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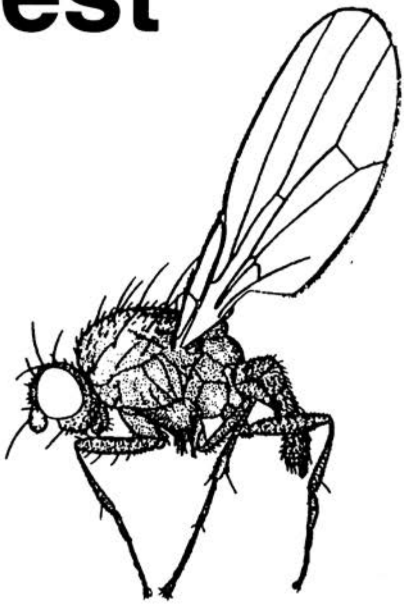

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Dipterists Digest

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 NW European flies. All notes and papers submitted to **Dipterists Digest** are refereed. The scope of **Dipterists Digest** is:

- the behaviour, ecology and natural history of flies;
- new and improved techniques (e.g. collecting, rearing etc.);
- the conservation of flies;
- provisional and interim reports from the Diptera Recording Schemes, including maps;
- records and assessments of rare or scarce species including those new to regions, countries etc.;
- local faunal accounts and field meeting results, especially if accompanied with good ecological or natural history interpretation;
- descriptions of species new to science;
- notes on identification including 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 and should be supplied with the article. References to journals should give the title of the journal in full. Scientific names should be underlined or, preferably, italicised. **If an article is to be supplied on disc, scientific names should always be italicised.** Authors of scientific names should be given in full (with parentheses if applicable) and nomenclature should follow the most recent check list, unless reflecting subsequent changes. Tables should be on separate sheets. Figures should be drawn in clear black ink, about 1.5 times their printed size and lettered clearly. 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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The early stages of *Xylota abiens* Meigen, with a key to the larvae and puparia of British *Xylota* species (Diptera, Syrphidae)

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Summary
The third stage larva and puparium of *Xylota abiens* Meigen are described. The early stages of this species are compared with those of the six other *Xylota* species occurring in the British Isles of which early stages are already known. Using early stage characters the genus *Xylota* is diagnosed and compared with other syrphid genera. A key is provided to separate British *Xylota* larval and puparial stages. Notes on distinguishing each *Xylota* species, their breeding sites and larval biology are also provided.

Introduction

Xylota Meigen is noteworthy among genera of Syrphidae in being one of only four with over 100 species and a cumulative distribution that includes all biogeographical regions except Antarctica. The three other genera are *Allograpta* Osten Sacken, *Ceriana* Rafinesque and *Microdon* Meigen. About twenty *Xylota* species occur in Europe (Peck 1988) and seven are known from the British Isles (Stubbs and Falk 1983; Chandler 1998).

Adults of the British species are mostly associated with woodland where they may often be found feeding from the surfaces of leaves or visiting fallen and decaying wood (Stubbs and Falk 1983). Within Britain the seven species show a remarkable range of distribution patterns (Ball and Morris 2000). *Xylota abiens* Meigen, *Xylota florum* (Fabricius) and *Xylota xanthocnema* Collin are mostly confined to southern Britain with only a few records in northern England and none confirmed for Scotland. *Xylota jakutorum* Bagatshanova (= *coeruleiventris* sensu Stubbs and Falk 1983 (Mutin and Gilbert 1999)) is widespread in Wales, northern England and Scotland but almost absent from the south-eastern half of England. *Xylota tarda* Meigen is scarce but has a disjunct distribution in southern England and northern Scotland while *Xylota segnis* (Linnaeus) and *Xylota sylvarum* (Linnaeus) are common and widespread throughout Britain.

Xylota larval biology is poorly known for such a worldwide, speciose group. The larval notes and descriptions referred to *Xylota* in Lundbeck (1916) and Heiss (1938) belong to other genera such as *Chalcosyrphus*, *Brachypalpus* and *Brachypalpoides* (Hippa 1978). However Lundbeck (1916) gives a generalised description of the larva of *segnis*. Dušek and Láska (1960) provided a description of *florum* but Speight et al. (1999) suggest that this identification requires confirmation due to taxonomic problems. Based on British material obtained from the field, Hartley (1961) described the early stages of *segnis*, *sylvarum* and *xanthocnema*. The early stages of *jakutorum* (as *coeruleiventris*) and *tarda* and were described by Rotheray and Stuke (1998) and Rotheray (1991) respectively. Most *Xylota* rearing records come from some form of decaying wood although Hartley (1961) obtained *segnis* from wet decomposing silage and Blackith and Blackith (1989) obtained this species from decaying potatoes at the edge of a field.

In this paper I describe the early stages of *Xylota abiens*, re-examine the early stages of *florum* and give diagnoses of distinguishing features of larval and puparial morphology for each species occurring in the British Isles. The genus *Xylota* is diagnosed on early stage characters and compared with other syrphid genera. An identification key to larval and puparial stages and notes on breeding sites are provided.

Materials and Methods

Larvae and puparia of *Xylota segnis*, *sylvarum* and *xanthocnema* collected and studied by Hartley (1961), a larva identified as *Xylota florum* by Dušek and Láska (1960) and larvae and puparia of *jakutorum* and *tarda* described by Rotheray and Stuke (1998) and Rotheray (1991) respectively were examined. Additional larvae were collected in the field, details under each species. They were either fixed by boiling in water and preserving in 70% alcohol or reared through to the adult stage to check identity and obtain puparia.

External morphology was studied using preserved larvae and puparia and a binocular microscope. Preserved larvae were either studied in alcohol in solid watch glasses or examined dry. Puparia were examined dry. Head skeletons were studied by dissecting them from preserved larvae or removing them from puparia, after soaking in KOH for about 1 hour. If dirt and soil obscured puparial characters, it was removed by soaking the puparium in KOH for about 1 hour and picking it off with a pin and washing in water.

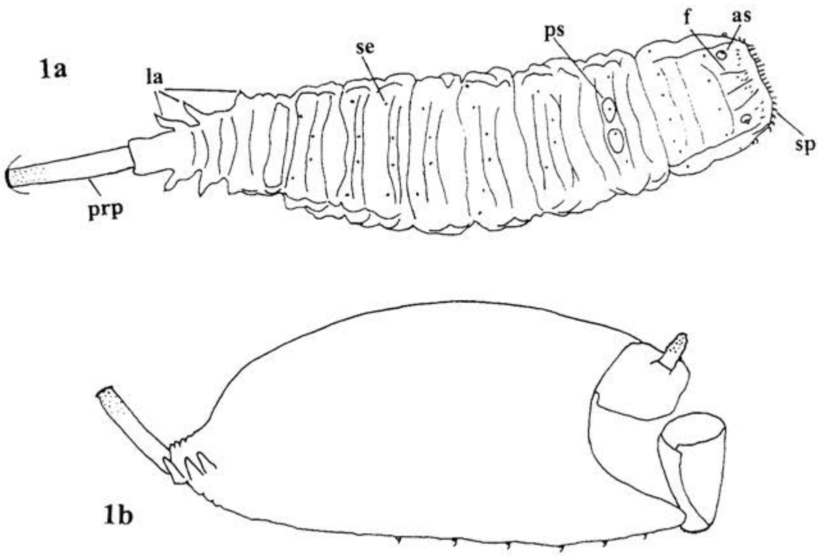
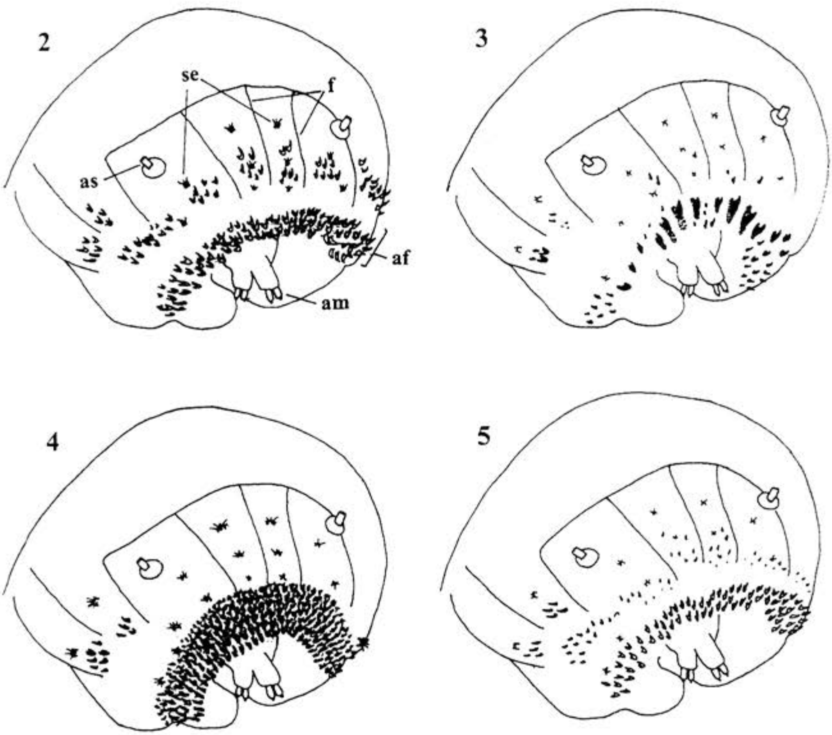


Fig. 1. Early stages of *Xylota abiens*: 1a, whole third stage larva, dorsal view, head to the right, length 8mm; 1b, puparium, head to the right, length 6mm. as = anterior spiracles; la = lappets on anal segment; f = longitudinal folds on dorsum of prothorax; prp = posterior breathing tube; ps = discs of differentiated cuticle on 1st abdominal segment from which pupal spiracles protrude after pupariation; sp = spicules; se = sensilla.



Figs 2-5. Distribution of thoracic spicules in *Xylota* third stage larvae, anterodorsal view, not to scale: 2, *X. abiens*; 3, *X. jakutorum*; 4, *X. sylvarum*; 5, *X. tarda*. af = anterior fold; am = antennomaxillary process; as = anterior spiracle; f = longitudinal folds on dorsum of prothorax; se = sensilla.

Drawings were made using a drawing tube attached to the microscope. Measurements were made using a measuring eyepiece. It was not possible to measure the complete length of the posterior breathing tube because the base was embedded in the puparial integument and the amount embedded appeared to vary from individual to individual within a species. This was also true of the pupal spiracles but their lengths were confirmed by turning over the piece of integument that is loosened naturally when the adult emerges and from which they protrude. In *Xylota* the apical part of the posterior breathing tube is unevenly coated in punctures. At a certain point along the breathing tube punctures end and are replaced by a smooth surface. The apex of the breathing tube containing punctures was usually exposed in puparia and this part was measured. Morphological terms follow Hartley (1963) and Rotheray and Gilbert (1999). Except where noted, material examined in this study is deposited in the National Museums of Scotland (NMS).

Results

Description of third stage larva and puparium of *Xylota abiens* Meigen
Overall appearance of the third stage larva (Fig. 1a)
A "short-tailed" larva i.e. the compounded anal segment moderately elongate (in dorsal view, up to 4 x length of the sixth abdominal segment) and the posterior breathing tube at the apex of the segment. Anal segment with three pairs of approximately equidistant, tapering fleshy projections, the lappets. Abdominal segments 1-6 with crochets and prolegs. Anteroventral margin of metathorax with two groups of sclerotised spicules. Anterolateral margins of mesothorax with spicules. Mesothoracic prolegs and crochets present. Mouthparts of the saprophagous type (Rotheray and Gilbert 1999). Anterior fold with 3-4 interrupted rows of opaque to pale brown spicules. Anterodorsal and lateral margins of the prothorax with spicules.

Diagnosis
Shape and dimensions: length 8-10mm and 2mm wide; in cross-section, subcylindrical when contracted to slight dorsoventrally flattening i.e. up to 1.5 x as broad as high when extended; truncate anteriorly and tapering posteriorly; **head:** antennae and maxillary organs approximated and mounted on a bifurcated fleshy projection; dorsal lip without setae; **head skeleton (Fig. 20):** pharyngeal sclerite at junction of dorsal and ventral cornea black and heavily sclerotised; **thorax:** coated in vestiture of backwardly directed setae up to 0.03mm long; anterior fold with 3-4 interrupted rows of sclerotised spicules up to 0.08mm tall; each dorsal and upper lateral longitudinal fold of the prothorax with a group of up to 10 variously sized spicules of maximum length 0.07mm; these spicules forming an approximate transverse band of spicules between the anterior fold and the anterior spiracles and extending between sensilla 2 and 3 on the mid-longitudinal folds; base of lateral lips with a few sclerotised spicules, otherwise coated in fine setae; these spicules and setae shorter than setae surrounding the sensilla at the apex of the lateral lips; apex of the two main lateral folds of mesothorax with a group of between 3 and 5 spicules the same size as those on the anterior fold; mesothoracic prolegs with about 10 primary crochets and two rows of smaller crochets behind; anteroventral margin of metathorax with two groups of up to 6 small (up to 0.05mm long) sclerotised spicules; **abdomen:** coated in vestiture of backwardly directed setae up to 0.06mm long, vestiture on dorsum of abdominal segments 5-8 longer (0.08mm), more upright and sparser in distribution; prolegs and crochets present on segments 1-6, up to 6 primary crochets, 8 secondaries and a third row of up to 10 smaller crochets; **anal segment:** when extended, 1.5 x as long as segment 6; lateral margins with 3 pairs of fleshy tapering lappets coated in setae, lappets becoming longer from base to apex, basal pair about 0.25mm long, apical pair 0.05mm long; **posterior breathing tube (Figs 6, 13):** pale brown, shiny with punctures; parallel sided, 2.1mm long and 0.3mm wide; spiracular plate pale brown with three pairs of S-shaped spiracular openings; **puparium (Fig. 1b):** 6-8mm long and 2-3mm wide; **pupal spiracles (Fig. 27):** 0.6mm long, pale brown with dorsal and lateral margins coated with spiracles borne on triangular cone-like projections up to 0.03mm broad at base; dorsally spiracles almost reaching the base of the pupal spiracle.

Material examined: 2 larvae and 12 puparia, ENGLAND, Staffordshire, Chartley Moss, SK0228, 28.iv.1997, in decaying sap under bark at base of dead, standing *Pinus* trees, G. Rotheray.

Distinguishing features: in having spicules between the longitudinal folds on the dorsum of the prothorax of a similar size to those on the anterior fold and an anterior fold with up to four rows of spicules, the larva of *abiens* is most similar to *segnis* and *florum*. These are difficult species to separate in the larval stages. *X. abiens* may be distinguished from these species by having vestiture on the dorsum of the anal segment more than half as long as setae coating the lappets, a feature it shares with *segnis*, these setae being very short and inconspicuous in *florum*. In distinguishing *abiens* from *segnis* larvae, the vestiture on the dorsum of the first abdominal segment is shorter than the spicules of the anterior fold, a feature best appreciated by viewing the larva from the side. These setae are as long as or longer in *segnis*. *X. abiens* also has a more heavily black sclerotised region in the pharyngeal sclerite of the head skeleton than do *segnis* and *florum* (Figs 20, 24 and 21 respectively). Also the punctured end of the posterior tube is more than 2 x apical width in *abiens* but less than this in *florum* and *segnis*. Puparia may be separated by the length of the pupal spiracle that is 3 x basal width in *abiens*. In *segnis* and *florum* the pupal spiracle is more than 3 x basal width.

Xylota florum (Fabricius) (Figs 8, 15, 21 and 30)

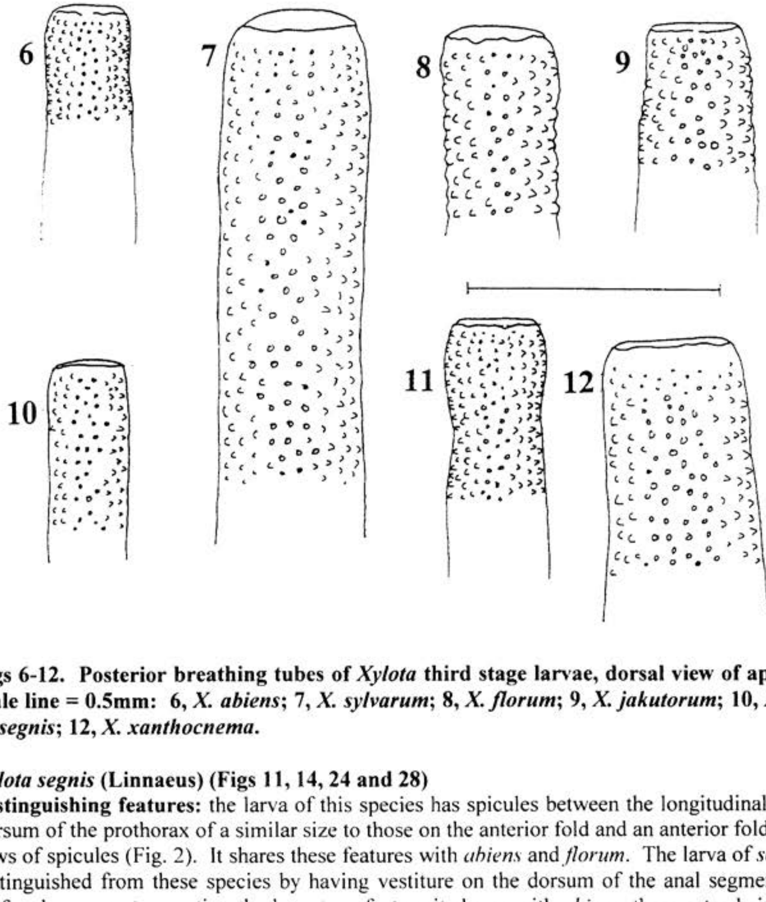
Distinguishing features: the larva and puparium of this species has spicules between the longitudinal folds on the dorsum of the prothorax of a similar size to those on the anterior fold and an anterior fold with up to 4 rows of spicules. It shares these features with *abiens* and *segnis*. The larva of *florum* may be distinguished from *abiens* and *segnis* by the vestiture of the dorsum of the anal segment. In *florum* the vestiture here is short and inconspicuous being less than half the length of setae coating the lappets. The punctures on the apical section of the posterior breathing tube are larger in *florum* (Figs 8 compared to 6 and 11) although comparative material may be required to appreciate this character. The puparium of *florum* may be distinguished by the spiracular openings on the pupal spiracles that lack setae and extend almost to the base, but they end higher up on the pupal spiracles of *abiens* and *segnis* (Figs 30 compared to 27 and 28) although again, without comparative material this character may be difficult to judge.

Material examined: 1 puparium, ENGLAND, Shropshire, Bannister's Coppice near Buildwas, SJ6102, 16.v.2000, male emerged by 13.vi.2000, ex log by the side of a stream, A. Godfrey; 1 larva, CZECHOSLOVAKIA, Moravia, Lednice, 7.v.1958, ex wet decaying wood in a split tree trunk of *Populus nigra* (Dušek and Láska, 1960).

Xylota jakutorum Bagatshanova (= *coeruleiventris* sensu Stubbs and Falk 1983) (Figs 3, 9, 16, 22 and 31)

Distinguishing features: the larva of this species shares with all *Xylota* species studied here except *sylvarum*, the presence of spicules between the longitudinal folds on the dorsum of the prothorax even though very few are present (Fig 3). However, of the seven species studied here, this is perhaps the easiest species to recognise on account of the unique state of large black spicules on the upper row of the anterior fold (Fig 3). Another distinctive feature is the relative short length of the pupal spiracle, about 2.5 times basal width (Fig. 31). In other *Xylota* species the pupal spiracle is longer, more than 2.5 times basal width. It shares with *abiens* a heavily sclerotised head skeleton (Figs 20-26).

Material examined: 1 larva and 5 puparia, ENGLAND, Staffordshire, Chartley Moss, SK0228, 28.iv.1997, in decaying sap under bark at base of dead, standing *Pinus* trees; 1 larva, SCOTLAND, Inverness-shire, Glen Nevis, NN1468, 17.iv.1993, ex sap-filled borings of *Hylobius abietis* (Linnaeus) (Coleoptera, Curculionidae) in a *Picea* stump, K. Watt; 6 larvae, 1 puparium, SCOTLAND, Dumfriesshire, Castle O'er, near Eskdalemuir, NY2295, 30.x.1991 and xi. 1991, ex sap-filled borings of *H. abietis* in *Picea* stumps, K. Watt and G. Rotheray.



Figs 6-12. Posterior breathing tubes of *Xylota* third stage larvae, dorsal view of apical section, scale line = 0.5mm: 6, *X. abiens*; 7, *X. sylvarum*; 8, *X. florum*; 9, *X. jakutorum*; 10, *X. tarda*; 11, *X. segnis*; 12, *X. xanthocnema*.

Xylota segnis (Linnaeus) (Figs 11, 14, 24 and 28)

Distinguishing features: the larva of this species has spicules between the longitudinal folds on the dorsum of the prothorax of a similar size to those on the anterior fold and an anterior fold with up to 4 rows of spicules (Fig. 2). It shares these features with *abiens* and *florum*. The larva of *segnis* may be distinguished from these species by having vestiture on the dorsum of the anal segment more than half as long as setae coating the lappets, a feature it shares with *abiens*, these setae being very short and inconspicuous in *florum*. In distinguishing *segnis* from *abiens* larvae, the vestiture on the dorsum of the first abdominal segment is as long as or longer than the spicules of the anterior fold, a feature best appreciated by viewing the larva from the side. These setae are shorter in *abiens*. The relatively long, more than 4 times basal width, pupal spiracles readily separate puparia of *segnis* from those of *abiens* and *florum* which have shorter pupal spiracles, about 3 times basal width.

Material examined: 2 larvae, SCOTLAND, Midlothian, Arniston, NT3259, 23.iv.1994, in wet decay under bark of fallen *Fagus* tree, G. Rotheray; 2 puparia, ENGLAND, Buckinghamshire, Burnham Beeches, SU9585, 23.iv.1998, in decaying sap under bark at base of dead, standing *Salix* trees, G. Rotheray; 1 larva, ENGLAND, Cornwall, Caerhays Park, SW9741, iv.1994, in wet decay under bark of fallen *Fagus* tree, K. Alexander; 1 larva and 5 puparia, ENGLAND, Staffordshire, Chartley Moss, SK0228, 28.iv.1997, in decaying sap under bark at base of dead, standing *Pinus* trees; 1 larva, 10 puparia, ENGLAND, Cambridgeshire, Fulbourn, TL5156, 24.ii.1957, in sawdust pit, C. Hartley; 3 larvae, SCOTLAND, Ross-shire, Rassal Ashwood NNR, NG8443, 24.iv.1997, in wet decay under bark of fallen *Fraxinus* tree, G. Rotheray and I. MacGowan.

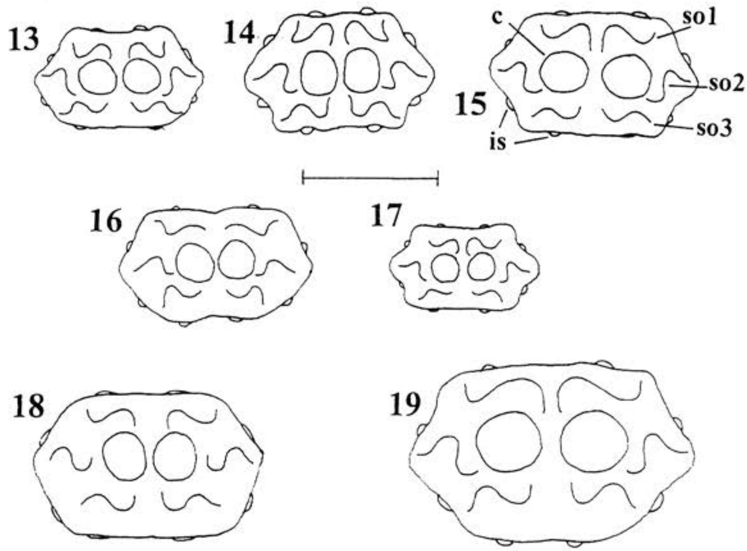
Xylota sylvarum (Linnaeus) (Figs 4, 7, 18, 26, and 29)

Distinguishing features: the larva of this species is most similar to *xanthocnema* in having more than 5 rows of spicules on the anterior fold and having setae associated with spiracular openings on the pupal spiracles (Figs 4, 29, 32). It is readily separated from *xanthocnema* by the lack of spicules between the longitudinal folds of the dorsum of the prothorax (present in *xanthocnema*) and by the punctured part of the posterior breathing tube being 3.5 x apical width, the most extensive of the species studied here (less than 2 x apical width in *xanthocnema*). It is the largest of the seven British species and has a relatively elongate anal segment. The head skeleton is lightly sclerotised (Fig. 26).

Material examined: 1 puparium, male emerged, SCOTLAND, Braemar, Alltdourie, NO1693, 6.vi.1997, in wet decaying heartwood of a *Pinus* stump, I. MacGowan; 1 larva, SCOTLAND, Midlothian, Dalkeith Country Park, NT3368, 23.v.1993, in rot hole at base of *Quercus* tree, G. Rotheray; 26 larvae, 19 puparia, ENGLAND, Hampshire, New Forest, Denny Wood, SU3305, 16-18.v.1989 and 11.iii.1990 (5 puparia), all in wet decaying roots of *Fagus* stumps, G. Rotheray; 1 larva, SCOTLAND, Perthshire, Dunkeld, NO0041, i.1997, in wet decaying heartwood of a *Pseudotsuga* stump, I. MacGowan; 1 puparium, female emerged, SCOTLAND, Lanarkshire, Lanark, NS8843, viii.1994, in wet decaying heartwood of a *Picea* stump, B. Barr; 1 puparium, male emerged, SCOTLAND, Perthshire, Killin, NN5832, v.1996, in wet decaying heartwood at base of live *Populus tremula* tree, I. MacGowan; 1 puparium, male emerged, SCOTLAND, Clackmannanshire, near Alva, Myreton Hill, Myretoun Wood, NN5832, v.1996, in wet decaying heartwood at base of fallen *Fraxinus* tree, G. Rotheray; 2 puparia, male and female emerged; SCOTLAND, Midlothian, Newbattle Abbey, NT3266, vi.1994, in wet decaying heartwood at base of fallen *Fagus* tree, G. Rotheray.

Xylota tarda Meigen (Figs 5, 10, 17 and 23)

Distinguishing features: the larva of this species shares with all *Xylota* species studied here except *sylvarum*, the presence of spicules between the longitudinal folds on the dorsum of the prothorax (Fig. 2). However the small size of these spicules in relation to those on the anterior fold is a unique character (Fig. 5). It shares with *segnis* a similar proportion, about twice apical width, of the posterior breathing tube coated in punctures. Unfortunately, the pupal spiracles were missing from the two *tarda* puparia available for this study and so could not be characterised.

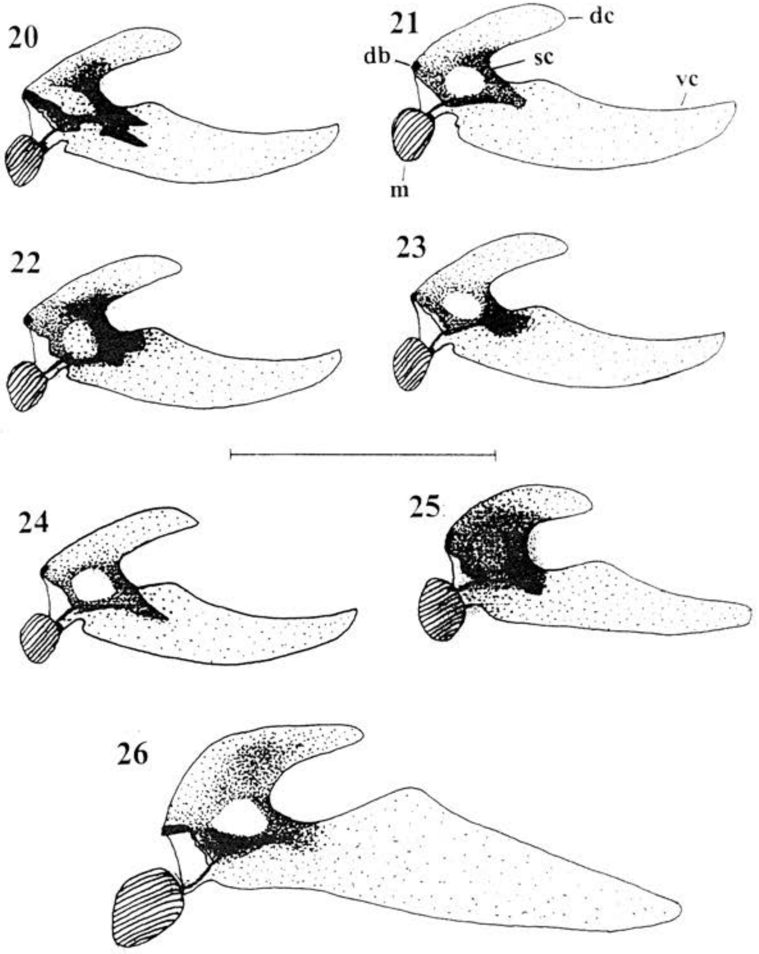


Figs 13-19. Spiracular plates of posterior breathing tubes of *Xylota* third stage larvae, apical view, dorsal side uppermost, scale line 0.25mm: 13, *X. abiens*; 14, *X. segnis*; 15, *X. florum*; 16, *X. jakutorum*; 17, *X. tarda*; 18, *X. sylvarum*; 19, *X. xanthocnema*. c = cuticular scar; is = site of interspiracular setae, not illustrated; so 1-3 = spiracular openings, pairs 1 to 3 reading from dorsal to ventral margin.

Material examined: 1 larva, SCOTLAND, Ross and Cromarty, near Loch Achilty, NH4155, v.1996, in sap run at base of live *Populus tremula*, I. MacGowan; 1 larva, SCOTLAND, Inverness-shire, Boat of Garten, NH9317, 18.vii.1995, in decaying sap under bark of fallen *Populus tremula* tree, G. Rotheray; 4 larva, 2 puparia, SCOTLAND, Inverness-shire, Kingussie, near Inverton, NN7399, 22.vii.1990, in sap runs at base of live *Populus tremula* trees, G. Rotheray; 1 larva, SCOTLAND, Inverness-shire, Kincraig, Speybank, NH8306, 23.x.1995, in sap run at base of live *Populus tremula* tree, G. Rotheray; 1 larva, SCOTLAND, Inverness-shire, Grantown, Speybridge, NJ0326, 19.v.1996, in sap run at base of live *Populus tremula* tree, G. Rotheray.

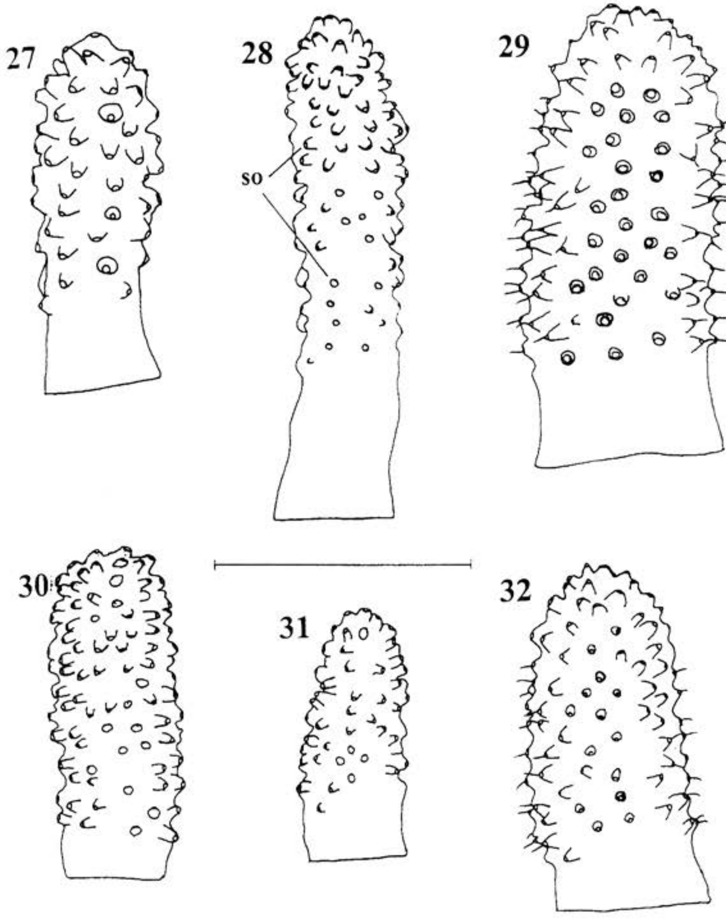
Xylota xanthocnema Collin (Figs 12, 19, 25 and 32)

Distinguishing features: the larva of this species is most similar to *sylvarum* and both are distinguished from other species studied here by having more than 5 rows of spicules on the anterior fold and setae associated with spiracular openings on the pupal spiracles (Figs 4, 29, 32). It is separated from *sylvarum* by the presence of spicules between the longitudinal folds of the dorsum of the prothorax (absent in *sylvarum*).



Figs 20-26. Head skeletons of *Xylota* third stage larvae, lateral view, anterior end to the left, scale line = 0.5mm: 20, *X. abiens*; 21, *X. florum*; 22, *X. jakutorum*; 23, *X. tarda*; 24, *X. segnis*; 25, *X. xanthocnema*; 26, *X. sylvarum.* db = dorsal bridge, dc = dorsal cornu of pharyngeal sclerite; m = mandible/mandibular lobe complex; sc = heavily sclerotised region; vc = ventral cornu of pharyngeal sclerite.

Material examined: 3 larvae, 4 puparia, ENGLAND, Avon, Brockley Coombe, ST4766, 3.v.1958, in rot hole on *Taxus* tree, C. Hartley; 10 puparia, 1 female and 8 males emerged, ENGLAND, Derbyshire, Chatsworth House, SK2570, 17.v.1990, in rot hole on *Quercus* tree, G. Rotheray.



Figs 27-32. Pupal spiracles of *Xylota* puparia, dorsal view, scale line = 0.5mm: 27, *X. abiens*; 28, *X. segnis*; 29, *X. sylvarum*; 30, *X. florum*; 31, *X. jakutorum*; 32, *X. xanthocnema*. so = spiracular openings.

Diagnosis of *Xylota* final stage larva and puparium

Size and shape: length 8-15mm; width 3-4mm; truncate anteriorly, tapering posteriorly; a short-tailed larva, subcylindrical in cross-section (Fig. 1a); **head:** antennae and maxillary organs mounted on a bifurcating fleshy projection (Figs 2-5); dorsal lip without setae; **head skeleton:** of the saprophagous type (Rotheray and Gilbert 1999) i.e. mandibles reduced to a narrow strip supporting the mandibular lobes; pharyngeal sclerite varying in sclerotisation according to species; dorsal cornu up to half length of the ventral cornu; dorsal apodeme, dorsal bridge, ventral pharyngeal ridges and lateral depression (Hartley 1963) present (Figs 20-26); **thorax:** lacking hooks i.e. if sclerotised structures are present other than spicules on the anterior fold, they are the same size or smaller than those of the anterior fold; anterior spiracles non-retractile, short and cylindrical with up to 8 openings round a dorsal, tapered margin; base of lateral lips with a few thick or lightly sclerotised spicules, otherwise coated in fine setae; these spicules and setae shorter than setae surrounding the sensilla at the apex of the lateral lip; anterior fold with a continuous coating of 2-8 rows of sclerotised spicules of varying size and sclerotisation but spicules larger than integumental thoracic setae (Figs 2-5); mesothorax with each anterolateral margin bearing two groups of spicules and anteroventral margin with prolegs and primary and secondary rows of crochets; anteroventral margin of metathorax with two groups of spicules; **abdomen:** integumental setae usually becoming longer towards anal segment, less so in *florum*; prolegs and crochets present on segments 1-6, up to 8 primary crochets, 10 secondaries and a third row of 10-12 smaller spicules; **anal segment:** when extended, up to 5 x as long as segment 6; lateral margins with 3 pairs of fleshy, non-bifurcating, tapering lappets coated in setae, each pair of lappets becoming slightly longer from base to apex of the anal segment; **posterior breathing tube:** pale brown, shiny with apical end having punctures to varying amounts according to species (Figs 6-12); spiracular plate pale brown with three pairs of slightly curved to wavy, S-shaped spiracular openings (Figs 13-19); **puparium:** 6-10mm long and 2-4mm wide; inflated anteriorly (Fig. 1b); **pupal spiracles:** from 0.5 to 1.0mm long and not club-tipped; pale brown with dorsal and lateral margins coated with spiracular openings borne on cone-like projections (Figs 27-32); these openings sometimes with apical setae (Figs 29, 32); dorsally, spiracular openings almost reaching the base of the pupal spiracle but openings absent mid-ventrally; in lateral view, spiracles on 5-8 transverse raised bars but under light microscopy, these bars inconspicuous in dorsal view.

Distinguishing features: the absence of hooks separates *Xylota* from otherwise similar looking larvae of *Neoascia*, *Chalcosyrphus*, *Brachypalpus* and *Brachypalpoides* (Rotheray 1993). *Xylota* larvae and puparia are similar to those of other short-tailed, saprophagous genera lacking hooks such as *Ceriana* (non-British), *Sphegina*, *Syritta* and *Tropidia*. They differ fròm *Ceriana* in having a continuous coating of spicules on the anterior fold. In *Ceriana*, the spicules of the anterior fold are aggregated into groups. They differ from *Sphegina* in not having a bifurcating basal pair of lappets on the anal segment and from *Tropidia* in lacking spicules on the anterodorsal margin of the mesothorax.

Of syrphid saprophages *Xylota* larvae are most similar to *Syritta* but differ in a range of characters that are more quantitative than qualitative. For example in *Syritta* the spicules of the anterior fold are about the same size as surrounding setae and only brown at their extreme tips, but these spicules are much larger than surrounding setae in *Xylota* and pale brown or black to their base. Also, the punctured apex of the posterior breathing tube extends only to about the apical width of the tube in *Syritta* but is much more extensive in *Xylota* from 1.5 to 3 or more times apical width. The anal segment is longer and more extended in *Xylota* than in *Syritta* but this can be difficult to see without a comparative series of specimens and also because the degree of extension of the anal segment depends on how well larvae are fixed. However, a useful qualitative character that separates the puparia of *Syritta* and *Xylota* are the pupal spiracles. In *Syritta* (and *Tropidia*) these are club-tipped but in *Xylota* they are smooth tipped with spiracles extending almost to the base.

Key to British *Xylota* third stage larvae and puparia

1 Short-tailed larva (Fig. 1) with mouthparts of the saprophagous type without obvious mouth hooks (Rotheray and Gilbert 1999); anterior fold of prothorax with a continuous coating of brown, sclerotised spicules; anterodorsal margin of mesothorax lacking a row of sclerotised spicules; thorax without hooks i.e any sclerotised structures present, not larger than those of the anterior fold; anal segment with three pairs of approximately equidistant fleshy lappets not bifurcating at apex; apical end of posterior breathing tube with punctures extending further than apical width; pupal spiracles not club-tipped or curved backwards ***Xylota* 2**

\- Not like this **other Syrphidae, see Rotheray and Gilbert (1999)**

2 Anterior fold with a wide band of 5-7 rows of sclerotised spicules (Fig. 4); pupal spiracles with setae (Figs 29, 32) **3**

\- Anterior fold with a narrow band of 3-4 rows of sclerotised spicules (Figs 2-3); pupal spiracles without setae (Figs 27-28, 30-31) **4**

3 Longitudinal folds of prothorax without sclerotised spicules (Fig. 4); punctured end of posterior breathing tube more than 2 x apical width (Fig. 7) ***Xylota sylvarum***

\- Longitudinal folds of prothorax with sclerotised spicules (cf. Fig. 2); punctured end of posterior breathing tube less than 2 x apical width (Fig. 12) ***Xylota xanthocnema***

4 Dorsal row of anterior fold with a group of 6-8 extra large black spicules (Fig. 3) ***Xylota jakutorum***

\- Dorsal row of anterior fold with spicules same size or smaller than those elsewhere (Figs 2, 4-5) **5**

5 Spicules on longitudinal folds of the prothorax shorter and smaller than those of the anterior fold (Fig. 5) ***Xylota tarda***

\- Some spicules on mid-dorsal longitudinal folds of the prothorax as large as or larger than those on the anterior fold (Fig. 2) **6**

6 Vestiture of anal segment short and inconspicuous, shorter than setae on the lappets; punctures of the apical section of the posterior breathing tube large (Fig. 8); spiracular openings almost reaching base of pupal spiracles (Fig. 30) ***Xylota florum***

\- Vestiture of anal segment at least half as long or longer than setae on the lappets; punctures of the posterior breathing tube small (Figs 10, 11); spiracular openings separated from base (Figs 27 and 28) **7**

7 Vestiture on dorsum of the first abdominal segment shorter than the spicules of the anterior fold (view larva from the side); heavily sclerotised region in the pharyngeal sclerite of the head skeleton (Fig. 20); pupal spiracles less than 4 x basal width (Fig. 27) ***Xylota abiens***

Vestiture on dorsum of the first abdominal segment as long as or longer than the spicules of the anterior fold, view larva from the side; no heavily sclerotised region in the pharyngeal sclerite of the head skeleton (Fig. 24); pupal spiracles more than 4 x basal width (Fig. 28)
Xylota segnis

Discussion

Xylota larvae and puparia are readily distinguished from other short-tailed, saprophagous syrphid larvae in lacking hooks on the thorax, having a relatively elongate posterior breathing tube with a punctured apex longer than apical width and having pupal spiracles that are smooth and straight, not club-tipped or bent backwards. However with such a small proportion of larvae known within the genus, such a characterisation is provisional.

The seven British species considered here vary in the ease with which they can be recognised. The most distinctive are *jakutorum* with several large black spicules on the anterior fold on the prothorax (Fig. 3) and *sylvarum* with 5-8 rows of spicules on the anterior fold and none on the dorsum of the prothorax (Fig. 4). The most similar species in early stage characters are *segnis*, *abiens* and *florum*. The length of the vestiture on the abdomen in relation to the setae of the lappets and to the length of spicules on the anterior fold separates these species. In addition, the elongate pupal spiracles, more than 4 times basal width, readily distinguish the puparium of *segnis* which is the most common of the three species (Figs 28 compared to 27 and 30).

With such a large genus it is not surprising that species groups have been recognised within it. Hippa (1978) characterises several of these based on adult characters and Mutin and Gilbert 1999) have provided some support with phylogenetic methods. Early stage characters do not entirely agree with these groups. For example Hippa (1978) places *segnis* in a separate group from *abiens* and *florum* and both latter species are in a group that includes *sylvarum* and *xanthocnema*. On early stage characters, *abiens*, *florum*, *segnis* and *tarda* are similar to each other and separate from *sylvarum* and *xanthocnema*. These latter two species are similar to each other and share characters such as more than 5 rows of spicules on the anterior fold (Fig. 4) and hairs associated with spiracular openings on the pupal spiracles (Figs 29 and 32). On the other hand *jakutorum* is in a separate group and this is supported by early stage characters such as large spicules on the anterior fold (Fig. 3).

The early stage characters that exhibit most variation within the *Xylota* species considered here are those of the prothorax in the size, number and distribution of spicules (Figs 2-5), the length of vestiture coating the abdomen and the length of the pupal spiracles in relation to basal width (Figs 27-32). Some of this variation may be explained by the type of habitat characteristically occupied by larvae. The larvae of *sylvarum* and *xanthocnema* live in wet, decaying wood and in rot holes respectively. These types of habitat are relatively more liquid than the most frequent larval habitats of *abiens*, *jakutorum*, *segnis* and *tarda* and possibly *florum* such as decaying sap under bark and sap runs. In liquid habitats larvae live immersed in food and imbibe it directly but decaying sap has to be scraped into the mouth (Rotheray and Gilbert 1999). In contrast to wet decaying wood and rot holes, space in sap runs, under bark and in tunnels excavated by wood-boring beetles, is limited and larvae appear to flatten themselves when moving and feeding. These constraints are not features of liquid habitats. These differences may explain the relatively greater size of larvae of *sylvarum* and *xanthocnema* and possible associated character states such as elongate anal segments and anterior folds coated with more rows of protective spicules.

Within *Xylota* species living in decaying sap there is variation in spicule characters of the thorax. At one extreme *jakutorum* has large spicules on the anterior fold. Contrastingly, *tarda* has extremely small spicules on the dorsum of the prothorax. The functional significance of such differences are unclear pending more detailed observations.

Finding *Xylota* larvae in the field is not difficult and depends on locating the correct microhabitats. *X. sylvarum* is frequently found in tree stumps with holes due to heart rot. To find larvae, it is necessary to follow holes down into stumps until accumulations of wet decaying wood are located. Such accumulations may extend into the roots. Larvae can often be present in large numbers. In tree holes containing standing water and/or wet decaying wood larvae are similarly buried deeply. *Xylota* larvae under bark are usually found in decaying sap between the bark and the sapwood. A layer of decaying sap builds up in such a position within 1-3 years of the tree or branch dying but it is a temporary habitat and eventually dries out (Rotheray 1993). Thus only a small proportion of fallen wood is suitable at any one time in most semi-natural woodlands. However species such as *sylvarum*, *segnis* and possibly *florum* may be found under bark in situations where, in addition to decaying sap, water is present. This may either result from fallen wood lying partially immersed in water or where large fallen branches or trees are inclined so that, under gravity, fluids flow to the lowest point. In a similar way, decaying sap may accumulate under bark at the base of dead standing trees, particularly where the base of the tree is in wet conditions such as the margins of water bodies such a bogs and similar habitats.

The range of tree species used by *Xylota* larvae varies according to species. In Scotland, *tarda* appears to be confined to aspen, *Populus tremula*. In England it will probably be found associated with *Populus* and *Salix* species (Salicaceae). Another *Xylota* species showing evidence of being restricted in tree species used for breeding is *jakutorum* which is apparently confined to conifers such as *Picea* and *Pinus*. However, the most common and widespread *Xylota* species, *segnis* and *sylvarum*, do not appear to be so restricted and occur in a wider range of trees, including both conifer and broad-leaved species. Although in this study *abiens* has only been reared from *Pinus*, its adult distribution in Britain is not confined to conifer woodlands and it is unlikely to be so restricted in breeding preferences. *Xylota xanthocnema* may be more restricted to a particular breeding habitat, tree holes, rather than to particular species of tree. However more larval records are required of both this species and *florum*, to fully characterise their breeding preferences.

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A recent record of *Aedes vexans* (Meigen) (Diptera, Culicidae) from Berkshire

Berkshire – A male of *Aedes vexans* (Meigen) was among mosquitoes swept on 22 July.2003 in an area of carr woodland (SU690711), between the River Kennet and the Kennet and Avon canal near Southcote, south of Reading, Berkshire at a point where these watercourses are separate. Both sexes of *Ochlerotatus annulipes* (Meigen) (formerly included in *Aedes*) were also present.

Aedes vexans was recorded widely but sporadically in southern England in the first half of the 20th century, in particular occurring regularly in Surrey in the 1950s. According to A. Rees and K.R. Snow (1995. The distribution of the genus *Aedes*: subgenera *Aedes*, *Aedimorphus* and *Finlaya* in Britain. *Dipterists Digest* (*Second Series*) **2,** 41-48), who included a distribution map (based on 15 sites in 14 10km squares), the most recent records were from Brownsea Island, Dorset in 1968 and Cliffe, Kent in 1989. It was not given conservation status because there was some doubt about it being native. It is also a cosmopolitan species described as the "world's most widespread pest mosquito" by P.S. Cranston, C.D. Ramsdale, K.R. Snow and G.B. White (1987. Adults, larvae and pupae of British Mosquitoes (Culicidae) *Freshwater Biological Association Scientific Publications* **48,** 1-152), a persistent man-biter with large populations occurring in seasonally inundated pasture.

Keith Snow (*pers. comm.* 2003) was unsure of the current status in Britain but had found a few specimens in a carbon dioxide trap close to his home at Chingford, Essex in July 2003 so it may either have recently become established in this country again or have been overlooked in the mean time, due to insufficient recording – **PETER CHANDLER,** 606B Berryfield Lane, Melksham, Wiltshire, SN12 6EL

***Leia arsona* Hutson (Diptera, Mycetophilidae) found again in Britain –** The fungus gnat *Leia arsona* Hutson, was originally found in Britain in 1974 in a London warehouse that contained 53 tons of rotting root ginger (Hutson, A.M. 1978. An undescribed African species of *Leia* (Diptera: Mycetophilidae) infesting root ginger in London. *Entomologist's monthly Magazine* **113,** 121-124). It was present in such numbers that complaints were made when the flies began to enter a nearby betting shop and office. Shortly after the discovery of the fly, the warehouse burnt down and the infestation came to a sudden end. At that time the fly was thought to be an undescribed species; the specific name given to it by Hutson is a reference to its fate! Later it was found to be the same as *Leia fasciata* Storå, 1937 described from the Canary Islands but the name *arsona* stands as *fasciata* is a homonym of a South American species *L. fasciata* (Kertész, 1902) (Chandler, P. and Ribeiro, E. 1995. The Sciaroidea (Diptera) (excluding Sciaridae) of the Atlantic Islands (Canary Islands, Madeira and the Azores). *Boletim do Museu Municipal do Funchal* (*História Natural*) *Suplemento* No. **3,** 1-170). The fly is mainly yellow with black markings like many other species of the genus but is easily distinguished from native species of *Leia* by the dark knob to its halteres.

Subsequently no further records of *Leia arsona* were known in mainland Britain (it having in the mean time been recorded by Malaise trapping in Jersey, Channel Islands: Chandler and Ribeiro *op. cit.*) until 16.i.2004, when some decaying bulb scales on an amaryllis, *Hippeastrum* 'Christmas Carol', were sent to the Entomology section at RHS Garden, Wisley. The *Hippeastrum* bulb was being grown as a house plant at Congleton, Cheshire and had been supplied by a mail order firm from stock obtained from Holland, where this bulb is sold under the cultivar name of 'Supreme Garden'. The bulb scales had a freshly emerged adult female and several larvae that were feeding in silk galleries. The adult fly was retained and shown to Peter Chandler. He immediately recognized it, having recently contributed to a paper that had noted the fly's discovery in New Zealand and had mentioned the lack of further British records after the warehouse fire. (Toft, R. J. and Chandler, P.J. in press). An illustration of the male fly in colour is included in that paper.

Leia arsona has been recorded in many parts of the world, including New Zealand, South Africa, Kenya, Algeria, Tunisia, Malta, Israel, the Canary Islands, Madeira, Azores, Cape Verde Islands, St. Helena, Switzerland, the Netherlands and the Channel Islands. The root ginger in the London warehouse had been imported from Brazil so that country may also be a locality for this fly. Hutson suggested an Afrotropical origin but this has not been confirmed and it is likely that *Leia arsona* has become widely distributed by the international trade in plants and plant products.

This wide distribution has evidently been facilitated by a wide range of larval habitat, including the damp funnel-shaped rosette of *Neoregelia carolinae* (Bromeliaceae) in Israel and larvae were living in the fungal mycelium between the rotting roots of *Gerbera* plants in nurseries in the Netherlands (Burger, H.C., de Goffau, L.J.W. and Ulenberg, S.A. 1984. Bijzondere aantastingen door insekten in 1983. *Entomologische Berichten* **44**(10), 145–150). In New Zealand, where it is mainly associated with urban and port areas, it has recently been trapped from compost bins and has also been reared from honey fungus, *Armillaria* species, the first record from a fungus fruiting body (Richard Toft *pers. comm.* to Peter Chandler).

I would like to thank Patricia Hall for sending me the *Hippeastrum* samples and Peter Chandler for identifying the fly and providing further information on the biology and distribution –
A.J. HALSTEAD, Royal Horticultural Society's Garden, Wisley, Woking, Surrey, GU23 6QB

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Agromyza audcenti sp. n. (Diptera, Agromyzidae) from the Forest of Dean, Gloucestershire, Great Britain

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Summary

A new species *Agromyza audcenti* sp. n. (Diptera, Agromyzidae), from Great Britain, is described and compared to related species.

Introduction

Amongst a large sample of Diptera collected during a survey for the RSPB (Royal Society for the Protection of Birds) at their Nagshead reserve in 2003, was an *Agromyza* which I did not recognise. Using Spencer (1972) and Spencer (1976) it became clear that it is related to *A. idaeiana* (Hardy, 1853), *A. alnibetulae* Hendel, 1931, *A. filipendulae* Spencer, 1976 and the non-British *A. spiraeoidearum* Hering, 1954. The structure of the genitalia is closest to *A. spiraeoidearum* but sufficiently different to exclude that species. The fact that the host plant of *A. spiraeoidearum* is not a native British species and is not present at the collecting locality further rules out this species. A search through the illustrations in Spencer (1990) also failed to identify the specimen. I then sent a drawing of the aedeagus to Michel Martinez and Dr Michael von Tschirnhaus who were unable to name it. Dr Michael von Tschirnhaus concluded that it is an undescribed species.

Identification

Using the key by Spencer (1972) *A. audcenti* runs readily to couplet 32 and of the two species in this couplet it is closest to *A. idaeiana* (as the synonym *spiraeae* Kaltenbach, 1867). The holotype differs from *A. idaeiana* only in its slightly larger size, longer hairing on the arista and browner squamal hairs. The structure of the aedeagus, while clearly of the same general type, is quite distinct.

Using Spencer (1976) *A. audcenti* runs readily to couplet 39 where it becomes difficult to go further on external characters. The aedeagus of *A. audcenti* differs conspicuously from all four of the species in couplets 40 and 41.

Using Hendel's key (1931-1936), which has been amended by many authors, the new species runs to couplets 29 and 31c where *A. sanguisorbae* Hendel, 1931 and *A. spiraeae*, synonyms of *A. idaeiana*, have been placed. A separation is only possible after dissection and examination of the male genitalia. Hering (1957) pointed out that in Hendel's key *A. sanguisorbae* is a junior synonym of *A. idaeiana* (= *spiraeae*) and that the *A. spiraeae* of this key is really *A. spiraeoidearum*.

Agromyza audcenti sp. n.

Description

Head black in ground colour, with a covering of grey dust, except for yellow proboscis and very slightly brownish front of frons. Head shape and chaetotaxy including epistoma and palps as in *A. idaeiana*. Antenna black; first flagellomere rounded with a fringe of pale hairs, a little longer than the base of the arista, along the dorsal margin, stopping short of insertion of arista; no sensory pits visible at x 90 (as in *A. idaeiana*). Arista conspicuously pubescent, the longest hairs about half the width of the swollen basal part of the arista.

Thorax black in ground colour with a covering of grey dust, not differing from *A. idaeiana* in colour or dusting. Chaetotaxy also very like *A. idaeiana* but setae smaller and hairs in upper hind corner of anepisternum more restricted, stopping well short of the middle of the sclerite. Also, small hairs in front of the large katepisternal seta fewer in number. **Wing** (Fig. 1) 2.9mm, venation not differing from *A. idaeiana*; squamal hairs dark brownish. Haltere dull yellow. **Legs** with coxae brownish black, the hind pair a shade lighter; trochanters brown, a little lighter than the corresponding coxae; femora blackish brown, darker than the coxae, paler yellowish on knees; tibiae brown, rather darker around middle, shading into paler yellow on knees. Tarsi yellowish brown, not differing from tip of tibiae. No conspicuous posterolateral bristles present on mid tibia.

Abdomen dull black with a coating of grey dust that is rather denser than in *A. idaeiana*, thus the abdomen is less shiny. **Genitalia** (Figs 2-6).

Type Material. Holotype ♂ ENGLAND, Gloucestershire, V.C. 34, Forest of Dean, Nagshead RSPB reserve SO6090 (2°34'W, 51°48'N), 7 August 2003. Pinned with genitalia preparation in glass vial below specimen. Deposited in Oxford University Museum.

Etymology

Agromyza audcenti is named in honour of Henri Louis Felix Audcent (1875-1951), a biology teacher who lived in Clevedon in North Somerset. He collected Diptera of most families through the first half of the 20th century, especially in North Somerset and South Gloucestershire, amassing a large collection now housed in the Bristol Museum. He was a very popular dipterist, known for his wide knowledge and willingness to help others in their pursuit of entomology. In the final years of his life he published the first comprehensive list of the Diptera of Somerset and Gloucestershire (Audcent 1948 and Audcent 1950), which has yet to be superseded.

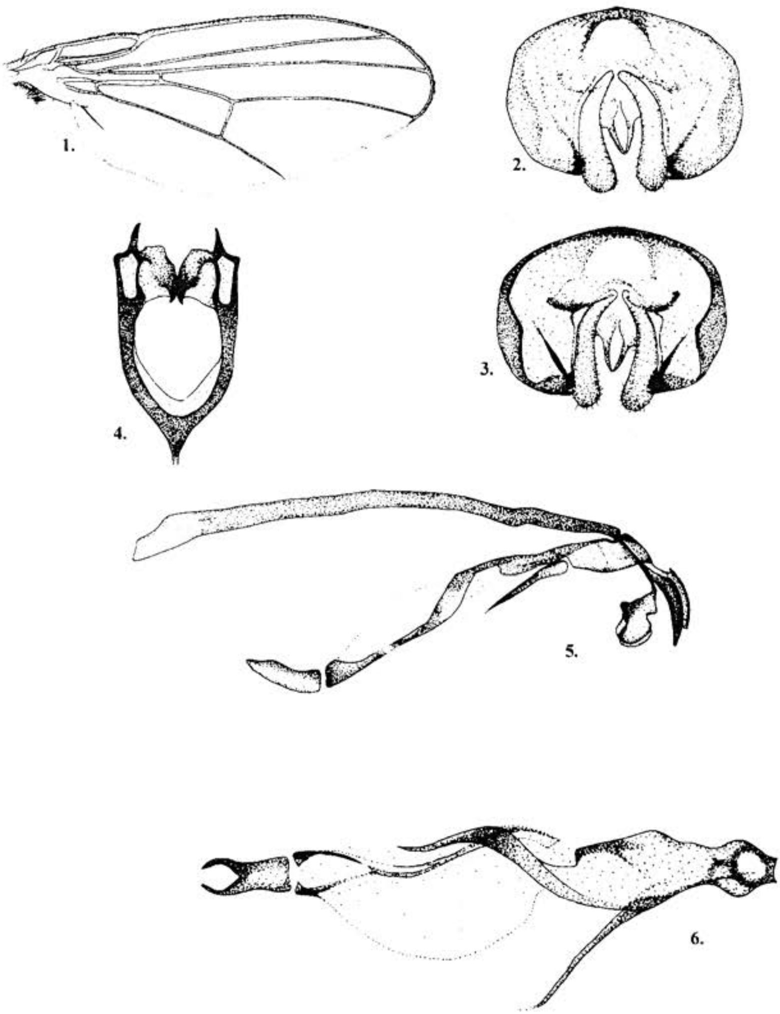
Biology

The single specimen was swept from vegetation along a shallow valley, close to a stream bordered by alder trees *Alnus glutinosa*. The predominant habitat is deciduous woodland with open glades and some marshy areas with a great variety of tree and herb species present. There are no gardens in the vicinity and few, if any, non-native plant species growing along the stream. Unfortunately, the fly was not noticed in the field so no host association can be suggested.

The genitalia show an affinity with *A. alnibetulae* on birch *Betula*, *A. alnivora* Spencer, 1969 on alder *Alnus*, *A. filipendulae* on meadowsweet *Filipendula ulmaria*, *A. idaeiana* on a wide variety of rosaceous herbs, *A. pittodes* Hendel, 1931, *A. polygoni* Hering, 1941 and *A. sergii* Beiger, 1971, all three on bistort *Polygonum bistorta*, *A. spiraeoidearum* on spiraea *Spiraea* and *Aruncus* and *A. sulfuriceps* Strobl, 1898 on cinquefoil *Potentilla* and salad burnet *Sanguisorba*. The wide range of host families in this group does not help much in deducing potential hosts for *A. audcenti*. However, the rose family Rosaceae provides the host for half of these species so it is likely to be most profitable to search for the mine of *A. audcenti* in members of this family.

Acknowledgements

I am very grateful to Michel Martinez (Montpellier, France), for taking the time to comment on my findings and I am particularly thankful to Dr Michael von Tschirnhaus (Bielefeld, Germany), for his opinions and comment on the specimen and considerable advice and help in producing this paper. I would also like to thank Mark Telfer of the RSPB who commissioned the work at Nagshead Reserve.



Figs 1-6. ***Agromyza audcenti*** **sp. n. 1, left wing from below; 2, genital capsule, caudal view; 3, genital capsule, internal view; 4, 9th sternite; 5, aedeagus and aedeagal apodeme, lateral view; 6, aedeagus, dorsal view.**

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Eriozona syrphoides (Fallén, 1817) (Diptera, Syrphidae) in Oxfordshire – One female of this species was captured in Eaton Wood, Oxfordshire (SU259965) on 10 May 1998. It was swept from hawthorn blossom on the edge of a ride. Eaton Wood contains mixed woodland, with some old deciduous trees and coniferous woodland. S.G. Ball and R.K.A. Morris (2000. *Provisional atlas of British Hoverflies (Diptera, Syrphidae)*. Huntingdon, Biological Records Centre) noted that *E. syrphoides* is usually associated with mature conifers and the larvae are aphidivorous. They showed that the species is widely distributed in Scotland, Wales and northern England but there are few records from south and south-east England. It has not previously been recorded from Oxfordshire according to the NBN Gateway (http://www.searchnbn.net). This record is thus an extension of the range of the species away from northern and western Britain. Ball and Morris (*op. cit.*) noted a record, which they considered anomalous, of a dead specimen found in the centre of Coventry in 1982. The record from Oxfordshire supports the authenticity of this earlier record. The specimen has been deposited in the Hope Entomological Collections – **J.W. ISMAY,** Hope Entomological Collections, Oxford University Museum of Natural History, Parks Road, Oxford, OX1 3PW, schultmay@onetel.com

Syntormon macula Parent (Diptera, Dolichopodidae) in Berkshire - According to S. Falk and R. Crossley (in preparation. A review of the scarce and threatened flies of Great Britain: Empidoidea. JNCC) *Syntormon macula* Parent, 1927 is mainly known from the south-west of England and South Wales with one 1964 record for Kent. After PC recorded it from Wiltshire (Chandler, P.J. 2003. *Syntormon macula* Parent (Diptera, Dolichopodidae) and other Diptera new to Wiltshire. *Dipterists Digest* (*Second Series*) **10**, 66), Steven Falk (*pers. comm.*) informed him that he had recorded it at a dozen sites in Warwickshire, although males at only two of them, so it is clearly more widespread than previously thought, though a pair taken *in copula* on the Kennet Floodplain, near Southcote (SU7071) on 23.v.2003 by JD appear to be the first from Berkshire - **JONTY DENTON,** Kingsmead, Wield Road, Medstead, Hampshire, GU34 5NJ and **PETER CHANDLER,** 606B Berryfield Lane, Melksham, Wiltshire, SN12 6EL

Dipterists Digest 2004 **11**, 103-106

The occurrence of the micropterous fly *Crumomyia pedestris* (Meigen) (Diptera, Sphaeroceridae) in conservation field margins, with comments on its collection and distribution in Britain

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Summary

The occurrence of the micropterous fly *Crumomyia pedestris* (Meigen, 1830) (Diptera, Sphaeroceridae) in recently established conservation field margins in arable farmland is described. The habitat requirements of this species are discussed and a Vice County distribution map for Britain is provided.

Introduction

Crumomyia pedestris (Meigen) is a micropterous lesser dung fly that has a widespread Palaearctic distribution being recorded from Great Britain, Austria, Belgium, China, Czech Republic, Denmark, France, Germany, Hungary, Italy, Latvia, Netherlands, Norway, Poland, Romania, Russia, Sweden and Switzerland and has also been recorded in the Oriental Region in parts of China (Roháček 2001). It is habitually associated with damp grasslands, reed beds and under cut sedges where it is probably utilising tussock forming vegetation as a refuge (JNCC 2002, Pitkin 1988). Individuals have also been found under debris within small mammal nests and in mole nests (Hackman 1967, Norrbom and Kim 1985, Roháček 1991), and in *Carex* tussocks. A single male specimen in the BMNH collection was collected in bat guano *circa* 400m into the dark zone of a cave [Dorset, for full data see below]. This, according to Roháček (*in litt.* 2004) is a very interesting record as this is the first reported instance of this species being recorded in a cave habitat, and it was not included in the list of cavernicolous *Crumomyia* species given by Roháček and Papp (2000), although this same specimen was included in the paper by Norrbom and Kim (1985: 190). Roháček (1980) described this as a typically terricolous species, occurring in lowland wet meadows in Czechoslovakia. The larval ecology is according to Buck (1997) primarily necrophagous, being recorded in the laboratory as feeding on both vertebrate and invertebrate carrion, though he goes on to say that this species has a strong preference for snail carrion. This molluscan food preference has also been reported by Deeming and Knutson (1966), Guibé (1939) and Roháček (1980) and according to Roháček (1991: 2) this is 'surely its normal food in the wild.' Identification of this species may be achieved using Pitkin (1988). Roháček (1991) gave a detailed discussion of the species' biology and ecology, and a detailed description of all the immature stages are given by Guibé (1939), and its puparium and cephalopharyngeal skeleton were also described and illustrated by Deeming and Knutson (1966).

Within the British Isles the status of this species is unclear, as there are relatively few published records, and there are only a small number of museum specimens; indeed in four of the major museum collections only 77 specimens were present, which were from just eighteen localities. It is likely that the species' cryptic habit makes it unlikely that it would be encountered by the normal collecting techniques employed by most dipterists e.g. sweep netting. According to the most recent literature (Pitkin *op. cit.*) on this species in the British Isles it has been recorded from the following counties: Sussex, (Surrey), Berkshire, Oxfordshire, Hampshire, Wiltshire, Suffolk, Norfolk, Cambridgeshire, Yorkshire and Nottinghamshire and Co. Down, Ireland [parenthesis added by Pitkin for material he had not examined himself]. Clemons (1998) added Kent (V.C. 16) to the list of known counties, and Holmes *et al.* (1991) recorded the species for the first time from three rich fen sites in two counties in Wales, Monmouthshire (V.C. 35), and Pembrokeshire (V.C. 45). To this we can add the following newly recognised vice county records: **Dorset** (V.C. 09), Langton Matravers, (SY97), 1♂, 12.ii.1980, bat dung in cave *circa* 400m in dark zone, leg. R. Stebbins, det. B.R. Pitkin, 1980 [checked DJM/JWI] (BMNH collection); **Huntingdonshire** (V.C. 31), Port Holme (TL2371), 1♀, 19.ix.1993, trampling *Phragmites* reed bed, leg. D.J. Mann (NMGW collection); **North Hampshire** (V.C. 12), near the River Test at Leckford (SU3636), 1♂ 16.iii.1975, 2♂ 1♀ 20.ii.1977, from *Carex paniculata* tussocks, leg. P. Chandler and A.E. Stubbs (Peter Chandler *pers comm.*).

Occurrence in field margins of *Crumomyia pedestris*

On 15.vi.2002 two specimens of *C. pedestris* were collected in field margins that had been established as part of the *Sustainable Arable Farming For an Improved Environment* (SAFFIE) project at the ADAS farm at High Mowthorpe, Yorkshire (SE8876, V.C. 61). These field margins were established in autumn 2001 and comprised three seed mixes, all dominated by grasses although some also contained a number of other sown forbs and perennial herbs. Specimens were collected by suction sampling with a Vortis© (Burkland Ltd, UK) suction sampler. The two specimens were found in separate experimental plots planted with two different seed mixtures, although the tussock forming grass *Dactylis glomerata* (Poaceae) dominated both plots. *Dactylis glomerata* had a percentage cover of approximately 40% and the ground was almost always damp or on occasions water-logged. Both plots were separated by more than 200m and adjoined the same hedgerow. While collection of this species is unlikely to be achieved by the use of a net other methods are likely to prove more successful. Such methods will include destructive sampling of tussocks, hand sorting of sieved vegetation and detritus, pitfall trapping and suction sampling of wet or tussock dominated grasslands. The recent proliferation of suction sampling by entomologists is likely to mean that more records of this species will occur. Stewart and Wright (1995) gave specifications for the modification of leaf blowers to form an inexpensive vacuum sampling apparatus, providing a cheap and effective suction sampler for invertebrates.

Comments on the status of *Crumomyia pedestris* in Britain

The probable colonisation by *C. pedestris* of field margins that only the previous year were under an arable crop regime indicates that this species can rapidly take advantage of a new habitat resource, and while it is likely to be utilising tussocks it is not restricted to old or long established damp grasslands. However, it is likely that while this species can make use of recently established damp grasslands its utilisation of these habitats will be dictated by the current existence of source populations within a relatively low dispersal distance. Once *C. pedestris* has been lost from a site due to changes in management e.g. the introduction of drainage ditches, its re-establishment should the grassland be reverted to its original form may well be extremely unlikely. However, as the High Mowthorpe site was predominantly arable in nature and had no areas of tussock dominated damp grassland in the immediate area it is unclear where the individuals of *C. pedestris* originated. *Crumomyia pedestris* was either persisting in rather small marginal areas around hedgerows or displays a much greater dispersal capability than might be expected from a micropterous fly. Rohácek (*in litt.* 2004) suggested that in less suitable (e.g. drier) habitats this species may utilise the burrows and nests of small mammals (see also Hackman 1967; Norrbom and Kim 1985), and it may have been from this niche that the specimens originated; this is possible since suction sampling is known to extract insects from mammal runs in grassland and arable field margin habitats (DJM *pers. obs.*). Due to the cryptic nature of this species it is probable that it may be considerably more widespread than is indicated by currently available records. It may also be fairly generalist in its habitat requirements, potentially inhabiting a wide range of damp/wet grassland types. Many entomologists may have encountered this fly; however, as the sampling techniques most suitable for its capture e.g. tussocking and suction sampling have only recently become widely used by dipterists, it is likely that the number of records of this species will increase over the next few years and more complete representation of its distribution will become apparent.

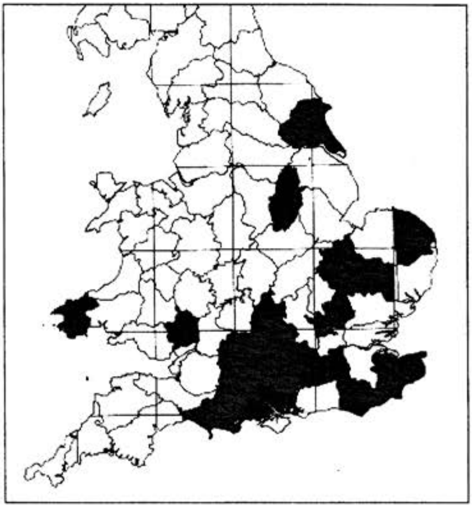

Fig. 1. Distribution map by vice-county of *Crumomyia pedestris* in England and Wales (black infill = material examined and verified by either PJC/JWI/DJM/BAW, grey infill = data from the literature).

Fig. 1 shows a distribution map for *C. pedestris* in England and Wales based on data from the literature, personal communications and from museum specimens held at BMNH (18 specimens from 11 localities), OUMNH (37 individuals from 7 localities), the National Museums and Galleries of Wales (NMGW: 15 individuals form 2 localities), the University Museum of Zoology, Cambridge (UMZC: 7 individuals from 3 localities). All specimens examined were micropterous. Guibé (1939) studied the genetics of the wing length and concluded that is was due to a recessive gene, therefore likely to be of rare occurrence in natural populations and only Papp (1976) and Roháček (1991) appear to have published on the capture of the macropterous form in the wild. Roháček (*op. cit.*) noted that the rare macropterous and submacropterous forms only occur in some populations, and these tend to be those in the 'drier end' of the habitat range of this species.

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Dipterists Digest 2004 **11**, 107-110

Meiosimyza mihalyii (Papp, 1978) (Diptera, Lauxaniidae) new to Britain with a note on the status of *M. obtusa* (Collin)

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Summary
Six British records of *Meiosimyza mihalyii* (Papp 1978) and characters distinguishing it from related species are given, with a note on the previously suggested synonymy with *M. subfasciata* (Zetterstedt) var. *obtusa* (Collin).

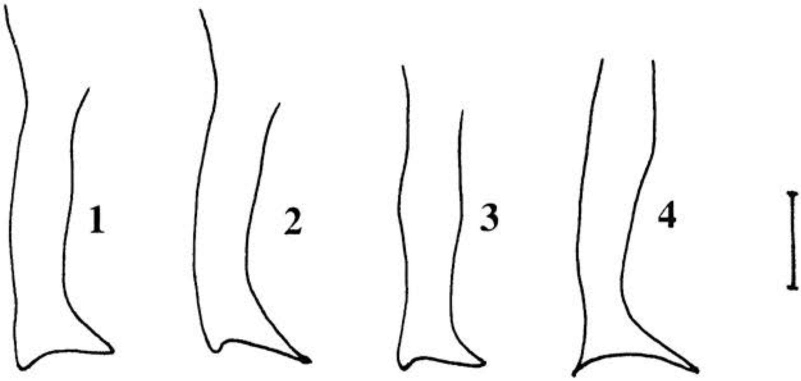
Introduction

In July 1991, during a Dipterists Forum field week on the Isle of Skye, the authors collected some material containing *Meiosimyza illota* from one site, and several years later JC was looking through some of AG's unpinned residual specimens and found a male like *illota* but with one gonite of very different shape. None was present in JC's collection from that site but another male was found among *illota* from County Durham collected in 1983. From Papp (1978a) they appeared to be *Meiosimyza mihalyii* (Papp), although there were minor differences. JC sent both specimens to Dr. Papp who compared them with the holotype and other material in the National Natural History Museum of Hungary. He confirmed the identification and wrote (*pers. comm.*) that "the small difference in the genital parts are not any larger than those found between far distant conspecific populations hitherto. This phenomenon is one of the characteristics of numerous European lauxaniid species, which makes their study even more problematic". Since then other specimens have been found in northern England and Scotland.

Meiosimyza Hendel 1925 was raised from synonymy by Shatalkin (2000), who recognised that it had priority over *Lyciella* Collin 1948, to include most species placed in *Lyciella* by Collin. This was predicted and later accepted by Chandler (1998 and 2000 respectively) and also followed in the translation of Shatalkin's key from Russian to English by Schacht *et al*. (2004).

Identification

Meiosimyza mihalyii (Papp) is very similar to *M. subfasciata* (Zetterstedt) and *M. illota* (Loew) to which pair it keys out, under *Lyciella*, in Collin (1948), still the work of first reference to British Lauxaniidae. Papp (1978a), in describing *M. mihalyii*, compared it with *subfasciata* with which it agrees externally in having the thoracic dorsum slightly less pruinose and therefore more shining and in having no darkening of the wing tip. However, as noted by Greve (2002) the genitalia are more like *illota*, with truncate surstyli, prominent gonites and a conical aedeagus almost as long as the gonites, while *subfasciata* has narrower pointed surstyli, no gonites and a much shorter aedeagus hardly surpassing the surstyli. The gonites are a pair of asymmetrical rods of characteristic shapes which lie on either side of the aedeagus in some species of *Meiosimyza* and *Pseudolyciella* Shatalkin, and the defining feature of *mihalyii* is the distinctive shape of the right gonite which is broadly truncated with pointed corners, one of which is drawn out more than the other (Figs 1-4) while in *illota* it is a simple rod with the apical half curved evenly outwards to a tapered point. The left gonite is a little shorter with a sharply bent pointed tip and is not distinguishable from that of *illota* (Papp 1978a, Fig. 24).



Figs 1-4. Variations in the right gonite of British specimens of *Meiosimyza mihalyii* (Papp). 1, Isle of Skye; 2, Ayrshire; 3, Co. Durham; 4, South Yorkshire. Scale bar = 0.1mm.

The male genitalia of *Meiosimyza illota* were illustrated by Papp (1978b), Remm and Elberg (1979, Fig. 26) and Shtakel'berg (1989, Fig. 625.8). The right gonites of the British specimens of *mihalyii* differ from Fig. 25 in Papp (1978a) in being slightly longer in proportion to the width and in having the shorter apical point more prominent. Another difference is that the pregenital sternite is completely divided into two ovoid sclerites unlike Fig. 41 in Papp (1978a) in which it is only slightly emarginate posteriorly, but like the deeply emarginate sternite of *subfasciata* (Papp 1978a, Fig. 31) carried a stage further. The sclerotisation of this sternite is very thin and delicate and may be too variable within species to be of diagnostic value.

Females of *M. mihalyii* have not so far been characterised, but one of us (AG) has taken females associated with males, at two sites where *illota* was not present, which appear to have a cleft sternite 8 like *illota* and unlike *subfasciata*.

The biology of *M. mihalyii* and related species appears not to be known. It has been assumed for lack of more positive evidence that the larvae live in rotting plant detritus. Like *M. illota,* with which it was found at two of the six localities, *mihalyii* appears to have a northern distribution in Britain. In Europe it is now known to be widespread and has been recorded from Norway (Greve 2002), Hungary, Romania, Russia and Slovakia (Papp 1978a), Switzerland (Merz 1998) and Italy (Merz 2003). There are also unpublished records from Andorra, Poland and Sweden (Bernhard Merz *pers. comm.*).

Material examined of *Meiosimyza mihalyii* (Papp)

ENGLAND: Hawthorne Dene, Co. Durham (NZ439461), 22.viii.1983, 1 male swept from woodland edge herbage, leg. JC; River Etherow, Woodhead, Derbyshire (SE123996), 5.vi.2003, 1 male and 8 probable females swept from upland grassland and heath with riverside habitat, leg. AG; Pikenaze Moor, Woodhead, Derbyshire (SE111000), 5.vi.2003, 2 males swept from conifer plantation with clearings dominated by *Vaccinium,* leg. AG; Windle Edge, Dunford Bridge, near Penistone, South

Yorkshire, (SE142006), 23.vi.2003, 1 male and 3 probable females taken with a modified garden vacuum, leg. AG.

SCOTLAND: Allt-nam-Fitheach, Isle of Skye. (NG3827), 10.vii.1991, 1 male swept from tall herbage on stream bank, leg. AG; Haylie Reservoir, Ayrshire, (NS216579), 4.viii.1995, 1 male swept from wet meadow with marshy stream, leg. JC.

A note on *Lyciella subfasciata* var. *obtusa* Collin.

In the current British checklist (Chandler 1998) *Lyciella obtusa* Collin was listed as a queried synonym of *L. mihalyii*, but Collin (*op. cit.*) described *obtusa* as a variety of *subfasciata* having blunt ended instead of pointed surstyli. Since *subfasciata* has a short aedeagus and no gonites it seems inconceivable that Collin had a *mihalyii* before him when naming var. *obtusa*. One of us (AG) has examined Collin's material in the Oxford University Museum and found that the male genitalia of var. *obtusa* are not at all like those of *mihalyii*. In support of this Beuk (2002) listed *obtusa* as of specific rank, but Oelerich (1999) continued to place *obtusa* as a synonym of *subfasciata*.

Acknowledgements.

We are grateful to Dr. Lászlo Papp for confirming the identity of *M. mihalyii* and for his comments.

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Recent records of some rare wetland snail-killing flies (Diptera, Calliphoridae) from Berkshire – In 2003 we carried out a large scale survey of the invertebrate fauna of the Kennet Floodplain and surrounding areas as part of an Environmental Impact Assessment, in which 1067 species of Diptera were recorded, including many accorded conservation status. Among these we were surprised to find both British species of *Angioneura*, a rarely recorded genus of Calliphoridae. The occurrence of these species in the same area of the Kennet flood-plain (SU6671) confirms its richness as a water meadow site but also suggests that these relatively small black calliphorids could have been overlooked in similar sites elsewhere.

The only previous British record of the RDB1 species *Angioneura acerba* (Meigen) was from a "marshy area" near the Thames at Oxford on 12 July 1966 (Ackland, D.M. 1967. *Angioneura acerba* (Meigen, 1838) (Diptera, Calliphoridae) new to Britain. *Entomologist* **100,** 122-123). It is rare but widespread in Europe, with adults recorded from May to October in northern Europe (Rognes, K. 1991. Blowflies (Diptera, Calliphoridae) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* **24,** 1-272). The biology is unrecorded but it is probably a parasitoid of snails like *A. cyrtoneurina*. A male was swept by PC from herb rich marsh vegetation on the West Floodplain north of the railway adjacent to the Holy Brook, a tributary of the River Kennet on 7.vii.2003 (SU6671).

A male *Angioneura cyrtoneurina* (Zetterstedt) (RDB2) was found at the same location as *A. acerba* on 31.viii.2003 by PC, and a female in shaded carr at Sheffield Bottom (SU640697) on 16.vi.2003 by JD. This species is a little better known in Britain than *A. acerba* although it is also rare in Europe (Rognes *op. cit.*). S.J. Falk and A.C. Pont. (in preparation. *A review of the scarce and threatened flies of Great Britain: Calyptratae*. JNCC) refer to four sites in Hampshire (Wick 1945), Kent (Westbere 1966), Norfolk (Horning Ferry, 1928, 1932, 1952) and Cambridgeshire (Chippenham Fen 1983), but there is one more recent unpublished record, from Malaise samples from Suffolk (Minsmere RSPB Reserve 2001), collected by Mike Edwards and identified by David Gibbs. It is a parasitoid of snails of the family Succineidae in fens or damp woodland; in central Europe it has been reared from *Oxyloma pfeifferi* (Rossmässler) (Rognes *op. cit.*). These appear to be the first records from Berkshire (V.C. 22). In view of the abundance of its hosts it is unclear why it is so rarely recorded.

Angioneura belongs to subfamily Melanomyiinae, of which all members are probably malacophagous. Apart from the more commonly encountered species of *Melinda* and *Melanomya*, this subfamily includes the Notable species *Eggisops pecchiolii* Rondani, one male and one female of which were also recorded on this survey, in a drier area of herb-rich meadows and hedges at Southcote (SU6871) on 1.vi.2003. This species, widespread but very local in England north to Warwickshire with one old record from Sutherland, mainly occurs in grassland and scrub as well as hedges and woodland on calcareous soils. The female is viviparous and larvae are parasitoids of terrestrial snails. Falk and Pont (*op. cit.*) refer to there being about 20 known post 1960 localities.

We are grateful to David Gibbs for enabling us to include his record of *A. cyrtoneurina* –
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Dipterists Digest 2004 **11**, 111-113

Homoneura interstincta (Fallén, 1820) (Diptera, Lauxaniidae) in Britain

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Summary
Homoneura interstincta (Fallén, 1820) (Diptera, Lauxaniidae) is confirmed to be a British species and its separation from *H. mediospinosa* Merz, 2003 is described.

Introduction.
This name was first introduced to the British list by Collin (1948) but it would appear that he reached this identification without referring to any type specimens. Recently it has been shown by Merz (2003) that Collin misapplied this name and that the specimens available to him are referable to the newly described species *H. mediospinosa* Merz, 2003.

While surveying the gardens at Montacute House, Somerset (ST4917) for the National Trust on 15 July 2003 I collected three *Homoneura* specimens which readily keyed to *interstincta* (Fallén) in Collin (1948). When it was pointed out to me that Collin's *interstincta* had been named *mediospinosa* and that the true *interstincta* was not known from Britain (Peter Chandler *pers. comm.*), I checked the identity of my specimens using Merz (2003). It was immediately apparent from the excellent illustrations of the genitalia and sternites that my two male specimens were, in fact, the true *interstincta*. Later I macerated the abdomen of the female specimen and confirmed that this too was *H. interstincta*.

Identification.
Males and females of both *H. interstincta* and *mediospinosa* will run to *interstincta* in the key provided by Collin (1948). These two can be separated by the following characters.

Character	*H. interstincta*	*H. mediospinosa*
ocellar bristles	long, reaching forward to anterior fronto-orbital	shorter, not reaching anterior fronto-orbital
frons	with depression in anterior half	flat
genae	one third height of eye	one fifth height of eye
face	bulging in lower half	flat
black costal spinules	reaching two thirds of the way from R_{2+3} to R_{4+5}.	reaching R_{4+5}
black av spinules on front femur	a short, irregular row of 4-7 spinules	7 more closely set spinules
male 5th sternite	medially divided into two triangular sclerites (Fig. 1)	with a median square projection armed with strong, black spines apically (Fig. 2)

The male genitalia of *H. interstincta* (Fig. 3) are abundantly distinct from those of *H. mediospinosa* (see Merz 2003, Figs 16-20; Remm and Elberg 1979, Fig. 3). Apart from the external characters in the table above, females also differ in the structure of the ovipositor and spermathecae (see Merz 2003, Figs 21-26).

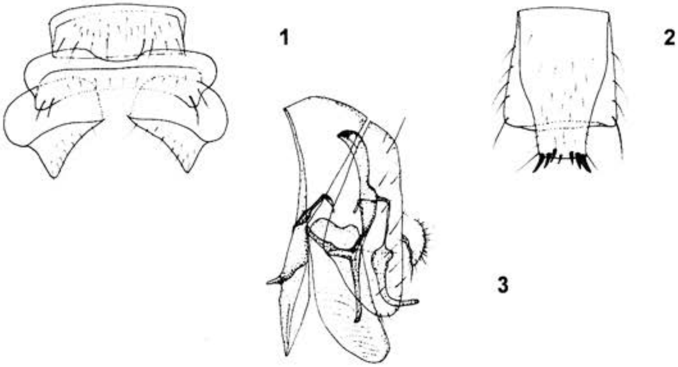

Fig. 1. ***Homoneura interstincta*** **(Fallén), ventral view of male sternites 3-5. Fig. 2.** ***Homoneura mediospinosa*** **Merz, ventral view of male sternite 5 (after Merz 2003). Fig. 3.** ***Homoneura interstincta*** **(Fallén), left lateral view of male genitalia.**

It is worth noting that the truncated row of black spinules on the costa of *interstincta* might cause it to run to *Sapromyza* in Collin (1948) if only the first sentence of the couplet is read. If it is run through the *Sapromyza* key then it falls out at female *albiceps* Fallén on the basis of the front dorsocentral being in the suture, but it lacks any black spots on the apical tergites.

Status and distribution

In addition to the three specimens of the true *interstincta* collected in Somerset in 2003, a further three (2♂, 1♀) were collected by the author from Keynsham (ST6668), Somerset on 28 June 2004. Specimens of *interstincta* sensu Collin (1948) are scarce in British collections. So far four collections have been examined with specimens under this name. Those at the Natural History Museum, London, the Hope Entomological Collections at Oxford and Peter Chandler's private collection have proved to be *mediospinosa* (Peter Chandler *pers. comm.*). However, a further specimen of *H. interstincta* was found in Adrian Plant's private collection from West Moor (ST2926, V.C. 6), 9.vi.2003 (leg. A.R. Plant) (Adrian Plant *pers. comm.*). *H. mediospinosa* is a scarce species in Britain and has RDB3 status (as *interstincta* sensu Collin). It seems likely that the true *interstincta* is even rarer than this.

Biology

Nothing is known of the life-cycle of *interstincta* or *mediospinosa*. Most records refer to shady situations in damp broadleaved woodland, but a few refer to wetlands, with one from pingo pools in Norfolk, possibly in association with carr (Falk and Ismay in preparation). Most of these records presumably refer to *mediospinosa*.

The three specimens of *interstincta* from Montacute House were swept from dense shade along the edge of a row of trees with an under-storey of dense cherry laurel *Prunus laurocerasus* and other shrubs. The other side of the path was pasture with several veteran sweet chestnuts *Castanea sativa* and other trees. The three specimens from Keynsham were swept from the lower branches of Lombardy poplars *Populus nigra* var. *italica* in a relatively exposed situation. The site is not close to any significant woodland or ancient trees. The West Moor specimen was from freshwater grazing marsh.

Acknowledgements
I would like to thank the gardeners and all the staff at Montacute House who assisted me on my visit to the garden and the National Trust who commissioned the work. Peter Chandler and Adrian Plant kindly checked their collections and Andy Godfey checked Adrian's specimen.

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Falk, S.J and Ismay, J. (in preparation) *A review of the scarce and threatened flies of Great Britain; Acalyptratae*. Joint Nature Conservation Committee.

Merz, B. 2003. The Lauxaniidae (Diptera) described by C.F. Fallén with description of a misidentified species of *Homoneura* van der Wulp. *Insect Systematics and Evolution* **34,** 345-360.

Remm, E. and Elberg, K. 1979. Terminalia of the Lauxaniidae (Diptera) found in Estonia, Latvia and Lithuania. *Dipteroloogilisi Uurimusi* **5,** 66-117.

A belated note of the first record of *Tanyptera nigricornis* (Diptera, Tipulidae) from S.W. England (Devon) – A minor correction is necessary to a recent comment by Alan Stubbs (2000. *Bulletin of the Dipterists Forum* No. **50,** 5), where he asserted that "The summer field meeting [in Cornwall] produced the first record of *Tanyptera nigricornis* from SW England". I can provide an earlier regional record of this species as I took it in Blanchdown Wood, Scrubtor, Devon (SX415735) on 13 June 1985, though inexplicably omitting to report it to the Recording Scheme.

This spectacular fly was a lucky find at rest in the outside lavatory of our rented holiday cottage deep inside the wood. Rarely has a call of nature been so rewarded!

This varied woodland was rich in insects generally, producing many species of Lepidoptera previously unseen by me including some rarities, and among a number of caddis flies taken at MV, a specimen of *Oecetis notata* (Rambur) kindly identified by Ian Wallace, who observed that "This is a national rarity previously recorded only from the Rivers Wye, Teifi and Towy, hence this is a new record for an entire region of Britain and probably indicates two new Vice County records as it presumably bred in the River Tamar." A short path from the garden of our isolated cottage led down to this river, alongside whose banks a light trap was frequently run – **BILL HARDWICK,** 4 Caister Way, Over Winsford, Cheshire CW7 1LT

Dipterists Digest 2004 **11**, 114-116

Gymnomus spectabilis (Loew, 1862) (Diptera, Heleomyzidae) in Britain.

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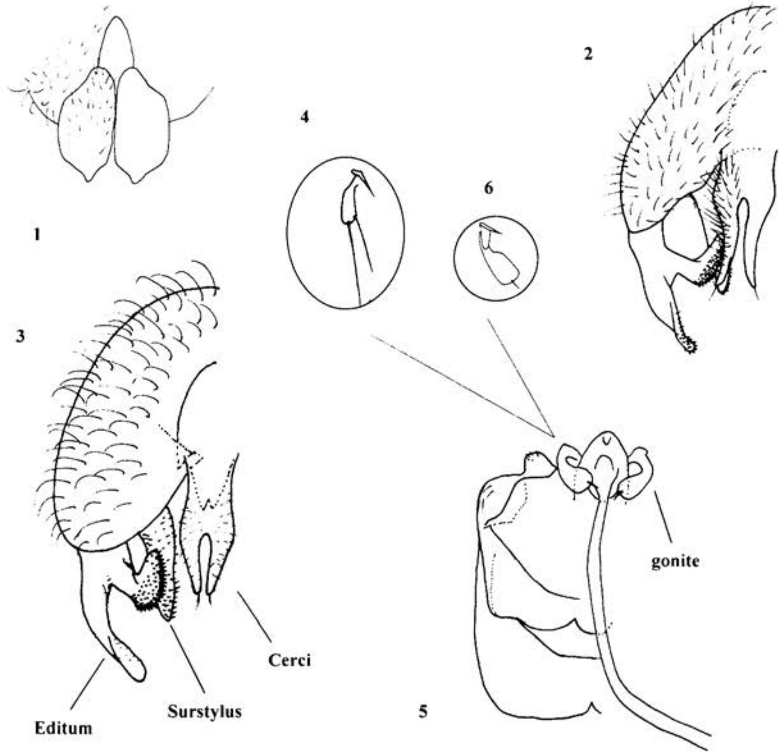
Summary
Gymnomus spectabilis (Loew, 1862) (Diptera, Heleomyzidae) is added to the British list and its separation from *G. caesius* (Meigen) is discussed.

Introduction
In October 2003 I collected a male heleomyzid, which ran to the final couplet in the key to *Scoliocentra* provided by Collin (1943) where *Scoliocentra amplicornis* (Czerny, 1924) and *Gymnomus (*then in *Scoliocentra) caesius* (Meigen, 1830) key out. My specimen would not run readily to either species, having the orange abdomen of the former but the genitalia type of the latter. I then referred to Papp and Woźnica (1993) where my specimen readily ran to *Gymnomus spectabilis* (Loew, 1862) in the key to the Palaearctic species of the genus.

Identification.
Males are quite distinct from *S. amplicornis* and *G. caesius* by the structure of the genitalia. Females are more difficult to separate, the differences being confined to the number of rows of peristomal bristles (which seems to be rather variable and perhaps not reliable) and the colour of the abdomen. No significant differences in the structure or chaetotaxy of the ovipositors of *G. caesius* and *G. spectabilis* could be found.

Character	*S. amplicornis*	*G. caesius*	*G. spectabilis*
Abdomen colour	clear orange	partly infuscated	clear orange
Number of rows of peristomal bristles	3	2	1
First flagellomere	large, clear orange, as long as deep, rather square	small, infuscated, longer than deep	small, clear orange, as long as deep, round
Cerci	broad with blunt prongs (Fig. 1)	longer with long prongs diverging apically (Fig. 2)	longer with long prongs straight apically (Fig. 3)
Editum	simple, spatulate	bifurcate, large external lobe with black stud-like spines apically (Fig. 2)	bifurcate, lacking these black spines, almost bare apically (Fig. 3)
Gonite	small, narrow with two long black bristles on each	small, narrow with two long black bristles on each (Fig. 4)	larger, expanded apically with one or two very short black bristles on each (Figs 5 and 6)



Figs 1-6. Male genitalia. 1, *Scoliocentra amplicornis*, cerci; 2, *Gymnomus caesius* epandrium, cerci, editum and surstylus; 3, *Gymnomus spectabilis*, epandrium, cerci, editum and surstylus; 4, *Gymnomus caesius*, gonite; 5, *Gymnomus spectabilis*, hypandrium showing position of gonites; 6, *Gymnomus spectabilis*, gonite.

Discussion

My single male specimen, from Nagshead RSPB Reserve (SO6009), was swept in broad-leaved woodland along a shallow valley with a permanent stream. Other specimens seen (all from Peter Chandler's collection) are from woodland in central England north to North Yorkshire, with Gloucestershire being particularly productive, and one from Sutherland, Scotland. *G. caesius* is much more widespread with records from Kent west to Monmouthshire and north to Inverness-shire in Scotland as well as Antrim and Wicklow in Ireland. The Nagshead specimen was found on 9 October and most others were also late in the season from 8 to 21 October, with the exception of the only Scottish specimen, which was collected on 26 June. *G. caesius* is also essentially a late summer to autumn species with records from April to 10 November with most in October. Examination of modern collections suggests that *G. spectabilis* is less frequent than *G. caesius* by a factor of at least ten. However, it appears that there are no specimens in the collections of the Natural History Museum (London) (Peter Chandler *pers. comm.*) or in the Hope Collection, Oxford, so perhaps it was much rarer in the past.

Specimens examined of *Gymnomus spectabilis*:
ENGLAND: Ashberry Pastures, North Yorkshire, 14.x.1990, leg. PJC, 1♀; Forge Valley, North Yorkshire, 13.x.1990, leg. PJC, 3♂; Frithsden Beeches, Hertfordshire, 16.x.1997, leg. PJC, 1♂; Ashridge Estate, Hertfordshire, 8.x.1999, leg. PJC, 2♂; Daneway SSSI, Gloucestershire, 12.x.1997, leg. PJC, 1♂; Old Park Wood, Gloucestershire, 21.x.1972, leg. PJC, 2♂; The Slaughter, Wye Valley, Gloucestershire, 16.x.1981, leg. PJC, 2♂; Nagshead RSPB reserve, Forest of Dean, Gloucestershire, 9.x.2003, leg DJG, 1♂; Midger Wood, Gloucestershire, 17.x 2003, leg. PJC, 1♀; Out Wood SSSI, Gloucestershire, 17.x 2003, leg. PJC, 1♀; Goring Heath, Oxfordshire, 14.x.1972, leg. PJC, 1♂.
SCOTLAND: Torboll Wood, Sutherland, 26.vi.1999, leg. PJC, 1♂.

From the material of *G. caesius*, examined by myself or Peter Chandler, the following distribution in the British Isles can be confirmed for that species. Chandler *et al.* (2002) gave details of the Irish records. Corbet (2004) records it from Fife and refers to only a single previous published Scottish record from the Isle of Rum, which now requires confirmation. As the species is evidently widespread in Scotland the localities of Scottish material examined are also given below:
ENGLAND: Berkshire, Cambridgeshire, Derbyshire, Devon, Dorset, Durham, Hampshire, Herefordshire, Hertfordshire, Kent, Lancashire, North Yorkshire, Oxfordshire, Shropshire, Somerset, Staffordshire, West Yorkshire, Worcestershire. WALES: Monmouthshire. SCOTLAND: Aberdeenshire (Dinnet Oakwood NNR), Angus (Prosen Bridge), Ayrshire (Dean Castle Country Park), Inverness-shire (Aviemore, Divach Falls, Geal Charn, Loch Garten), Nairn (Culbin Sands, Dulsie Bridge), Perthshire (Birks of Aberfeldy), Selkirk (Selkirk). IRELAND: Antrim, Wicklow.

Acknowledgements
I am very grateful to Peter Chandler for making his extensive collection of heleomyzids available for study and also to Mark Telfer of the RSPB who commissioned the work at Nagshead.

References

Chandler, P.J., O'Connor, J.P., Nash, R. and Withers, P. 2002. Diptera new to Ireland in seventeen families. *Dipterists Digest (Second Series)* **9,** 121-136.

Collin, J.E. 1943. The British species of Heleomyzidae (Diptera). *Entomologist's monthly Magazine* **79,** 234-51.

Corbet, G.B. 2004. Noteworthy Diptera at Dumbarnie Links Wildlife Reserve, Fife, Scotland. *Dipterists Digest (Second Series)* **11,** 127-143.

Papp, L. and A. Woźnica 1993. A revision of the Palaearctic species of *Gymnomus* Loew (Diptera, Heleomyzidae). *Acta Zoologica Hungarica* **39**(1-4), 175-210.

Dipterists Digest 2004 **11**, 117-119

Dorylomorpha fennica Albrecht, 1979 (Diptera, Pipunculidae) new to Britain

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Summary
Dorylomorpha fennica Albrecht, 1979 is added to the British list and figures are provided to assist separation of the males of *D. fennica*, *D. xanthopus* (Thomson, 1870) and *D. anderssoni* Albrecht, 1979, the most similar species.

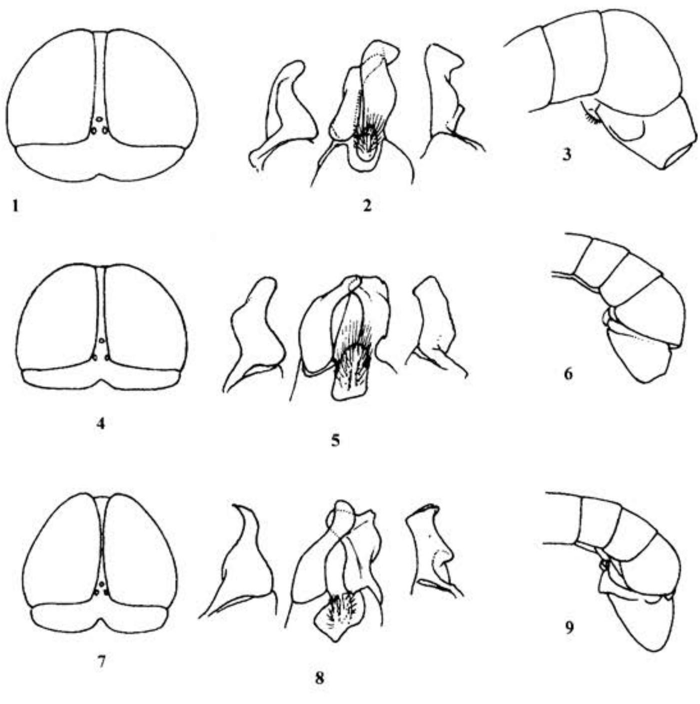
Introduction.
While examining specimens collected by SF we came across a male *Dorylomorpha* which at first sight looked like a rather robust *D. xanthopus* (Thomson, 1870). A closer inspection revealed that the membranous area of sternite 8 was much too large for *D. xanthopus* and it did not fit any species with which either of us was familiar. It was then keyed using Albrecht (1990), in which it readily ran to *D. fennica*. This identification was confirmed by dissecting the specimen and comparing it with the excellent illustrations in that revision.

Identification.
Dorylomorpha fennica is entirely black on head, thorax and abdomen, the male abdomen being distinctly club-ended, somewhat intermediate between *D. xanthopus* and the very robust species *D. hungarica* (Aczél, 1939) and *D. haemorrhoidalis* (Zetterstedt, 1838), and the eyes being separated by about twice the width of the front ocellus. The legs are largely yellow with black coxae, dull brownish to yellow trochanters and the femora are black basally for half the length dorsally and one quarter to a third the length ventrally. The tarsi are infuscated apically, the last tarsal joint being blackish. The third antennal segment is brown and relatively short and blunt (like *xanthopus*).

Using Coe (1966) it will not run to any species comfortably. The relatively large hypopygium and large membranous area on segment 8 resemble Coe's description of '*D. haemorrhoidalis*' (which now encompasses two species, *D. hungarica* and the scarcer *D. haemorrhoidalis*). However, both of these species have the femora at least two thirds black, tibiae with at least a dark band, a larger membranous area on segment 8 (occupying most of the height of the segment) and eyes more closely approximated than the width of the front ocellus. If taken further in Coe's key, it will run to *D. xanthopus* though this has a much smaller segment 8 (resulting in a less clavate abdomen) with a relatively small round membranous area. The abdomen of *D. xanthopus* will occasionally have orange lateral spots, a state not reported in *D. fennica*.

No females have been seen but from Albrecht (1990) it is clear that they are very similar to *D. xanthopus* but rather larger with a wing length 4.1-4.7mm (*xanthopus* 2.6-3.8mm) and an ovipositor length of 1.3-1.44mm (*xanthopus* 0.86-1.02mm). The ovipositor also differs in shape, the basal part being wider and constricted close to the piercer, not tapering evenly as seen in *D. xanthopus*.

The species is known to be variable; rarely the membranous area of sternite 8 can be much smaller, so some specimens can only be recognised by examination of the surstyli. The male genitalia afford an abundance of characters, the left surstylus (shown to the right in Fig. 2 due to orientation) having an apical triangular projection, so appearing quite different from that of *D. xanthopus* (Fig. 5). Illustrations are provided to aid separation of male *D. fennica* from *D. xanthopus* and also *D. anderssoni* Albrecht, 1979 (the *D. semimaculata* (Becker, 1897) of Coe 1966). These three species form a natural group in an unpublished key by Gibbs (2004) and *D. fennica* will also tend to fall out close to the other two species in the earlier unpublished key by Stubbs (1988). However, *D. anderssoni* tends to have distinct red markings on tergites 2 and 3 and very narrowly separated eyes, so is only likely to be confused with some *D. xanthopus*.



Figs 1-9. Male *Dorylomorpha*. 1-3, *D. fennica* Albrecht; 4-6, *D. xanthopus* Thomson; 7-9, *D. anderssoni* Albrecht. Illustrations for each comprising of male head in dorsal view (Figs 1, 4, 7), surstyli in dorsal view (central) flanked by individual surstyli in lateral view (2, 5, 8), and apex of abdomen in lateral view (3, 6, 9). Fig. 3 based on Albrecht 1990.

Biology

On the continent *D. fennica* has been found in both damp and dry habitats in warm, sunny situations. It is known in Finland from dry meadows and road verges associated with *Calamagrostis epigejos*, *Agrostis capillaris*, *Elymus repens*, *Deschampsia flexuosa*, *Poa* species and other grasses. In wetter habitats along the margins of fens it has been found amongst *Carex* species, *Calamagrostis canescens* and other grasses. It is single brooded, in Scandinavia recorded from June to early July peaking in the second week of June; in central Europe from early May to mid June peaking the last week in May; apparently overwintering in the pupal stage (Albrecht 1990).

The single British specimen was taken in extensively replanted ancient woodland on calcareous clays, with habitats such as patches of limestone grassland and wet seepages with plants such as *Carex pendula* beneath the woodland canopy. No *Calamagrostis* grasses are recorded, but *Brachypodium pinnatum*, *B. sylvaticum*, *Deschampsia caespitosa*, *Carex pendula* and *C. sylvatica* are frequent in the rides.

Distribution.

This species is so far known from the former Czechoslovakia, Finland, Germany, Sweden, Estonia, Kazakhstan and the Ukraine (Albrecht 1990).

The single British example was caught at Wellesbourne Wood, Warwickshire, V.C. 38, SP2753, on 24 May 1997 by S.J. Falk. The specimen is retained in the collection of SF.

References.

Albrecht, A. 1990. Revision, phylogeny and classification of the genus *Dorylomorpha* (Diptera, Pipunculidae). *Acta Zoologica Fennica* **188,** 1-240.

Coe, R.L. 1966. Diptera: Pipunculidae. *Handbooks for the Identification of British Insects* **10,** 1-83. Royal Entomological Society of London.

Villa cingulata (Meigen) (Diptera, Bombyliidae) in the Bristol region –

This rare bee-fly had not been reported since 1938 when it was discovered at Tucking Mill, near Bath (ST7661) in 2000 by David Gibbs (Gibbs, D.J. 2002. Scarcer Diptera found in the Bristol Region in 1999, 2000 and 2001. *Dipterists Digest (Second Series)* **9,** 1-13). That same year a single individual, assumed to be this species, was noted by Matthew Oates at a site in the Cotswolds (Stubbs, A. 2000. Wildlife Reports – Flies. *British Wildlife* **11**(6), 441). Subsequently several more have been seen in the latter locality (D. Iliff) and a single female was caught and released in Woodchester Park, Gloucestershire on 2 August 2002 (D.J. Gibbs). Earlier records were from scattered localities in southern England, but especially in the Oxfordshire Chilterns, where it has also been found again in recent years. The usual habitat appears to be among long grass or at flowers of umbels (Apiaceae) in sheltered calcareous sites (Stubbs, A. and Drake, M. 2001. *British Soldierflies and their allies*. 512 pp. British Entomological and Natural History Society).

On 11 July 2004 I took a female *V. cingulata* at the North Road entrance to the Leigh Woods National Nature Reserve on the edge of Bristol, ST5573. A further example was also witnessed on the "Plain", the grassy woodland clearing just inside the Leigh Woods reserve.

This additional new site in the west of England would seem to suggest that the species is currently on the increase and should be looked for in other suitable sites in the region – **RAY BARNETT,** City Museum & Art Gallery, Queen's Road, Bristol BS8 1RL, ray_barnett@bristol-city.gov.uk

Dipterists Digest 2004 **11**, 120-122

Corrections and changes to the Diptera Checklist (12) – 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. Stuart Ball has been preparing a revised checklist for the Dipterists Forum website and has found many minor errors and inconsistencies, of which some are reported here.

In the notes below where names of genera and species are given as in the Checklist, authorship is not stated here. Changes are listed under families; names new to the British Isles list are given in bold type. The notes below refer to no deletions or losses due to synonymy and addition of 7 species, resulting in a new total of 6803 species.

Corrections

p. 3 Under *Tricyphona* is cited Savchenko & Krivolutskaya (1992), which should be (1976) as in References.

p. 16 Under *Trichonta fusca* is cited Cole & Chandler (1981), which should be 1979 as in References.

pp. 21-22 References to Menzel & Mohrig, 1997b (e.g. under *Corynoptera subtilis*) relate to Menzel & Mohrig 1998 (not changed in all cases at proof stage) (as indicated in a previous supplement this work was in fact published in 2000).

p. 22 Under *Scatopsciara*, Menzel, Mohrig & Báez (1998) should be 1997 as in References.

p. 25 Under *Aprionus spiniger*, Edwards (1938), should be 1938b as in References.

p. 37 Under *Spurgia capitigena*, Gagné, 1990 was omitted from References. This should be added: GAGNÉ, R.J. 1990. Gall complex (Diptera: Cecidomyiidae) in bud galls of Palaearctic *Euphorbia* (Euphorbiaceae). *Annals of the entomological Society of America* **83:** 335-345.

p. 40 In Note 30 is cited Gagné (1989), which was omitted from the References. This should be added:
GAGNÉ, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press. xi & 356 pp.

p. 41 In Note 34, Buhr (1964) has a u-umlaut in error in the citation. This name is given correctly elsewhere without the umlaut.

p. 51 Under *Simulium juxtacrenobium* is cited ICZN Opinion 1683, which was omitted from the References. This should be added as follows:

International Commission on Zoological Nomenclature. 1992. Opinion 1683. *Simulium* (*Nevermannia*) *juxtacrenobium* (Insecta, Diptera): specific name first available from the intended original description by Bass and Brockhouse, 1990. *Bulletin of Zoological Nomenclature* **49**(2): 168.

p. 111. Under Note 12 the citation of Thompson & Vockeroth (1987) should refer to Vockeroth & Thompson (1987), which is listed in the References.

p. 140 Under Note 4 is cited Spencer (1971), which was omitted from the References. This should be added:
Spencer, K.A. 1971. Notes on a revision of the British Agromyzidae (Diptera), and the description of 14 new species. *Entomologist's Gazette* **22:** 141-195.

p. 150 Under Note 3, ICZN (1994) should be corrected to (1995), which is listed in the References.

Changes

Mycetophilidae. The following species was added by J. COLDWELL (2004. Some fungus-gnats new to Yorkshire from the Barnsley area. *Bulletin of the Yorkshire Naturalists Union* **41,** 23-25):
Mycomya (S. *Mycomyopsis*) ***paradentata*** Väisänen, 1984

Cecidomyiidae. The following genus and species were added by K.M. HARRIS (2004. A new species of gall midge, *Acericecis campestre*, inducing leafgalls on Field Maple (*Acer campestre*). *Cecidology* **19**(2), 41-44. This species is described from the larva only. Although not stated the name is presumed to be a noun in apposition since it is a neuter adjective in the tree name while the generic name *Acericecis* is feminine:
ACERICECIS Gagné, 1983
Acericecis ***campestre*** Harris, 2004

Empididae. The following change is due to M. CHVÁLA (2004. Revision of the Empididae (Diptera) from the Alps described by Gabriel Strobl. *Acta Universitatis Carolinae Biologica* **48,** 99-139):
Hilara ***longifurca*** Strobl, 1892 = *Hilara monedula* Collin, 1927

Pipunculidae. The following species is added in the present issue:
Dorylomorpha ***fennica*** Albrecht, 1979

Lauxaniidae. Some nomenclatural changes in *Minettia* result from B. MERZ (2004. Revision of the *Minettia fasciata* species-group (Diptera, Lauxaniidae). *Revue Suisse de Zoologie* **111**(1), 183-211):

Minettia fasciata (Fallén, 1826) = *rivosa* (Meigen, 1826) (i.e. *rivosa* of the British list)
Minettia ***tabidiventris*** (Rondani, 1877 – *Sapromyza*) = *fasciata*: authors, including Collin, 1948

The following species is restored to the British list in the present issue (see Corrections and changes to the Diptera Checklist (10) in Vol. **10,** 148):
Homoneura ***interstincta*** (Fallén, 1820 - *Sapromyza*)

Meiosimyza mihalyii, added in the checklist (under *Lyciella*), is formally added here; *M. obtusa* Collin is removed from its synonymy and may be a good species, but its status remains uncertain.

Agromyzidae. The following species is added in the present issue:
Agromyza ***audcenti*** Gibbs, 2004

Heleomyzidae. The following species is added in the present issue:
Gymnomus ***spectabilis*** (Loew, 1862 – *Blepharoptera*)

Tachinidae. The following species is added in the present issue:
Thelaira ***leucozona*** (Panzer, 1809 – *Musca*)

Changes to the Irish Diptera List (2) – Editor

This section will appear as necessary to keep up to date the initial update of the Irish list in Vol. **10,** 135-146. Species will be listed under families as in the overall checklist update, but with references listed separateiy. The additions reported here bring the confirmed Irish list to 3144 species.

Chironomidae
Cryptotendipes pflugfelderi Reiss, 1964 (Trodd and Murray 2004)

Dolichopodidae
Achalcus vaillanti Brunhes, 1987 (Speight 2004)
Hercostomus chetifer (Walker, 1859) (Speight 2004)

Syrphidae.
Platycheirus aurolateralis Stubbs, 2002 (Speight *et al.* 2004)
Platycheirus splendidus Rotheray, 1998 (Speight *et al.* 2004)

Tephritidae
Trypeta artemisiae (Fabricius, 1794) (Speight 2004)

References

Speight, M.C.D. 2004. *Achalcus vaillanti*, *Hercostomus chetifer* and *Trypeta artemisiae* (Diptera: Dolichopodidae & Tephritidae), insects new to Ireland. *Irish Naturalists' Journal* **114,** 428-429.

Speight, M.C.D., Brown, M.J.F. and Stout, J.C. 2004. *Platycheirus aurolateralis* and *P. splendidus* (Diptera: Syrphidae), insects new to Ireland and their separation from related species. *Irish Naturalists' Journal* **114,** 413-417.

Trodd, W.R. and Murray, D.A. 2004. *Cryptotendipes pflugfelderi* Reiss, 1964 (Diptera: Chironomidae) in the Turraun Nature Reserve and the first record from Ireland. *Entomologist's Gazette* **55,** 171-172.

Dipterists Digest 2004 **11**, 123-126

Brood dimorphism in male *Cheilosia cynocephala* Loew (Diptera, Syrphidae) and separation of the first generation from *C. vernalis* (Fallén)

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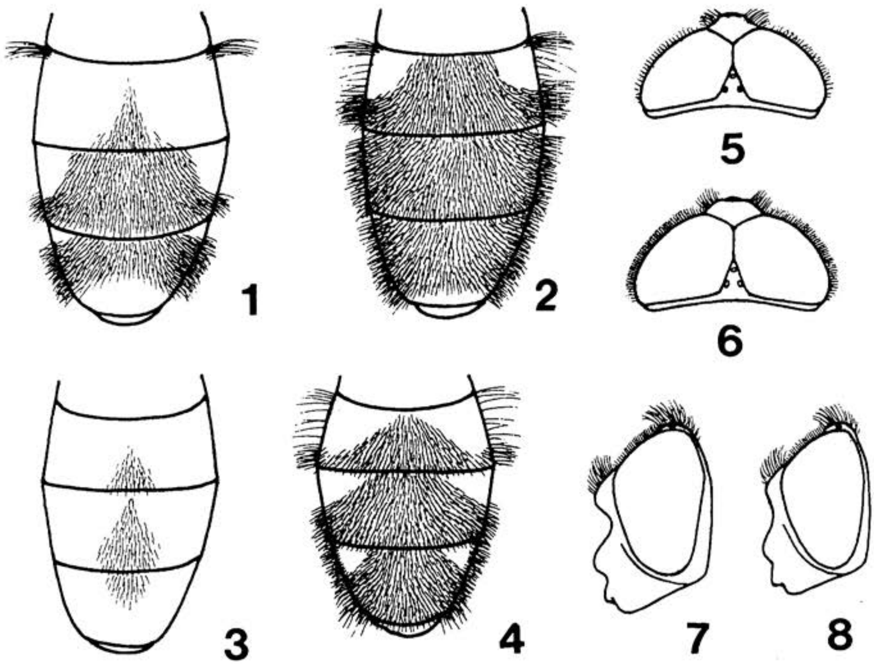
Summary
Hitherto undescribed brood dimorphism in male *Cheilosia cynocephala* Loew, 1840 is described, and the separation of the first (spring) generation from the similar *C. vernalis* (Fallén) is discussed.

Introduction
Brood dimorphism in certain bivoltine *Cheilosia* has been recognised for some years and is described for species such as *C. vulpina* (Meigen), *C. proxima* (Zetterstedt) and *C. pagana* in Stubbs and Falk (2002). The degree of expression varies between species but has caused taxonomic confusion. For example, the smaller, less hirsute summer brood of *C. vulpina* was regarded as a separate species *C. conops* Becker in European literature for many years. Stubbs and Falk (1983) provisionally separated *Cheilosia proxima* into two forms termed species D and E by (now known to represent the summer and spring generations respectively) and Verrall (1901) had described larger, more hirsute spring specimens of *C. pagana* as var. *floccosa*. This dimorphism is also present in a number of other species at a lower level of expression that tends not to interfere with identification e.g. *C. bergenstammi* Becker, *C. fraterna* (Meigen) and *C. vernalis* (Fallén) but is often masked by the natural variation present within the broods.

The main expressions of brood dimorphism are summarised in the following Table.

Spring generation	**Summer generation**
Averages larger e.g. wing length of typical male *vulpina* 9.5mm, typical male *proxima* 7.5mm, typical male *pagana* 8mm	Averages smaller, wing length of typical summer *vulpina* 8.5 mm, typical male *proxima* 6.5mm, typical male *pagana* 7mm
Arista less pubescent, sometimes scarcely so	Arista distinctly pubescent
Facial profile with facial knob tending to be more convex or straighter on upper part (especially in *vulpina* and *proxima*)	Facial profile with facial knob tending to be smaller and more concave above
Pilosity averaging longer on all parts of body in *vulpina*, *pagana* and *proxima*	Pilosity usually shorter in these species
Pilosity of mesonotum and tergites with black hairs often more restricted, those of mesonotum often confined to hind part of disc or missing, adpressed black hairs on discs of tergites 2-4 usually more restricted (the precise expression depending on the species)	Mesonotum often extensively black-haired with yellow hairs missing on hind part of disc, and tergites with patches of adpressed black hairs more extensive and grading into more extensive lateral black hairing at the posterior corners of tergites 2-4

It should be noted that not all bivoltine or trivoltine *Cheilosia* exhibit such dimorphism, as it does not seem to be present in *C. griseiventris* Loew (a bivoltine species) and the closely related *C. latifrons* (Zetterstedt) (trivoltine in many areas), *C. impressa* (Loew) or any of the three fungus feeders, *C. longula* (Zetterstedt), *C. scutellata* (Fallén) and *C. soror* (Zetterstedt).



Figs 1-8. Comparative views of male *Cheilosia cynocephala* Loew and *C. vernalis* (Fallén). Figs 1-4, dorsal views of abdomen showing distribution of black hairs: 1, *C. cynocephala*, typical spring specimen; 2, *C. cynocephala*, typical summer specimen; 3, *C. vernalis*, typical spring specimen; 4, *C. vernalis*, summer specimen with particularly extensive black hairs, for comparison with *C. cynocephala*. Figs 5-8, dorsal and side views of head: 5, *C. cynocephala*, dorsal view; 6, *C. vernalis*, dorsal view; 7, *C. cynocephala*, side view; 8, *C. vernalis*, side view. All drawn to same scale.

Brood dimorphism in male *C. cynocephala*

The bivoltinism of *C. cynocephala* has been known for some time, though the first generation seems to be much scarcer than the second one (Ball and Morris 2000) and relatively little material is present in collections. 2003 may have been an unusually good year for the first generation. The author encountered two males on 16 April at Elveden Centerparc, Suffolk and a further male at Beachy

Head, Sussex on 23 April. Mick Parker contacted me some weeks later to say he had obtained a series of males of an unusual *Cheilosia* from Tadnoll Watermeadows, Dorset on 5 May. All these specimens are unusual in that they lacked the extensive lateral black hairs of the tergites that is so characteristic of typical *cynocephala* and considered one of the main characters for separating it from the majority of *C. vernalis* specimens. Careful examination of these spring specimens suggests that this is just a further case of brood dimorphism and the author has previously recorded the summer generation of *C. cynocephala* at Elveden and at downland sites close to Beachy Head.

The dimorphism of *C. cynocephala* is moderate, and mainly expressed in the extent of black hairs on the tergites, particularly the lateral fringes. In the more familiar second generation the lateral hairs are predominantly black except for the first tergite, the anterior half of the second tergite and the extreme anterior corners of tergites 3 and 4 (Fig. 2). In the scarce first generation, the lateral hairs are typically mostly white except for the anterior corner of tergite 2, and to varying extents on the posterior corners of tergites 3 and 4 (Fig. 1). One spring specimen to hand has black hairs more extensive, and is intermediate with the second generation in this character state, a situation that also frequently arises in *C. pagana* and *C. proxima*. The arista of the second generation has very short though discernible pubescence. That of the first generation is essentially bare. In contrast to *C. vulpina*, *C. pagana* and *C. proxima*, no significant differences in pilosity length and facial profile between generations can be found in *C. cynocephala*.

Separation of first generation *C. cynocephala* from *C. vernalis*

Whilst the key in Stubbs and Falk (2002) works well for separating the summer generation of *C. cynocephala* from *C. vernalis*, the spring generation will tend to fall between couplets. The following summarises the many characters that can assist in distinguishing spring males of *C. cynocephala*.

Spring *C. cynocephala*	**Spring *C. vernalis***
Averaging larger, wing length typically 7mm and rather more elongate in build, body shining blue-black	A smaller, dumpy species, wing length rarely exceeding 6.5mm, body with a more aeneous tone
Wing membrane usually distinctly darkened with a darker cloud in the middle	Wing membrane not noticeably darkened or clouded
Head in dorsal view relatively smaller, more transverse (less deep from front to back) with eyes touching for a distance shorter than the distance they contact the ocellar triangle; frons narrower but more produced Arista relatively short (less than 3 x length of 3rd antennal segment measured from tip to apex of 2nd segment) Facial profile with a larger knob, a more pronounced concavity above the knob and mouth edge produced forward and downwards Eyes with less conspicuous pilosity	Head more conical viewed from above, the eyes in contact with each other for a distance as great as that for which they touch the ocellar triangle; frons broader Arista at least 3.5 x length of 3rd antennal segment. Facial knob smaller and mouth-edge and frons less produced Eyes with conspicuous dark pilosity

Mesonotum and scutellum with dense black pile, with whitish hairs at extreme front only, occasionally thinly scattered on the disc at the front	Mesonotum and scutellum typically with extensive yellow hairs, sometimes almost entirely so, occasionally all black
Legs mainly black with bases and apices of tibiae usually obscurely orange, tarsi blackish	Legs more extensively pale - basal third plus apices of all tibiae orange and often also mid basitarsus
Tergites with discs more extensively overlain with adpressed black hairs, though hind margin of tergite 4 always with a strongly contrasting band of whitish hairs. Any pale hairs of tergites tending to be whitish Sternites 3 and 4 with short, adpressed hairs Genital capsule distinctly dusted in contrast with tergite 4	Adpressed black hairs usually much less extensive and often completely missing from tergite 4, but when more extensive, no strongly contrasting band of whitish hairs across hind margin of tergite 4. Pale hairs of tergites yellow Sternites 3 and 4 often with longer pale hairs Genital capsule shining, not contrasting with tergite 4

There are, additionally, minor differences in genitalia between the two species, with the superior lobes of *C. cynocephala* being proportionately slimmer in relation to the rest of the hypandrium than those of *C. vernalis* (see figures in Stubbs and Falk 2002). The author has not examined any female material of first generation *C. cynocephala*, although the darker wing membrane, differences in the face profile, shorter arista and more extensive black hairing of the tergites should serve equally well for the identification of this sex.

Acknowledgements
I am grateful to Mick Parker for loaning additional material of the spring generation for the preparation of this paper.

References

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Dipterists Digest 2004 **11**, 127-143

Noteworthy Diptera at Dumbarnie Links Wildlife Reserve, Fife, Scotland

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Summary
A total of 282 species of Diptera are recorded from Dumbarnie Links Reserve, Fife (Scottish Wildlife Trust), which consists mainly of calcareous dune grassland. For 175 of these there appear to be no previous published records for Fife; details of these are given. For six species there appear to be no previous published records for Scotland: *Geomyza apicalis* (Meigen) (Opomyzidae), *Phytomyza wahlgreni* Rydén (Agromyzidae), *Coproica vagans* (Haliday) (Sphaeroceridae), *Setacera micans* (Haliday) (Ephydridae), *Chlorops limbatus* (Meigen) and *Dicraeus vagans* (Meigen) (Chloropidae), although earlier unpublished records of the last two are known.

Introduction

Dumbarnie Links, fringing Largo Bay on the south coast of Fife, comprise one of the largest surviving remnants of calcareous dune grassland on the east coast of Scotland, having some affinity with the 'machair' of the western isles. They are quite different in character from the other large dune system in Fife at Tentsmuir, including Tentsmuir Point NNR, where the soil becomes rapidly more acidic away from the front dune-ridge. A small area (c.7 hectares: NO4302, NO4402) at the west end of Dumbarnie Links SSSI was acquired by the Scottish Wildlife Trust in 1999, since when I have endeavoured to compile an inventory of invertebrates, concentrating on the Diptera especially during 2002–2004 (dates from this survey are given as 99-04, other years cited in full).

Habitats on the reserve are limited to the tideline, dunes, dune grassland, a very little scrub (hawthorn *Crataegus* and rose *Rosa*), slacks that are flooded only in winter, and a seasonally wet ditch, with no permanently wet areas.

Diptera have been poorly recorded in Fife in the past. In the early 20th century William Evans recorded especially on the south coast (Grimshaw 1903, 1904, 1906). More recently recording has mostly been done on contract for Scottish Natural Heritage, most of these records being in unpublished reports.

The species listed here with annotation have not hitherto been recorded in Fife in published form, as indicated by the 'Scottish Insect Record Index' held in the National Museums of Scotland. These comprise 175 out of the 282 species of Diptera so far recorded on the reserve. However, for some of these earlier unpublished records for Fife are given, based on unpublished reports or specimens in the National Museums of Scotland (indicated by NMS). Some specimens in the Natural History Museum, London are also cited (indicated by BMNH). Where grid references are suggested for older records, for which they had not been recorded, they appear in square brackets.

The author has retained voucher specimens for all the annotated species. Other species recorded on the reserve are listed as names without annotation; details of all species are on the database of the Fife Environmental Recording Network (FERN) at Fife House, Glenrothes. The names and taxonomy follow Chandler (1998a) and subsequent updates. Note that 'Fife' refers here to the current county (which has not significantly changed its borders since 1890), not to V.C. 85 (also including Kinross but not the far west of Fife).

Tipulidae

Nephrotoma scurra (Meigen). 2♀ at light, 23.vii.03. The provisional atlas (Stubbs 1992) showed only seven 10km squares in Scotland, but gave coastal sand as a frequent habitat.

Tipula melanoceros Schummel. 1♂ at light 16.ix.03. Not hitherto recorded from the east coast of Scotland.

Tipula obsoleta Meigen. 1♂, 26.ix.02, confirmed by G. Hancock; ♀ at light, 16.ix.03 and ♂ in slack, 25.ix.03. These are the first certain records in eastern Scotland; it was tentatively identified from specimens at the lighthouses on the Isle of May and Inchkeith in the Firth of Forth, 26/27.ix.1913 (Evans 1915:39). Otherwise known in Scotland from a few localities in the west.

Tipula pagana Meigen. 1♂ in a slack, 7.ix.03. Widespread in S and E Scotland.

Tipula staegeri Nielsen. 2♂ on wall, 4.x.02. A previous unpublished record by the author nearby at Newburn (NO4503), 9.x.92. Widespread elsewhere in Scotland.

Tipula varipennis Meigen. 1♀ in pitfall under bramble, iv-v.00. Widespread in Scotland.

Also: *Nephrotoma appendiculata* (Pierre), *Tipula oleracea* Linnaeus, *T. paludosa* Meigen, *T. vernalis* Meigen.

Pediciidae

Tricyphona immaculata (Meigen). 1♀ swept in ditch, 7.ix.04. Widespread in Scotland.

Limoniidae

Dicranomyia chorea (Meigen). 1♀ on *Filipendula ulmaria*, 12.vii.02. Widespread in Scotland.

Euphylidorea lineola (Meigen). 1♀ at light, 16.ix.03 and 1♀ swept in ditch, 17.viii.04; confirmed by G. Hancock. Widely recorded in the west of Scotland, rarely in the east (one from Edinburgh, NMS).

Limonia phragmitidis (Schrank). 2♀ in pitfalls under rose and ivy, ix.99 and vi.00. A few, widely scattered, records elsewhere in Scotland.

Limonia nubeculosa Meigen. 1♂ on bracken, 7.ix.04. Previously recorded in Fife at Ceres [NO3910] by D.J. Jackson, 28.x.1946 (specimen in NMS) and at several sites subsequently, but apparently no published records. Widespread elsewhere in Scotland.

Rhipidia maculata Meigen. 1♂ at light, 7.vi.04. An earlier unpublished record in Fife at Bankhead Moss (NO446102), at light, 29.ix.2002 (GBC). Recorded widely in lowland Scotland and on Rum.

Trimicra pilipes (Fabricius). 1♂ at light, 16.ix.03. Only two old published records in Scotland: Berwickshire, 1843 (Grimshaw 1903) and Kirkcudbrightshire (Henderson 1905).

Bibionidae

Bibio clavipes Meigen. 1♂ swept from bracken, 16.ix.02. Widespread in Scotland.

Bibio ferruginatus (Linnaeus). 1♀ on lyme grass, 30.v.02. The only published Scottish record appears to be from 'Highland' in Freeman and Lane (1985), presumably based upon 1♀ in BMNH collected at Tongue, Sutherland on 26.vi.1951 by L. Christie (N. Wyatt *pers. comm.*).

Bibio johannis (Linnaeus). ♂ frequent in April. No published record for Fife, but a specimen in NMS from Lundin Links [NO4002], 9.vi.1929, collected by H.A. Latham. Widespread elsewhere in Scotland, north to Aberdeenshire.

Bibio leucopterus (Meigen). 1♂ in ditch, 23.v.04. No published record for Fife, but recorded nearby at Keils Den, Upper Largo, 26.v.2002 (GBC). Widespread elsewhere in lowland Scotland.

Dilophus febrilis (Linnaeus). Widespread, 2.v – 6.ix; larvae in soil under thistles and long grass, 5.xii.03. Widespread in Scotland.

Dilophus femoratus Meigen. Widespread 19.vi – 5.vii. Widespread in Scotland.
Also: *Bibio lepidus* Loew, *B. marci* (Linnaeus).

Sciaridae

Bradysia alpicola (Winnertz). 1♂ swept 6.viii.01. A few scattered records elsewhere in Scotland.

Bradysia praecox (Meigen). 1♂ swept on foredune, 13.v.03. The only published record known from Scotland is 'Highland Region' in Freeman (1983); there are specimens from Tomintoul (Moray) and Nethy Bridge (Strathspey) at BMNH (N. Wyatt *pers. comm.)*.

Cecidomyiidae

Cystiphora sonchi (Bremi). Galls on leaves of *Sonchus arvensis*, vii.01. Recorded from Aberdeenshire, Banff and Stirlingshire.

Dasineura aparines (Kieffer). Galled buds of *Galium aparine*, 23.vii.03, det. K.P. Bland. Recorded widely in the eastern lowlands of Scotland.

Dasineura rossi Rübsaamen. Galled leaves with larvae on *Astragalus danicus*, vii.01, vii.03. Only one other record is known from Scotland, in East Lothian (Bagnall 1932: 111).

Dasineura trifolii (Löw). Galled leaves of *Trifolium repens*, vii.01. Recorded sparsely throughout Scotland.

Geocrypta rostriformis Fedotova. Galls on *Galium verum*, 23.vii.03, det. K.P. Bland. Widespread elsewhere in Scotland (Bland *et al*. 2003).

Also: *Asphondylia ononidis* Löw, *Contarinia jacobaeae* (Loew), *C. nicolayi* (Rübsaamen), *C. ononidis* Kieffer, *C. steini* (Karsch), *Dasineura crataegi* (Winnertz), *D. galiicola* (Löw), *D. pustulans* (Rübsaamen), *D. rosae* (Bremi), *D. ulmaria* (Bremi), *D. urticae* (Perris), *Jaapiella veronicae* (Vallot), *Macrolabis heraclei* (Kaltenbach); all identified from galls only.

Psychodidae

Philosepodon humeralis (Meigen). 1♂ reared from a dead snail, *Trichia hispida* (Linnaeus), i.04. Chandler (2000) considered that previous records from Scotland required confirmation, but later confirmed it at Udale Bay, Easter Ross on 22.v.2002 (Chandler 2002).

Trichoceridae

Trichocera saltator (Harris). 1♀ in carrion trap, 1.iii.02. There is a specimen from St Andrews, Fife in NMS. Known from central Scotland and St Kilda.
Also: *Trichocera hiemalis* (De Geer), *T. regelationis* (Linnaeus).

Anisopodidae

Sylvicola punctatus (Fabricius). Found frequently April to September. Widespread in Scotland.

Dixidae

Dixa nubilipennis Curtis. 1♀ in ditch, 31.viii.04. Recorded in six widely scattered 10km squares in Scotland by Goldie-Smith (1990).

Culicidae

Anopheles claviger (Meigen), *Culex pipiens* Linnaeus.

Simuliidae

Simulium ornatum Meigen.

Chironomidae

Larvae are sometimes abundant in the flooded dune-slacks in late winter and early spring.

Metriocnemus eurynotus (Holmgren). A dancing swarm of males over the main dune, 28.ii.03. Recorded sparsely from the Highlands.

Metriocnemus fuscipes (Meigen). 2♂ caught in spider web, 1.iii.02. Widespread in west of Scotland.

Micropsectra atrofasciata (Kieffer). Males swept at ditch, 10.iv.02. Widespread in the west of Scotland.

Prodiamesa olivacea (Meigen). 1♀ on marram, 20.iv.01. Recorded from Loch Lomond and S.W. Scotland.

Smittia aterrima (Meigen). 1♂ swept from bracken, 19.x.04. The only published Scottish records appear to be from Gretna, Dumfriesshire and possibly St Kilda.

Rhagionidae

Rhagio tringarius (Linnaeus). Both sexes on several dates, viii.02, vii.03. Widespread in Scotland.

Also: *Rhagio scolopaceus* (Linnaeus).

Tabanidae

Haematopota pluvialis (Linnaeus).

Stratiomyidae

Beris vallata (Forster). Several vi-vii.02, 03. The atlas (Drake 1991) shows one square, NO32, that is predominantly in Fife, but Fife is not included in the tabulation of county records; the record for NO32 could be in Perthshire, north of the Tay Estuary. It was recorded at two other localities on the coast of east Fife in 1993: Cocklemill Burn (NO4601) and Earlshall (NO4723) (Horsfield 1993). Widespread elsewhere in Scotland.

Microchrysa cyaneiventris (Zetterstedt). 1♀ reared from a larva collected 9.i.04 on a bank at the edge of a tall-herb slack, emerged (indoors) 19.iii.04. No records for Fife are shown in the atlas (Drake 1991), but it was recorded at Aberdour [NT1985] between 1902 and 1908 (Carter and Waterston 1909). Recorded sparsely elsewhere in Scotland.

Also: *Beris geniculata* Haliday, *Chloromyia formosa* (Scopoli).

Therevidae

Acrosathe annulata (Fabricius), *Thereva nobilitata* (Fabricius).

Asilidae

Leptogaster guttiventris Zetterstedt. One swept from long grass, 23.vii.03; a specimen from Tentsmuir Point NNR [NO5027], pre-2002, in NMS. Sparsely recorded elsewhere in Scotland.

Hybotidae

Chersodromia alata (Walker). 1♀ in pitfall on foredune, vii.00. Predominantly a coastal species, recorded also in East Lothian, Dunbartonshire and Sutherland, but also inland on the shore of Loch Leven (Kinross) (Nelson 1983).

Crossopalpus nigritellus (Zetterstedt). Amongst marram, 3.i, 4.iv.03. Previously recorded from Dunbartonshire and Midlothian.

Hybos culiciformis (Fabricius). Males on tall herbs and grass, 5 vii - 6 viii. Widespread in Scotland.

Platypalpus longiseta (Zetterstedt). 1♂ swept, 28.vi.02. Recorded widely but sparsely in Scotland.

Platypalpus notatus (Meigen). Females on foredune plants, viii.02. Widespread elsewhere in Scotland.

Tachydromia aemula (Loew). 1♂ outside rabbit burrow, 12.vii.02, females on walls 4.x.02. Widespread elsewhere in Scotland.

Trichina opaca Loew. 1♀ at light, 7.vi.04. The only published records for Scotland are those of Collin (1961) from Aviemore (Inverness-shire) and Nairn, the latter probably that of Yerbury in 1905, quoted by Verrall (1912).

Empididae

Clinocera stagnalis (Haliday). 1♀ swept on foredune, 5.x.04. Widespread elsewhere in Scotland.

Empis trigramma Wiedemann. Frequent on *Taraxacum* flowers and swept from tall herbs, v.02, v.03. Widespread elsewhere in Scotland.

Hilara canescens Zetterstedt. 1♀ at light, 7.vi.04. Fairly widespread in Scotland.

Hilara clypeata Meigen. 1♂, 2♀ amongst marram, 30.v.03. A few scattered records elsewhere in Scotland.

Hilara maura (Fabricius). 2♀ swept from tall herbs, 30.v.03. There are several unpublished records from elsewhere in Fife. Widespread elsewhere in Scotland.

Rhamphomyia barbata (Macquart). 1♂ at light, 7.vi.04. There appears to be only one published record for Scotland, at Donside, Aberdeenshire in the 1870s (Vice 1883/4).

Rhamphomyia sulcata (Meigen). Several, including 2 pairs *in copula*, 7-30.v.03. Widespread elsewhere in Scotland.

Also: *Empis livida* Linnaeus, *E. opaca* Meigen, *E. tessellata* Fabricius, *Hilara litorea* (Fallén), *Rhamphomyia erythrophthalma* Meigen.

Dolichopodidae

Aphrosylus celtiber Haliday. Several flying over seaweed at midshore during low water, the males twinkling vividly in the sunlight from the reflective white palps, 5.vii.02; subsequently found at Earlsferry, Fife (NT4799) on 22.ix.03. Published Scottish records are only from the west coast, but specimens from the Moray coast are in NMS.

Campsicnemus curvipes (Fallén). 1♀ swept from ditch; an unpublished record from Tentsmuir Point NNR, Fife, by E.C. Pelham-Clinton, 4.x.62. Widespread elsewhere in Scotland.

Dolichopus claviger Stannius. 1♀ swept from *Filipendula ulmaria*, 12.vii.03. A Fife record for NO41 was mapped by MacGowan (1987). Widespread elsewhere in Scotland.

Dolichopus trivialis Haliday. 2♂, 1♀ swept from *Filipendula ulmaria*, 12.vii.03. Widespread elsewhere in Scotland.

Dolichopus ungulatus (Linnaeus). Widespread on tall herbs and shrubs, 8.vi – 5.vii.02. Widespread elsewhere in Scotland.

Hercostomus germanus (Wiedemann). Several on flowers of *Heracleum*, 18.vii.02. Scattered records throughout Scotland.

Medetera truncorum Meigen. 1♂ on sand at rabbit burrow, 5.vii.02. Widespread elsewhere in Scotland.

Sympycnus desoutteri Parent. 1♀ swept from grass, 6 and 16.ix.03. 1♂, 1♀ from Aberdour, Fife, pre-1904, in NMS, as *S. annulipes*. Widespread elsewhere in Scotland.

Xanthochlorus ornatus (Haliday). 1♂ swept from ditch, 7.vi.04. A specimen in NMS was collected at Aberdour, Fife [c.NT1986] on 7.viii.04. Fairly widespread elsewhere in Scotland.

Opetiidae

Opetia nigra Meigen. 1♂ swept from tall herbs, 5.xii.03. The few published records are from southern Scotland and the coast near Aberdeen, but it is widespread in Scotland with specimens in NMS from four localities in Ross-shire, including one in coastal grass on the Black Isle and also other unpublished records from about 20 sites in Perthshire, Kincardine, Angus, Aberdeenshire, Moray, Banffshire, Inverness-shire, Argyll, Easter and Wester Ross (Peter Chandler *pers. comm.*).

Phoridae

Anevrina curvinervis (Becker). 2♀ at a carrion trap, 22.iv.02. Widespread in Scotland.

Anevrina urbana (Meigen). 1♂ in water trap, iv.01. Malloch (1910) wrote 'not a rare species', but his own locality (Bonhill, Dunbartonshire) appears to be the only localised one in Scotland.

Borophaga incrassata (Meigen). 1♂, 2♀ in pitfall, viii/ix.99, also amongst grass in subsequent Augusts. There are previous records from 'N Scotland' and Dumfriesshire. A parasite of the larvae of *Bibio marci* (Disney 1983).

Phora atra (Meigen). Frequent in May, including a dancing swarm outside a rabbit burrow, 30.v.03. Widespread in Scotland.

Spiniphora bergenstammi (Mik). Reared from dead snails, *Cepaea nemoralis* (Linnaeus), collected 30.v.03, emerged 12.vii.03. The only other known Scottish localities are Bonhill, Dunbartonshire; and Edinburgh, in the latter case reared from *Helix aspersa* Müller (K.P. Bland).

Triphleba lugubris (Meigen). In pitfalls, iii.00. The only other known site in Scotland is Bonhill, Dunbartonshire (Malloch 1910).

Triphleba papillata (Wingate). 1♀ swept on foredune, 21.iii.04. One published record for Scotland, in Glen Lyon, Perthshire (Parmenter 1965).

Lonchopteridae

Lonchoptera lutea Panzer.

Syrphidae

Helophilus trivitattus (Fabricius). On *Heracleum* and *Senecio jacobaea*, viii.02. Rare in Scotland other than on the Solway coast.

Riponnensia splendens (Meigen). 1♀ on *Ranunculus bulbosus*, 23.v.04. A previous unpublished record from nearby at Largo by H.A. Latham, 20.vii.1937 (NMS). Recorded very sparsely elsewhere in Scotland.

Sphaerophoria interrupta (Fabricius). 1♂ on *Taraxacum*, 22.iv.03. Widespread in Scotland.

Syrphus vitripennis Meigen. Both sexes at flowers, vii-ix. Widespread in Scotland (including Fife in spite of the apparent absence of published records).

Also: *Cheilosia illustrata* (Harris), *C. vernalis* (Fallén), *C. vicina* (Zetterstedt), *Episyrphus balteatus* (De Geer), *Eristalis abusivus* Collin, *E. arbustorum* (Linnaeus), *E. horticola* (De Geer), *E. interruptus* (Poda), *E. pertinax* (Scopoli), *E. tenax* (Linnaeus), *Eupeodes corollae* (Fabricius), *E. luniger* (Meigen), *Helophilus pendulus* (Linnaeus), *Melanostoma mellinum* (Linnaeus), *M .scalare* (Fabricius), *Meliscaeva auricollis* (Meigen), *Platycheirus albimanus* (Fabricius), *P. angustatus* (Zetterstedt), *P. clypeatus* (Meigen), *P. manicatus* (Meigen), *Rhingia campestris* Meigen, *Scaeva pyrastri* (Linnaeus), *Sphaerophoria scripta* (Linnaeus), *Syritta pipiens* (Linnaeus), *Syrphus ribesii* (Linnaeus), *S. torvus* Osten-Sacken.

Pipunculidae

Chalarus spurius (Fallén). 1♂ swept in ditch, 10.v.04. Widespread elsewhere in Scotland.

Psilidae

Chamaepsila nigricornis (Meigen). 2♂ swept from *Filipendula*, 30.v.02; an earlier unpublished record from Tentsmuir, NE Fife (NO4727), 4.x.1962 (Pelham-Clinton 1962-1970). Widespread elsewhere in Scotland.

Chamaepsila obscuritarsis (Loew). One swept from long grass, 11.vi.01. A specimen from Lundin Links, Fife [NO4102] collected 14.vi.1930 by H.A. Latham is in NMS. Recorded widely throughout mainland Scotland.

Also: *Chamaepsila pallida* (Fallén).

Conopidae

Sicus ferrugineus (Linnaeus). 1♀ on flower of *Centaurea nigra*, 17.viii.04. One earlier unpublished record for Fife: Tentsmuir Point NNR, 23.viii.1970, 2♀ coll. E.C. Pelham-Clinton. Widespread elsewhere in Scotland.

Lonchaeidae

Dasiops mucronatus Morge. 2♂ swept tall herbs, 31.v.04. A specimen from Aberdour, Fife pre-1904 in NMS. Recorded by Collin (1953) as 'occurring from Ross and Cromarty . . . to Kent' and by Chandler (1998b) from Devon to Ross, but there appear to be no precise published Scottish localities. Peter Chandler (*pers. comm.*) found it at Udale Bay, Easter Ross (NH7065), 18.vi.2003.

Pallopteridae

Palloptera quinquemaculata (Macquart). Beaten from hawthorn and swept from tall herbs, 11.vi.01; an earlier unpublished record from near Kirkcaldy (NT2691), 26.v.1964 (Pelham-Clinton 1962-1970), and subsequently recorded by GBC at Barnyards Marsh SWT reserve (NO4802), 10.vi.02. Widespread elsewhere in Scotland.

Also: *Palloptera saltuum* (Linnaeus).

Piophilidae

Liopiophila varipes (Meigen). On a long-dead rabbit, 27.viii.02. Widespread in Scotland.

Parapiophila vulgaris (Fallén). Reared from puparia from a nest (of a finch, ? species) in a hawthorn bush, emerged (indoors) 30.iii.03; no published record from Fife known, but there are three from a dead crow at Tentsmuir (NO4727) on 4.x.1962 in NMS. Widespread elsewhere in Scotland.

Tephritidae

Chaetostomella cylindrica (Robineau-Desvoidy). Reared from seed-heads of *Centaurea nigra*, iii.01; no published records from Fife are known, but reared from *Centaurea nigra* from two localities in east Fife (NO6012, NO5215), 1989/1991, by K.P. Bland. Widespread in S., E. and central Scotland, north to the north coast.

Dioxyna bidentis (Robineau-Desvoidy). Numerous, including a pair *in copula*, on and around flower-heads of *Tripleurospermum inodorum*, ix 02. Since there is no *Bidens* anywhere near, it seems almost certain that they were developing in the capitula of *T. inodorum*. One was recorded in east Fife (NO6309) on 23.vii.92 by K.P. Bland. These and one other in south Fife were shown in the provisional atlas (Clemons 2004), which also included two sites in the Highlands, but other Scottish records are uncertain because of confusion with *Campiglossa absinthii* (Fabricius).

Euleia heraclei (Linnaeus). 1♂ on *Centaurea nigra*, 4.vii.03. There are unpublished Fife records nearby at Newburn, 10.vi.1992 and at Kilminning coast (NO6308), 23.vii.1992. Widespread elsewhere in Scotland.

Rhagoletis alternata (Fallén). Reared from larvae in rose-hips ix.02 – v.03; an earlier record from Anstruther, East Fife (NO5603), 16.iv.02, collected by A-M. Smout. Sparsely recorded in E. and S. Scotland.

Tephritis bardanae (Schrank). 1♂ on *Arctium minus*, 2.vii.00; larvae and puparia frequent in seed-heads of *A. minus*. A few scattered records north to Inverness.

Tephritis hyoscyami (Linnaeus). 1♂ beaten from ivy, 22.x.03 and 1 swept in ditch, 30.v.04. A few plants of *Carduus crispus* nearby contained larvae and puparia in the capitula that are compatible with *Tephritis*. The only published records for Scotland appear to be those of Stewart (1811) from 'the neighbourhood of Edinburgh', quoted by Grimshaw (1904), which presumably could have been the more widespread *T. bardanae* (Schrank); and one from Crichton, Midlothian [NT3861, not 6138 as first published] where a specimen was recorded on 3.vii.1985 (Falk 1991, Clemons 2004).

Tephritis vespertina Loew. 1♀ swept, 26.iii.04. Recorded sparsely throughout Scotland.

Also: *Urophora jaceana* (Hering), *Xyphosia miliaria* (Schrank).

Lauxaniidae

Calliopum elisae (Meigen). 1♀ swept in ditch, 7.vi.04. 1♂ in NMS from west Fife was tentatively identified as this species by E.C. Pelham-Clinton. Otherwise sparsely recorded in Scotland.

Minettia tabidiventris (Rondani) (= *M. fasciata* (Fallén) sensu Collin). 1♂ swept from grass, 7.v.04. The only published record for Scotland appears to be that of Murray (1941) from Dumfriesshire, but the identity of that is doubtful because of possible confusion with *M. fasciata* (Fallén, 1826) (= *rivosa* of Collin).

Chamaemyiidae

Chamaemyia herbarum (Robineau-Desvoidy). Swept from grass, 28.vi.02. There is a specimen in NMS from Wemyss Wood, Fife (NT3197) collected by E.C. Pelham-Clinton, 3.vi.1964. Records from elsewhere are uncertain because of confusion with *C. juncorum* (Fallén).

Coelopidae

Coelopa frigida (Fabricius), *C. pilipes* Haliday.

Dryomyzidae

Heterocheila buccata (Fallén).

Phaeomyiidae

Pelidnoptera nigripennis (Fabricius). Males swept on foredune, 13 and 30.v.03. There are specimens in NMS from widely scattered localities in the Highlands, but mostly from native pine-wood sites, a little surprising if it is indeed always a parasitoid of millipedes, which tend to be scarce in pine-woods. However pine-woods do share with coastal dunes the large yellow-striped millipede, *Ommatoiulus sabulosus*, and the related *O. moreleti* is known to be parasitized by *P. nigripennis* in Portugal (Hopkin and Reid 1992).

Sciomyzidae

Euthycera fumigata (Scopoli). Frequent in pitfalls on the main dune, viii – ix.99; one swept from long grass, 12.vii.02. The only published records for Scotland appear to be from the island of Rum (Brindle 1982) and the Dornoch Firth (Ball and McLean 1986), but there are specimens in NMS from the Lothians.

Limnia unguicornis (Scopoli). 1♂ swept, 7.vi.04. Fairly widespread elsewhere in Scotland.

Pherbellia cinerella (Fallén). Swept from long grass and tall herbs, 1.iii – 4.x.02; 6 at light, 16.ix.03. Widespread elsewhere in Scotland.

Pherbellia ventralis (Fallén). A pair *in copula* in a ditch, 16.iv.04. Widespread elsewhere in Scotland.

Tetanocera elata (Fabricius). 1♀ swept from long grass, 23.vii.03; apparently no published record from Fife but specimens from Tentsmuir Point NNR are in NMS. Widespread elsewhere in Scotland.

Sepsidae

Nemopoda nitidula (Fallén), *Orygma luctuosum* Meigen, *Sepsis cynipsea* (Linnaeus).

Agromyzidae

Chromatomyia primulae (Robineau-Desvoidy). Leaf-mines with larvae on *Primula veris*, 23.vii.03 (K.P. Bland); an earlier Fife record from Kinkell Braes (NO5215), 20.xi.1989 (K.P. Bland). Widespread elsewhere in Scotland.

Napomyza lateralis (Fallén). Reared from capitula of *Tripleurospermum inodorum*, ix.02; recorded in Fife from Kincraig Point (NT4699), 12.ix.1995 by K.P. Bland, and subsequently by GBC at other sites in S.E. Fife and the Isle of May, all on *Tripleurospermum* except for one on *Matricaria recutita*. Recorded widely elsewhere in Scotland.

Phytomyza spondylii Robineau-Desvoidy. Vacated mines in leaves of *Heracleum sphondylium*, vii.03 (K.P. Bland); mines on the same host have been recorded in Fife by KPB at Cullaloe (NT1887) on 23.xi.1997 and subsequently elsewhere in south Fife. Elsewhere in Scotland the only published records appear to be from the Hebrides.

Phytomyza wahlgreni Rydén. 1♂, 1♀ of this species, whose larvae produce gall-like swellings in the midrib of *Taraxacum* leaves, were swept on 16 and 26.ix.02 (det. confirmed by K.P. Bland); affected dandelion leaves have not yet been found. The species has not previously been recorded in Scotland.

Opomyzidae

Geomyza apicalis (Meigen). One ♀ on main dune, 22.viii.01. This species has been recorded widely in England (Drake 1993) but apparently not hitherto in Scotland.

Geomyza subnigra Drake. In pitfalls under rose on the main dune ridge, ix.99; also on walls and on bare sand outside rabbit burrows, 8.vi – 4.x.02 (5♂, 3♀). Previously confused with *G. breviseta*, the only other Scottish record appears to be that given by Drake (1992) from Kinrara, Inverness-shire, 17.vii.1990. Drake (1993) recorded that 'it has been observed running and jumping among the deeper layers of tall dune grassland'.

Geomyza tripunctata Fallén. In pitfalls on the main dune and foredune, ix.99 and vii-viii.00; and amongst tall herbs by ditch, 6.xii.02. Widespread in Scotland.

Opomyza punctella Fallén. One ♂ in pitfall in tall-herb slack, ix-x.99. There are Scottish records from Braemar (Aberdeenshire) (Collin 1945) and Strathclyde (Drake 1993).

Also: *Opomyza florum* (Fabricius), *O. germinationis* (Linnaeus).

Chloropidae

Aphanotrigonum nigripes (Zetterstedt). 1♀ in pitfall on foredune 18-27.vii.00; 1♂ and 1♀ reared from St George's mushroom, *Calocybe gambosa*, collected 21.v.02, emerged 1-4.vii.02; confirmed by J.W. Ismay. This appears to be the first rearing record of this species from a fungus

(J.W. Ismay *pers. comm.)*. The only previously published Scottish record appears to be from Gretna (Dumfriesshire) in 1937 as *A. griseum* var. *curtipenne* (Collin 1946).

Chlorops limbatus (Meigen). 1♀ on bracken, 7.ix.04. There appear to be no published records for Scotland, but there are specimens in NMS from several widely scattered localities.

Dicraeus vagans (Meigen). Several swept from long grass/herbs 28.vi.02 and a pair *in copula* 4.vii.03. Apparently no published records for Scotland but there are specimens in NMS from Edinburgh and Dunbartonshire.

Elachiptera cornuta (Fallén). Frequent on ivy *Hedera helix*, xii-i. Widespread elsewhere in Scotland.

Oscinella nigerrima (Macquart). 3♀ in long grass/herbs, 3 and 10.v.04 (det. J.W. Ismay). There are no certain published records for Scotland, but there are specimens in NMS from the Lothians and Dunbartonshire. However, this may be only a form of *O. frit* (Linnaeus) (J.W. Ismay *pers. comm.*).

Oscinella vastator (Curtis). 1♀ in pitfall on foredune, 18-27.vii.00. The only published record for Scotland is from Rum, but there is a specimen in NMS from Gullane, E Lothian.

Thaumatomyia glabra (Meigen). 1♀ swept from grass, 6.viii.01, det. J.W. Ismay. A few widely scattered records elsewhere in Scotland.

Thaumatomyia notata (Meigen). Beaten from hawthorn, 8.vi.02 and ivy 20.ix.02 and 21.ix.03. Recorded sparsely through lowland Scotland.

Also: *Chlorops hypostigma* Meigen, *Meromyza pratorum* Meigen.

Heleomyzidae

Gymnomus caesius (Meigen). 1♀ outside rabbit burrow, 1.ii.02. The only previously published Scottish site appears to be the island of Rum (Brindle 1982, as *Scoliocentra caesia*); that needs confirmation in view of the recent discovery of *G. spectabilis* (Loew) in Britain, including Sutherland (Gibbs 2004). The specimen from Dumbarnie Links agrees with Gibbs' description of *G. caesius*. Gibbs (2004) cites further Scottish records of *G. caesius*

Heteromyza commixta Collin. 1♀ swept from ditch, 12 iv 03. Widespread in Scotland.

Heteromyza rotundicornis (Zetterstedt). 1♀ swept in tall-herb slack, 5.xii.03. Widespread elsewhere in Scotland.

Neoleria maritima (Villeneuve). 1♀ swept from marram etc., 16.x.02 and 26.ix.03. The only published Scottish records are from the Hebrides, but there is a specimen from Edinburgh in NMS.

Suillia variegata (Loew). 1♂ beaten from ivy, 21.xi.03; an earlier unpublished record from Fife, at Newburn (NO4503), 29.vii.2002 (GBC). Widespread elsewhere in Scotland.

Tephrochlamys rufiventris (Meigen). One swept on foredune, 21.x.03. No published records are known for Fife but there are five specimens in NMS from Lundin Links, Fife [NO4002] collected by H.A. Latham iv-vi.1929. Fairly widespread elsewhere in Scotland.

Trixoscelis obscurella (Fallén). In pitfall trap on foredune, vii.00. The only other published site in Scotland is in similar habitat at Aberlady, E Lothian.

Also: *Eccoptomera microps* (Meigen), *Tephrochlaena halterata* (Meigen).

Sphaeroceridae

Coproica vagans (Haliday). 1♂ in carrion trap, 12.iii.02. Widespread in England and Wales but no Scottish records nor specimens have been found.

Copromyza stercoraria (Meigen). In tall herbs and bracken, 10.iv and 6.xii.02. Widespread in Scotland.

Crumomyia fimetaria (Meigen). 1♂ in ditch, 21.x.03. A slightly earlier record nearby at Newburn (NO 453035) on 14 and 17.ii.02, on carrion. Recorded sparsely but widely elsewhere in Scotland.

Crumomyia nitida (Meigen). One in pitfall under bramble, ii/iii.01. Widespread elsewhere in Scotland.

Crumomyia roserii (Rondani). 3♀ in pitfall in tall-herb slack, iii.01. Widespread elsewhere in Scotland.

Gonioneura spinipennis (Haliday). 1♀ in leaf litter under bramble, 10.i.03. Widespread in Scotland.

Ischiolepta pusilla (Fallén). 1♂ in leaf litter under hawthorn, 4.i.02. There are specimens from a few localities in lowland Scotland in NMS, but the only published Scottish record appears to be 'Edinburgh' in Pitkin (1988).

Leptocera fontinalis (Fallén). Four on main dune, 1.iii.02 – 13.v.03. Widespread in Scotland.

Lotophila atra (Meigen). 1♂ in pitfall, ix.99; 1♀ in carrion trap, 12.iii.02; swept from ivy, 4.iv.03. Widespread in Scotland.

Minilimosina fungicola (Haliday). 1♂ in carrion trap, 1.iii.02. Recorded north to Aberdeen and Banff.

Pseudocollinella humida (Haliday). 3♀ swept from tall herbs in ditch, 12.ii.02. Widespread in Scotland.

Spelobia clunipes (Meigen). 1♂ swept from tall herbs in ditch, 12.iii.02. Widespread in Scotland.

Sphaerocera curvipes Latreille. 1♀ reared from puparium in horse dung, v.03. Widespread in Scotland.

Thoracochaeta brachystoma (Stenhammar). In tideline wrack, 2.xi.01 and 18.ii.02. Recorded also from Nairn and the Hebrides.

Also: *Pteremis fenestralis* (Fallén), *Thoracochaeta zosterae* (Haliday).

Drosophilidae

Drosophila andalusiaca Strobl. Swept from tall herbs and in marram and bracken litter, 6.ix.02, 6.xii.02, 7.v.03. Elsewhere in Scotland known from Edinburgh and Dunbartonshire (Basden 1954).

Drosophila busckii Coquillett. Several (3♂ retained) emerged 15.vii – 3.viii.04 from horse mushrooms, *Agaricus arvensis*, collected 8.vii.04. No published record from Fife, but reared from the fungus *Lactarius deliciosus* from Devilla Forest, W Fife (NS9587, V.C. 87), vii-viii.04 (GBC). Elsewhere in Scotland recorded from Midlothian, East Perthshire and Angus by Basden (1954), who reared them from decaying, but not from fresh toadstools. The *Agaricus* at Dumbarnie Links was beginning to decay when picked but the *Lactarius* at Devilla was mature and still fresh.

Drosophila transversa Fallén. Reared from toadstools, *Calocybe gambosa*, vi.02. Widespread in Scotland.

Scaptomyza pallida (Zetterstedt). One swept from *Filipendula ulmaria*, 2.viii.02. Widespread in Scotland.

Also: *Drosophila cameraria* Haliday, *D. subobscura* Collin.

Diastatidae

Diastata costata Meigen. 1♂ swept from *Filipendula ulmaria*, 7.ix.04. Specimens from several parts of Scotland in NMS; only published previously from the Outer Hebrides (Skidmore 1994).

Ephydridae

Hyadina guttata (Fallén). One swept on foredune, 7.v.03. Scattered records in south and central Scotland.

Hydrellia griseola. (Fallén). 1♂ in ditch, 31.viii.04. Recorded widely but sparsely in Scotland.

Lamproscatella sibilans (Haliday). On foredune, 4.iv.03 and 30.v.02. Widely recorded in Scotland.

Limnellia quadrata (Fallén). Swept from tall herbs and foredune vegetation 1.iii – 26.ix.02, 12.iv.03. Widespread elsewhere in Scotland.

Parydra quadripunctata (Meigen). Swept from tall herbs in ditch, 17.iv.03. There are several records from western Scotland but apparently only one previous one from the east, at Edinburgh.

Psilopa leucostoma (Meigen). Abundant in pitfalls on foredune, vii.00. The only other recorded site in Scotland is at Cardross, Dunbartonshire.

Setacera micans (Haliday). 1♀ at light, 7.vi.04; identification confirmed by W.N. Mathis. This appears to be the first record for Scotland.

Also: *Scatella stagnalis* (Fallén).

Scathophagidae

Ceratinostoma ostiorum (Haliday). A pair *in copula* on a concrete block below high water mark, 8.vi.02. Previously published Scottish records are all from the west coast.

Norellisoma spinimanum (Fallén). Females swept 2.v – 13.viii.03; previous Fife records from Tentsmuir Point NNR (NO5024), 4.vi.1993 and Kinkell Braes [NO5315], 21.viii.1993 (Horsfield 1993). Widespread elsewhere in Scotland.

Also: *Nanna fasciata* (Meigen), *Scathophaga stercoraria* (Linnaeus).

Anthomyiidae

Delia planipalpis (Stein). 1♂ on *Galium verum*, 18.vii.02, det. D. Horsfield. Recorded from widely scattered localities in Scotland.

Pegoplata infirma (Meigen). Two on *Heracleum*, 16.vii.02, det. D. Horsfield; a previous unpublished record from Tentsmuir Point NNR (NO5024), 4.vi.1993 (Horsfield 1993). Widespread elsewhere in Scotland.

Phorbia bartaki Ackland & Michelsen. 1♂ swept, 13.v.03. There are a few scattered records from Scotland, as *P. curvicauda*.

Also: *Botanophila fugax* (Meigen), *Delia coarctata* (Fallén), *D. platura* (Meigen), *Fucellia fucorum* (Fallén), *F. maritima* (Haliday), *Pegoplata aestiva* (Meigen), *Phorbia sepia* (Meigen).

Fanniidae

Fannia postica (Stein). 1♀ swept 19.vi.02; there is an unpublished record for Tentsmuir Point NNR, 5.vii.1970 by E.C. Pelham-Clinton (NMS), and subsequently from other sites on the Fife coast. Widespread elsewhere in Scotland.

Also: *Fannia armata* (Meigen), *F. canicularis* (Linnaeus), *F. mollissima* (Haliday).

Muscidae

Coenosia mollicula (Fallén). 1♂, 3♀ swept from grass, 12 and 23.vii.03; a previous unpublished record nearby at Ruddons Point (NO4600), 20.vi.1993 (Horsfield 1993). Widespread in Scotland.

Coenosia pedella (Fallén). 2♀ swept grass, 19.vi.02, det. D. Horsfield, 1 at light 16.ix.03; a previous unpublished record nearby at the Cocklemill saltmarsh (NO4601), 20.vi.1993 (Horsfield 1993). Widespread elsewhere in Scotland.

Coenosia tigrina (Fabricius). Widespread 30.v – 27.viii.02, 6.ix.03; previous unpublished Fife records at Ruddons Point (NO4600), 20.vi.1993, and Carlingnose SWT reserve (NT1380), 15.viii.1993 (Horsfield 1993). Widespread elsewhere in Scotland.

Coenosia lacteipennis (Zetterstedt). One ♀ swept on foredune, 6.ix.03; a previous unpublished record at Tentsmuir Point NNR (NO5027), 4.vi.1993 (Horsfield 1993). Widespread in Scotland.

Helina quadrum (Fabricius). Widespread, vii-viii; previous unpublished records from four coastal sites in East Fife, vi-viii.1993 (Horsfield 1993). Widespread elsewhere in Scotland.

Helina setiventris Ringdahl. 1♀ swept grass, 2.viii.02; previously recorded in Fife at Kinkell Braes (NO5215) and Carlingnose SWT reserve (NT1380), 15.viii.1993 (Horsfield 1993). Apparently rare in Scotland and only recorded near the east coast: Morayshire (d'Assis-Fonseca 1968) and three sites in East Lothian (NMS).

Hydrotaea irritans (Fallén). 1♂ on *Heracleum*, 5.vii.02; recorded widely on the coast of East Fife vii-vii.1993 (Horsfield 1993). Widespread throughout Scotland.

Muscina levida (Harris). Reared from toadstools, *Calocybe gambosa*, vi/vii.02 and from dead snails, *Cepaea nemoralis*, v/vi.03. Recorded sparsely in Scotland: Midlothian, Angus, Isle of Rum.

Neomyia cornicina (Fabricius). 1♂ on *Echium* flower, 4.vii.03; abundant on many different flowers, viii.04. Distribution elsewhere is uncertain because of confusion with *N. viridescens*.

Phaonia incana (Wiedemann). Several on flowers v-vii.02, det. D. Horsfield; recorded widely on coast of East Fife vi-vii.1993 (Horsfield 1993). Widespread in central Scotland, and on Rum.

Phaonia serva (Meigen). 1♂, 4♀ on flowers of *Ranunculus bulbosus*, v.02; previous record at Tentsmuir Point NNR (NO5027), 4.vi.1993 (Horsfield 1993). Widespread elsewhere in Scotland.

Polietes lardarius (Fabricius). 1♂, 1♀ swept from grass 8.vi.02; a previous record at Tentsmuir Point NNR (NO5027), 4.vi.1993 (Horsfield 1993). Widespread throughout Scotland.

Schoenomyza litorella (Fallén). 1♀ swept from grass, 20.ix.02. Widespread in Scotland.

Also: *Eudasyphora cyanella* (Meigen), *Helina evecta* (Harris), *H. reversio* (Harris), *H. subvittata* (Séguy), *Hydrotaea dentipes* (Fabricius), *Mesembrina meridiana* (Linnaeus).

Calliphoridae

Bellardia viarum (Robineau-Desvoidy). Swept from herbs and on flowers, 7.v, 18.vii.02 and 7.vi, 12.vii 03. Widespread elsewhere in Scotland.

Pollenia amentaria (Scopoli). 1♂ swept from grass, 23.vii.03. Widespread in Scotland.

Also: *Calliphora vicina* Robineau-Desvoidy, *Cynomya mortuorum* (Linnaeus), *Melanomya nana* (Meigen), *Pollenia rudis* (Fabricius).

Sarcophagidae

Sarcophaga nigriventris Meigen. 1♀ in pitfall on foredune, vii.00; on flowers, 18.vii.02; a pair *in copula* on yarrow, *Achillea millefolium*, 13.viii.03. Previous unpublished records from Fife: Ruddons Point (NO4600), 20.vi.1993 and Carlingnose SWT Reserve [NT1380], 15.viii.1993 (Horsfield 1993). The only published Scottish record located is from Morayshire by van Emden (1954), who also recorded this species as: 'Parasitizing living snails (*Helicella ericetorum itala* L. and *Theba cantiana*)'. The former, now *Helicella itala* (Linnaeus), is abundant at Dumbarnie Links and at Ruddons Point, but does not occur at Carlingnose, nor in Morayshire. The latter, now *Monacha cantiana* (Montagu), is rare in Scotland and has not been recorded at any of these sites.

Tachinidae

Brachicheta strigata (Meigen). 1♀ swept from long grass, 12.iv.03. Previous Scottish records appear to be only from Aviemore (Belshaw 1993) and Doweel, Dumfries & Galloway (NMS).

Gymnocheta viridis (Fallén). 1♂ on path, 30.vi.03 and on wall, 23.v.04; recorded at Tentsmuir Point NNR (NO5027), 23.v.1970 (Pelham-Clinton 1962-70). Widespread elsewhere in Scotland.

Ocytata pallipes (Fallén). 1♀ swept from bracken, 8.viii.03; one old record from Aberdour, Fife (pre-1904) in NMS, as *Rhacodineura antiqua* (Meigen). A few other scattered throughout Scotland.

Pelatachina tibialis (Fallén). 1♂ swept in ditch 10.v.04. Published records for Scotland are only from Sutherland and Nairn and there is a specimen from Rannoch (Perthshire) in NMS.

Siphona geniculata (De Geer). One swept, 26.ix.01. Widespread elsewhere in Scotland.

Voria ruralis (Fallén). 3♂, 2♀ reared from a caterpillar of an *Autographa* species (Noctuidae) collected 7.v.03, emerged 23.v.03. Fairly widespread in Scotland.

Also: *Eriothrix rufomaculata* (De Geer).

Discussion

Only a small proportion of the species recorded here can be considered specific to these habitats. The tideline wrack is in the form of 'strings' rather than deep beds, but most of the expected species that develop in wrack were found: *Coelopa* species, *Thoracochaeta* species, *Fucellia* species, *Orygma luctuosum* and *Heterocheila buccata*. The last, whose larvae feed on relatively dry wrack (Egglishaw 1965), was the only one of these frequently found away from the tideline, for example by sweeping bracken in winter.

Groups with larvae feeding on grass are well represented, e.g. amongst the Chloropidae and Opomyzidae. Amongst the more specialized flowering plants of dune grassland, the purple milk-vetch, *Astragalus danicus*, is host to a specific gall-midge, *Dasineura rossi*, and rest harrow, *Ononis repens*, to two: *Contarinia ononidis* and *Asphondylia ononidis*. Flies visiting flowers are less host-specific, and the most productive flowers, e.g. *Centaurea, Heracleum, Ranunculus, Sonchus*, are not specific to this habitat. It was noticeable that the dominant species at flowers varied greatly from year to year. For example *Empis punctata* was abundant on many different flowers in 2001 and 2002, but scarce in 2003 and 2004. The hosts of those species that develop in the capitula of composite flowers, e.g. the tephritids *Dioxyna, Tephritis, Urophora and Xyphosia*, are likewise not specific to coastal habitats.

The common yellow dung-fly, *Scathophaga stercoraria*, frequent at flowers, probably came from adjacent pasture, but the diverse sphaerocerids are likely to have developed in rabbit dung and carrion. Runs of field voles, *Microtus agrestis*, are abundant in the long grass and the sphaerocerid *Pteremis fenestralis*, all short-winged, was frequent at vole latrines.

Being a highly calcareous habitat terrestrial snails are abundant. Although five species of Sciomyzidae were recorded by sweeping, attempts to rear flies from dead snails produced only the psychodid *Philosepodon humeralis*, the phorid *Spiniphora bergenstammi*, the sepsid *Nemopoda nitidula* and the muscid *Muscina levida*.

Although the freshwater habitats are only seasonally wet, several families of fly are probably dependent upon them, e.g. the Chironomidae, the Ephydridae and some of the crane-flies. It was noticeable that when an MV lamp was operated on three occasions, for an hour or two after sunset, many of the flies attracted were species not recorded by other means (and indeed many of them new to the county). However, because of the small size of the site it is possible that some were being attracted from outside the reserve.

Comparison of the dipteran fauna of Dumbarnie Links with that of similar sites elsewhere is difficult because of the differences in the variety of habitats represented and in the intensity of recording. The most obvious comparison is with Tentsmuir Point NNR in extreme north-east Fife where a moderate amount of recording has been undertaken since it was established as a reserve in 1954. However, apart from significant differences in the dune habitat itself – wholly calcareous at Dumbarnie Links, backed by acidic heather/lichen heath at Tentsmuir – the latter has many additional habitats lacking at Dumbarnie Links, e.g. saltmarsh, willow *Salix* and alder *Alnus* carr and pines *Pinus*.

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I am grateful to Mark Shaw, Graham Rotheray, Andy Whittington and Keith Bland for their help in accessing the collection and data at the National Museums of Scotland; to Keith Bland also for contributing records of Cecidomyiidae and Agromyzidae and for helpful scrutiny of the first draft; to David Horsfield for identifying some Muscidae and Anthomyiidae and agreeing to the inclusion of some unpublished records from Fife; to Geoff Hancock for confirming identifications of some Tipulidae and Limoniidae; and to John Ismay for identifying and confirming some Chloropidae. Nigel Wyatt kindly provided data on relevant specimens in the Natural History Museum, London.

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Rearing records of *Seri obscuripennis* (Oldenberg) (Diptera, Platypezidae) from Oxfordshire – Specimens of *Polyporus durus* (= *badius*), collected in connection with surveys for the Oxfordshire Fungus Survey group, were kept for rearing flies. Two collections have produced numbers of *Seri obscuripennis* of both sexes. The first collection on 9.x.2004, from a damp log pile under bramble in the nature area at St Michael's Primary School, Marston, Oxford (SP530069), produced 60♀ and 1♂ over three days from 15.x.2004. A second collection on 10.x.2004, from a log pile in a partially wooded area at Eynsham Park, Oxfordshire (SP4012), had flies emerging over 3-4 days from 25.x.2004, in this case comprising 56♀ and 51♂. The first collection produced only *Seri obscuripennis*, whereas from the second collection many other flies emerged, including many *Ula mollissima* Haliday (Pediciidae) and small numbers of the following: *Ditomyia fasciata* (Meigen) (Ditomyiidae); *Sciophila lutea* Macquart (Mycetophilidae); unidentified Sciaridae; *Crumomyia fimetaria* (Meigen) and *Spelobia parapusio* (Dahl) (Sphaeroceridae); *Psychoda minuta* Banks and *P. buxtoni* Withers (Psychodidae); *Phaonia subventa* (Harris) (Muscidae). *Ditomyia* is restricted to polypores but the other species, of which the *Phaonia* has predaceous larvae, are known to develop in a wider range of fungi, except for the psychodids for which the only previously published rearing records appear to be those given by P. Withers (1988. *British Journal of Entomology and Natural History* **1,** 69-76), for *P. minuta* from *Polyporus squamosus* and *Grifola frondosa* and for *P. buxtoni*, newly described by him, from a *Boletus* species.

Both rearings were carried out by placing the fungus on damp coir.fibre in a plastic tub and covering the top with net. They were kept at room temperature.

The rearing of *S. obscuripennis* from *Polyporus durus* is useful confirmation that this is a regular host as it has been reared in the Czech Republic, both from this species (as *P. badius*) and *P. varius*, by Jan Sevcík (2001. *Acta Universitatis Carolinae Biologica* **43,** 157-168). This association was previously suggested when I found one female flying around *P. durus* growing from a shaded willow log on soil in my garden at Kidlington, Oxfordshire (SP497138) on 26.ix.2002. It seems likely that the suggested association with *Polyporus squamosus* (Chandler, P.J. 2001. *Fauna Entomologica Scandinavica* **36,** 1-276), host of the similar species *Bolopus furcatus* (Fallén), was incorrect.

The males of *Seri obscuripennis* have not been previously recorded in Britain and females are rarely recorded (Chandler, P.J. 2002. *Dipterists Digest (Second Series)* **9,** 162). I am grateful to Peter Chandler for the identification of the flies – **JUDITH A. WEBB,** 18 Croft Avenue, Kidlington, Oxfordshire OX5 2HU

Dipterists Digest 2004 **11**, 144-146

A re-examination of Tabanidae (Diptera) in the Wingate Collection

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Summary
Records of *Hybomitra solstitialis* (Meigen, 1820) and *Tabanus autumnalis* Linnaeus, 1761 in Wingate (1906) are stated to be erroneous as a result of re-examination of source specimens in the Wingate Diptera Collection held at The Hancock Museum, Newcastle-upon-Tyne. Annotated records are given for the Tabanidae specimens alluded to by Wingate (1903 and 1906).

Introduction
Rev. William John Wingate (1846-1912) gave a full annotated list of Durham Diptera in Wingate (1903), but is best known for Wingate (1906), often referred to as 'Wingate's Durham Diptera', which, in addition to annotated Durham Diptera records, contained keys to all the Diptera he knew from the county of Durham, also including other British and foreign species which he suspected could occur in the county. He deliberately omitted British species which he considered would not occur in Durham; nevertheless, many past dipterists took Wingate (1906) to be a key to British Diptera.

The Tabanidae sections of Wingate (1903) and Wingate (1906) contain questionably authentic Durham records of *Hybomitra solstitialis* (Meigen) and *Tabanus autumnalis* Linnaeus, the latter of which has been subsequently quoted by the following authors: Edwards *et al.* (1939), Drake (1991) and Stubbs and Drake (2001). Wingate's Diptera collection is held at The Hancock Museum, Newcastle-upon-Tyne, and since *circa* 1990 I have been mindful to pay a visit and re-examine Wingate's material. I eventually did so on 6.ii.2004!

With the exception of a *Chrysops caecutiens* (Linnaeus) from Bishop Auckland, 2.vii.1900, and a *Haematopota pluvialis* (Linnaeus) from Wearhead, viii.1897, both of which are housed in a cabinet drawer containing an educational display; all the specimens listed below are in the Wingate Diptera Collection. This collection is housed within store-boxes with glass-topped lids, stacked on their sides in a larger cabinet with framed-glass doors. Wingate's neat and tidy arrangement of specimens is apparently in contemporary checklist order using cut-out labels from Verrall (1901). His cut-out labels are in blocks of species-names, the name at the top referring to the specimens situated above it, and his specimens are mounted on circular pieces of white 'Bristol board' of various sizes, The accompanying data labels are square and miniscule, with 'Wingate' printed at the base, and a locality name printed at the top. These locality names are not given in full, instead, for example, we have BP AUCK for Bishop Auckland, H'RP'LEY for Harperley, WR'HEAD for Wearhead, W'SK'L'Y for Waskerley, and W'TTON for Witton-le-Wear. Further data is often written in ink on the miniscule labels and the underside of the 'Bristol board' discs.

Wingate (1903) gave the following information about localities alluded to in this paper: *Bishop Auckland*, 350 feet above sea-level, practically the small plot of ground round St. Peter's Vicarage, Bishop Auckland: *Escomb*, 350 ft., wooded Wear banks above Bishop Auckland: *Harperley*, 400 ft., wooded Wear banks: *Waskerley*, 700-1,300 ft., wooded glen and moorland: *Wearhead*, 1,000-1,500 ft., high dales and moors.

Specimens in the Wingate Diptera Collection compared with data in Wingate (1903) and Wingate (1906)

Chrysops caecutiens (Linnaeus, 1758)
Six specimens: Bishop Auckland, 8.vii.1899 (1♀), 10.vii.1899 (1♀), 2.vii.1900 (2♀), viii.1902 (1♀), W.J. Wingate (teste A. Grayson); Witton-le-Wear, 12.vii.1897 (♀), WJW (teste AG). Wingate (1903) stated "Escomb, one ♀; Bishop Auckland, 6 ♀s July.1897-1902", whereas Wingate (1906) stated "Witton, 1♀, 12-7-99; Bishop Auckland, 6♀ July-August, 1900-02", i.e. the published data does not quite match that on the labels accompanying his specimens. It is highly conceivable that 'Escomb' and 'Witton' refer to the same locality.

Chrysops relictus Meigen, 1820
Four specimens: no data, (2♂, 2♀), WJW (teste AG). These specimens appear to have been set and mounted by Wingate, and possibly relate to the following statement in Wingate (1906):- "2♂and 3♀ were taken near Greatham by Mr. Gardner of Hartlepool". There is no mention of *C. relictus* in Wingate (1903).

Haematopota crassicornis Wahlberg, 1848
One specimen: Waskerley, 6.vii.1901 (1♂), WJW, det. AG. This specimen was filed by Wingate under *H. pluvialis*, and erroneously listed under that species in Wingate (1903).

Haematopota pluvialis (Linnaeus, 1758)
Five specimens: Wearhead, viii.1897 (4♀), WJW, (teste AG); Waskerley, 6.vii.1901 (♀), WJW, (teste AG). Wingate (1903) listed 1♂ (in error, see notes on *H. crassicornis*) and 1♀ from Waskerley in July 1901, and 5♀ from Wearhead in August 1897.

Hybomitra distinguenda (Verrall, 1909)
One specimen: Bishop Auckland, (1♀), Mr. Greenwell, det. AG. This specimen is the source of the erroneous records of *H. solstitialis* in Wingate (1903) and Wingate (1906).

Hybomitra montana (Meigen, 1820)
One specimen: Waskerley, 5.vii.1901 (1♀), WJW, (teste AG). His identification was correct; however, Wingate (1906) stated "I am not at all sure of this identification".

[*Hybomitra solstitialis* (Meigen, 1820)]
The records given as "Bishop Auckland, one ♀" in Wingate (1903) and "One female caught by Mr. Greenwell in the neighbourhood of Bishop Auckland" in Wingate (1906) are erroneous and refer to a single ♀ *H. distinguenda*.

[*Tabanus autumnalis* Linnaeus, 1761]
The records given as "Bishop Auckland one ♂and two ♀s July 1899" in Wingate (1903) and "Bishop Auckland, 1♂, 1♀, July, 1899; Harperley, 3♀, 28-6-02" in Wingate (1906) are erroneous and refer to *T. cordiger*. It is somewhat extraordinary that the "analytical tables" in Wingate (1906) diagnose *T. autumnalis* as a "Large plump species with a short broad abdomen", since his purported specimens of *T. autumnalis* disagree with this rudimentary description.

Tabanus cordiger Meigen, 1820
5 specimens: Bishop Auckland, 17.vii.1899 (1♂), 18.vii.1899 (1♀), WJW, det. AG; Harperley, 28.vi.1902 (3♀), WJW, det. AG. These specimens are the source of the erroneous records of *T. autumnalis* given by Wingate (1903) and Wingate (1906).

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Heringia senilis **Sack, 1938 (Diptera, Syrphidae) in the Bristol Region –**

On 19 July 2004 a single individual of *Heringia* emerged from a sample of galls, formed by the aphids *Pemphigus bursarius* (Linnaeus, 1758) and *P. spyrothecae* Passerini, 1860, collected from Lombardy poplars *Populus nigra* var. *italica* at Keynsham (ST6668), Somerset, V.C. 6, on 28 June 2004. Unfortunately it was a female so could not be certainly determined but its emergence from aphid galls on poplar strongly suggested that it might be *H. senilis* (Jones, R. A. 2002. *Heringia senilis* Sack (Diptera: Syrphidae): a hoverfly new to Britain. *British Journal of Entomology and Natural History* **14,** 185-194). This prompted me to look at my other specimens of *Heringia*; of the four males in my collection, two from Berkshire are *H. heringi* (Zetterstedt, 1843) but the remaining two, from Bath (ST3090), Somerset, V.C. 6, on 14 August 2001, proved to be *H. senilis*. On the next day, 20 July 2004, I caught a male *Heringia* in my garden (Redfield, Bristol, ST6173, V.C. 34) that also proved to be *H. senilis*. Although Lombardy poplars are scattered across the city of Bristol there are none close to my garden so the latter individual had either wandered some way or the species is not entirely dependent on poplar associated aphids – **DAVID GIBBS,** 6 Stephen Street, Redfield, Bristol BS5 9DY, davidjgibbs@aol.com

Dipterists Digest 2004 **11**, 147-166

Predicting impacts of changes in farm management on sciomyzids (Diptera, Sciomyzidae): a biodiversity case study from southern Ireland

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Summary

Data are presented on Sciomyzidae (Diptera) collected by emergence traps installed on a farm in County Cork (Ireland), to test sciomyzid habitat occupancy predictions made using databased habitat-association information for the species recorded from the farm by Malaise trap survey. The emergence trap results reinforced the predictions made. The dominant role played by disused land in supporting the farm's sciomyzid fauna is highlighted. In contrast the productive land was both predicted and found to support virtually no sciomyzid species. It is pointed out that agri-environmental schemes that fail to maintain disused farmland habitats could lead to loss of most sciomyzids from a farmed landscape. It is concluded that computerised, habitat association-based prediction of invertebrate faunas can provide a rapid mechanism for evaluation of biodiversity management options, but that few taxonomic groups could be used at present, due to the lack of computerised information relating to them.

Introduction

In Europe, biodiversity loss from farmland is a recognised problem (Stanners and Bordeau 1995). Related literature dealing with invertebrates involves various taxonomic groups and scales of investigation, from farm level comparisons (Shah *et al.* 2003; Weibull *et al.* 2003), down to studies of individual landscape features such as field margins (Bäckman and Tiainen 2002; Kells *et al.* 2001). There are also reviews of the impact of farming systems upon particular taxonomic groups, for instance by Holland and Luff (2000) for ground beetles (Carabidae). However, these publications are almost universally based only on investigation of adult insects, with rarely any attempt made to relate the location of developmental stages to location of adults. Similarly, there is literature on developing predictive systems, for use in evaluating the potential consequences upon biodiversity of changes in farmland management. The need for and lack of such predictive systems is clear in reviews of effects of farming on biodiversity (Benton *et al.* 2003; Braband *et al.* 2003; Waldhardt 2003). In this study (Good 2001; Speight 2001; Speight and Good 2001a, 2001b) the inter-relationships between all habitats on an individual farm have been explored, in the context of maintaining biodiversity within a farmland landscape, using a habitat-based predictive system and selected taxonomic groups. Predictions made using this system have been tested, by gathering data on where, on the farm, development occurs of the species observed there as adults.

The core taxon in this study is the Syrphidae (Diptera), but Sciomyzidae (Diptera) have also been examined as well, chosen on the basis of criteria listed by Speight (1986), which suggested the use of sciomyzids particularly where wetland habitats are involved, as on this farm (Good 2001; Speight 2001). Logistical criteria were ignored by Speight (1986), but were included in an expanded set of criteria listed by Speight *et al.* (2000). In particular, sciomyzids are readily studied in conjunction with syrphids because the two groups may be sampled synchronously, using the same traps. Syrphids have been employed in other biodiversity-related studies of farmland, for instance by Kramer (1996), Krause (1997), Nötzold (2001) and Salveter and Nentwig (1993). The monumental study by Rozkošný and Vaňhara (1992) included Sciomyzidae, but no study that focuses specifically on sciomyzid biodiversity within farmland seems to have been conducted till now.

The predictive procedure used for sciomyzids is the same as that employed for farmland Syrphidae by Speight *et al.* (2002). Predictions engendered using this procedure for sciomyzids led Speight (2001) to deduce that changes occurring in nearby farms, if introduced to the study farm, could lead to total eradication of the sciomyzid fauna. A less extreme scenario, involving loss only of disused land habitats from the farm, was considered likely to reduce the sciomyzids to 8 species (*i.e.* to result in loss of more than 50% of the species recorded).

Since predicting which sciomyzid species would probably be associated with which habitats on the farm (Speight 2001) an extensive emergence-trapping programme has been undertaken there, during the period 2000-2003, to test the accuracy of the predictions. This paper uses the emergence trap data to re-examine habitat occupancy predictions made previously and goes on to consider how use of this predictive approach could impact on land management measures aimed at biodiversity maintenance in farmland.

The unit of biodiversity is taken here to be the species and effects of land management are considered here at the level of species maintenance, gain or loss. Effects that are non-lethal but may be debilitating are mentioned only briefly, in relation to behavioural changes that may be induced by habitat fragmentation within the farmed landscape.

Methods

Glinny-Boulaling Farm, at Riverstick, some 20km from the coast in County Cork (Ireland) has for some years hosted studies of its insect fauna. The 41 hectare farm, its ecology, recent history and current use, were described by Good (2001). The sciomyzids, derived from an intensive Malaise trapping-programme carried out in 2000, were listed and discussed by Speight (2001). There were 17 species recorded, all of which would be predicted to be resident, because habitats with which they are known to be associated were represented on the farm. The study farm habitats were grouped under three broad headings by Good (2001), Speight (2001) and Speight *et al.* (2002) and this grouping is used here:

- productive land
  the field surfaces, used directly for production
- infrastructural land
  man-made features that are adjuncts to farming, but not used directly in production (e.g. hedges, walls, ditches, ponds, field margins)
- disused land
  land not in productive use, because the expenditure necessary to bring it into production would not provide sufficient economic return.

Two types of emergence traps were deployed on the farm, both supplied by Marris House Nets. Small emergence traps, each enclosing an area of approximately 1m², were used in short vegetation (they became disfunctional in tall vegetation). These traps were of the "Owen" emergence trap design (Owen 1989), but without the bottom sheet of the normal "Owen" trap. They had standard Malaise trap heads and collection bottles and were pegged onto the ground using plastic or metal tent pegs. Large emergence traps, each enclosing approximately 4m², were used for locations with taller vegetation (e.g. cereal crops, wetland tall herb communities, field margins). These traps were based on Marris House Malaise traps, with the same dimensions and general design, but with the middle, vertical panel removed and replaced by two lateral panels, thus converting the trap into a tent-like structure. These traps had standard Malaise trap heads and collecting bottles and were pegged onto the ground like a Malaise trap.

Care was taken to ensure that the emergence traps were effectively pegged to the ground, to minimise opportunities for flying insects to either enter or leave traps under their skirts. This required checking the growth of ground-vegetation that might lift the edges of the trap as the season progressed. On occasion, stones or other heavy objects were used to weigh down the trap margins between peg attachments. This was necessary where traps had to be installed on uneven, hard ground surfaces. At wet locations the trap margins were below the water surface.

Sample bottles were part-filled with 70% industrial alcohol. During the sampling programme bottles were replaced on the traps at monthly intervals, or more frequently if necessary. The traps were also visited weekly for maintenance purposes. During warm and windy weather, the alcohol in collecting bottles on the small emergence trap sometimes evaporated excessively, and had to be replaced by 30% ethylene glycol to avoid loss of samples. At the end of each sampling period the collecting bottles were removed, capped, labelled and then stored until sorted. In the case of bottles containing ethylene glycol the liquid was drained off and replaced by 70% alcohol, prior to storage. Sorting and determination were subsequently carried out in the laboratory. Vala (1989) was used as the standard reference work for determination augmented, as necessary, by other literature. The nomenclature used follows Chandler (1998).

The emergence traps were installed in various habitats, under the trapping programme summarised in Table 1. There are 30 hectares of productive land on the farm, 5 hectares of infrastructure and 5 hectares of disused land. Considerably more emergence trapping effort was therefore necessary in the productive area than in the infrastructure or the disused land. Some of the habitats were considered irrelevant to emergence trapping for sciomyzids. These were: scattered trees in open ground; old walls; farmyard organic waste; farm buildings. Another two habitats, Atlantic thickets and hedges, are effectively inaccessible to emergence trapping, and no traps were installed within them. The remaining habitats were all subject to emergence trapping to varying extent, with the exception of the orchard, where no emergence trapping was carried out.

Sciomyzid species collected from the farm subsequent to the list given by Speight (2001), and additional to those species (see Results), had their farm habitats predicted as previously, using the same data set of coded macrohabitat association information. The resultant habitat occupancy predictions, together with those derived previously (Speight 2001), are shown in Table 2. Macrohabitat association data were coded as in the syrphid (StN) database, using a simplified fuzzy-coding system (see Castella and Speight 1996). As an example, a portion of the Macrohabitats spreadsheet is given in Appendix 1. Definitions of the Macrohabitat categories used are the same as those provided by Speight *et al*. (2003). At present, the sciomyzid database is much more restricted in its application than the StN database, covering as it does only the Atlantic zone sciomyzids and habitats.

Results

The results of the Malaise trapping and emergence trapping programmes are summarised in Tables 2 and 3. There are now 23 species of Sciomyzidae recorded from the farm, amounting to 44% of the known Irish fauna and including all but five of those known from County Cork. The recorded species include six not listed by Speight (2001): *Elgiva cucularia, Limnia unguicornis, Pherbellia schoenherri, Pherbina coryleti, Pteromicra angustipennis, Tetanocera hyalipennis*. These six species were all recorded from emergence traps, two of them (*Limnia unguicornis* and *Tetanocera hyalipennis*) also from Malaise traps. In total, 18 of the 23 sciomyzid species (i.e. 78%) recorded from the farm were taken in emergence traps and so can be assumed to breed successfully on the farm. All 23 species recorded are predicted to occur, together with the remaining 5 County Cork species not known from the farm. These predicted, but not observed species, are as follows:

Habitat type	Number of trapping units	Number of species observed	Trapping period	Year
Productive land habitats	**852**	**3**		
intensive grassland, silage	58	1	VII-IX	2001
intensive grassland, cattle grazing	280	2	IV-IX	2001
setaside, 1st year	12	0	IV-IX	2000
setaside, 2nd year	12	0	IV-IX	2000
cereal strips in intensive grassland, cattle grazed	32	0	VII-VIII	2002
cereal strips in 2nd year setaside	32	2	V-VI	2003
Infrastructural habitats	**232**	**7**		
field margin + wall	20	0	IV-VIII	2002
field margin + hedge	80	2	IV-VI, VIII	2001, 2002,
field margin + hedge + ditched seasonal stream	78	3	IV-IX	2002, 2003
field margin + hedge + ditched perm stream	48	4	IV-VIII	2002
seasonally-flowing stream in ditch	8	2	IV-VIII	2002
Disused land habitats	**232**	**17**		
seasonally-flooded *Deschampsia* grassland	36	0	IV-VI	2000
seasonally-flooded *Deschampsia* grassland with seepages	32	9	VIII-IX	2003
permanent wet flush in seasonally-flooded oligotrophic *Molinia* grassland	64	12	IV-VIII	2002
outflow streamlet from flush in oligotrophic *Molinia* grassland/*Salix* scrub	8	5	IV-VIII	2002
oligotrophic *Molinia* grassland	84	11	IV-VIII	2002
seepage in *Fraxinus* woods	8	0	IV-VIII	2002
Fraxinus/*Acer* copse	24	0	VII-IX	2003
permanent wet flush in wet *Alnus* woods	4	3	IV-VIII	2002

Table 1. Number of sciomyzid species collected per habitat by emergence traps on the farm, plus emergence trap effort per habitat. Emergence trap effort is represented as the number of trapping units per habitat. One trapping unit is 1 square metre trapped for 1 month.

Pherbellia griseola (Fallén), *Sepedon sphegea* (Fabricius), *Sepedon spinipes* (Scopoli), *Tetanocera phyllophora* Melander, *Trypetoptera punctulata* (Scopoli).

The greatest difference between the habitat occupancy predictions made by Speight (2001) and the observed (i.e. emergence trap records) habitat occupancy results reported here is the lack of evidence for breeding on the farm of five species predicted to do so. Beyond that, the emergence trap records are of species occurring where they were predicted to occur and not occurring where they were predicted to be absent (Table 2). The most noticeable exception to this generality is the occurrence of four species (*Hydromyza dorsalis*, *Renocera pallida*, *Pteromicra angustipennis*, *Tetanocera hyalipennis*) in emergence traps in infrastructural habitats, where they were not predicted to be.

From the emergence trap results there is but one species, *Pherbellia cinerella*, recorded only from the productive land on the farm. In contrast, all species recorded from emergence traps, other than *P. cinerella*, were recorded from disused land habitats. The infrastructural habitats sampled (field margins and ditches) had no sciomyzids found only there, sharing all their species with the disused land. Only one of the three species occurring in productive land is shared with those infrastructural habitats. Further (Table 1), there was nearly four times as much emergence trap sampling of the productive land as of either infrastructural habitats or disused land habitats.

Sciomyzidae observed on farm (all sources, July 2003)	**Collection method**					Species code for Table 3
	Malaise trap	Emergence trap location				
		All	production land	infrastructure	disused land	
Coremacera marginata (Fabricius, 1775)	P		x		x	CM
Elgiva cucularia (Linnaeus, 1767)		P			R	EC
Elgiva solicita (Harris, 1780)	P				x	ES
Hydromya dorsalis (Fabricius, 1775)	P	P		r	R	HD
Ilione albiseta (Scopoli, 1763)	P	P			R	IA
Ilione lineata (Fallén, 1820)	P	P			R	IL
Limnia paludicola Elberg, 1965	P	P			R	LP
Limnia unguicornis (Scopoli, 1763)	P	P	r		R	LU
Pherbellia cinerella (Fallén, 1820)	P	P	R		x	PC
Pherbellia dubia (Fallén, 1820)	P	P		R	R	PD
Pherbellia schoenherri (Fallén, 1826)		P			R	PI
Pherbellia scutellaris (von Roser, 1840)	P	P		x	r	PS
Pherbellia ventralis (Fallén, 1820)	P	P		R	R	PV
Pherbina coryleti (Scopoli, 1763)		P			R	PN
Pteromicra angustipennis (Staeger, 1845)		P		r	R	PT
Renocera pallida (Fallén, 1820)	P	P		r	R	RP
Tetanocera arrogans Meigen, 1830	P	P			R	TA
Tetanocera elata (Fabricius, 1781)	P	P	R	R	R	TE
Tetanocera ferruginea Fallén, 1820	P	P	x		R	TG
Tetanocera fuscinervis (Zetterstedt, 1838)	P				x	TS
Tetanocera hyalipennis von Roser, 1840	P	P		r	R	TH
Tetanocera punctifrons Rondani, 1868	P				x	TP
Tetanocera robusta Loew, 1847	P		x	x	x	TR

Table 2. Sciomyzidae collected by Malaise and emergence traps on the farm, showing which species occurred in productive land, infrastructural land and disused land habitats (see text). Also shown are the codes used for sciomyzid species names in Table 3.
Abbreviations used: P = presence recorded; r = presence recorded but not predicted; R = occurrence predicted and recorded; x = occurrence predicted but not recorded; blank = absence predicted and recorded

Notes on the results for individual species

Coremacera marginata

Only one specimen of this species was collected, by a Malaise trap situated in a humid hay meadow in August. While this capture accords with the known habitats of *C. marginata*, lack of evidence of breeding means there is insufficient basis for concluding that it is resident on the farm.

Field name	Species recorded																						
	CM	EC	ES	HD	IA	IL	LP	LU	PC	PD	PI	PS	PV	PN	PT	RP	TA	TE	TG	TS	TH	TP	TR
Alder wood				M		M				M		e	e			eM	M	M	M				
Brake																							
Bulls field																							
East field																		eM		M			
Glinny field								M										eM					M
Hill bog				eM		eM		M					eM		e	M	M	eM	e	M	e		
Lawn								e	M									eM	M				
Lodge field				M			M					M	e		e	e		eM	M				M
Long bog																M		M	M				
Middle field																		eM					
Pairc Giol				eM	M				e						e			eM	e			M	
Priestgate field										e								eM					
Small bog				eM		eM	e				e				e	e		eM	e	M	e		
Snipe bog		e			eM	eM	e	e		e	e		e	e	e	eM	eM	eM	eM	M	eM	M	M

Table 3. Concordance between Malaise and emergence trap records of sciomyzids from different fields on the farm. Fields listed are those where both emergence trapping and Malaise trapping were carried out. Species CM and ES were collected by Malaise trap in fields not subject to emergence trapping (see text).

The codes used for the names of sciomyzid species are given in Table 2. Other abbreviations used: e = emergence trap record; M = Malaise trap record.

Elgiva cucularia

This species was not recorded in Malaise traps, but two were collected by an emergence trap installed over a *Juncus*-dominated sward in seasonally-flooded acid fen/oligotrophic *Molinia* grassland. This area is in the disused land category and judged from what is known of *E. cucularia* its presence on the farm may be indicative of survival there from the recent past, when the area from which it was collected was wetter and covered more extensively with acid fen (Good 2001). If the habitat in which the emergence trap was installed were categorised as acid fen *E. cucularia* would be predicted to occur on the farm, but not if it were categorised as oligotrophic *Molinia* grassland.

Elgiva solicita

The situation of this species contrasts with that of *Elgiva cucularia*. A single *E. solicita* was found in May, in a Malaise trap in *Deschampsia* grassland with flushes, largely invaded by *Salix* and *Prunus spinosa* scrub. That location was also subject to emergence trap survey. Standing water is absent and it would seem an unlikely situation for the development of *E. solicita*. Although this species was predicted to occur on the farm, there is, as yet, no adequate basis for concluding it is resident there.

Hydromya dorsalis

Recorded by Malaise trap from various situations on the farm: the disused haggard, the orchard, hay meadow, wet *Alnus* woodland, from beside a hedge containing a ditched, seasonal stream and beside flushes in oligotrophic *Molinia* grassland. However, emergence trap records were only from seasonally-flooded *Juncus* sward within oligotrophic *Molinia* grassland, flushes within oligotrophic *Deschampsia* and *Molinia* grasslands and a field margin immediately beside a small stream running alongside a hedge of *Crataegus* and *Prunus*. Essentially, the Malaise trap records include much more freely-draining situations than those from which the emergence trap records are derived. Also the Malaise trap records include sites with no surface water, in contrast to the emergence trap records. While this species was predicted to occur in the farm's seasonally-flooded grassland, its occurrence in better-drained situations like the orchard would not be expected.

Ilione albiseta
Malaise trap records are very few, from a disused area covered by acid fen/oligotrophic *Molinia* grassland with flushes, plus one from beside a small stream flowing between a hedge and its associated field margin. Emergence trap records were from the same part of the farm, where the traps were installed over flushes and in seasonally-flooded *Juncus* sward. *Ilione albiseta* was predicted to occur at these locations.

Ilione lineata
This species was recorded by Malaise trap from the same wetland locations as *I. albiseta* but also from wet *Alnus* woodland. It was also collected by the same emergence traps as *I. albiseta*, installed over flushes in the acid fen/oligotrophic *Molinia* grassland, and from other traps in seasonally-flooded swards of both *Juncus* and *Molinia* in this habitat mosaic. Emergence traps in seasonally-flooded *Deschampsia* grassland with small, permanent ground-water seepages also collected *I. lineata*, but not *I. albiseta*. The sphaeriid bivalves (pea-mussels) that are the larval host of *I. lineata* are also recorded from the flushes. However, emergence traps installed over flushes within the *Alnus* woodland did not produce any *I. lineata*. *Ilione lineata* was predicted to occur in association with flushes in humid grassland, and in fen.

Limnia paludicola
Only one male of this species was collected by Malaise trap, from a field margin beside a ditched seasonal stream backed by a mature hedge. Emergence traps yielded male specimens from a trap installed in a seasonally-flooded *Juncus* sward, in acid fen/oligotrophic *Molinia* grassland, another from a trap over a seepage in seasonally-flooded *Deschampsia* grassland. *Limnia paludicola* was predicted to occur on the farm at the locations where it turned up in emergence traps.

Limnia unguicornis
This is one of the few sciomyzids to be collected from production land on the farm. A single male was collected by Malaise trap from the intensive grassland (i.e. grassland that has been ploughed, resown and fertilised) of a silage field. One male was collected by emergence trap in humid, cattle-grazed, intensive pasture and a second male from seasonally-flooded oligotrophic *Molinia* grassland invaded by *Salix* scrub. The records from the farm would fit in a general way with the habitat range for this species, which is known from both grassland (in particular unimproved, dry grassland) and wetland, but it would not be expected from intensive grassland. *Limnia unguicornis* is thus the only sciomyzid emerging from intensive grassland in this study that was not predicted to occur there. As one of a very small group of sciomyzids known to include slugs among its larval hosts, but also using succineid pond snails, its larval biology probably helps to explain its "bimodal" habitat range.

Pherbellia cinerella
This species is regarded as exhibiting a wider habitat range than any other *Pherbellia* species (Bratt *et al.* 1969). It is known from unimproved grassland in a wide range of situations (including fixed dune grassland) and also from improved grassland (grassland that has received fertiliser but not been ploughed and resown), so it might be expected to occur on the farm. However, *P. cinerella* is not a

species of intensive grassland and this is reflected in the Malaise trap records. It was recorded from them as only as single specimens, from an *Urtica* bed in an unharvested hay meadow; adjacent to a ditch on the field margin of another hay meadow and from the humid grassland of the disused haggard.

The hedge and tall herb (such as *Urtica* beds) snail *Cepaea nemoralis* (Linnaeus), that occurs on the farm (E. Moorkens *pers. comm.*), is one of the known larval hosts of *P. cinerella* and the Malaise trap records accord well with what is known of habitat associations of both *P. cinerella* and *C. nemoralis*. *Pherbellia cinerella* might be expected to occur also in the poor fen/oligotrophic, unimproved *Molinia/Deschampsia* grassland, where the alternative host snail *Trichia hispida* (Linnaeus) would be expected to provide for its larvae. However, *T. hispida* is not at present recorded from the farm, providing a possible explanation for the absence of *P. cinerella* from the disused wetland/humid grassland. Such a suggestion is not very convincing though, because, although they are terrestrial, larvae of *P. cinerella* are also known to attack sub-aquatic snails of the families Lymnaeidae and Succineidae, or even aquatic snails like planorbids, if they come across them. Although apparently infrequent there, snails belonging to these groups are present in parts of the wetland/humid grassland on the farm (E. Moorkens *pers. comm.*).

The sole emergence trap record of *P. cinerella* was from a wide, hedge-side strip sown with winter wheat for the benefit of the yellowhammer, *Emberiza citrinella* (Linnaeus), population on the farm. There are significant differences between cereal strips sown to provide bird food and commercial crops of the same cereals. The cereal strips are not subject to herbicidal control of weeds and the crop is left in place following seed maturation. It may be left in place until the following spring, as was the case where the emergence trap was installed that yielded the *P. cinerella* specimen. That trap was on the over-wintered remains of the previous year's cereal strip crop, for the period May/June. One might postulate that the presence of weeds in the cereal strip might have supported *C. nemoralis*, the presumed molluscan host on the farm, and that the lack of autumnal ploughing of the ground carrying the remains of the cereal crop enabled *P. cinerella* to survive there and hatch the next spring. The potential interest of the molluscan fauna of the cereal strips was unfortunately not recognised while they were still available for sampling.

Pherbellia dubia

Malaise trap records for this species were of two specimens from the disused haggard and one from wet *Alnus* woodland. Emergence trap records were of one specimen from a field margin with an adjacent hedge, bordering an intensive grassland and a second specimen from a trap installed in a slow-moving streamlet surfaced by floating leaves of *Potamogeton*, beneath *Salix* scrub and within acid fen/oligotrophic *Molinia* grassland. While the field-margin emergence trap record, and the Malaise trap records, accord with available habitat information for this species, the immediate environment associated with the other emergence trap record does not, since the larvae of *P. dubia* are known to be predators of various terrestrial gastropods. The lateral walls of this emergence trap were pegged into the organic mud bordering the two sides of the streamlet, which flowed, more-or-less unimpeded, through the trap. One can presume that the *P. dubia* specimen was derived from the edges of the streamlet, but this cannot be proved. *Pherbellia dubia* was predicted to occur in association with the hedges and woodland on the farm, but not in wetland areas.

Pherbellia schoenherri

There are no Malaise trap records of this wetland species from the farm. All six specimens collected by emergence trap were from permanently-wet flushes or seepages within acid fen/seasonally-flooded, oligotrophic *Molinia* grassland or *Deschampsia* grassland. Malaise traps were installed adjacent to these flushes in a year prior to installing the emergence traps. The presence of *P. schoenherri* was predicted for the locations at which it was collected by emergence trap.

Pherbellia scutellaris

There is one Malaise trap record and one emergence trap record of *P. scutellaris* from the farm. The former was from a broad field margin adjacent to a mature hedge, along which also runs a seasonally-flowing stream canalised into a ditch. The latter is from a permanently-flowing flush vegetated largely by *Juncus*, within acid fen/oligotrophic *Molinia* grassland. *Pherbellia scutellaris* was predicted to occur in association with woodland and hedges on the farm, but not for a flush habitat.

Pherbellia ventralis

Although this was numerically the most frequently recorded *Pherbellia* species in the emergence traps (more than 70 individuals collected), only two individuals were caught by Malaise trap. One of the latter came from beside an intermittently-flowing ditch, in the disused haggard, the other from beside a flush in acid fen/oligotrophic *Molinia* grassland. The bulk of the emergence trap material also came from traps installed within acid fen/oligotrophic *Molinia* grassland, some from seasonally-flooded *Juncus* sward, others from permanently-flowing flushes thinly vegetated by *Juncus* and *Mentha*. Additional records came from a flush in wet *Alnus* woodland and the un-vegetated bottom of a field-edge ditch, into which a seasonally-flowing stream had been channelled. This ditch was heavily shaded by the overhanging foliage of mature *Fagus* trees, located in the adjacent hedgerow. This species was predicted to occur in the wetland habitats from which it was collected. It would also be expected from alongside streams in grassland, but the ditch-bottom record was not predictable.

Pherbina coryleti

This species was unexpectedly scarce on the farm, with no Malaise trap records and only a solitary emergence trap record, from a seasonally-flooded location dominated by *Juncus*, in acid fen/oligotrophic *Molinia* grassland. When present, *P. coryleti* is normally a prominent feature of the sciomyzid fauna of a site and its presence would have been expected at more than one location in the disused land areas of the farm.

Pteromicra angustipennis

While no *P. angustipennis* were collected by Malaise trap, 30 individuals were obtained from emergence traps. The great majority of these were from acid fen/oligotrophic *Molinia* grassland, in both *Molinia* and *Juncus* swards and in permanently wet flushes, but four were from field margins alongside ditches containing canalised streams, in one case a permanent stream, in the other a seasonally-flowing stream that dried up during the summer months. This species was predicted for the wetland habitat and its relative abundance there, together with the lack of Malaise trap records, suggests that it may be caught less efficiently by Malaise traps than other sciomyzids. Since adults run actively over the substrate, rarely taking flight, Malaise traps (designed as an interception trap for flying insects) are potentially less suitable for trapping them than, for instance, pitfall traps, designed for collection of cursorial insects. The same may be true for adults of other *Pteromicra* species, with similar habits. However, Kassebeer (1999) showed that Malaise traps are more efficient at collecting *Pteromicra* than is a hand-held sweep net. If pitfall or emergence traps are the most effective ways of recording this genus, *Pteromicra* species may be more frequent than is currently supposed.

Renocera pallida
This species was recorded by Malaise trap from both acid fen/oligotrophic *Molinia* grassland and wet *Alnus* woodland. Emergence trap records are from permanently wet flushes in the same two habitats, with two additional specimens originating from traps installed in the bottom of a ditch used to channel a seasonally-running stream along the edge of a field. *Renocera pallida* was predicted to occur in association with both the wetland and wet woodland habitats, but not with the ditch bottom. In the laboratory, the larvae of *R. pallida* have been shown to prey on sphaeriids (Horsáková 2003). There are three species of pea mussels recorded on the farm, *Pisidium casertanum* (Poli), *P. obtusale* (Lamarck) and *P. personatum* Malm (E. Moorkens *pers. comm.*).

Tetanocera arrogans
The Malaise trap records of this species on the farm are from acid fen/oligotrophic *Molinia* grassland, wet *Alnus* woodland and a dense stand of *Urtica* at the edge of a hay meadow. Emergence trap records were only from the same acid fen/oligotrophic *Molinia* grassland that yielded Malaise trap records, being from traps located in permanently-wet flushes and in seasonally-flooded *Juncus*. The species was predicted to occur in association with humid, flooded grassland, but not with fen.

Tetanocera elata
This is the only sciomyzid recorded repeatedly, in both Malaise and emergence traps, from the productive land on the farm. In Malaise traps it was recorded from the productive land in intensive grassland used for silage production and intensive grazing, from improved pasture and hay meadow. In emergence traps it was taken in productive land from intensive grassland, improved grassland and cereal strips. Given that the larva of *T. elata* is a slug parasitoid (Knutson *et al.* 1965) and slugs are almost the only terrestrial molluscs with high populations in intensively-farmed land, the ability of *T. elata* to survive there, where other sciomyzids apparently do not (at least from the data gathered during course of this study) would seem to be closely related to availability of its larval food.

Knutson *et al.* (1965) stated that young larvae of *T. elata* are apparently "restricted to feeding on *Agriolimax* (= *Deroceras*) *reticulatus* and *A. laevis* (Müller)". *Deroceras reticulatum* (Müller) is one of the principal molluscan pests of croplands in parts of the Atlantic zone of Europe, attracting a range of control measures, including general land surface application of molluscicides (see, for instance Bolton *et al.* 1996, Cook *et al.* 1996, Kennedy 1996, Walker *et al.* 1996). It is also one of the commonest slugs on the farm (E. Moorkens *pers. comm.*). *Tetanocera elata* was recorded by Malaise trap from the following disused land habitats: wet *Alnus* woodland, acid fen/oligotrophic *Molinia* grassland and seasonally-flooded *Deschampsia* grassland. It also appeared in Malaise traps installed on field margins. Additional emergence trap records were from field margins and acid fen/oligotrophic *Molinia* grassland. Perhaps needless to say, *T. elata* was predicted to occur in many of the habitats represented on the farm.

Tetanocera ferruginea
In Malaise traps, *T. ferruginea* was recorded from: acid fen/oligotrophic *Molinia* grassland; winter-flooded *Deschampsia* grassland; improved grassland heavily-grazed by cattle; wet *Alnus* woodland; the disused haggard; the grassy field margin of a hay field, beside a seasonally-flowing stream channelled into a field-edge ditch and from the hay field itself. In emergence traps, *T. ferruginea* was recorded from a permanently-wet flush in seasonally-flooded oligotrophic *Molinia* grassland and from the grassland itself, plus a grassy field margin bordering a permanently-flowing small stream backed by a hedge. It would not have been expected from the grassy field margin location, where there is no water, other than in the adjacent ditch.

Tetanocera fuscinervis
Eight specimens were collected by Malaise trap during the period 1 August/18 September, but none were collected by emergence trap. The Malaise trap records are from seasonally flooded oligotrophic *Molinia* grassland, the surface of a field of intensive grassland heavily grazed by cattle (one female) and adjacent to a flush in seasonally-flooded, *Deschampsia* grassland invaded by *Prunus spinosa*/*Salix* scrub. All of these locations were subject to emergence-trapping. This species was predicted to occur in association with both the *Deschampsia* grassland and *Molinia* grassland habitats where it was recorded by Malaise trap, but its residency on the farm remains unproven. Five of the collected specimens were males, all confirmed by checking their terminalia.

Tetanocera hyalipennis
One specimen was collected by Malaise trap from seasonally-flooded, oligotrophic *Molinia* grassland. There are emergence trap records from the same habitat, both from the grassland itself and from a permanently-wet flush (vegetation dominated by *Juncus* and *Mentha)* there. Additional records were from emergence traps in other permanently wet flushes in acid fen/oligotrophic *Molinia* grassland and from emergence traps installed over the small outflow stream from the flushes in the acid fen/oligotrophic *Molinia* grassland, pegged down in the organic mud edging the lateral margins of this stream, the surface of which was largely covered by floating leaves of *Potamogeton*. A male and female of *T. hyalipennis* were collected by emergence trap from the field margin of a hay field, adjacent to a ditch containing a canalised, seasonally-flowing stream backed by a hedge, an infrastructural habitat in which this species was not predicted to occur.

Tetanocera punctifrons
Only one male and one female were recorded from the farm, both by Malaise trap during September. The female was collected from a grassy field margin beside a permanently-flowing streamlet backed by a hedge. The male was from acid fen/seasonally-flooded, oligotrophic *Molinia* grassland. This species was predicted to occur in both situations, but if adults are only on the wing in September (which does seem unlikely) the species would not have been detected by the emergence trapping programme in those particular habitats, which terminated at the beginning of that month. This is an extremely localised species in Ireland, these records being the first from County Cork.

Tetanocera robusta
This species was collected by Malaise trap from various locations and habitats during May and June, but not by emergence trap. The records are as follows: intensive grassland used for silage production; hay meadow and its associated field margin, where that was accompanied by a seasonally-flowing stream channelled into a ditch; improved grassland subject to light grazing by cattle; the disused haggard; acid fen/oligotrophic *Molinia* grassland. The association with fen, along streams in *Molinia* grassland and with a grassy field margin accompanying a seasonal stream, were predictable but not occurrence in hay meadow or silage grassland. It is surprising that, with nine Malaise trap records of this species (including both sexes), from five different locations most of which have also been subject to emergence trapping during May/June, there are no emergence trap records for *T. robusta*. Perhaps the reasons for its occurrence in the Malaise traps are somewhat different to other sciomyzids? From the results of laboratory rearing of this species conducted by Foote (1999), the larvae are aquatic predators of various gastropod genera, including *Gyraulus* and *Lymnaea*, both of which are represented on the farm (E. Moorkens *pers. comm.*). The Malaise trap records are more at odds with the information for this species than is the case for the other sciomyzids recorded. If *T. robusta* "wanders" as an adult more than do other sciomyzids there is no

obvious reason why this should be so. Available data would seem insufficient to usefully address this issue. Suffice it to say that despite the Malaise trap records, the presence on the farm of apparently appropriate molluscan hosts and supposedly appropriate habitats, residency of *T. robusta* remains unproven.

Discussion

Validation of habitat occupancy predictions

All of the 23 sciomyzid species recorded from the farm were predicted to be resident there, based on their known habitats. The collection of 18 of these species by emergence traps in large part substantiates that prediction. Limitations of the emergence trapping programme can be identified, that may be responsible for the lack of emergence trap records for a further species (see notes on *Tetanocera punctifrons*). In contrast, lack of emergence trap records for two of the species (*Tetanocera fuscinervis* and *T. robusta*) collected by Malaise trap is inexplicable, unless the habitat data used for prediction are currently insufficiently precise. The remaining two species missing from the emergence traps, i.e. *Coremacera marginata* and *Elgiva solicita*, were each recorded from the Malaise traps only once as single specimens. Whether these species are sufficiently localised in their breeding areas on the farm that they were undetected in the emergence trapping, or whether they represent a non-resident element of the farm sciomyzid fauna, intercepted by Malaise trap "in transit", is unclear from existing data - both explanations are possible. Since most Malaise trap records for a given sciomyzid species are from parts of the farm where it has also been collected by emergence trap (see Table 3), except in the case of *Tetanocera* species, there is perhaps an indication that emergence trap records for *Coremacera marginata* and *Elgiva solicita* would be expected, if emergence traps were installed close to the Malaise traps from which they were recorded. That there were only single specimens of *Coremacera marginata* and *Elgiva solicita* among the more than 600 sciomyzid specimens collected by Malaise trap might indicate that these two live somewhere in the vicinity of the farm, but not within its area. However, there are three species recorded only as single specimens in the emergence trap records, and for one of them (*Pherbina coryleti*) the solitary trapping is the only record of this species for the farm. The entire County Cork sciomyzid fauna was predicted to occur on the farm, on the basis of the habitats present. However, nearly 20% of those species were not recorded, by any method. Taken together with the result that 5 of the 23 recorded species were not obtained from emergence traps this implies that an element of over-prediction was involved. Whether this is due primarily to imprecision in habitat-association data or effects of the species-area relationship (appropriate habitats being available on the farm within a total area of only 10 hectares), or interaction between these and other factors cannot be effectively investigated with the available data.

Under-prediction would seem to have affected a minority of species in infrastructural habitats. When the predictions were made there was a failure to recognise the significance of seasonally-flowing streams, canalised into field-margin ditches, as potentially providing habitat for the species concerned. In this instance, the emergence trap results highlight the functional difference between ditches intermittently carrying water originating in surface run-off (i.e. from recent rainfall) and ditches continuously carrying water, originating from seasonal springs, during seasons of high ground-water level. The unreliability of habitat conditions in the former contrasts with the seasonally-reliable habitat conditions in the latter, that provide habitat continuity from autumn to spring - a long enough period to make larval development possible for various sciomyzids. An attempt has now been made to accommodate seasonal streams within the habitat array coded for sciomyzids, in order to minimise under-prediction related to this habitat in future. A second unexpected feature of the results from the emergence traps installed on a field margin beside a canalised seasonal stream is that these traps collected one sciomyzid species (*Tetanocera hyalipennis*) with aquatic larvae. Mature aquatic larvae of some sciomyzid species (e.g. *Tetanocera vicina* - see Foote 1999) are known to leave the water and climb a short distance up, into emergent or water's edge vegetation, prior to pupariation. However, in this instance the emergence traps were located more than one metre above the level of the stream and at least a metre from the ditch edge. Either the larvae moved a surprisingly long distance away from water prior to pupariation or some alternative explanation has to be sought for collection of this species in these emergence traps. Perhaps the larvae of this species are not obligatorily aquatic to the extent that the existing literature would suggest? A second species (*Pteromicra angustipennis*) from the same ditch-side emergence traps has larvae that feed largely on aquatic molluscs stranded away from water, or aestivating in water-side vegetation (Rozkošný and Knutson 1970). This might well reflect the fluctuating nature of the water supply provided by the seasonal stream.

Returning to the issue of potential over-prediction of species it is apposite to note that many sciomyzids occur within humid, seasonally-flooded grassland/fen and, while these are two major habitat types that can occur separately, they frequently occur in mosaic form, with protracted transition zones from one to the other. This leaves ample scope for mis-recording of the habitats of associated sciomyzids, or for adults to be collected from fen though they developed a few metres away in humid, flooded grassland, or vice versa. Also nearly all available habitat-association data are from either direct observation (i.e. adult specimens collected by hand net) or from Malaise traps, there being almost no relevant emergence trap information. Further information on precisely where particular sciomyzid species occur, within the humid, seasonally-flooded grassland/fen transition, is needed to clarify the habitat associations involved. Better data on which molluscs act as hosts for which sciomyzid species in the field, and under what conditions, could also have a bearing on this issue. Another approach to dealing with this problem would be to find some way to recognise the seasonally-flooded grassland/fen mosaic as a habitat category in its own right, since it is the essentially "artificial" segregation of its two phytosociologically defined CORINE habitat category components that causes the difficulty. The need to adopt generally available "habitat" definitions of itself leads to use of the CORINE system or its equivalent for defining invertebrate macrohabitat categories, a course of action leading to much difficulty, since co-incidence between invertebrate habitats and CORINE "habitats" is all-too-frequently lacking (Speight *et al.* 1997).

Prediction of sciomyzid survival in farmland

Whatever may be the case for the minority of sciomyzid species recorded from the farm but not confirmed to breed there, the great majority of the species collected would seem to be extremely sedentary within this farmed landscape, at least within the area of the farm (see Table 3), over the four years it has been under study. Is this because these flies are now more-or-less unable to move through the farmed landscape they inhabit, due perhaps to the small area and proportion of wetland habitats within it and the reality that these wetland areas may be effectively isolated from one another by elements of landscape structure that act as barriers to movement? Certainly, there is evidence to suggest that adult Diptera can react to field boundaries as though they were barriers to flight (Wratten *et al.* 2003). Merckx *et al.* (2003) demonstrated that the progeny of populations of a woodland butterfly species, *Pararge aegeria* (Linnaeus), derived from a farmed landscape in Belgium with a similar structure to that in which our case study farm is located, are less inclined to cross such habitat barriers than the progeny of populations of the same species from non-fragmented, forested landscape in the same country. While no such work has been carried out using sciomyzids, in the light of the available information it seems realistic to suppose that similar, genetically controlled "island effect" behavioural traits could develop among sciomyzids inhabiting wetlands scattered over a farmed landscape.

An alternative explanation for the apparently sedentary habit of most sciomyzids on the farm studied would be that sciomyzids have no need to move through this farmed landscape with any frequency, only a small percentage of them (e.g. *Tetanocera fuscinervis* and *T. robusta*, in this study?) attempting such activity during any one year. If so, then study of permeability of landscape to flying insects requires to be conducted over a period of time longer than that available to the present study, in order to yield meaningful results, to judge by the sciomyzids.

Given that 80% of the sciomyzids recorded from the farm are apparently resident there and there is little evidence for movement of species through inappropriate habitat on the farm, it may be concluded that *maintenance of existing sciomyzid populations* there is of paramount importance in maintaining sciomyzid biodiversity on the farm i.e. species lost are unlikely to be replaced by immigration from elsewhere, at least in the short term. Essentially, this amounts to a requirement to maintain the disused land on the farm, since it is there that occur the wetland habitats on which most of the sciomyzids depend. Speight (2001) reached the same conclusion, based on habitat occupancy predicted for the recorded species. Loss of these disused land habitats on the farm would thus be expected to reduce its sciomyzid fauna by more than 50%.

The difficulties inherent to maintaining the existing fauna of the disused land on the farm were considered by Speight (2001) and Speight and Good (2001a, 2001b). Essentially, EU policy-driven change in use of farmland is considerable and likely to continue to cause a decrease in biodiversity within the actively-farmed landscape, a process that may be accelerated by existing "environmentally friendly farming" schemes introduced to counteract this trend, since they cannot be relied upon to provide for appropriate management of disused land on farms. Further, these schemes treat farms individually, rather than at landscape unit level, potentially enhancing adverse effects of farming on maintenance/enhancement of landscape permeability. It was the overall conclusion of Speight and Good (2001a) that, given the management options realistically available, the diversity of both sciomyzid and syrphid faunas on the farm would inevitably decline, since even the *laissez faire* option of leaving the wetland area unmanaged would cause loss of species, due to habitat loss caused by scrub encroachment.

Prior to falling into disuse, the wetland areas of the farm were subject to light grazing by cattle (Good 2001) and it was pointed out by Speight and Good (2001a, 2001b) that some grazing of these areas is needed to prevent scrub encroachment and resulting loss of wetland fauna. Alternative scenarios, such as conversion to improved grassland or plantations of conifers or deciduous trees, were predicted to result in greater species loss. It was, however, also argued that reversion to light grazing was not an economically viable option, in the absence of financial support from agri-environmental measures. Thus agri-environmental schemes that failed to maintain the wetland habitats on this farm would result in impoverishment of its sciomyzid fauna, whatever might be the impact of these schemes on infrastructural or productive sector habitats. Validation of the basis for these predictions has served only to reinforce them.

When habitat modification, rather than habitat replacement is involved, predictions of the consequences of replacement of one habitat by another are of limited application. For instance, an improved grassland used for cattle grazing remains the same habitat whether or not it is subject to topping. The modification introduced by topping impacts particularly on the microhabitat(s) represented by tall, strong herbs, transferring the focus of prediction from habitat to microhabitat level. Predicting the consequences to biodiversity of alternative management regimes then becomes a matter of predicting the impact of each management practice on the fauna of the microhabitat(s) affected (Speight 2000) and considering these impacts together to assess the overall effect. In the case of maintaining wetland sciomyzids on the farm this degree of predictive precision is not needed, unless pro-active management of disused land for conserving biodiversity was proposed as part of an agri-environmental scheme. Even then, if wetland management was confined to scrub clearance, unaccompanied by grassland improvement (e.g. tussock-grubbing and topping), habitat association could still be used for prediction, since scrub is a habitat type, rather than microhabitat. Given that the farm wetlands were subject to more flooding in the recent past, before being partially drained (Good 2001), it would be logical that any attempt at wetland management would also include introduction of drainage control to permit partial reflooding of the wetland, without adversely influencing other land on the farm. Again, if partial reflooding led to permanent pools of standing water, this is a habitat-level alteration in site character, whose consequences could be predicted from use of habitat-association information. Effectively, habitat-scale environmental manipulation would seem likely to dictate wetland sciomyzid survival on the farm, whether through agri-environmental schemes or otherwise, making habitat-based prediction generally useful for evaluating the potential consequences of different management scenarios.

Perhaps the deduction that half of the sciomyzid fauna of the case-study farm would disappear if its disused areas were converted to improved or intensive grassland (Speight 2001) could be regarded as no great revelation. After all, in this instance little more is being said than that species with aquatic larvae - like most of the sciomyzids recorded from the farm - are apparently unable to develop in non-wetland habitats like silage grassland! This is in line with the findings of Rozkošný and Vaňhara (1992), who recorded only one sciomyzid specimen among the thousands of specimens of Diptera they collected (as adult insects) from fields of barley and legumes and their surrounding hedges, in an artificially-irrigated, farmed landscape. Similarly, and perhaps equally unsurprisingly, Brose (2003) established that the occurrence of wetland carabids in farmland was correlated with the longevity and frequency of temporary wetland habitat in the landscape. Consequently testing habitat-occupancy predictions, as has been carried out here, might seem to be a demonstration of the obvious? However, the diagnostic strength of predictions made possible by bringing together, in a simple computerised system, the wealth of data that now exist for a wide range of habitats for certain groups of invertebrate (e.g. European Sciomyzidae) is of potentially wide application. Use of such data in a predictive system is sufficiently novel that field-testing is arguably necessary, even if it might appear a redundant exercise from some points of view. Once such a database is set up for a particular taxonomic group predictions for the potential impact of a range of different management options upon biodiversity can be made for a site from a few days of accurate and comprehensive habitat survey, if a reliable regional list (e.g. for the county in which the site is located) is available for that target species group (see Speight and Castella 2001).

This paper highlights disused land habitats as potential biodiversity "hotspots" within a farm, through both prediction and observation of the sciomyzid fauna. It also shows that agri-environmental measures that do not provide for pro-active management of such disused land habitats are largely irrelevant to maintenance of biodiversity of organisms like sciomyzids. However, assessment of effects of farm management practices on biodiversity should logically involve some significant proportion of the biodiversity involved, even if it is neither practical nor necessary to consider *all* elements of biodiversity. If biodiversity is assessed at species level, as here, then the taxonomic groups targeted in this farm study - the sciomyzids and syrphids - between them represent hardly 1% of the potential biodiversity of the area. If carefully chosen taxonomic groups together amounting to a notional 10% of the biodiversity of the farmed landscape could all be subject to similar study, this would perhaps be sufficient and would certainly be more satisfactory. The key problem is a lack of computerised information. Among invertebrates even the ground beetles (Coleoptera: Carabidae), frequently studied in agricultural environments because large numbers of the adult beetles are easily caught by pitfall trapping, cannot be employed as the sciomyzids have been in this study, due to lack of computerised ecological data on the species.

Conclusions

1. Predictions of habitat occupancy by the sciomyzids recorded from a farm are supported by the results of an emergence trapping programme carried out there.

2. Given that these predictions can be regarded as generally reliable, deductions relating to the fate of the farm's sciomyzid fauna under different management regimes, based on habitat loss and gain, can be regarded as sound.

3. The deduction that the future of the farm's sciomyzid fauna is largely dependent upon disused land habitats on the farm, rather than on either productive land (i.e. field surfaces) or infrastructural land (i.e. hedges, field margins, ditches etc.) is reinforced, highlighting the potential significance of areas of disused land habitats as "hotspots" for biodiversity maintenance within the farmland landscape.

4. Areas of disused land habitats within the farmland landscape may now be so isolated that their fauna, once lost, is unlikely to return, at least in the short term.

5. Alternative management scenarios for disused land within farmland suggest that, currently, the only way their fauna is likely to be maintained is through pro-active (rather than laissez-faire) management, driven by agri-environmental schemes.

6. Computerised habitat-association data for invertebrates can provide a rapid mechanism for prediction of the effectiveness of proposed agri-environmental measures involving habitat loss, gain and maintenance.

7. There is need for computerisation of ecological data for a wider range of taxonomic groups, to provide a more robust and comprehensive system for evaluation of the biodiversity maintenance potential of different management measures.

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Appendix 1: Wetlands section of sciomyzid database macrohabitats spreadsheet

IRISH SCIOMYZIDAE	MACROHABITAT CATEGORY Wetland (general)	Bog Blanket	Raised	Transition Mire	Fen	Marsh	Reed bed	Salt marsh
Anticheta analis (Meigen, 1830)	1		1		1	1		
Anticheta brevipennis (Zetterstedt, 1846)								
Colobaea bifasciella (Fallén, 1820)	1				1			
Colobaea distincta (Meigen, 1830)								
Colobaea punctata (Lundbeck, 1923)								
Coremacera marginata (Fabricius, 1775)	2				2			

	(general)	Bog Blanket	Raised	Transition Mire	Fen	Marsh	Reed bed	Salt marsh
Dictya umbrarum (Linnaeus, 1758)	2	1	1	2	2	2		
Ditaeniella grisescens (Meigen, 1830)								
Elgiva cucularia (Linnaeus, 1767)	2			2	2	2		
Elgiva solicita (Harris, 1780)	3				3			
Hydromya dorsalis (Fabricius, 1775)	1	1	1		1	1		
Ilione albiseta (Scopoli, 1763)	2	1	1		2	1	1	
Ilione lineata (Fallén, 1820)	2	1	2	2	2	1	2	
Limnia paludicola Elberg, 1965	2	1	1		2			
Limnia unguicornis (Scopoli, 1763)	1				1			
Pherbellia albocostata (Fallén, 1820)	2				2			
Pherbellia argyra Verbeke, 1967	1					1		
Pherbellia brunnipes (Meigen, 1838)	1				1	1		
Pherbellia cinerella (Fallén, 1820)	2				2	2		
Pherbellia dubia (Fallén, 1820)								
Pherbellia griseola (Fallén, 1820)	2				2			
Pherbellia knutsoni Verbeke, 1967								
Pherbellia nana (Fallén, 1820)	3				3			
Pherbellia pallidiventris (Fallén, 1820)								
Pherbellia schoenherri (Fallén, 1826)	2				2	2	2	
Pherbellia scutellaris (von Roser, 1840)								
Pherbellia ventralis (Fallén, 1820)	2	1	1		2	1		
Pherbina coryleti (Scopoli, 1763)	2				2	2	2	
Psacadina verbekei Rozkošný, 1975	2				2			
Psacadina zernyi (Mayer, 1953)	3				3	2		
Pteromicra angustipennis (Staeger, 1845)								
Pteromicra leucopeza (Meigen, 1838)								
Pteromicra pectorosa (Hendel, 1902)								
Renocera pallida (Fallén, 1820)	2				2			
Renocera striata (Meigen, 1830)	2		1	2	2			
Renocera stroblii Hendel 1900	2				2			
Salticella fasciata (Meigen, 1830)								
Sciomyza dryomyzina Zetterstedt, 1846								
Sepedon sphegea (Fabricius, 1775)	2		1		2	2		
Sepedon spinipes (Scopoli, 1763)	2				2	1	1	
Tetanocera arrogans Meigen, 1830	2			2		2		
Tetanocera elata (Fabricius, 1781)	2	1	1	1	2	2		
Tetanocera ferruginea Fallén, 1820	2			2	2	2	2	
Tetanocera freyi Stackelberg, 1963	2		2	2	2	2		
Tetanocera fuscinervis (Zetterstedt, 1838)	2			2	2	2		
Tetanocera hyalipennis von Roser, 1840	2	1			2	2		
Tetanocera phyllophora Melander, 1920								
Tetanocera punctifrons Rondani, 1868	3				3			
Tetanocera robusta Loew, 1847	2			1	2	2		
Tetanocera silvatica Meigen, 1830								
Tetanura pallidiventris Fallén, 1820								
Trypetoptera punctulata (Scopoli, 1763)								

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Notes on the autecology of the cranefly *Idioptera linnei* Oosterbroek, 1992 (Diptera, Limoniidae)

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Summary

Larvae of the RDB1 cranefly *Idioptera linnei* Oosterbroek were found, with other larvae, in the bog-moss *Sphagnum cuspidatum* at Fenn's, Whixall & Bettisfield Mosses NNR (SJ490357) in Shropshire (V.C. 40) on 28.iv.2004. The larvae successfully pupated in controlled conditions and the pupae of the species are sketched. New information on the phenology of the species is given.

Introduction

The RDB1 cranefly *Idioptera linnei* Oosterbroek, 1992 (formerly known by the name *Limnophila fasciata* (Linnaeus, 1767)) has long been suspected of developing in boggy conditions (Falk 1991). The larva of the species remained elusive to Alan Brindle during his time studying cranefly larvae and pupae (Brindle 1967). Following on from fieldwork during 2003 and the discovery of the species new to Wales (Boardman 2004), I decided to carry out further work to identify breeding locations upon Fenn's, Whixall & Bettisfield Mosses NNR, a reserve that straddles the England / Wales border. As part of an MSc dissertation with the University of Birmingham I have been investigating the distribution of this and the other member of the genus, *Idioptera pulchella* (Meigen, 1830).

Methodology

Using the locations of adult sightings of *I. linnei* from 2003, a likely area of suitable habitat was identified upon Fenn's, Whixall & Bettisfield Mosses NNR within Shropshire (V.C. 40). A visit was made (with John Kramer) on 28.iv.2004 and an area of old hand-cut peat workings was sampled. The study area comprised a number of peat-cuttings at SJ490357, including one approximately 1m x 3m that had in-filled over a long period with the bog-moss *Sphagnum cuspidatum* and the sedge *Eriophorum angustifolium*. Larvae were searched for in two ways. Firstly hand-sized samples of bog-moss were removed to plastic trays and carefully hand searched. Any dipterous larvae encountered were potted with a small amount of damp moss. Secondly larger samples of bog-moss were bagged and removed from the site for further investigation. These were later hand-shredded and washed with running water to reveal any dipterous larvae.

Enough bog-moss and bog water was removed to provide suitable habitat for trans-located larvae and housed in a small glass aquarium tank. This was placed outside in a sheltered location, having been searched for larvae first.

Results

Several dipterous larvae were encountered within the bog-moss *Sphagnum cuspidatum* from Fenn's, Whixall & Bettisfield Mosses NNR on 28.iv.2004.

The 1m x 3m cutting and the immediate surrounding vegetation (approximately 5m x 5m), where larvae were taken, were subjected to a vegetation survey. The cutting was shallow, no more than 25cm deep within a landscape of old cuttings and peat baulks with scattered scrub up to 1.5m tall. The pH was measured at approximately 4.5 as would be expected upon a lowland raised bog.

Fig. 1 - ♂ pupa of *Idioptera linnei*

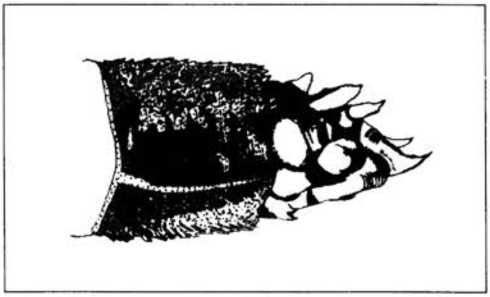

Fig. 2 ♂ pupa of *Idioptera linnei* showing anal appendages

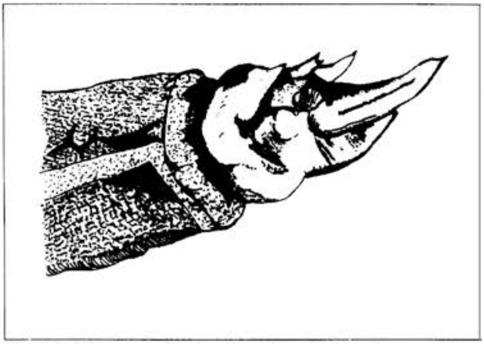

Fig. 3 - ♀ pupa of *Idioptera linnei* showing anal appendages

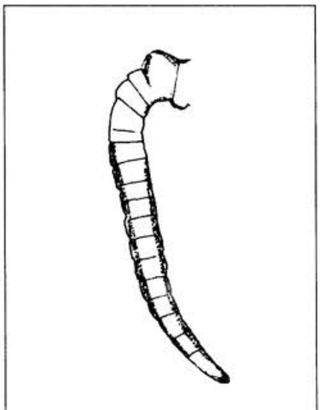

Fig. 4 – Pronotal horn of ♂ *Idioptera linnei* pupa

The species of vegetation within and surrounding the ditch, in terms of percentage cover, are detailed in Table 1.

Species	% cover
Sphagnum cuspidatum a bog-moss	40
Calluna vulgaris Common Heather	25
Erica tetralix Cross-leaved Heath	20
Eriophorum vaginatum Hare's-tail Cotton Sedge	15
Betula pendula Birch	10
Eriophorum angustifolium Common Cotton Sedge	10
Pinus sylvestris Pine	5
Narthecium ossifragum Bog Asphodel	>1
Vaccinium vitis-idaea Cowberry	>1
Rhyncospora alba White-beaked Sedge	>1

Table 1. Vegetation at the survey site upon Fenn's, Whixall & Bettisfield Mosses NNR

Trans-located larvae that resembled the larvae of limoniid craneflies (Brindle 1967) were housed in the aquarium tank, and a male *I. linnei* hatched on 16.v.2004. A female hatched on the following day. The pupal exuviae of the two craneflies were retained and sketched by the author.

The male pupa (Figs 1, 2 and 4) measured 11mm in length and was brown in colour, except at the seams of the abdominal segments, which were beige in colour and bore an obvious end spine on each segment. The lower four abdominal segments also bore a spine at the central point within the beige seam. Elsewhere each abdominal segment was found to be clothed in numerous small yellow spines over the dorsal and ventral surfaces with the end of each segment displaying a concentrated row of the same spines. In contrast the front edge of each abdominal segment bore a row of "bottle-shaped" or ovate spines.

The female pupa measured 12mm, due to a larger anal spine (Fig. 3). The colour and abdominal spines were similar to the male, if a little less pronounced.

Whilst searching for larvae several adult *Idioptera linnei* were encountered. Both sexes were represented and these records, when added to other records of the species collected as part of my MSc research, show a lengthening of the phenology to that previously quoted. I found records to range from April (25th) to September (17th) whereas June to August was the previously listed flight period (Falk 1991). Fig. 5 shows a phenology histogram based upon 58 records ranging from 1901 to 2004. The peak is shown as June; however, on several sites distinct spring and late summer broods are suggested. This may depend upon geographical location and the more northern sites may only produce a single generation. It is also possible that the suggested peak in June represents the most popular time for dipterists to search for what is an uncommon species and therefore more data would reveal a truer situation.

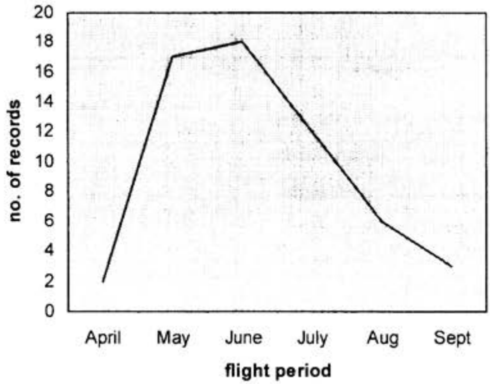

Fig. 5 – Phenology histogram of *Idioptera linnei*

Of the adults seen on 28.iv.2004 two males and two females were collected and encouraged to mate by confining them in a small tube. One pair successfully mated immediately whilst the second pair failed to mate. They were then introduced into the aquarium with the hope that the females would oviposit into the wet bog-moss. The mated female survived the longest and lived for ten days following capture. This shows that individuals can survive for at least ten days from emergence.

Conclusions

The pupae of male and female *Idioptera linnei* are described for the first time after larvae were found in bog-moss on Fenn's, Whixall & Bettisfield Mosses NNR on 28.iv.2004. Further researches into larval characteristics are needed as well as other aspects of the autecology of this species.

Acknowledgements

I would like to thank John Kramer for assistance and encouragement with this project, Dr. Joan Daniels of English Nature for all relevant permissions regarding the site and Karen Horton for putting up with tanks of cranefly larvae around our home. I would also like to thank all the organisations and individuals, who have submitted records of *Idioptera* craneflies or given me access to their collections, to enable the phenology histogram to be compiled.

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Thelaira leucozona (Panzer) (Diptera, Tachinidae) new to Britain

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Summary
The first British records of *Thelaira leucozona* (Panzer, 1809) are given, based on six specimens reared from *Arctia caja* (Linnaeus) (Lepidoptera, Arctiidae).

Introduction

Thelaira leucozona (Panzer) is a very rare species with scattered records in southern Europe north to Germany (Nordrhein-Westfalen) and Poland. The British specimens were found when I examined a small collection of *Thelaira* from the National Museum of Scotland kindly sent to me by David Robertson. The collection contained many old specimens that were determined as *Thelaira nigrina* (Fallén) [= *Thelaira nigripes* (Fabricius) in Belshaw (1993)] but also some specimens that originated from T.H. Ford's collection. Five of these specimens reared from *Arctia caja* (Linnaeus) (2 males 3 females, 1985 Portslade, Sussex (ARC)) were originally determined as *Thelaira nigripes* and published under this name by Ford, Shaw and Robertson (2000). The sixth specimen also reared from *A. caja* (male, 1985 Hollingbury, Brighton Sussex (ACR), apparently four tachinid larvae in the same host-larva producing four puparia but only one fly emerged) represents a previously unpublished record.

However, these specimens represent a species new to Britain i.e. *Thelaira leucozona* (Panzer) that is known only as a parasitoid on *Arctia caja*. (Herting and Tschorsnig 1994). Belshaw (1993) mentioned three rearing of *T. nigrina* from the same host and also referred to the paper of Hammond and Smith (1955). I have not been able to re-evaluate these records so there is a possibility that they also represent *Thelaira leucozona*. For *T. nigrina* I have been able to confirm the following British host-records: *Spilosoma lubricipeda* (Linnaeus) (3 males, 1969, L.W.A. Watson, University Museum Oxford (UMO); 2 males, 1996/1997, Ford, Shaw and Robertson 2000, National Museum of Scotland) and *Spilosoma lutea* (Hufnagel) (1 male, 1 female, 1992/1993, Ford, Shaw and Robertson 2000, National Museum of Scotland). Regarding older records mistakes in the determination of the hosts cannot be ruled out and we should be aware of the fact that *S. lutea* previously has been treated as *S. lubricipeda* by some authors. *Thelaira solivaga* (Harris) was recorded from *Arctia villica* (Linnaeus) by Belshaw (1993) and also by Tschorsnig (*in litt.*) but I have not been able to confirm these records. In Great Britain this host has also been recorded for *T. nigrina* (Sperring 1932, Parmenter 1953) but this surely needs confirmation. *Thelaira leucozona* (Panzer), the third British species of the genus, is easily distinguished from *Thelaira nigrina* (Fallén) and *Thelaira solivaga* (Harris) using the following new amendments to Belshaw's key.

Identification

Thelaira leucozona keys out together with *solivaga* and *nigrina* on page 16 at couplet 11 but it is a well separable species because the male genitalia are distinct. The male genitalia have been figured by Mesnil (1975: 1337) and also by Ziegler and Shima (1996: 461). It can then be recognized by modifying the key on page 58.

Genus *Thelaira*

1. The black longitudinal stripe at the side of the thorax before the suture is clearly defined, reaching wedge-shaped to the strong outer posthumeral bristle (as in Fig. 241), broadly separated from the restricted black area of the pronotum. Abdominal tergites 3 and 4 are densely white dusted in more than the anterior half, tergite 5 in female dusted in about anterior third. Male genitalia: Syncercus distinctly longer than the narrow and pointed surstyli *leucozona* (Panzer)

- The black longitudinal stripe at the side of the thorax before the suture is mostly diffuse and connected with the backwards directed extended black area of the pronotum. Abdominal tergites 3 and 4 with narrow (anterior 1/5 or 2/5) and thinly white dusted anterior bands, tergite 5 in female undusted. Male genitalia: Syncercus as long as (*nigrina*) or slightly longer (*solivaga*) than the broad and apically rounded surstyli 2

2. [insert Belshaw's key to *solivaga* and *nigrina*]

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