P. excisus*, described as *Tachydromia excisa* Becker, 1907, preocc. by *Tachista excisa* Loew, 1864 (now *Tachydromia*)]

Sciomyzidae. The following synonymy, that has been previously overlooked, was proposed by J.-H. STUKE (2005. Die Sciomyzoidea (Diptera: Acalyptratae) Niedersachsens und Bremens. *Drosera* **2005,** 135-166):
Pherbellia ***goberti*** (Pandellé, 1902) (= *P. stylifera* Rozkošný, 1982)

Agromyzidae. The following species is added in the present issue:
Liriomyza ***puella*** (Meigen, 1830 - *Agromyza*)

Sphaeroceridae. The following species is added in the present issue (J.H. COLE in Dipterists Day Exhibits 2009 and 2010):
Opacifrons ***maculifrons*** (Becker, 1907 - *Limosina*)

Ephydridae. The following species is added in the present issue:
Psilopa ***polita*** (Macquart, 1835 – *Hydrellia*)

Muscidae. It should be noted that a subfamily AZELIINAE is now recognised to include the two tribes Azeliini and Reinwardtiini, while Muscini and Stomoxyini are retained in MUSCINAE. This classification was followed in C.J.B. CARVALHO, M.S. COURI, A.C. PONT, D. PAMPLONA and S.M. LOPES (2005. A Catalogue of the Muscidae (Diptera) of the Neotropical Region, *Zootaxa* **860,** 1-282. Magnolia Press, Auckland, New Zealand).

The following synonymy was proposed by A.C. PONT (2011. The Muscidae described by J.W. Zetterstedt (Insecta: Diptera). *Zootaxa* **2852,** 1-83). It should be noted that *M. detrita* was the name used before 1986 for the species now known as *M. orthonevra*. It also results that *arctica* (which is a good species not found in the British Isles) should be deleted from the synonymy of *Spilogona contractifrons*, *hirsutulus* should be transferred from synonymy of *Thricops cunctans* to that of *T. innocuus* and *duplaris* from synonymy of *Helina reversio* to that of *H. obscurata*:
Mydaea ***detrita*** (Zetterstedt, 1845 – *Anthomyza*) (= *M. electa* (Zetterstedt, 1860))

Tachinidae. The following species, including one in an additional genus, are added in the present issue:
THELYCONYCHIA Brauer & von Bergenstamm, 1889 (Exoristinae, Tribe Eryciini)
Thelyconychia ***solivaga*** (Rondani, 1861 - *Masicera*)
Eumea ***mitis*** (Meigen, 1824 - *Tachina*)
Phytomyptera ***minutissima*** (Zetterstedt, 1844- *Tachina*)
Phytomyptera ***zonella*** (Zetterstedt, 1844- *Tachina*)

The third British record for *Dolichopus excisus* (Loew) (Diptera, Dolichopodidae), from Walberswick NNR, Suffolk – The record of one male specimen of *Dolichopus excisus* (Loew, 1859) from Walberswick National Nature Reserve, Suffolk constitutes the third British locality for this species, following the original discovery in Britain at Poole, Dorset in 2005 (Gibbs, D. 2006. *Dolichopus excisus* Loew, 1859 (Diptera, Dolichopodidae) new to Britain discovered in southern England. *Dipterists Digest* (*Second Series*) **13,** 5-10) and a second record from Oare Meadow, East Kent (Clemons, L. 2009. *Dolichopus excisus* Loew, 1859 (Diptera, Dolichopodidae) in East Kent. *Dipterists Digest* (*Second Series*) **16,** 188). The specimen was collected in a water trap, from wet fen habitat (NVC: M22a *Juncus subnodulosus-Cirsium palustre* fen meadow, typical sub-community) on 10 July 2010. The habitat description of the two previous British localities for *D. excisus* appears to suggest some association with saline environments. However, Gibbs (*op. cit.*) described the Poole site as having some freshwater seepages with some *Juncus*, and Clemons (*op. cit.*) referred to the Oare Meadow site as mostly freshwater marsh. As *D. excisus* was collected from wet fen at Walberswick this infers that the habitat preference for this species in Britain agrees with the recognised affinities given by M. Pollet in Gibbs (*op. cit.*) of a humid open habitat. Furthermore, the recent occurrence of *D. excisus* at three sites on the south and east coast of Britain, supports the proposition by Gibbs that *D. excisus* has indeed has shown an expansion of range and may be in the process of colonising Britain from the European mainland – **PETER J. VINCENT**, 10, Laxfield Road, Fressingfield, Eye, Suffolk, IP21 5PT

Dipterists Digest 2011 **18,** 71-72

A second Scottish record of *Mallota cimbiciformis* (Fallén) (Diptera, Syrphidae)

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Summary

The rearing of *Mallota cimbiciformis* (Fallén) from a second Scottish locality is reported

The first record for Scotland of *Mallota cimbiciformis* (Fallén) was the finding of an empty puparium in a horse chestnut *Aesculus hippocastanum* rot hole on 8 August 1994, at Barons Haugh, an RSPB Reserve, near Motherwell, South Lanarkshire (Barr 1996). We report here a second site, Pollok Country Park, Glasgow, based on finding larvae on 4 May 2010 in a sycamore *Acer pseudoplatanus* rot hole, situated about 1.80 m from ground and measuring 16.5cm (width) x 35.0cm (height) in size. The larvae were identified using Rotheray (1993). Two of the larger larvae were kept with rotting leaves and debris from the rot hole, in a large jar with a muslin cover. An adult male emerged on 6 June 2010. Voucher specimens of two dead *Mallota* larvae from the sample and the male with its empty puparium are preserved in the Hunterian Museum, Acc. No. 141703. Other flies that emerged were large numbers of *Sylvicola cinctus* (Fabricius) (Anisopodidae) and *Myathropa florea* (Linnaeus) (Syrphidae).

Numbers of small *Mallota* larvae in the sample were retained for captive rearing. Not wishing to damage these by excessive handling, they were not counted but were in excess of 20 individuals. During the winter these were kept at normal room temperature except for a period at the end of December into early January when they were moved to a non-heated garage. Three larvae in their second instar were known to have died during the winter and now (as observed on 27 April 2011) there are 9 live third instar larvae in the jar. If they continue to develop it is anticipated that adults will emerge during the coming summer and will be released in the same area of the park.

Nearby, a second rot hole in a mature horse chestnut *Aesculus hippocastanum* tree about 1.47 m above ground and 10.0cm (width) x 17.5cm (height) in size was noted. On 27 May 2010 larvae from this rot hole were identified on site as *Mallota*, using a hand lens. It was decided not to disturb them any further as pupariation was likely to be about to occur. This hole will be monitored in the future. The original sycamore rot hole suffered some vandalism when an attempt was made to infill it with gravel from a nearby path and as a result more substrate with larvae was removed for rearing at Glasgow Museums Resource Centre. An adult male *M. cimbiformis* emerged from that sample on 15 June 2010. The rot hole appears not to have been permanently damaged, however, as when re-inspected in July 2010 a 1 litre sample of rot taken from it contained roughly 20 live larvae.

Both trees are typical parkland specimens with an open aspect. The sycamore is on an east/west ride with the rot hole facing east. The horse chestnut is in a south sloping pasture with its rot hole also facing south. In this latter area mature trees stand in fields grazed by Glasgow City Council's fold of Highland cattle, whose fearsome appearance seems to deter the public from gaining access to the area. Pollok Country Park, voted 'Best Park in Europe 2008', is a busy place and the sycamore tree is next to a public walkway and so vulnerable to acts of casual vandalism. The second site appears a more suitable place for populations of *M. cimbiciformis* to thrive, being in a fenced off area of classic pastureland (see Gemmell 2010). Adult *Brachypalpoides lentus* (Meigen) and *Criorhina floccosa* (Meigen) (Syrphidae), both considered rare in Scotland, were also recorded in this field during summer, 2010. A female *C. floccosa* found investigating rot holes along the base of a mature beech *Fagus sylvatica* tree and a male *B. lentus* swept off nettles *Urtica dioica* in the Highland Cattle Pasture, Pollok Country Park, 20 May 2010, have been preserved as voucher specimens. The *C. floccosa* has been deposited in Glasgow Museums Resource Centre and the *B. lentus* in the Hunterian Museum, Entry Number 833.

Acknowledgements

We thank Marilyn Muir, Manager, Pollok Country Park, for encouraging this work and Garth Foster, the Aquatic Coleoptera Conservation Trust, in whose company the rot holes at this site were first inspected in searching for beetles.

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Rotheray, G.E. 1993. Colour guide to hoverfly larvae (Diptera, Syrphiidae). *Dipterists Digest* **9,** 156 pp.

An early British record of *Phytomyza astrantiae* (Hendel) (Diptera, Agromyzidae)

– R. Homan (2009. *Phytomyza astrantiae* (Hendel, 1924) (Diptera, Agromyzidae) new to Britain *Dipterists Digest (Second Series)* **16,** 183-184) and H.C.J. Godfray (2010. Further British records of *Phytomyza astrantiae* (Hendel, 1924) and its parasitoids *Dipterists Digest (Second Series)* **17,** 60) have reported on the occurrence of *Phytomyza astrantiae* in Britain. Like them I have been aware of the mine of this species for some years, having first noted it in my Norwich garden (TG211082) in 2002. In 2003 I also received specimens from Ken and Gillian Beckett (Stanhoe, W. Norfolk, TF801369) and Dick Jones (Dersingham, W. Norfolk, TF687304).

These records might suggest that the species is a recent arrival in Britain. However, I recently found a herbarium specimen of *Astrantia major* (Norwich Museum no. 1961.362) showing the characteristic blotch mine of this species. The plant was gathered in a garden in Clabon Road, Norwich in 1961, so evidently the species has been present in Britain for 50 years – **A.G. IRWIN,** Norfolk Museums and Archaeology Service, The Shirehall, Market Avenue, Norwich, Norfolk NR1 3JQ

Dipterists Digest 2011 **18,** 73-74

Two species of *Phytomyptera* Rondani (Diptera, Tachinidae) new to Britain

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Summary

Two species of *Phytomyptera* Rondani (Diptera, Tachinidae), *P. minutissima* (Zetterstedt, 1844) and *P. zonella* (Zetterstedt, 1844) are added to the British List. A key allowing these species to be distinguished from the widespread species *P. cingulata* (Robineau-Desvoidy, 1830) is given.

Introduction

On 11 June 1997, during the Dipterists Forum Field Meeting at Abergavenny, the author visited Craig y Cilau NNR, Powys (SO183167), where he obtained two males of the genus *Phytomyptera*. The habitat was upland limestone grassland, rather heavily sheep grazed at the time, on the north facing slopes below Myngdd Llangatwg. Hawthorn scrub and nettles were present in damp areas against the cliff face. The significance of the find was not realised at the time and it was not until sometime later after consulting the keys of Tschorsnig and Herting (1994), that they were identified as *P. minutissima* (Zetterstedt). The identification was confirmed by Matthew Smith and Chris Raper. On 18 June 2009 a female *P. minutissima* was found at Camghouran, Perthshire (NN536568), on the southern shore of Loch Rannoch. The habitat was a small boggy stream fringed with sallows, within an area of birch woodland.

Whilst conducting a survey on the North Downs at Denbies, Surrey (TQ147502) on 22 August 2009, a female of *P. zonella* was obtained; identification was made through the keys of Tschorsnig and Herting (1994) and Andersen (1988). A further female was collected at the same site on 21 August 2010. Both specimens were found on the flowers of wild parsnip *Pastinaca sativa* in herb rich calcareous grassland, adjacent to mature beech woodland. After the initial discovery contact was made with Chris Raper, who informed me that he had recently collected an unusual looking male *Phytomyptera*, which subsequently also proved to be *P. zonella*. It was found at Moor Copse Nature Reserve, Tidmarsh, Berkshire (SU634738) on 21 August 2009. The site is a mix of deciduous woodland and flower-rich meadows with mature hedges.

Identification

Both *P. minutissima* and *P. zonella* will key to *P. cingulata* when using Belshaw (1993), although the male of *P. minutissima* was originally confused with *Neaera laticornis* (Meigen, 1824), as it has a pair of long apical bristles on the scutellum. In addition to the other differences given by Belshaw (1993) for separating *N. laticornis,* the presence of more than one bristle on the node of vein R_{4+5}, only a single one being present in *Phytomyptera*, is a useful additional character. The other British species *P. nigrina* (Meigen, 1824) can be easily identified from Belshaw (1993) as it has cross-vein m-cu absent, although it should be borne in mind that there are other European species that also lack this feature and such specimens should be checked with Andersen (1988). A key based on Tschorsnig and Herting (1994) is provided here for the British *Phytomyptera* other than *P. nigrina.* Andersen (1988) should be consulted for genitalia figures of the species concerned.

1 Hind tibia with three dorsal apical spurs. Three dorsocentral bristles before the suture. Fore tibia with three to four anterior dorsal bristles .... *zonella* (Zetterstedt)

- Hind tibia with two dorsal apical spurs (the posterior dorsal spur missing or very short). Two dorsocentral bristles before the suture. Fore tibia with one to two anterior dorsal bristles 2

2 Distance of m between m-cu and the deflection 0.8-1.3 times as long as that between r-m and m-cu. Post-angular vein scarcely thinner than the remaining vein m. Lateral scutellar bristles longer and stronger than the ground hairs .... *cingulata* (Robineau-Desvoidy)

- Distance of m between m-cu and the deflection 1.5-2.0 times as long as that between r-m and m-cu. Post-angular vein faded, very much thinner than the remaining vein m. Lateral scutellar bristles not or scarcely differentiated from the ground hairs .... *minutissima* (Zetterstedt)

Biology

The known hosts of *Phytomyptera* are usually mining or otherwise concealed caterpillars of Microlepidoptera, although the specific hosts of *P. minutissima* and *P. zonella* appear to be unknown. The record of *P. zonella* from *Oecophora bractella* (Oecophoridae), given in Andersen (1988), is considered by Tschorsnig and Herting (1994) to be erroneous. *Phytomyptera zonella* and the non-British *P. vaccinii* Sintenis, 1897, have been observed feeding from flowers and the former has previously been collected from *P. sativa* (Andersen 1988). Most other species probably feed at honey dew and I have never seen *P. cingulata* or *P. nigrina* at flowers, although the latter can be quite frequent in a variety of habitats in southern England. Both *P. minutissima* and *P. zonella* are recorded from Central and Northern Europe and with records of the former predominantly from Scandinavia, it may prove to be restricted to upland areas in this country.

Acknowledgements

I would like to thank Matthew Smith and Chris Raper for confirming my identification of the first *P. minutissima* and the latter for enabling me to publish his record of *P. zonella*. The National Trust are thanked for allowing me to survey their properties on the North Downs in Surrey.

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Dipterists Digest 2011 **18,** 75-76

Eumea mitis (Meigen) (Diptera, Tachinidae) new to Britain

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Summary

Eumea mitis (Meigen, 1824) (Diptera, Tachinidae) is added to the British List from two males found on the North Downs in Surrey. Details of its known distribution and biology are given.

Introduction

Since 2007 the author has made several visits to the North Downs in Surrey to study the Diptera fauna and has found the area particularly rich in Tachinidae. On 22 August 2009 at Denbies, Surrey (TQ147502), a male tachinid was collected off the flower head of wild parsnip *Pastinaca sativa*. The initial identification made from Belshaw (1993) was of *Eumea linearicornis* (Zetterstedt, 1844); however, the specimen didn't look quite right for that species and after consulting Tschorsnig and Herting (1994), the possibility that it was *E. mitis* (Meigen, 1824) seemed more likely. The specimen was passed to Chris Raper who in turn forwarded it to Hans-Peter Tschorsnig, and he confirmed the identification as *E. mitis*. A further male was found at the same site on 21 August 2010, also on the flowers of *P. sativa.* The habitat at Denbies is herb-rich calcareous grassland on a south facing slope, fringed with mature, mainly beech *Fagus* woodland. The site has an abundance of *P. sativa,* which has proved very attractive to various Diptera, particularly the Tachinidae.

Identification

Eumea mitis is very similar to *E. linearicornis* and will readily key to that species when using Belshaw (1993). To separate the two, the key provided by Tschorsnig and Herting (1994) is reproduced here:

Facial ridges (seen from the side) convex in males, straight in females. Face distinctly longer than frons in male, about as long in female. Under the frontal bristles only 2-4 hairlets. Hairs on the parafrontalia at the anterior third much more sparse and shorter than for the posterior third. The first flagellomere in male 4.3-5.5 times as long as the pedicel, on its base strongly prominent, in female 2.9-3.7 times as long as the pedicel .... *E. linearicornis* (Zetterstedt)

Facial ridges straight in males, weakly concave in females. Face about as long as the frons in male, a little shorter in female. Hairlets under the frontal bristles more numerous, often reaching down to the middle of the cheeks. Hairs on the parafrontalia in front nearly as dense and long as at the back. First flagellomere in male 3.0-3.9 times as long as the pedicel, not prominent at its base, in females 2.1-2.9 times as long as the pedicel .... *E. mitis* (Meigen)

Biology

E. mitis is widely distributed in Europe and occurs as far north as Finland. Like *E. linearicornis* it is a species of deciduous woodland and scrub, where it can be found resting on foliage, but is rarer than that species (Tschorsnig and Herting 1994). In my experience *Eumea* species are rarely found at flowers, although this trait may prove to be more frequent in *E.*

mitis. On the Continent it has two generations a year, occurring from the end of April to the end of June and is more numerous from early July to early October (Tschorsnig and Herting 1994). *Eumea mitis* has been recorded from a variety of Lepidoptera hosts, including Tortricidae, Pyralidae, Psychidae and more rarely Noctuidae such as the Dun-bar *Cosmia trapezina* (Linnaeus) and Antler Moth *Cerapteryx graminis* (Linnaeus). It has also been reported as reared in the Czech Republic from the sawfly *Nematus oligospilus* Forster (Hymenoptera, Tenthredinidae) (Herting 1960).

Discussion

With its distribution including Northern Europe and its ability to utilise a variety of hosts, it is perhaps surprising that *E. mitis* has not been correctly recorded in Britain before. There was a record from Cornwall by Wainwright (1928), but that later proved to be erroneous and based on a specimen of *E. linearicornis* according to van Emden (1958). However, its close resemblance to *E. linearicornis* along with the fact that recent British keys have failed to alert to its possible occurrence, have probably combined to prevent its discovery. It is possible that it may be a recent arrival in this country, but it seems more likely that it has been overlooked and careful examination of collections may reveal further specimens.

Acknowledgements

I would like to record my appreciation to Chris Raper and Hans-Peter Tschorsnig for confirming the identification of the first *E. mitis*. The National Trust is thanked for allowing the survey of their properties on the North Downs in Surrey.

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Dipterists Digest 2011 **18,** 77-79

Thelyconychia solivaga (Rondani) (Diptera, Tachinidae) new to Britain

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Summary

Thelyconychia solivaga (Rondani, 1861) is added to the British list from three coastal localities in south-east England. A detailed description is given based on the females obtained and its known distribution and biology are summarised.

Introduction

On 18 May 2008 LC visited, with other members of the Kent Field Club, Romney Warren, St. Mary's Bay near Dymchurch, Kent (TR092273) between 14.10 and 15.00 hrs. The site is closely grazed grassland on coastal sand and the conditions were somewhat cool and windy. Among a sample of seventeen species of Diptera swept was a small female tachinid which could not be determined using the keys by Day (1948), van Emden (1954) or Belshaw (1993). This was submitted to Nigel Wyatt of the Natural History Museum, London, who identified it as *Thelyconychia solivaga* (Rondani). During the Dipterists Forum field meeting at Lewes, Sussex on 27 June 2006 IP visited Dungeness, Kent. In the afternoon, while collecting at the edge of the ARC Pit (TR073193), a small female tachinid was swept from low sallow *Salix* scrub. This specimen was subsequently identified by Chris Raper as *T. solivaga*. On 5 June 2010 IP visited The Naze, Essex (TM263247). While sweeping a sparsely vegetated shingle and sandy ridge, six females of a small tachinid were collected. Recognising that they were conspecific with the Dungeness specimen, one was submitted to Chris Raper who identified it as *T. solivaga*.

Identification

Using Belshaw (1993) *T. solivaga* will run to couplet 155 and with its up-curved apical scutellar bristles could be determined as belonging to the genus *Meigenia*. However, it differs from that genus in having four, not three, postsutural dorsocentral bristles and a bare propleuron, which is hairy in *Meigenia*.

As *T. solivaga* is a small, rather undistinguished species that may have been overlooked in the past, a detailed description is given here based on the female specimens obtained. Details of the differences in the male (given in square brackets) were provided by Hans-Peter Tschorsnig.

Overall body length 4 - 5mm, wing length 3.6 - 4mm.

Head. Antennae mainly black, but on two of the Essex females the first, second and basal quarter of the third antennal segments are reddish. Arista pubescent, with hairs at most as long as the diameter of the arista at the base, and long, ending beyond the tip of the first flagellomere. Eyes bare (a few scattered fine hairs were discernible on the Dungeness specimen) and large, about 17 times the depth of the gena below. Frons, at widest part, about half [a third in male] width of head including eyes. Frontal vitta reddish brown. Frontoorbital plate and ocellar tubercle densely dusted with golden reflections, parafacial area and facial plate silver. Genae extensively reddish. One pair of weak, proclinate ocellar bristles. Two pairs of well-developed proclinate orbital setae [no proclinate orbital setae are present in the male]. Two pairs of vertical setae, the inner about twice the length of the outer. Parafacial area with bristles extending to a level approximately equal to the tip of the pedicel. Facial ridge completely bare. Occiput grey, with a postocular row of black bristles that become biserial on the lower half. The back of the head has a scattering of fine pale hairs. Vibrissae long, extending well beyond the front of the frons, with two weaker bristles above and a line of six robust genal bristles below. Proboscis short. Palpi, visible on some specimens, dark with orange tips.

Thorax. Dorsum dusted greyish with two pairs of narrow black vittae between the acrostichals and dorsocentrals and between the dorsocentrals and intra-alars. Pleura more thinly dusted so that the black ground colour is evident. Two pairs of presutural and four pairs of postsutural dorsocentrals. Two pairs of well developed and widely spaced presutural and three pairs of postsutural acrostichals. Postpronotum and notopleuraon each with two setae. One pair of posthumeral and of presutural setae. One pair of presutural and three pairs of postsutural intra-alars. One pair of strong pre-alar and supra-alar setae. One pair of long and one pair of shorter postalar setae. Scutellum dusted greyish with four pairs of marginal setae; the apical pair about half the length of the subapical pair, crossed at the tips and curved upwards in lateral view; lateral seta between the subapical and basal setae weak; one pair of long discal setae towards apex, with shorter hairs elsewhere. Two pairs of strong proepimeral setae. Katepisternum with four setae; two moderately developed anteriors, one well-developed posterior with a shorter one in between. Anepisternum hairy on posterior half with a row of irregularly sized setae along hind edge. Halteres reddish with brownish knob.

Wing. Basicosta black; the costagulum and basal parts of other veins pale. Vein R_1 and R_{4+5} between the node and r-m bare. Node with one dorsal seta about twice the length of r-m and a weak ventral seta. Vein M abruptly angled and meeting wing margin just below R_{4+5}. Calypters cream coloured.

Legs. Entirely black. Fore claws about as long as a third [four fifths in male] of fifth tarsal segment. F1 with a complete row of posteroventral setae. T1 with a row of five, fairly strong, anterodorsal setae in proximal half and a similar number of shorter bristles in distal half; two well-developed posterodorsals at about middle. F2 with a pair of outwardly splayed bristles on the anteroventral and posteroventral surface of the basal third; one strong bristle on the anterior face and a row of five weaker anteroventrals towards the tip; two posterodorsal preapicals. T2 with a long, strong, anterodorsal at the middle and a shorter posterodorsal at the same level; a row of shorter anterodorsal and posterodorsal bristles before and beyond. F3 with two long ventral bristles in basal half and with two preapical anteroventrals. T3 with a strong anterodorsal just beyond the middle and with five shorter bristles, of varying length, proximally and a similar number distally; one strong posterodorsal beyond the level of the strong anterodorsal and with three weaker bristles proximally.

Abdomen. Black with conspicuous silver bands at the base of T3 to T5, that on T3 not reaching the side margin. Excavation of T1+2 reaching the hind margin of the tergite. T3 with a pair of strong median marginal setae. T4 with a row of six or eight marginal setae, the median pair slightly more robust than the others. T5 with short, scattered discal setae.

Biology

According to Tschorsnig and Herting (1994), *T. solivaga* is rare and restricted to extremely xerothermic places, including sand dunes, which coincides with its known localities in this country. It has been recorded from June to the end of September, with at least two generations a year. The Romney Warren specimens extend that flight period to include May. Host(s) are not known for certain.

Systematics

Herting and Dely-Draskovits (1993) placed *Thelyconychia* Brauer & von Bergenstamm, 1889 in the tribe Eryciini between *Drino* Robineau-Desvoidy, 1863 and *Hubneria* Robineau-Desvoidy, 1847. In the current checklist of the Diptera of the British Isles (Chandler, 1998) the genera were arranged in alphabetical order and therefore the text on page 185 should be amended to include

THELYCONYCHIA Brauer & von Bergenstamm, 1889
solivaga (Rondani, 1861 - *Masicera*)
    macrophthalma (Belanovsky, 1953 - *Erycia*)
    compressa: (Baranov, 1952 - *Platerycia*), **misident**.

Palaearctic distribution

The type specimen was found near Parma, Italy (Rondani 1861). Herting and Dely-Draskovits (1993) summarised the known Palaearctic distribution as: Europe: Germany, Hungary and Italy. USSR: South European Territory, Transcaucasus, Soviet Middle Asia and East Siberia. Asia: Israel, China and Japan. In Europe, *T. solivaga* is also known from Switzerland, Poland, the Czech Republic, Bulgaria, Spain, Greece and Cyprus (http://www.faunaeur.org/).

Acknowledgements

LC would like to thank Nigel Wyatt for identifying the Romney Warren specimen. IP wishes to express his gratitude to Barbara and John Ismay for providing transport and companionship during the visit to Dungeness and to Chris Raper who identified his material. We also thank Hans-Peter Tschorsnig for useful comments on the manuscript and additional information.

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Dipterists Digest 2011 **18,** 80

A remarkable local abundance of *Lauxania cylindricornis* (Fabricius) (Diptera, Lauxaniidae) in outer Troms, Norway

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Summary

Local abundances of *Lauxania cylindricornis* (Fabricius, 1784) are recorded at four localities in Norway.

In summer 2004 while collecting insect material in Troms, northern Norway, on an excursion arranged by Midt-Troms Museum, I noted a local abundance of one species of Lauxaniidae viz. *Lauxania cylindricornis* (Fabricius, 1784). The collected material was later listed in an atlas of Norwegian Lauxaniidae (Greve 2009).

The genus *Lauxania* can roughly be recognized in the field by its long antennae, size and black colour. Three species have been recorded from Norway, *L. cylindricornis*, *L. albomaculata* Strobl, 1909 and *L minor* Martinek, 1974. The two latter are, however, very rare, and recorded from 3 and 1 localities respectively in southern Norway only. The total material of *L. cylindricornis* collected for the atlas comprised 344 specimens (182 ••, 160 •• and 2 specimens of unknown sex) from 77 different localities. On most occasions only a few or single specimens were netted or caught in traps of various kinds at the different localities. At a few localities, however, local abundances were found in late May to late June.

The locality is on the large island Senja, in Troms "Fylke", south of the town Tromsø, and is among the northernmost localities at which *L. cylindricornis* is recorded in Norway (Greve 2009). The municipality is Torsken, and the collection was made on 22 June 2004 in Kaperdalen near the small Same Museum, which was formerly a small farm, by netting in an open grass meadow around the museum. The weather was cloudy, but there was no rain at the time of collection. Some other localities were visited on the same day, so the time reserved for this particular locality was restricted. A considerable number of individuals was seen in the grass and the sample taken comprised 113 specimens, 63 •• and 50 ••, which constitutes a third of the total material of *L. cylindricornis* collected from a total of 77 different localities from most parts of Norway.

At a few other localities in Norway fairly high numbers of individuals have been noted. During the same week 16 males and 9 females were collected at Kongsvoll, in Målselv municipality, inner Troms, also one of the northernmost for Norway. It has not yet been possible for the author to revisit either of these two localities. This summer at two other localities in the southern part of Norway again abundances of *L. cylindricornis* were noted. In the late evening of 29 May and the early morning of 30 May 2010, 14 •• and 11 •• were collected in fylket Buskerud in the municipality Nes, at Smedsgården Hotell, mostly in grass meadows near the hotel and more specimens were seen. On 19 June 2010, 24 ••, 14 •• and 2 of indeterminate sex, were collected at OS Ringebu: Skard (also known as "Hesteskobakken"), a locality noted among Norwegian entomologists for its rich fauna.

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Dipterists Digest 2011 **18,** 81-93

The puparia of *Chyromya femorellum* (Fallén) (Chyromyidae), *Camilla atrimana* Strobl and *Camilla fuscipes* Collin (Camillidae) (Diptera) reared from bird and mammal nests and burrows

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Summary

The puparia of *Chyromya femorellum* (Fallén, 1820) (Chyromyidae), *Camilla atrimana* Strobl, 1910 and *Camilla fuscipes* Collin 1933 (Camillidae) (Diptera), are described from material obtained by E.B. Basden from bird and mammal nests and burrows. Head skeleton characteristics suggest contrasting food gathering mechanisms, with chyromyids better suited to feeding on liquid food and camillids on solid food.

Introduction

The early stages and breeding habits of Chyromyidae and Camillidae (Diptera, Acalyptratae) are poorly known (Ferrar 1987, Smith 1987). Chyromyidae have been reared from bird nests, bird and bat dung, mammal burrows, decaying wood and gymnosperm cones and Camillidae have been reared from, or are associated with bat, bird and hyrax dung, rabbit burrows and rodent nests (Ferrar 1987, Gibbs 2007, Barraclough 1998, Ebejer 2008, 2009). Apparently the only descriptions of the early stages in either family are of the chyromyids *Aphaniosoma zaharensis* Ebejer & Deeming, 1997, obtained from a mouse nest on a beach in Spain (Ebejer and Deeming 1997), *Gymnochiromyia inermis* (Collin, 1933) from the nest of a thrush in England (Deeming 1998) and the camillid *Katacamilla cavernicola* Papp, 1978 from bat and pigeon guano in caves in Namibia (Kirk-Spriggs *et al.* 2002). In addition, Gibbs (2007) figured the puparium and larval head skeleton of *Chyromya britannica* Gibbs, 2007.

The puparia described in this paper were obtained by the late E.B. Basden in the 1930s as part of his extensive investigation of Diptera from bird and mammal nests and mammal runs, burrows and dung in southern England, the collection of which is housed in the National Museums of Scotland (Rotheray 1989). Although Basden (1961) reported rearing four camillid species from rabbit burrows and rodent nests, he did not describe their early stages nor did he publish his rearing records of chyromyids, although a reference to the latter was provided by Collin (1933) who referred to Basden's reared material in his description of the chyromyid species *G. inermis*. Collin (1933) mentioned that, from the puparium of this species, "… the posterior spiracles project from each side at the tip of a large tubercle which has a somewhat constricted base."

Materials and Methods

In the collections of the National Museums of Scotland, specimens of Chyromyidae and Camillidae reared by E.B. Basden were examined. Thirty-six adults with puparia were found. Identifications were checked using keys in Collin (1933) and Beuk and De Jong (1994) for Camillidae and Andersson (1976), Ebejer (1998) and Gibbs (2007) for Chyromyidae. All puparia were obscured by encrusting dirt and debris. They were cleaned by soaking in warm water or a solution of KOH and picking debris off with pins or a paintbrush. Head skeletons were extracted by soaking puparia in a solution of potassium hydroxide (KOH) at room temperature for about 30 minutes and removing head skeletons with pins. Specimens were examined using binocular and compound microscopy. Following examination, puparia were stored in gelatin capsules and head skeletons in genitalia capsules containing a drop of glycerol. 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

Descriptions of Puparia

***Chyromya femorellum* (Fallén, 1820) (Chyromyidae)**

Shape and size: length 3.1-3.3mm ($n = 3$); truncate anteriorly; tapered and upturned posteriorly (Figs 1-2); yellow-brown in colour; subcylindrical in cross section, except thoracic segments which are dorsoventrally flattened; apparent boundaries between segments indicated by indented lines circumventing the puparium; 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.

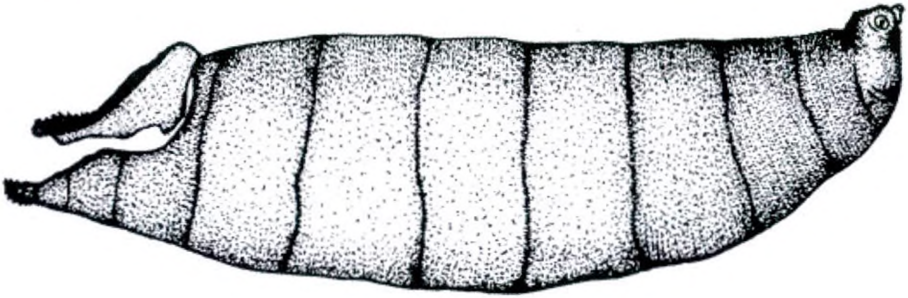


Fig. 1. ***Chyromya femorellum*, whole puparium: lateral view, anterior end to the left, length 3.1mm.**

Anterior spiracles: small and inconspicuous comprising a fan of 3 respiratory bulbs, 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.

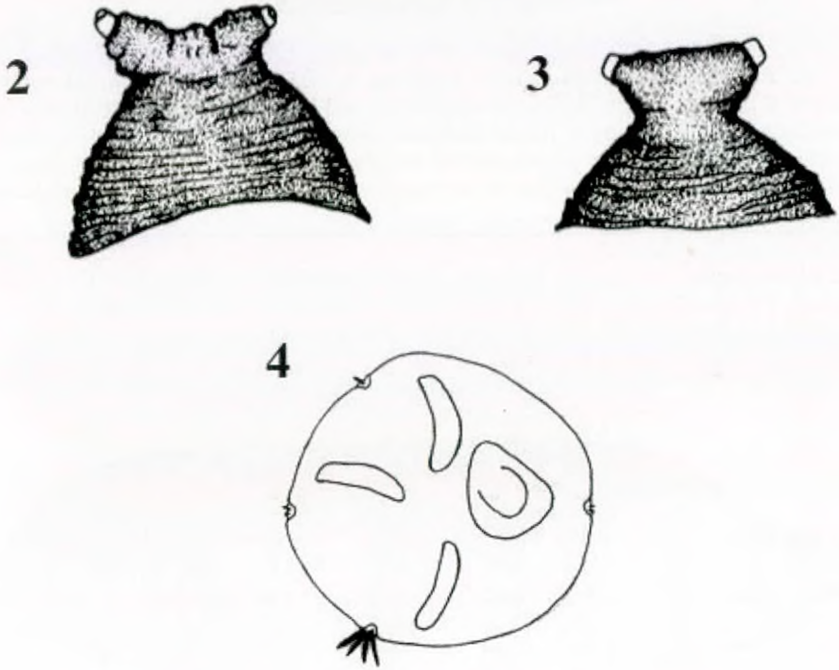
Head skeleton (Figs 5-6): length measured from tip of mandible to apex of ventral cornu of the basal sclerite 0.7mm; highest point in lateral view 0.2mm; except for a small window in the of the mandible, rest of mandible, apical half of intermediate sclerite and the middle of the vertical plate black and heavily sclerotised; mandibles separate, each with a rectangular base and from the anterodorsal corner, an apical mouthhook; mouthhook tapering, about as long as distance between posterodorsal and anteroventral muscle attachment points on the rectangular base; these points drawn out into apodemes about as long as rectangular base is high; mandible about two-thirds as long as intermediate sclerite; small, comma-shaped dental sclerites and parastomal bars present; labial sclerites in the floor of the pharynx, inconspicuous; intermediate sclerite bar-like in lateral view, separate from the basal sclerite; ventral bridge lightly sclerotised and long: reaching from mid-point to just before apex (Fig.

6); basal sclerite tapering anteriorly, approximately 1.5x as long as high; dorsal bridge lightly sclerotised; dorsal cornu about half as narrow and slightly shorter than ventral cornu and both cornua diverging; ventral cornu with a conspicuous circular dorsal apodeme bearing a heavily sclerotised rim and an open window at the posterior end; cibarial ridges absent.

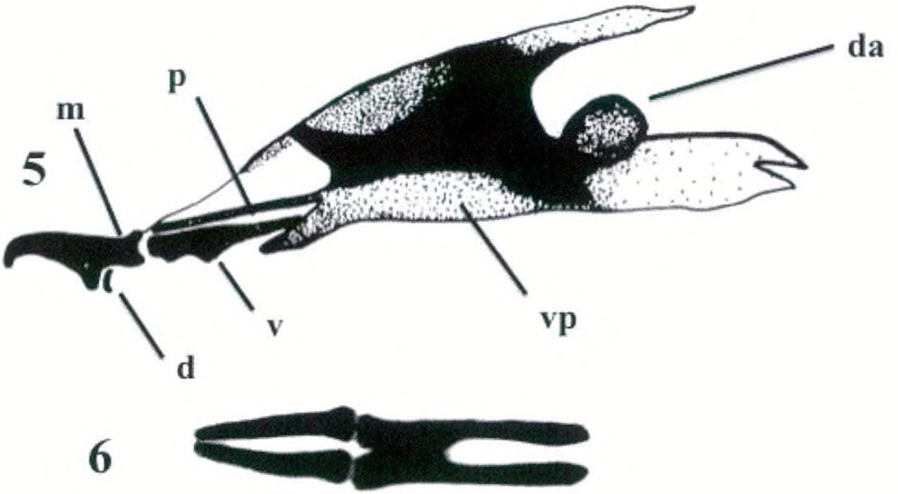
Vestiture: integument smooth, lacking vestiture and sculpturing although formed into wrinkles along the anterior and lateral margins of the thorax, around the anus and at segmental boundaries which are clearly indicated by indented lines circumventing the puparium (Fig. 1).

Locomotory spicules: spicules lacking on most segments, but about the segment boundaries where they normally occur, 10-12 rows of transverse striae are present, except for an area within these rows close to the midline, which is clear of striae.

Posterior spiracles: posterior spiracles borne on tapering projections on either side of the apex of the markedly narrowed and raised anal segment (Fig. 2): spiracular plate (Fig. 4) spherical in shape with a sloping margin bearing three approximately equidistant, radial, slightly curved, spiracular openings: ecdysial scar with a horseshoe shaped mark and each of four groups of peristigmatical tufts comprising four, short thick setae, less than half as long as a spiracle (but tufts frequently broken and missing).



Figs 2-4. ***Chyromya femorellum*** **and** ***Gymnochiromyia inermis*****, puparia: 2,** ***C. femorellum*****, apex of anal segment, dorsal view; 3,** ***G. inermis*****, apex of anal segment dorsal view; 4,** ***C. femorellum*****, posterior breathing tube, apical view, peristigmatical tufts missing and broken in upper three groups.**



Figs 5-6. ***Chyromya femorellum*, head skeleton: 5, whole head skeleton, lateral view, mandible to the left, length 0.6mm; 6, mandibles and intermediate sclerite, dorsal view; d = dental sclerite adjacent to the mandibular anteroventral muscle attachment point; da = dorsal apodeme; m = posterodorsal muscle attachment point of mandible; p = parastomal bar; v = ventral bridge of intermediate sclerite; vp = vertical plate (= front part of basal sclerite).**

Material examined: 5 puparia, England, Buckinghamshire, Farnham Royal, ex nest of hedgehog *Erinaceus europaeus* Linnaeus, nest collected 10.ix.1933; adults, all males, emerged 1-5.vi.1934, E.B. Basden; records from other nests and burrows exist (Table 1).

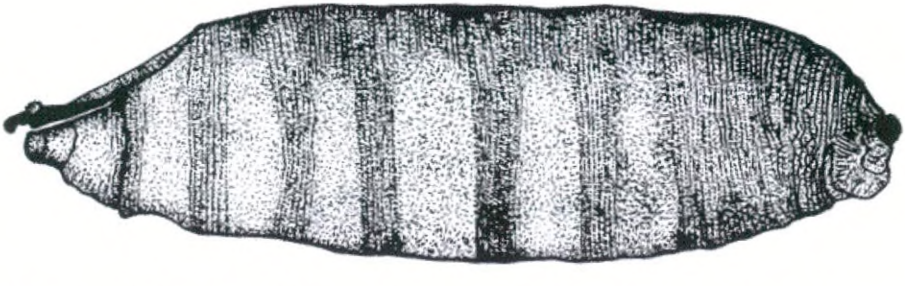
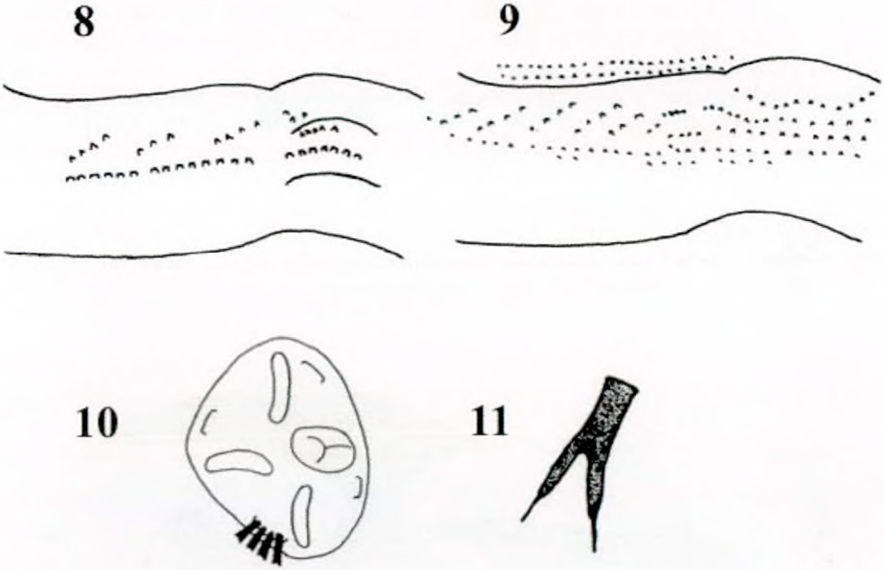


Fig. 7. ***Camilla fuscipes*, whole puparium: lateral view, anterior end to the left, length = 2.7mm.**



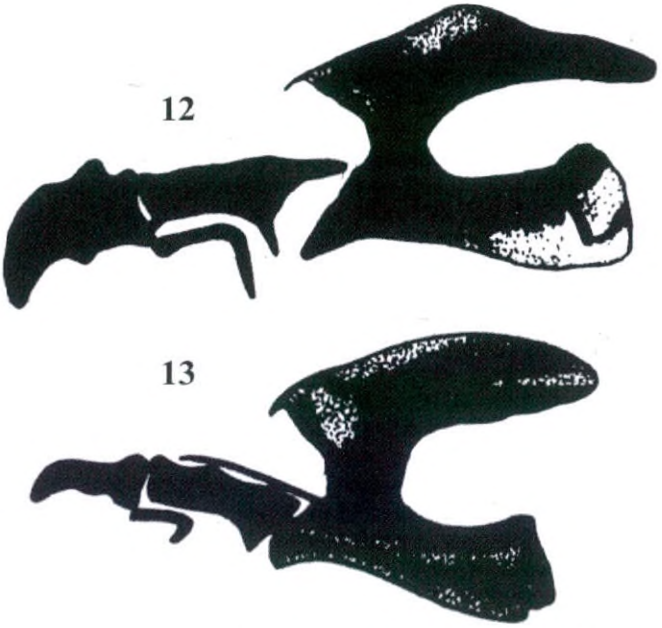
Figs 8-11. ***Camilla fuscipes*** **and** ***Camilla atrimana*****, puparia: 8,** ***C. fuscipes*****, locomotory spicules from left hand side of the 3rd abdominal segment; 9,** ***C. atrimana*****, locomotory spicules, same view as Fig. 8; 10,** ***C. atrimana*****, posterior breathing tube, apical view, basal sections of a peristigmatical tuft, depicted only in lower group; 11,** ***C. atrimana*****, peristigmatical seta, dorsal view.**

Camilla fuscipes **Collin 1933 (Camillidae)**

Shape and size: length 2.7-2.8mm (n = 7); somewhat tapered anteriorly and truncate posteriorly (Fig. 7); yellow-brown in colour; subcylindrical in cross section, except thorax, which is dorsoventrally flattened; segment boundaries inconspicuous but indicated by circumventing rows of striae; 7th abdominal segment and anal segment with larger, more conspicuous striae; anterior end split by eclosion of the adult, from just in front of the anterior spiracles on the prothorax to the posterior half of the first abdominal segment.

Anterior spiracles: small and inconspicuous, forming a fan of 6 or 8 respiratory bulbs; 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 12, 14-15): length measured from tip of mandible to apex of ventral cornu of basal sclerite 0.5mm; highest point in lateral view 0.2mm; mandible, intermediate sclerite, and most of basal sclerite, black and heavily sclerotised (Fig. 12); mandibles separate and constricted about middle when viewed from above (Fig. 14), relatively large (about as half as long as basal sclerite) and comma-shaped in lateral view, without a clearly defined rectangular base; mouthhook short and broad; muscle attachment points short and rounded; dental sclerite developed to an extraordinary degree: in lateral view, L-shaped (Fig 12) but extending anteriorly under the base of the mandibles and posteriorly just anterior to the ventral bridge and almost meeting to form bridges (Figs 14-15); labial sclerites in the floor of the pharynx, well developed and sclerotised; intermediate sclerite bar-like in lateral view, separate from the basal sclerite; parastomal bar separate from the basal sclerite and fused to the intermediate sclerite except at the apex; ventral bridge deep, i.e. extending below the intermediate sclerite by about a quarter the length of the intermediate sclerite and narrow, sclerotised and close to the base; basal sclerite not tapered anteriorly, about as high anteriorly as posteriorly and forming a square-shape in lateral view, but anteroventral margin developed forward and down; vertical plate very narrow, less than half as long as the mandible; except for anterior margin, dorsal bridge lightly sclerotised; on both dorsolateral sides of the bridge, a linear group of 4 drop-shaped spots, clear of sclerotisation, as if holes were present; dorsal cornu slightly longer than ventral cornu and cornua parallel about equally wide basally; dorsal cornu narrowing apically and ventral cornu widening apically; both cornua with vague, linear apical windows; ventral cornu with slight dorsal apodeme at extreme posterior apex; cibarial ridges absent.



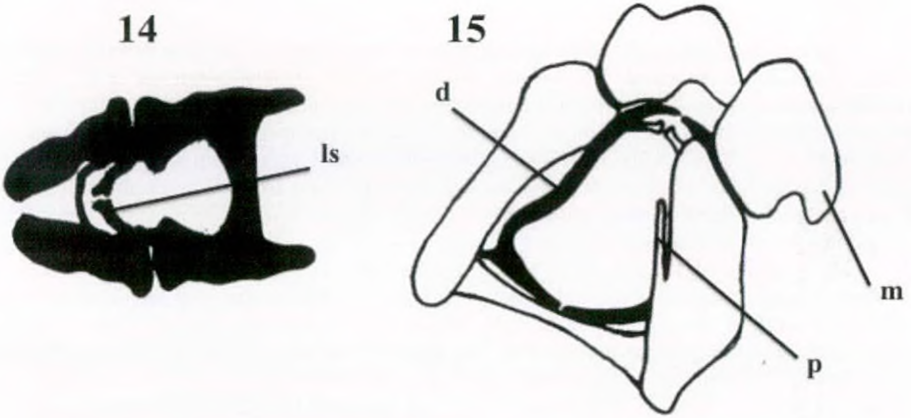
Figs 12-13. ***Camilla fuscipes*** **and** ***Camilla atrimana*****, head skeletons: 12,** ***C. fuscipes*****, whole head skeleton, lateral view, mandible to the left, length 0.5mm; 13,** ***C. atrimana*****, whole head skeleton, lateral same view as Fig 12, length 0.4mm.**

Vestiture: integument smooth, lacking vestiture and sculpturing although striae along the dorsum, circumventing segment boundaries and lateral margins of thorax and anal segment (Fig. 7).

Locomotory spicules: spicules apparently only present on the anterior half of abdominal segments 1 to 7; spicules forming an interrupted transverse line posteriorly with 1-3 inclined bars of 3-4 spicules on the lateral margins (Fig. 8).

Posterior spiracles: posterior spiracles borne on short (as long as broad), black projections on either side of the apex of the anal segment (Fig. 7) and separated by about twice their width; spiracular plate (similar to Fig. 10) spherical in shape bearing three, approximately equidistant, radial, slightly curved, spiracular openings; ecdysial scar with crescent shaped marks and each of four groups of peristigmatical tufts comprising four, flattened bifurcating setae (similar to Fig. 11), setae often broken or missing.

Material examined: 7 puparia: England, Buckinghamshire, Burnham, ex soil taken from entrance to burrows of rabbits, *Oryctolagus cuniculus* Linnaeus: soil collected 24.ii.1934, adults emerged: 24.iv.1934 and 10.v.1934; soil collected 21.iv.1934, adults emerged 23.v.1934 and 23.v.1934; soil collected 19.v.1934 two adults emerged 9.vi.1934; soil collected 19.v.1934, adult emerged 6.vi.1934, E.B. Basden.



Figs 14-15. ***Camilla fuscipes*, head skeleton: 14, mandibles and intermediate sclerite, dorsal view; 15, dorsolateral view between the two sides of the intermediate sclerite with the dental sclerite marked black; d = dental sclerite; ls = labial sclerite; m = mandible; p = parastomal bar.**

Camilla atrimana Strobl, 1910 (Camillidae)

Similar to *C. fuscipes* in general form (Fig 7) and posterior breathing tube (Figs 10-11) but differing in the following features: puparium shorter, length 2mm (n = 1); head skeleton smaller (Fig. 13): length measured from tip of mandible to apex of ventral cornu of basal sclerite 0.4mm; highest point in lateral view 0.2mm; mandible less indented when viewed from above; dental sclerite not as deep and not incurved posteriorly; intermediate sclerite with ventral bridge not as deep; parastomal bar attached to the basal sclerite and not attached to the intermediate sclerite; anteroventral margin of vertical plate not so down-turned; locomotory spicules more numerous (Fig. 9).

Material examined: 1 puparium, England, Buckinghamshire, Farnham Royal, ex nest of common shrew, *Sorex araneus* Linnaeus, nest 30cm below ground collected early 1931, adult emerged 7.v.1931, E.B. Basden; records from other nests and burrows exist (Table 1).

Discussion

From about 330 bird and mammal nests and mammal runs, burrows and dung, the late E.B. Basden reared over 20,000 Diptera specimens of more than 200 species, but very few details of this extensive investigation have been published (Rotheray 1989). Of the chyromyid and camillids considered here and including *G. inermis* also reared by Basden, 1,957 specimens were obtained from nests and burrows of 18 species of bird and mammal (Table 1). However, only about a third, 621, of these specimens were preserved and an even smaller number, only 36, have puparia associated with them. The lack of puparia is probably due to the rearing protocol Basden used. This involved an initial search through the sample before placing each nest or burrow material individually in gauze-covered stoneware jars. Adult flies were extracted over a 12 month period, after which time the material was discarded (Rotheray 1989). Perhaps puparia were only collected if they were noticed during the initial search. Alternatively, if larvae pupated near the gauze in the stoneware jar, they may have been noticed and extracted.

The number of camillid and chyromyid specimens obtained per nest or burrow varied hugely, from 1 to a staggering 598 with an average number per nest or burrow of 59.3 (Table 1). The camillids were only reared from nests and burrows of mammals, the chyromyids from bird and mammal nests and mammal burrows. *Camilla fuscipes* was only reared from one host, the rabbit, *O. cuniculus*, but *Gymnochiromyia inermis* was obtained from 14 bird and mammal hosts (Table 1). The latter species was obtained from arboreal nests, including those at canopy level. The five other fly species in Table 1 were obtained from subterranean and ground level nests and burrows.

The puparia of the chyromyids, *C. femorellum*, *A. zaharensis*, *G. inermis* and *C. britannica*, appear to share the character of a tapered apex to the anal segment with the posterior breathing tubes borne on laterally orientated projections. This character was first noted by Collin (1933) and the shape was described by Deeming (1998) as that of a hammer-head shark. Within the Sphaeroceroidea to which McAlpine (1989) referred the Chyromyidae, this character is not a feature of all included families, for instance, based on figures in Ferrar (1987), it is absent in the Heleomyzidae, but similar looking states exist in some puparia of the Sphaeroceridae (Pitkin 1988). More extensive sampling of puparia within these families is needed to test the diagnostic value of this character. Possibly, different states of this character exist that enable taxa to be distinguished, such as occurs between *C. femorellum* and *G. inermis* in the size and shape of the lateral projections (Figs 2-3). The functional significance of an upturned anal segment is probably that the breathing tubes are raised out of a liquid or wet medium into the air for respiration. Air exchange via the posterior spiracles is probably important because pupal spiracles appear to be absent in chyromyid puparia. Except possibly for *A. zaharensis*, the cleared space among the striae and lack of locomotory spicules on the ventral surface are other shared characters, but their distribution across the Sphaeroceroidea is unknown. Another shared feature is the large, dorsal apodeme of the ventral cornu. An apodeme at this point is frequent in head skeletons of other families of the Sphaeroceroidea, but the particular state in Chyromyidae may define the family or certain genera within it. The functional significance of this apodeme is probably as an attachment point for mandibular muscles.

Individually, *A. zaharensis* is distinguished from the three other known puparia by the presence of numerous locomotory spicules (Ebejer and Deeming 1997). The puparium of *C. femorellum* is separated by the sclerotised rim of the dorsal apodeme on the ventral cornu (Fig. 5). Characters distinguishing the other two species are unclear.

The puparia of the camillids, *C. atrimana*, *C. fuscipes* and *K. cavernicola*, share the character of bands of striae circumventing segment boundaries and a fenestrated dorsal bridge with small, drop-shaped 'holes' (Figs 7, 12 and 13). Within the Ephydroidea to which McAlpine (1989) refers the Camillidae, these characters are not diagnostic as they are present in certain Drosophilidae and Ephydridae (Ferrar 1987). Another feature shared by the three species is the extension of the dental sclerite under the base of the mandibles. This character may distinguish the Camillidae but confirmation is required from dental sclerites in other families of the Ephydroidea. *Camilla atrimana* and *C. fuscipes* are easily separated by the head skeleton features referred to in the descriptions. *Katacamilla cavernicola* is distinguished by the anal segment which is coated in spicules and projections round the apex (Kirk-Spriggs *et al.* 2002). If these are present in the larvae of the camillid species studied here, they are obscured in puparia. In head skeleton characters, *K. cavernicola* is readily distinguished by the elongate form of the mouthhook, an elongate anteroventral apodeme for muscle attachment (= the accessory tooth of Kirk-Spriggs *et al.* 2002) and the elongate form of the dorsal apodeme at the base, not the apex, of the ventral cornu.

Kirk-Spriggs *et al.* (2002) demonstrated that the larva of *K. cavernicola* feeds on bird and bat guano. The feeding mode and type of food of the species described here was not investigated by Basden, but he did keep detailed notes on each nest or burrow sampled and these data show that dung was a frequent component of the material collected from mammal nests and burrows, suggesting that it could have been a source of food for the camillids. However, corvid nests excepted, dung was not noted as a very frequent inclusion of bird nests. One possible feeding mode in nests is haematophagy, but this has not been reported in either camillids or chyromyids (Ferrar 1987). A frequent type of material mentioned by Basden as occurring in nests, is decaying plant material which, soaked by urine, probably provides chyromyid larvae with food. Gibbs (2007) referred to rearing *C. britannica* and *C. femorellum* from tree holes and hollows (and the latter species also from a nest, that of a woodpecker). Based on these data, camillid and chyromyid larvae are most probably saprophages, with camillid larvae feeding on dung and chyromyid larvae feeding on decaying vegetation.

In cyclorrhaphan larvae, saprophagy is usually associated with cibarial ridges on the floor of the basal sclerite. These ridges separate and concentrate microbial food from a liquid medium (Dowding 1967). However in the chyromyids and camillids studied, cibarial ridges are absent and these families represent exceptions to the supposed association between saprophagy and cibarial ridges. Their absence suggests a diet of both microbes and decaying matter itself.

The morphologies of the head skeletons in the two families suggest contrasting food gathering mechanisms. The narrow elongate mandibles of chyromyids facilitate liquid food being raked and gathered (in front of the mouth ready for it to be sucked in by the pump in the head skeleton). This is supported by the basal sclerite, which in chyromyids has long vertical plates and diverging cornua. Basal sclerites of this type are known to be associated with liquid feeding (Roberts 1971). This is because they are characteristically coated in long, narrow bands of muscle that provide a deep, but relatively weak pumping action, effective for sucking in liquids. In contrast, the wide, large mandibles of the camillids are effective at rasping and scraping firmer, drier food. This is supported by the shape of their basal sclerites which have short, tall vertical plates and short, parallel cornua. Basal sclerites of this type are known to be associated with feeding on more solid matter (Roberts 1971). The wider, taller muscles that characteristically coat them, provide a powerful but shallow pumping action, effective for sucking in firmer, more solid food.

An additional influence on the size and shape of the basal and intermediate sclerites is supporting the mandibles and their musculature. This is because, in higher Cyclorrhapha, the two groups of muscles controlling the movement of the mandible are inserted on the basal sclerite (Roberts 1971) and to prevent the head skeleton collapsing, basal and intermediate sclerites must be able to withstand the compression forces caused when these muscles contract. Mandibular muscles most obviously insert on, or close to, the dorsal apodeme, a function of which does not seem to have been suggested previously. The amount of support required probably relates directly to mandible size which itself relates to whether the preferred food is a liquid or a solid. In feeding on firm or solid food, camillids probably require greater levels of support than chyromyids with a liquid diet, and this may explain the large size of their mandibles and intermediate sclerites and higher levels of sclerotisation in their basal sclerites. For example, not only are the mandibles wider in camillids but the length of the mandible as a proportion of the three sclerites of the head skeleton is greater: mean proportional length of the mandibles = 23.1%, range 20.3-26.9 compared to 16.5%, range 16.3-17.1 in the chyromyids. The contrasting shapes of camillid and chyromyid head skeletons, appear frequently across the Cyclorrhapha (Ferrar 1987) and may represent convergence towards either liquid or solid diets. Hence, where these head skeleton shapes occur, preferences for food quality can be predicted.

Compared to *K. cavernicola*, the mandibles of *C. atrimana* and *C. fuscipes* are similar in shape and lack an elongate, anteroventral apodeme for muscle attachment. The profile shape of the mandible in *K. cavernicola* is more like that of the chyromyids. Furthermore, the dental sclerite of *K. cavernicola* may be less developed. The dental sclerite supports the lower adductor mandibular muscles but, in all three camillids, it also extends beneath and round the basal part of the mandible. In *C. atrimana* and *C. fuscipes*, it is also greatly developed posteriorly, and in *C. fuscipes*, extends beneath the intermediate sclerite. Thus, in profile view, the dental sclerite is bar-shaped in *K. cavernicola* but T-shaped in *C. atrimana* and *C. fuscipes*. Furthermore, in *C. atrimana* and *C. fuscipes*, the ventral bridge of the intermediate sclerite is deeper than it apparently is in *K. cavernicola*, more so in *C. fuscipes* than *C. atrimana*. Finally, in *K. cavernicola*, the anteroventral point of the basal sclerite is straight but in *C. atrimana* and *C. fuscipes*, it curves down, again, more so in *C. fuscipes* than *C. atrimana* (Figs 12 and 13).

The anterior development of the dental sclerite under the mandible suggests a modification of the enveloping pseudocephalon. Supported by extensions of the dental sclerite, it may form a fleshy fold that widens the mouth opening when the adductor muscles are contracted, and by pressing against the substrate, prevents dissipation of sucking pressure. It was not possible to confirm this modification in puparia because the pseudocephalon collapses during the processes of pupariation. Such a feature is in contrast to liquid feeders that, instead, have narrow gaps between the enveloped dental sclerites and the labial lobe between them. Excess liquids expelled through the mouth by the head skeleton pump, are directed through these gaps.

Table 1. Rearing records of *Chyromya femorellum*, *Gymnochiromyia inermis* (Chyromyidae), *Camilla fuscipes* and *Camilla atrimana* (Camillidae), obtained by E.B. Basden in the 1930s from Berkshire and Buckinghamshire. * = number of nests or burrows with the number reared i.e. 1x2 = two nests/burrows with a specimen each.

fly taxon	**host bird or mammal**	**nest (n) burrow (b)**	**number**	**total**
Camilla atrimana	1. *Sorex araneus*	n	1	1
	2. *Oryctolagus cuniculus*	b	1x2*	2
Camilla fuscipes	1. *Oryctolagus cuniculus*	b	1x6, 2x6,3x8,9x2,10x2, 11x4,13x2,14,15x2,17, 18x2,20,21,25,32,34,38	417
Camilla glabra	1. *Oryctolagus cuniculus*	b	1	1
Camilla flavicauda	1. *Oryctolagus cuniculus*	b	1x2,2x6,3x2,4x2,14	42
Chyromya femorellum	1. *Erinaceus europaeus*	n	1	177
	2. *Arvicola terrestris*	n	1	9
	3. *Oryctolagus cuniculus*	b	1x4,2x4,3x3,4,5x2,6,11,36	88
Gymnochiromyia inermis	1. *Falco tinnunculus*	n	1	14
	2. *Columba palumbus*	n	1	22
	3. *Troglodytes troglodytes*	n	8,10,12	30
	4. *Prunella modularis*	n	1x2,4,5,6	17
	5. *Turdus merula*	n	1,2,3,50	56
	6. *Turdus philomelos*	n	1x2,2x2,8	14
	7. *Turdus viscivorus*	n	1	1
	8. *Carduelis chloris*	n	1x2,2,3,4,11,13	35
	9. *Carduelis cannabina*	n	3,121	124
	10. *Passer domesticus*	n	1	4
	11. *Pica pica*	n	1	105
	12. *Corvus frugilegus*	n	6,28	34
	13. *Sciurus carolinensis*	n	2x2,157,598	759
	14. *Sciurus vulgaris*	n	1,4	5

The posterior development of the dental sclerite appears to support an enlarged pharyngeal cavity between the mouth and the basal sclerite. That such an enlargement exists in *C. atrimana* and *C. fuscipes*, is revealed by the deep ventral bridge of the intermediate sclerite, the down-curved, anteroventral point of the basal sclerite, and by the wide gap between the arms of the intermediate sclerite, about 1.5x wider than the width of a supporting arm in camillids than chyromyids (Figs 6, 14). The salivary duct enters the pharynx from just behind the ventral bridge and part of the function of this cavity could be to provide space for food to be mixed with saliva. With dry, powdery or solid food, a large cavity may be more effective than a small one.

Dental sclerites modified to support other features than the adductor mandibular muscles, may not be unique to the Camillidae, as they apparently may occur in certain Muscidae and Sciomyzidae, although labial, not dental sclerites are possibly involved (Ferrar 1987). Nonetheless, across the three camillid species, the degree of adaptation to gathering and processing solid food is clearly not equal and appears greater in the sequence: *K. cavernicola* to *C. atrimana* to *C. fuscipes*. This suggests that a significant axis of diversification across the Camillidae is increasing specialisation towards exploiting solid food. Additional taxon sampling and observation of actively feeding larvae combined with morphological analysis of preserved material will test the validity of these structure/function relationships.

Acknowledgements

I am grateful to Richard Lyszkowski for assistance with the Olympus compound microscope and to him, Geoff Wilkinson and Antonio Ricarte for discussion about cyclorrhaphan head skeletons. Thanks also to Peter Chandler and Martin Ebejer for help with literature.

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***Psilopa marginella* Fallén (Diptera, Ephydridae) in Surrey** – *Psilopa marginella* is a small dark fly with a few small but striking black marks on its wings, which make it unmistakable among the known British fauna once it has been recognised as an ephydrid. B.H. Cogan and J.P. Dear (1975. Additions and corrections to the list of British acalyptrate Diptera. *Entomologists monthly Magazine* **110,** 173-181) figured the wing when they added the species to the British list from specimens collected in Norfolk. It has since been recorded rarely from widely spread sites in Anglesey, Pembrokeshire, Cardiganshire, Cornwall, more sites in Norfolk, and Yorkshire (Falk, S., Ismay, J.W. and Chandler, P.J. in preparation. *A review of the scarce and threatened flies of Great Britain. Part 3: Acalyptratae*. JNCC, Peterborough). As a key to the British *Psilopa* is given in this volume of *Dipterists Digest*, it seemed appropriate to add a further record of the uncommon species *P. marginella* from an intervening area of Britain. I identified a female collected by Derek Lott using a vacuum sampler at Chobham Common (SU980648), Surrey (V.C. 17), on 9 July 2006. The habitat was a thick, closed sward of grassy vegetation on damp sandy soil. The record was made during work undertaken for English Nature – **C. MARTIN DRAKE,** Orchid House, Burridge, Axminster, Devon EX13 7DF

Changes to the Irish Diptera List (15) – 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 additions cited below bring the total Irish list to **3351** species.

Mycetophilidae. The following species are added in the present issue (Alexander and Chandler 2011):
Docosia morionella Mik, 1884
Allodia (subgenus *Brachycampta*) *pistillata* (Lundström, 1911)
Brevicornu nigrofuscum (Lundström, 1909)
Exechia cincta Winnertz, 1863

Chironomidae. The following 21 species were added by Murray (2010); *Micropsectra roseiventris* (see page 68 above) had previously been recorded from Ireland under the name *M. fusca*):
Cladopelma bicarinatum (Brundin, 1947)
Cladopelma virescens (Meigen, 1818)
Cryptochironomus redekii (Kruseman, 1933)
Demicryptochironomus (*Irmakia*) *neglectus* Reiss, 1988
Parachironomus varus (Goetghebuer, 1921)
Cladotanytarsus iucundus Hirvenoja, 1962
Cladotanytarsus lepidocalcar Krüger, 1938
Neozavrelia cuneipennis (Edwards, 1929) (see above)
Stempellina almi Brundin, 1947
Tanytarsus gibbosiceps Kieffer, 1922
Tanytarsus lactescens Edwards, 1929
Tanytarsus palettaris Verneaux, 1969
Bryophaenocladius aestivus Brundin, 1947
Bryophaenocladius ictericus (Meigen, 1830)
Bryophaenocladius xanthogyne (Edwards, 1929)
Metriocnemus (*Metriocnemus*) *inopinatus* Strenzke, 1959
Rheocricotopus (*Psilocricotopus*) *tirolus* Lehmann, 1969
Smittia nudipennis (Goetghebuer, 1913)
Arctopelopia melanosoma (Goetghebuer, 1933)
Labrundinia longipalpis (Goetghebuer, 1921)
Tanypus (Tanypus) kraatzi (Kieffer, 1912)

References

Alexander, K.N.A. and Chandler, P.J. 2011. A notable assemblage of fungus gnats (Diptera, Sciaroidea) from St John's Wood, County Roscommon, Ireland. *Dipterists Digest (Second Series)* 18, 27-42.

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Dipterists Digest 2011 **18,** 95-99

Psilopa polita (Macquart) (Diptera, Ephydridae) new to Britain

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Summary

Psilopa polita (Macquart, 1835) is added to the British list from material collected in Cambridgeshire, Dorset, East Kent and South Hampshire. A revised key to the British species of the genus is given.

Introduction

Psilopa Fallén, 1823 is a moderately large genus of Ephydridae with at least sixty-nine species (Mathis and Zatwarnicki 1995). Cogan (1984) listed thirty-seven Palaearctic species, to which Mathis and Zatwarnicki (1995) added another four. The Fauna Europaea website (*www.faunaeuropaea.org* accessed 6 September 2010) gives twenty-six for the area under its remit. Stuke (2010) keyed fourteen central European species while Chandler (1998) listed seven from the British Isles.

Species of the genus have been known in the British Isles since the first half of the nineteenth century. Haliday (1833) listed *Ephydra leucostoma* and this was given as *Ephydra leucostoma* Meig. ? by Curtis (1832, 1838), although Meigen (1830) had described the species within the genus *Notiphila*. Haliday and Curtis also referred to *Ephydra compta* but this is not synonymous with Meigen's species of the same name and has been transferred to the genus *Scatophila* Becker (Cogan 1984, de Courcy Williams and O'Connor 1989). Haliday (1839) proposed a new subgenus, *Hygrella*, for Fallén's *Notiphila* in which he placed *leucostoma* Meigen "common among aquatic plants" and *nitidula* Fallén "communicated by F. Walker". In the same paper he described *Notiphila* (s.g. *Discocerina*) *pulicaria* as a new species, adding "Not common; mostly found on windows." This arrangement was maintained by Walker (1853) although by the time Verrall (1888) published his first list *leucostoma* and *nitidula* were ordered under *Psilopa*. Note that *pulicaria* was still being referred to as *Discocerina* until Collin (1942) transferred it to *Psilopa*. When Verrall published the second list (1901) *P. compta* (Meigen) and *P. nigritella* (Stenhammar) had been discovered in Britain and when Collin (1943) published the first complete key to the British species of the genus *P. nana* Loew was also known. John Ismay recorded the first British specimens of *P. marginella* (Fallén) from Horsey Warren on 2 and 24 October 1973 and Buxton, Norfolk on 20 February 1974 (Cogan and Dear 1974).

Psilopa polita (Macquart, 1835) in Britain

On 12 September 2002 Ivan Perry swept a single specimen of *Psilopa polita* from the edge of a ditch in flood meadows by the river Great Ouse, Ely (TL556804), V.C. 29 (Cambridgeshire). On 11 June 2008 Steven Falk recorded a female, by sweeping at a valley mire, from Denny Bog (SU352051), in the New Forest, Hampshire, V.C. 11 (South Hampshire) and on 8 October 2008 CMD collected a single female using a vacuum sampler in a base-rich valley mire at Frome St Quintin SSSI (ST578042), Dorset, V.C. 9 (Dorset). The mire was unmanaged tall dense fen vegetation dominated by giant horsetail *Equisetum telmateia,* over saturated peat with seepages. During 2009 the species was recorded from three widespread sites within V.C. 15 (East Kent). LC identified specimens found by general sweeping in a damp meadow at Conyer (TQ962653) on 21 February and a wet meadow at Hothfield Heathlands (TQ965459) on 21 March. Del Smith identified a male in material collected by Peter Harvey at Brockhill Country Park (TR1435) on 25 October, where the specimen was likely to have been collected in spring-fed marsh vegetation. The genitalia of this male were examined and compared with the figure given by Beschovski and Zatwarnicki (2000). In 2010 LC found the species in two further East Kent sites: within deciduous woodland with damp rides at Moor Wood, Iden Green (TQ8031 and TQ8131) on 10 April and in an area of chalky waste at Pegwell Bay (TR350641) on 18 April.

European distribution

Psilopa polita is widespread in the western Palaearctic and has been recorded from Austria, Bulgaria, Czech Republic, Estonia, Finland, France, Germany, Hungary, Italian mainland, Lithuania, Morocco [North Africa], Netherlands, Poland, Romania, Russia, Sicily, Slovakia, Spain, Sweden, Switzerland, Ukraine and the former Yugoslavia; it also occurs in Japan, Korea and the far east of Russia (Mathis and Zatwarnicki 1995, Canzoneri 1996, Hollmann-Schirrmacher 1998). Papp (1975) wrote that it was one of the commonest species of the family in Hungary and Stuke (2010) viewed it to be common and eurytopic in northern Germany with records from a wide range of habitats, which include dry grasslands, wetlands and woodlands. Our limited data are broadly similar and its occurrence at several widely spaced sites in the south and east of England suggest that it has probably been overlooked.

Previous key works

Psilopa polita was described, as *Hydrellia polita*, by Macquart (1835) on page 524 thus:

'5. H. POLIE. — *Hydrellia polita* , Nob.
Long. 1 lig. D'un vert métallique brillant. Antennes et pieds noirs; tarses postérieurs fauves.
Ailes presque hyalines ♂.
De Bordeaux.'.

Becker (1926, p. 33) keyed it at couplet 24 (along with *P. nigritella*) and (p. 37) gave a brief description while Séguy (1934, p. 413) keyed it at couplet 5 (also with *P. nigritella*) and (p. 415) described it equally briefly. In 1983 Canzoneri and Meneghini keyed it at couplet 2 (with *P. rutilans* Canzoneri & Meneghini) and provided the most detailed description (pp 297-298). Beschovski and Zatwarnicki (2000, p. 20) illustrated the male genitalia and Stuke (2010, p. 207) keyed it at couplet 2, with *P. stackelbergi* Nartshuk. The most recent key, in English, to the genera of Ephydridae was by Zatwarnicki (1997).

The outstanding feature is that the face is glossy black, a character also shared with *P. rutilans* and *P. stackelbergi*. *Psilopa polita* is easily distinguished from *P. rutilans* which has largely yellow antennae and mid and hind tibiae, all of which are black in *P. polita*. *Psilopa stackelbergi* is similar in many respects to *P. polita* but the polished face is violet, not black to greenish black, and has no micro-tomentum (minute hairs) just under the antennae; in *P. polita*, there is a small patch of tomentum in this position; the male genitalia differ markedly (Beschovski and Zatwarnicki 2000).

Using Collin's (1943) key to the genus *Psilopa polita* would be identified as *P. nigritella*, although its larger size is the most obvious difference from this tiny species, and there may be misidentified specimens of *P. polita* standing under *P. nigritella* in older collections.

Revised key to British *Psilopa*

1	At least mid and hind tibiae yellow; two basal antennal segments yellow.	2
-	All tibiae black; basal antennal segments dark.	4
2	Legs entirely yellow; crossvein dm-cu within an obvious dark patch.	*leucostoma* (Meigen)
-	Femora predominantly black; wings completely unmarked.	3
3	Front tibiae and tarsi predominantly pale. Vein R_{2+3} short so that costal section between R_{2+3} and R_{4+5} is approximately equal to the next section.	*compta* (Meigen)
-	Front tibiae and tarsi entirely black. Vein R_{2+3} longer, costal section between sc and R_{2+3} is about 1.5 times the next section.	*nitidula* (Fallén)
4	Wing with very obvious black marks: costal cell black, a spot at the end of R_{4+5} and over crossvein dm-cu.	*marginella* (Fallén)
-	Wing without obvious marks although membrane next to dm-cu or front third of the whole wing may be darker.	5
5	Face glossy greenish black, not micro-tomentose except just below the antennal bases.	*polita* (Macquart)
-	Face dulled by micro-tomentum, black, dark brown or greyish.	6
6	Genae broader, as wide as third antennal segment or front tibia; front tarsi dark and not obviously contrasting with the tibiae; small hairs everywhere more dense and stout, so that those on the third tergite are in about five ranks and each clearly overlapping the one behind; scutellum with about 12 obvious discal hairs. Larger species, wing length at least 1.9mm.	*pulicaria* (Haliday)
-	Genae narrower than third antennal segment or front tibia; front tarsi often clearly paler than tibiae; small hairs finer and less dense, so that those on the third tergite are in about four ranks and do not reach the ones behind; scutellum with about 8 relatively inconspicuous discal hairs. Smaller species, wing length 1.7mm or less.	7
7	Face dark, its colour and slightly shining but micro-tomentose surface similar to the frons; wing membrane next to crossvein dm-cu clear; front tarsi obviously yellow; vein R_{2+3} shorter so that costal section from sc to R_{2+3} is less than 1.5 times as long as the next section (R_{2+3} to R_{4+5}).	*nigritella* Stenhammar
-	Face and genae distinctly densely grey-dusted with scarcely any shine showing through and contrasting with the dark slightly shining frons [not obvious in wet specimens]; membrane next to crossvein dm-cu and often extreme tip of R_{4+5} slightly clouded; front tarsi usually less clearly yellow; vein R_{2+3} longer so that costal section from sc to R_{2+3} is 1.5 to	*nana* Loew

2 times as long as the next (occasional specimens overlap with *nigritella*). Coastal species in Britain.

Acknowledgements

We thank Steven Falk, Peter Harvey, Ivan Perry and Del Smith for allowing us to cite their records. The Dorset specimen was collected as part of a contract for Natural England.

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Dipterists Day Exhibits 2009 and 2010

- 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.

COLE, J.H. – **(2009)** (1) *Opacifrons maculifrons* (Becker) (Sphaeroceridae) new to Britain and a photograph of the site where it was recorded were exhibited. On 8.x.2009 samples were swept by the exhibitor of the small flies which swarm in great numbers on the shore of Grafham Water (TL157673), Cambridgeshire, and among some 2000-2500 were about 20 sphaerocerids which stood out from the mass of other black flies by having a shining silver patch on either side of the ocellar triangle in both sexes. They keyed to *Opacifrons* in the Handbook and then easily ran to *Opacifrons maculifrons* (Becker) in Rohá•ek's 1982 Palaearctic key. The species is known from S.E. Europe and Tunisia and had not been reported previously from Britain. The bulk of the catch consisted of *Rachispoda lutosa* (Stenhammar), *R. lutosoidea* (Duda) (Sphaeroceridae) and *Scatella paludum* (Meigen) (Ephydridae). There were also a few *Rachispoda limosa* (Fallén), *Leptocera nigra* (Olivier) (Sphaeroceridae), *Scatella tenuicosta* Collin (Ephydridae), *Themira putris* (Linnaeus) (Sepsidae) and a single *Speccafrons halophila* (Duda) (Chloropidae). There are at least 2-3 kilometres of similar shore round the reservoir and interest was expressed in observing whether *O. maculifrons* extends further here in subsequent years.

(2) Some scarce flies from an oak sap run at Brampton Wood (TL1870), Cambridgeshire, an ancient wood from which most of the usable timber was removed in the 20th century but two mature oaks (*Quercus robur*) were spared and stand either side of the main ride at the entrance to the wood. On 24.vii.2008, at the base of one oak, a fissure (photograph exhibited) which had been dry for many years had become a sap run from which a number of mainly drosophilid flies were pooted. Among them were the scarce species *Amiota basdeni* Fonseca, *Drosophila tristis* Fallén and *Scaptodrosophila deflexa* (Duda). On a return visit on 6.viii.2008 the latter two species were still present, also with *Drosophila*

helvetica (Burla). The infrequently recorded fanniids *Fannia aequilineata* Ringdahl and *Piezura pardalina* Rondani were also captured at the sap run. None of these species had previously been recorded from the wood. In 2009 the fissure had returned to its usual dry state.

DRAKE, C.M. – (2009) Uncommon flies caught using a pond-net. Flies were captured incidentally while sampling aquatic invertebrates by pond-netting in ditches or kick-sampling in streams. The specimens had been collected into ethanol or formalin, and were retrieved from the ethanol in which they were subsequently stored by hardening the cuticle in 2-ethoxy ethanol (one day) followed by a day in ethyl acetate. These incidental records show that an important element of the fauna is overlooked at ditches and streams by concentrating on only the traditionally accepted 'aquatic' fauna. The surveys in which the flies were recorded were conducted for Buglife - the Invertebrate Conservation Trust, the Royal Society for the Protection of Birds, and John Andrews Associates.

The following were found at ditches on freshwater grazing marsh: *Phalacrocera replicata* (Linnaeus) (Cylindrotomidae), Oxfordshire, Otmoor (SP566130), 24.vii.2006; *Limnophila pictipennis* (Meigen) (Limoniidae), Somerset, West Sedgemoor (ST372258), 14.v.2009; *Lonchoptera scutellata* Stein (Lonchopteridae), Norfolk, Oby Marshes (TG413130), 3.vi.2009; *Pherbellia dorsata* (Zetterstedt) (Sciomyzidae), Suffolk, Sizewell Marshes (TM467634), 27.iv.2009; *Pelina aenea* (Fallén) (Ephydridae), Norfolk, Fleggburgh Marshes (TG428124), 1.vi.2009.

The following were found at ditches on coastal, often brackish, grazing marsh: *Dicranomyia danica* (Kuntze) (Limoniidae), Kent, Grain Marshes (TQ872781), 14.v.2008; *Erioptera bivittata* (Loew) (Limoniidae), Essex, Blue House Farm, Fambridge (TQ865970), 30.iv.2009; *Pilaria scutellata* (Staeger) (Limoniidae), Essex, Fobbing Marshes (TQ730836), 5.vi.200; *Ochlerotatus flavescens* (Műller) (Culicidae), Essex, Vange Marshes (TQ732854), 6.v.2009; *Elachiptera rufifrons* Duda (Chloropidae), Kent, Allhallows Marshes (TQ856773), 16.v.2008; *Eurina lurida* Meigen (Chloropidae), Essex, Blue House Farm, Fambridge (TQ875971), 8.v.2009; *Hydrellia argyrogenis* Becker (Ephydridae), Kent, Halstow Marshes (TQ779768), 13.v.2008; *Notiphila guttiventris* Stenhammar (Ephydridae), Kent, Graveney Marshes (TR070647), 17.v.2008; *Parydroptera discomyzina* (Ephydridae), Kent, Halstow Marshes (TQ769766), 13.v.2008.

The following were collected by kick-sampling in small streams: *Dicranota robusta* Lundström (Pediciidae), Somerset, Leighton Hanging (ST700443), 13.iv.2008, shaded calcareous stream; *Kowarzia madicola* (Vaillant) (Empididae), Devon, Smallhanger Waste (SX574592), 12.x.2009, moorland stream; *Wiedemannia bistigma* (Curtis), Somerset, Holwell (ST728450), 10.x.2009, stony calcareous stream; *Lonchoptera nitidifrons* Strobl (Lonchopteridae), Somerset, Merehead Quarry (ST692435), 10.x.2007, tiny silty stream.

(2010) Uncommon flies caught in 2010 (acknowledgements were made to RSPB, Natural England, SLR Ltd, Hymettus and East Devon District Council, for whom surveys were conducted): *Ormosia bicornis* (de Meijere) (Limoniidae), Somerset, Cleaves Wood (ST761573), 25.ix.2010, dry deciduous woodland; *Odontomyia angulata* (Panzer) (Stratiomyidae), Norfolk, Sutton Fen (TG365229), 23.vi.2010, rich fen; *Kowarzia madicola* (Vaillant) (Empididae), Devon, Colyford Common (SY250918), 2.viii.2010, shaded lowland stony stream; *Aphrosylus mitis* Verrall (Dolichopodidae), Kent, Eastchurch Marshes (TQ989672), 16.vi.2010, sea wall by extensive saltmarsh; *Argyra auricollis* (Meigen) (Dolichopodidae), Devon, Channonsleigh Plantation (SX598549), 12.vi.2010, stream margin in wet deciduous woodland (this may be the most southerly records so far); *Argyra elongata* (Zetterstedt) (Dolichopodidae), Norfolk, Ebb & Flow NWT Reserve (TG361159), 29.vi.2010, rich fen; *Dolichopus agilis* Meigen (Dolichopodidae), Dorset, Brackett's Coppice (ST517070), 22.ix.2010, deciduous woodland; *Dolichopus laticola* Verrall (Dolichopodidae), Norfolk, Ebb & Flow NWT Reserve (TG363159), 29.vi.2010, rich fen; *Dolichopus nigripes* Fallén, Norfolk, Woodbastwick Fen (TG337164), 25.vi.2010, rich fen; *Syntormon monile* (Haliday in Walker) (Dolichopodidae), Norfolk, Horning Marsh Farm (TG351164), 27.vi.2010, rich fen; *Cercagnota collini* (Czerny) (Anthomyzidae), Kent, Eastchurch Marshes (TQ988671), 16.vi.2010, sea wall by extensive saltmarsh; *Sapromyza* (*Nannomyza*) *basalis* (Zetterstedt) (Lauxaniidae), Dorset, Brackett's Coppice (ST515072), 22.ix.2010, deciduous woodland (2010 seemed a particularly good year for this species); *Gymnomus spectabilis* (Loew) (Heleomyzidae), Herefordshire, Lord's Wood in Upper Wye Gorge SSSI (SO547151), 7.x.2010, deciduous woodland; *Suillia dawnae* Withers (Heleomyzidae), Dorset: Brackett's Coppice (ST515071), 22.ix.2010, deciduous woodland; *Suillia ustulata* (Meigen), Herefordshire, Lord's Wood in Upper Wye Gorge SSSI (SO538157), 7.x.2010, deciduous woodland; *Scathophaga scybalaria* (Linnaeus) (Scathophagidae), Devon, Colyford Common LNR (SY251920), 2.viii.2010, wet pasture; *Cinochira atra* Zetterstedt (Tachinidae), Dorset, Brackett's Coppice (ST517070), 22.ix.2010, deciduous woodland; *Coenosia stigmatica* Wood (Muscidae), Somerset, Cleaves Wood (ST756576), 25.ix.2010, dry deciduous woodland; *Pollenia labialis* Robineau-Desvoidy (Calliphoridae), Devon, New England Quarry (SX593546), 12.vi.2010, wet pasture.

GRAYSON, A. – (2010) Some local and uncommon British Diptera taken during recent years and not previously exhibited, comprising 44 species [49 specimens] full details of which are given below. Vice-county numbers are given in bold type. All V.C. 22, 41, 45 and 96 material was collected during Dipterists Forum field meetings. All V.C. 29, 54 and 70 material was obtained during surveys undertaken for Natural England. Material obtained from Otley and Sugden End was as a result of surveys undertaken for BE Brooks Ecological. The following localities were visited on Yorkshire Naturalists' Union excursions: Howell Wood, Keld, Pocklington Canal and Skipwith Common. Filey Brigg was visited on a Ryedale Natural History Society excursion. Material from Kilner Bank, Huddersfield was taken during a two-day local 'bioblitz'. The exhibitor thanked the Forestry Commission for permission to collect material in Dalby Forest.

Ctenophora flaveolata (Fabricius) (Tipulidae), **22**, ♂, Wood End, Windsor Forest (SU9270), 22.v.2010, **22**, ♀, High Standing Hill, Windsor Forest (SU9374), 23.v.2010 [found in small numbers at both localities]; *Ptiolina obscura* (Fallén) (Rhagionidae), **45**, ♂, Stackpole (SR9795), woodland by lakeside, 19.vi.2010; *Rhagio notatus* (Meigen) (Rhagionidae), **62**, ♀, Hold Cauldron (SE664869), 8.vi.2009; *Haematopota bigoti* Gobert (Tabanidae), **54**, ♀, Gibraltar Point (TF556579), 28.vi.2009; *Hybomitra bimaculata* (Macquart) (Tabanidae), **22**, ♀, High Standing Hill, Windsor Forest, (SU9374), 23.v.2010; *Hybomitra muehlfeldi* (Brauer) (Tabanidae), **41**, ♀, Oxwich (SS500866), field with ponies, 8.vii.2009 [several in field by marsh]; *Tabanus sudeticus* Zeller (Tabanidae), **41**, ♀, Oxwich (SS500866), field with ponies, 8.vii.2009; *Oxycera dives* Loew (Stratiomyidae), **65**, ♂, Keld, (NY895010), glade by River Swale, 25.vii.2009; *Odontomyia hydroleon* (Linnaeus) (Stratiomyidae), **62**, ♀, Seive Dale Fen, Dalby Forest (SE855874), 13.vii.2009 [several around flushes]; *Stratiomys potamida* Meigen (Stratiomyidae), **62**, ♀, Sand Dale, Dalby Forest (SE8584), 13.vii.2009; *Stratiomys singularior* (Harris) (Stratiomyidae), **29**, ♂, Wicken Fen (TL56017025), 19.vii.2010; *Rhadiurgus variabilis* (Zetterstedt) (Asilidae), **96**, ♀, Glen Feshie (NN847976), 4.vii.2008; *Dioctria linearis* (Fabricius) (Asilidae), **63**, ♂, Kilner Bank, Huddersfield (SE1517), 11.vii.2010; *Hilara lugubris* (Zetterstedt) (Empididae), **54**, ♀, Gibraltar Point, (TF562586), 28.vi.2009; *Achalcus flavicollis* (Meigen) [sensu Pollet, 1996]

(Dolichopodidae), **70**, ♂, Skinburness Marsh (NY129553), 2.vii.2009; *Diaphorus oculatus* (Fallén) (Dolichopodidae), **29**, ♂, Wicken Fen (TL56017025), 19.vii.2010; *Dolichopus notatus* Staeger (Dolichopodidae), **54**, ♂, Gibraltar Point (TF560581), 28.vi.2009; *Dolichopus rupestris* Haliday (Dolichopodidae), **65**, ♂, Keld, Black Moor area, south of Palla Nears (NY896026), 25.vii.2009 [locally common on hillside bog]; *Dolichopus strigipes* Verrall (Dolichopodidae), **54**, ♀, Gibraltar Point (TF560581), 28.vi.2009; *Hercostomus nanus* (Macquart) (Dolichopodidae), **64**, ♀, Otley (SE189467), 29.vi.2010; *Teuchophorus spinigerellus* (Zetterstedt) (Dolichopodidae), **29**, ♂, Wicken Fen (TL56017025), 19.vii.2010; *Sybistroma crinipes* Staeger (Dolichopodidae), **63**, ♀, Howell Wood (SE435098), 20.vi.2009; *Thinophilus flavipalpis* (Zetterstedt) (Dolichopodidae), **45**, ♂, West Williamston (SN027057), saltmarsh, 17.vi.2010; *Xanthochlorus galbanus* Chandler & Negrobov (Dolichopodidae), **29**, ♂, Wicken Fen (TL56017025), 19.vii.2010; *Chrysotoxum cautum* (Syrphidae), **45**, ♂, Trewent Point (SS018973), 16.vi.2010; ♀, **45**, Stackpole Warren (SR9894), 15.vi.2010; *Chrysotoxum festivum* (Syrphidae), **63**, ♂, Kilner Bank, Huddersfield (SE1516), 10.vii.2010; *Didea fasciata* Macquart (Syrphidae), **63**, ♂, Sugden End, near Howarth (SE052375), 22.viii.2009; *Eriozona syrphoides* (Fallén) (Syrphidae), **62**, ♂ & ♀, Sand Dale, Dalby Forest (SE859849), 13.viii.2009 [locally common along a woodland ride]; *Rhingia rostrata* (Linnaeus) (Syrphidae), **45**, ♀, Stackpole (SR9795), woodland by lakeside, 19.vi.2010; *Anasimyia transfuga* (Linnaeus) (Syrphidae), **61**, ♂, Pocklington Canal (SE747445), 15.v.2010; *Eristalinus aeneus* (Scopoli) (Syrphidae), **54**, ♂, Gibraltar Point (TF556579), 28.vi.2009; *Arctophila superbiens* (Müller) (Syrphidae), **62**, ♂, Sand Dale, Dalby Forest (SE8585), 9.viii.2009, **62**, ♀, Seive Dale Fen, Dalby Forest (SE855874), 9.viii.2009; *Ferdinandea cuprea* (Scopoli) (Syrphidae), **62**, ♀, Nawton (SE658852), 18.v.2009; *Criorhina asilica* (Fallén) (Syrphidae), **62**, ♀, Hold Cauldron (SE664869), 8.vi.2009; *Criorhina berberina* (Fabricius) (Syrphidae), **62**, ♀, Scorbern Plantation, Beadale Wood (SE776876), 19.v.2009; *Criorhina floccosa* (Meigen) (Syrphidae), **22**, ♂, High Standing Hill, Windsor Forest (SU9374), 23.v.2010 [cavities towards the base of trees often had a male hovering about them]; *Conops vesicularis* Linnaeus (Conopidae), **22**, ♂, High Standing Hill, Windsor Forest (SU9374), 23.v.2010 [males locally common along a shallow dry ditch]; *Physocephala rufipes* (Fabricius) (Conopidae), **61**, ♂, Skipwith Common (SE660377), 8.viii.2009, **63**, ♀, Ogden Water, near Halifax (SE0631), 2.viii.2008; *Riponnensia splendens* (Meigen) (Syrphidae), **63**, ♀, Howell Wood (SE435098), 20.vi.2009; *Homalocephala bipunctata* (Loew) (Ulidiidae), **29**, ♂, Wicken Fen, (TL55447008), 19.vii.2010; *Coelopa frigida* (Fabricius) (Coelopidae), **61**, ♂, Filey Brigg (TA132814), 31.vii.2010; *Coelopa pilipes* Haliday (Coelopidae), **61**, ♂, Filey Brigg (TA132814), 31.vii.2010; *Tetanocera punctifrons* Rondani (Sciomyzidae), **63**, ♂, Sugden End, near Howarth (SE051373), 27.viii.2009 [locally common]; *Gasterophilus intestinalis* (De Geer) (Oestridae), **41**, ♂, Cefn Bryn (SS523887), 8.vii.2009.

Dipterists Digest Volume 18, No. 1 2011

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Published by

Dipterists
Forum

ISSN 0953-7260

Printed and bound in the United Kingdom by Henry Ling Limited at the Dorset Press, Dorchester, DT1 1HD