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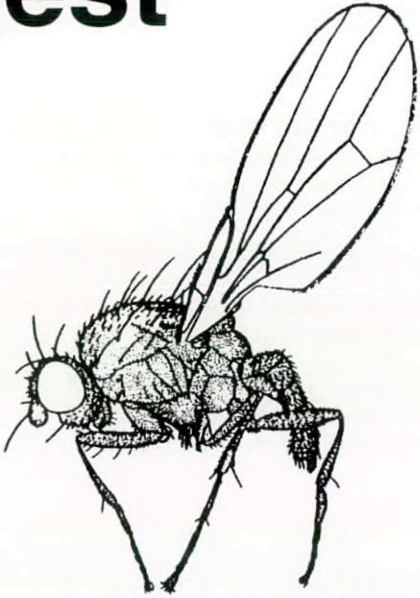
Cover illustration: *Neomochtherus pallipes* (Meigen, 1820) (Asilidae), male, Haughmond Hill, Shropshire © Nigel Jones, see article on pp 205-210.

Dipterists Digest



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Dipterists Digest is the journal of the **Dipterists Forum**. It is intended for amateur, semi-professional and professional field dipterists with interests in British and European flies. All notes and papers submitted to Dipterists Digest are refereed. Articles and notes for publication should be sent to the Editor at the above address.

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;
- reports from the Diptera Recording Schemes, including maps;
- records and assessments of rare or scarce species and those new to regions, countries etc.;
- local faunal accounts and field meeting results, especially if accompanied by ecological or natural history interpretation;
- descriptions of species new to science;
- notes on identification and deletions or amendments to standard key works and checklists.

Articles must not have been accepted for publication elsewhere and should be written in clear and concise English. **Contributions should preferably be supplied either as E-mail attachments or on 3.5" computer disc or CD in Word or compatible formats**.

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Style and format should follow articles published in the most recent issue. A short Summary (in the form of an Abstract) should be included at the beginning of each article. References to journals should give the title of the journal in full. Scientific names should be italicised. Authors of scientific names should be given in full and nomenclature should follow the most recent checklist, unless reflecting subsequent changes. 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, and a pdf of their contribution if requested.

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Observations on the Diptera and other insects frequenting sap exudations on an oak tree in Devon, south-west England

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Summary

The species of Diptera, Coleoptera and other insects present on an oak *Quercus robur* tree with copious basal white sap exudations were recorded over a seven-year period. Six species of Diptera were recorded feeding on the sap as both adults and larvae, 24 species as adults only and four species as larvae only. Nine other species, while not observed to feed on the sap either as larvae or adults, appeared more frequent on or around the tree than other trees nearby. The assemblage of flies attracted to the tree differed markedly from that described in the few other such studies reported, even those investigating white sap exudations on oaks in England. Oviposition was observed in *Ferdinandea cuprea* (Scopoli, 1763), *Volucella inflata* (Fabricius, 1794) and *Phaonia laeta* (Fallén, 1823): these species laid their eggs on bark some distance away from sap exudations. Larvae of *F. cuprea* were observed leaving sap exudations in the presence of *Bioblapsis polita* (Vollenhoven, 1878) (Ichneumonidae, Diplazontinae), an obligate parasitoid of *Ferdinandea* species. The tree attracted numerous insect predators including the hornet, *Vespa crabro* Linnaeus, 1758, three other species of wasp and several beetles, as well as insectivorous birds. Five beetles known to be sap exudation specialists were recorded, together with the endangered staphylinid *Velleius dilatatus* (Fabricius, 1787). Altogether eight nationally rare or scarce beetle and fly species, and a rarely recorded ichneumon, were found, confirming the importance of trees with sap exudations for insect conservation. The tree was of particular conservation significance within the context of Devon; three of the species recorded are not currently known from any other sites in the county (one beetle, one fly and one ichneumon), and four are known from only one other site. Trees with sap exudations should be valued and protected.

Fig. 1. *Volucella inflata* ovipositing on sound bark 15cm away from the nearest sap exudation, 19 June 2014.

Introduction

Sap exudations, variously known as sap runs, sap flows or slime fluxes, are well known to be important for invertebrates including Diptera (Perry and Rotheray 2010). A detailed study of saproxylic Diptera in Scotland found that sap exudations were the richest microhabitat in terms of species diversity after decaying sap under bark and decaying sapwood in fallen wood (Rotheray *et al.* 2001).

This paper supplements existing knowledge through presenting observations made over seven years on the species and behaviour of Diptera visiting a single pedunculate oak tree *Quercus robur* with copious basal sap exudations. Members of other insect orders using the sap, especially Coleoptera, are also covered. Godfrey and Whitehead (2001) observe that there are very few detailed accounts of the insects or other invertebrates using sap exudations, even at a world level.

Study site and methods

The oak tree. The tree, which blew over in December 2015, was a mature although not large specimen 118 years old (annual growth ring count), with a circumference at breast height of just 1.53m (Fig. 2). Examination of the root plate after the tree had blown over revealed that it was highly stressed with little living vascular tissue joining trunk and roots and substantial early loss of heartwood at the base of the tree. Growth ring inspection revealed that for the last 15 years growth had been minimal, with an annual increment in trunk diameter of 2mm or less (compared to 10 mm when the tree was about 20 years old and at its most vigorous). No accumulations of red rot were present, but one main root had substantial amounts of white rot. No fungal fruiting bodies were observed during the six years the tree was studied.

The tree (NGR SS518023) was in a narrow secondary woodland strip on land immediately adjacent to Locks Park Farm, near Hatherleigh in western Devon, south-west England. The surrounding countryside appears well-wooded due to the presence of a dense network of hedges, many grown into lines of trees, connected to scattered small secondary woodlands. The nearest ancient (i.e. pre AD1600) woodland over 0.5ha in size is 1km distant, although some closer hedges are probably about 600 years old. Nearby hedges contain oaks and other trees with veteran features such as rot holes, splits and hollows. No sap exudations of comparable size are known in the surrounding landscape where even small exudations appear rare.

Fig. 2. The oak tree, June 2014. The main sap exudations occurred between the root buttresses.

The tree was 100m away from a hedge where the Diptera fauna was studied intensively between 2011 and 2012 (Wolton *et al.* 2014). Further information on local landscape and habitats can be found in that paper.

The tree had numerous sap exudations around its base. The highest of these was 1.5m above the ground; most were between the root buttresses within 50cm of the ground. The sap emanated from wounds in the phloem. These wounds were often hidden beneath patches of outer bark (the periderm or cork layer) separated from the underlying sapwood (xylem). Observation revealed that wounds were initiated, kept open or expanded by the combined actions of grey squirrels *Sciurus carolinensis* Gmelin, great spotted woodpeckers *Dendrocopos major* (Linnaeus) and hornets *Vespa crabro* Linnaeus, 1758. The action of micro-organisms such as bacteria may have also kept the sap flowing (Cole and Streams 1970). Goat moths *Cossus cossus* (Linnaeus, 1758), which are often associated with sap exudations (Perry and Rotheray 2010), had no part to play and have not been recorded in the area for many years (McCormick 2001).

Oak sap exudations can broadly be divided into two main types: those that are brown and those that are white, the colour reflecting differences in the causative microbial communities (Perry and Rotheray 2010). The oak in this case produced white exudations – clear to begin with, the sap accreted to form white patches with the consistency of jelly. As these aged they formed dense yellow-white viscous structures resembling miniature calcite formations in limestone caves (Fig. 3). On a hot summer's day the tree had a strong and pleasant smell of fermentation, presumably caused by yeasts acting on the sap. The sap was never frothy.

Each year the sap started to flow in early May, was vigorous in June, July and August, but tailed away rapidly in September. By late September all sap deposits had disappeared.

Fig. 3. Aged yellow-white sap.

Observation and recording methods. Between 2009 and 2015, the tree was visited frequently from May to September, often several times a week and sometimes two or three times a day, although not on a systematic basis. Visits were usually between 10.00 and 16.00 BST, but some were made at night with the aid of a torch.

Flies and other insects were watched and their behaviour recorded, with adults being caught where necessary for identification, usually by placing a tube over them but sometimes with a pooter or net.

To avoid damaging the tree or sap exudations, prior to 2015, no bark or sap was removed to search for larvae or puparia. In 2015, to make it possible to observe behaviour on sap exudations, the largest of which were mostly hidden, and in particular to enable larvae to be found, three pieces of outer bark overhanging generous sap runs, each piece measuring about 100cm^2, were broken away from the tree. These were then wedged back into place so that they could be easily removed to see what was happening underneath. After the tree had blown over in December 2015, substantial flaps of outer bark were removed over the next two months to search for larvae and puparia.

On three occasions in the early spring two to three litres of soil and leaf litter were taken from base of the tree and placed in buckets covered with fine netting. The buckets were then placed either in a shady spot in a polytunnel or in an outside shed, the contents being kept damp with rain water as necessary. They were monitored regularly for emergent adult flies.

Any larvae and puparia found at the tree were kept at room temperature in loosely-closed plastic pots together with some of the substrate within which they were found. Those found actually within sap did not survive this treatment, the sap either desiccating quickly if the tube was kept open or quickly becoming lethal if closed, presumably due to rising alcohol concentration.

Results

Diptera recorded. A total of 64 species were recorded at the tree, of which 34 appeared to be attracted to the sap as a food source for either larvae or adults. No attempt was made to record smaller Nematocera (i.e. Psychodidae, Scatopsidae, Ceratopogonidae, Chironomidae) or Phoridae: members of these families were, however, seldom observed at the tree. The species observed to be, or considered likely to be, linked to the sap exudations are grouped into three categories:

1. Those using the sap exudations for larval development, as evidenced by observing oviposition nearby, by finding larvae or puparia, or through previous studies. Six of the ten species concerned were seen feeding on the sap as adults, the exceptions being *Sylvicola cinctus* (Fabricius, 1787), the two *Brachyopa* species and *Scaptodrosophila deflexa* (Duda, 1924). See Table 1 for details.

2. Those seen feeding as adults on the sap but for which no evidence was found to support larval development linked to sap exudations. See Table 2 for details of the 24 species concerned.

3. Other species that appeared more frequent around the base of the tree than on other trees in the immediate vicinity, although no attempt was made to quantify this. This category included a number of saproxylic species. Table 3 lists the nine species concerned.

Eight fly species not known or observed to be associated with sap flows either as larvae or adults emerged from soil and leaf litter collected from the base of the tree: *Ctenosciara hyalipennis* (Meigen, 1804), *Lycoriella ingenua* (Dufour, 1839*), Tachypeza nubila* (Meigen, 1804), *Scaptomyza pallida* (Zetterstedt, 1847), *Pseudolyciella stylata* Papp, 1978, *Helina depuncta* (Fallén, 1825) and *Paykullia maculata* (Fallén, 1815). The following Diptera not considered to have any association with sap were recorded at the tree as adults: *Tipula irrorata* Macquart, 1826, *Ochlerotatus geniculatus* (Olivier, 1791), *Tachydromia aemula* (Loew, 1864), *Tachypeza nubila* (Meigen, 1804), *Argyra perplexa* Becker, 1918, *Chrysotus gramineus* (Fallén, 1823), *Sybistroma obscurellum* (Fallén, 1823), *Suillia affinis* (Meigen, 1830), *Pegomya bicolor* (Wiedemann, 1817), *Pegoplata infirma* (Meigen, 1826), *Azelia cilipes* (Haliday, 1838), *Coenosia tigrina* (Fabricius, 1775), *Hydrotaea militaris* (Meigen, 1826) and *Mesembrina meridiana* (Linnaeus, 1758). These may be considered tourist species (*sensu* Godfrey and Whitehead 2001).

Table 1. Species either shown to use sap exudations for larval development or suspected to do so from previous studies.

Family	**Species**	**Adults seen feeding at sap?**	**Comments**
Anisopodidae	*Sylvicola cinctus* (Fabricius, 1787)	No	Two adult males emerged from bark collected from near sap exudations, and two females from soil and leaf litter collected from the base of the tree (determined from genitalia using the key in Hancock 1989).
Syrphidae	*Brachyopa scutellaris* Robineau-Desvoidy, 1843	No	Adults frequently seen between late April and early June. Males were often observed on root buttresses or on the ground between them, apparently waiting for females. Oviposition was not observed. Three females emerged from soil and humus collected in early spring from the base of the tree. Larvae are known to feed on sap (Rotheray 1996).
Syrphidae	*Brachyopa bicolor* (Fallén, 1817)	No	Adults infrequently seen. Oviposition was not observed. Five 3rd stage larvae found under loose bark in January – one reared to adult. Larvae are known to feed on sap (Rotheray 1996).
Syrphidae	*Ferdinandea cuprea* (Scopoli, 1763)	Yes	Adults frequent from early May to late July. Oviposition observed in bark crevices in exposed parts of root buttresses. Larvae were frequent in sap exudations. A puparium was found under loose bark near a sap exudation in August and a well-grown larva under loose bark in January (adult reared). An ichneumon *Bioblapsis polita* (Vollenhoven, 1878), believed to be restricted to *F. cuprea*, emerged from soil collected from the base of the tree in March.
Syrphidae	*Volucella inflata* (Fabricius, 1794)	Yes	Adults first seen at the tree in June 2014. In 2015, adults were frequent at the tree in June and July. Oviposition was observed on bark covering exposed parts of root buttresses. Larvae were not seen at sap

			exudations but are known to feed on sap (Rotheray 1999). Three 9-10 mm larvae were found under loose bark between January and March 2016.
Drosophilidae	*Drosophila immigrans* Sturtevant, 1921	Yes	Drosophilids were often abundant at the sap exudations as adults, with occasional specimens taken for identification. Several individuals of this species were identified and it appeared common. It is probable that *D. immigrans* larvae feed on sap exudations: the larvae of *D. littoralis*, which is in the same subgenus, *Drosophila* sensu stricto, have been reared from sap on a sycamore stump (Basden 1954).
Drosophilidae	*Drosophila obscura* Fallén, 1823	Yes	One adult specimen of this species was identified. Larval development occurs in sap exudations (Begon and Shorrocks 1978, Smith 1989).
Drosophilidae	*Drosophila tristis* Fallén, 1823	Yes	Four specimens of this species were taken as adults from sap exudations.
Drosophilidae	*Scaptodrosophila deflexa* (Duda, 1924)	No	23 males and 16 females emerged from leaf litter collected from the base of the oak in March. Frydenberg (1956) recorded the species from fermenting sap on oak in Denmark, where it was the most abundant species.
Muscidae	*Phaonia laeta* (Fallén, 1823)	Yes	Adults of both sexes were frequently seen. Oviposition was observed in bark crevices in dark places between root buttresses. Larvae were not seen at sap exudations but were likely to inhabit them (d'Assis-Fonseca 1952, Rotheray *et al.* 2001). Seven larvae were found under loose bark between January and March (adults reared).

Table 2. Species recorded feeding as adults on sap exudations but for which there was no evidence of larval development associated with sap exudations.

Family	Species	Frequency	Comments
Anisopodidae	*Sylvicola punctatus* (Fabricius, 1787)	Frequent	Adults of this genus were frequent on and around sap exudations. The few individuals identified to species were all *S. punctatus*.
Tabanidae	*Tabanus sudeticus* Zeller, 1842	Occasional	Both males and females were observed feeding on the sap (Fig. 4).
Syrphidae	*Volucella pellucens* (Linnaeus, 1758)	Two seen	
Dryomyzidae	*Dryomyza anilis* Fallén, 1820	Occasional	
Drosophilidae	*Leucophenga maculata* (Dufour, 1839)	One seen	Only one individual of this distinctive species was observed. The larvae are reported to feed in polypore and *Pleurotus* fungi (P. Chandler *pers. comm.*).
Anthomyiidae	*Delia florilega* (Zetterstedt, 1845)	One identified	Female
Anthomyiidae	*Hydrophoria lancifer* (Harris, 1780)	One identified	Male
Anthomyiidae	*Hydrophoria ruralis* (Meigen, 1826)	Two identified	Males
Fanniidae	*Fannia aequilineata* Ringdahl, 1945	Frequent	Females were frequent feeding on the sap (Fig. 7). Males were not seen at the tree. Larvae have been reared from detritus and the fungus *Pseudoinonotus dryadeus* (d'Assis-Fonseca 1968).
Fanniidae	*Fannia scalaris* (Fabricius, 1794)	One identified	Male
Fanniidae	*Fannia sociella* (Zetterstedt, 1845)	Two identified	Male and female

Fanniidae	*Fannia speciosa* (Villeneuve, 1898)	One identified	Female
Muscidae	*Hydrotaea militaris* (Meigen, 1826)	Occasional	
Muscidae	*Muscina levida* (Harris, 1780)	Occasional	
Muscidae	*Muscina prolapsa* (Harris, 1780)	Frequent	
Muscidae	*Phaonia errans* (Meigen, 1826)	Occasional	
Muscidae	*Phaonia pallida* (Fabricius, 1787)	Frequent	
Muscidae	*Phaonia subventa* (Harris, 1780)	Frequent	
Muscidae	*Phaonia tuguriorum* (Scopoli, 1763)	Frequent	
Muscidae	*Thricops nigrifrons* (Robineau-Desvoidy, 1830)	Two identified	Females
Calliphoridae	*Calliphora vomitoria* (Linnaeus, 1758)	Frequent	
Calliphoridae	*Lucilia caesar* (Linnaeus, 1758)	Frequent	
Calliphoridae	*Pollenia labialis* Robineau-Desvoidy, 1863	Occasional?	*Pollenia* individuals were seen occasionally: this was the only specimen taken and identified to species.
Calliphoridae	*Protocalliphora azurea* (Fallén, 1817)	One	Female

Table 3. Other species not recorded feeding as adults on sap and for which there was no evidence that they were using the sap exudations for larval development, but which nevertheless were apparently more frequent on or around the tree trunk than on or around other oak trunks in the immediate vicinity.

Family	**Species**	**Comments**
Xylophagidae	*Xylophagus ater* Meigen, 1804	Saproxylic larvae (Stubbs and Drake 2014). In May males were often seen visiting the tree, rapidly exploring the trunk and occasionally attempting to mate with each other.
Empididae	*Rhamphomyia crassirostris* (Fallén, 1816)	In April 2011, dense swarms of males and females were flying around tree.
Syrphidae	*Brachypalpus laphriformis* (Fallén, 1816)	Saproxylic larvae (Rotheray 1993). On two occasions in April 2011, single males were observed landing on a sunny patch on the tree trunk, making frequent sorties to investigate other insects of similar size, presumably mate searching. In the same month a female entered a hole in the base of the trunk and was not, after 10 minutes waiting, seen to re-emerge.
Syrphidae	*Episyrphus balteatus* (De Geer, 1776)	Males were frequently seen hovering in loose swarms around the tree.
Syrphidae	*Xylota segnis* (Linnaeus, 1758)	Saproxylic larvae (Rotheray 1993). Females were occasionally disturbed at the base of the tree between root buttresses.
Scathophagidae	*Scathophaga furcata* (Say, 1823)	Frequently seen sitting on the tree near sap exudations and occasionally seen mating on the tree.
Scathophagidae	*Scathophaga stercoraria* (Linnaeus, 1758)	Frequently seen sitting on the tree near sap runs and occasionally seen mating on the tree.
Fanniidae	*Fannia armata* (Meigen, 1826)	In July 2014, a loose swarm of males was seen flying around the tree on several occasions.
Fanniidae	*Fannia lustrator* (Harris, 1780)	Males occasionally observed hovering around the tree.

Fig. 4. Female *Tabanus sudeticus* feeding on sap, 22 July 2014.

Oviposition behaviour. Three sap exudation specialists, *Ferdinandea cuprea*, *Volucella inflata* and *Phaonia laeta*, were seen ovipositing on several occasions each (Figs 1, 5 and 8). In no instance were eggs placed in or even at the edge of sap flows. Rather they were placed on the outer surface of the bark, albeit usually within cracks, typically at least several centimetres away from sap exudations. In at least some of the places where eggs of the former two species were laid the bark was sound underneath.

Predators, parasitoids and hazards. The most obvious and numerous predators were hornets *Vespa crabro*, with several present on most occasions the tree was visited between July and September, both during daylight and at night. Although the hornets were primarily interested in feeding on the sap itself, they were observed seizing unwary flies on several occasions, in particular muscids and calliphorids. A female giant horsefly *Tabanus sudeticus* was watched being taken by a hornet. She was rapidly killed, and her head, wings and legs removed before her dorsum and abdomen were cut into three pieces and flown away, one at a time. The wasps *Vespula germanica* (Fabricius, 1793), *Vespula vulgaris* (Linnaeus, 1758) and in 2015, *Dolichovespula media* (Retzius, 1783) were also frequent and sometimes numerous: although they were not observed to attack or kill any flies, it is likely that they sometimes did so.

Fig. 5. ***Ferdinandea cuprea*** **ovipositing on sound bark about 10 cm from the nearest sap exudation, 22 May 2015.**

Fig. 6. ***Ferdinandea cuprea*** **larva moving away from a white sap exudation being probed by an ichneumon,** ***Bioblapsis polita*****, 5 June 2015.**

The sap attracted numerous predatory beetles. These included a number of ground beetles (Carabidae), although only *Pterostichus madidus* (Fabricius, 1775) appeared closely associated with the sap. When loose flaps of outer bark were temporarily removed, individuals of this species were often found actually on sap formations – although they may have been feeding on the sap, it is more probable that they was taking insect larvae from it (Luff 1974). Several rove beetles (Staphylinidae) were also recorded. The most notable of these was a single *Velleius dilatatus* (Fabricius, 1787) found on a sap run after the overlying patch of outer bark had been temporarily removed (Luff and Wolton 2016). This large species is associated with hornet nests, and adults have been observed at sap exudations caused by goat moths (Williams 1969). It is probable that the individual found was preying upon larvae in the sap. The predatory staphylinid *Quedius cruentus* (Olivier, 1795) was also recorded at the sap exudations.

Some flies may themselves have been predators on other flies. The larvae of *Phaonia laeta* are likely to prey upon larvae, including Diptera larvae, frequenting sap exudations: most *Phaonia* species are obligate carnivores (Smith 1989).

On 5 June 2015, after one of the loose flaps of outer bark had been temporarily removed, several larvae of *Ferdinandea cuprea* were seen moving rapidly away from a sap exudation – since the larvae were white and the wood across which they were moving dark, they were very obvious (Fig. 6). At the same time a female ichneumon *Bioblapsis polita* (Vollenhoven, 1878) was observed exploring the sap exudation, inserting her ovipositor into cracks within it. This species is an obligate parasitoid of *Ferdinandea cuprea* (Graham Rotheray *pers. comm.*, Mark Shaw *pers. comm.*): it is possible that the much rarer *F. ruficornis* (Fabricius, 1775) is also a host (Eck and Zwakhals 2015). On no other occasions were *F. cuprea* larvae observed outside sap exudations (within which they are well camouflaged). The behaviour observed was not a response to light since flaps of outer bark covering occupied sap runs were removed on frequent occasions without larvae leaving the sap. It appeared to be an escape response to the presence of the ichneumon. A wide range of host behavioural defences against parasitoids have been described (Gross 1993), and the escape response described here would not appear exceptional. Another *B. polita* individual emerged from soil collected in March from the base of the tree, as noted in Table 1. A female ichneumon of another species, *Rhembobius perscrutator* (Thunberg, 1824), was observed below one of the oak's sap runs – this is a known parasitoid of sap exudation syrphid larvae (Mark Shaw *pers. comm.*).

The tree also attracted insectivorous birds, with great spotted woodpecker *Dendrocopos major*, European robin *Erithacus rubecula* (Linnaeus) and chaffinch *Fringilla coelebs* Linnaeus frequently disturbed from the base of the tree. It is likely that rodents such as the wood mouse *Apodemus sylvaticus* preyed upon insects at the tree at night, and may have accounted for the aggregations of moth wings sometimes seen.

The sap itself proved a hazard to some flies, with several adult individuals of *Sylvicola punctatus* (Linnaeus) found securely trapped in the sticky exudate.

Other insects present at sap exudations. Along with larvae of *Ferdinandea cuprea* and probably of drosophilid and *Sylvicola* species, the sap had at times abundant larvae of sap beetles (Nitidulidae), known specialists of sap exudations (Luff and Wolton 2016). Four species were recorded as adults *Cryptarcha strigata* (Fabricius, 1787), *Cryptarcha undata* (Olivier, 1790), *Epuraea guttata* (Olivier, 1811) and *Soronia grisea* (Linnaeus, 1758). The staphylinid *Thamiaraea cinnamomea* (Gravenhorst, 1802), another sap exudation specialist, was frequent. The occurrence of the predatory beetles *Pterostichus madidus*, *Velleius dilatatus* and *Quedius cruentus* has already been noted.

Among the Hymenoptera, in addition to the wasps and ichneumons already mentioned, adult bumblebees *Bombus terrestris* (Linnaeus, 1758) were occasional visitors to the sap, feeding upon it.

A diversity of Lepidoptera frequented the tree. Red admiral butterflies *Vanessa atalanta* (Linnaeus, 1758) were often seen feeding on the sap, with peacock *Aglais io* (Linnaeus, 1758) and comma *Polygonia c-album* (Linnaeus, 1758) occasionally doing so. A range of moths were recorded feeding on the sap at night, with copper underwings, both *Amphipyra pyramidea* (Linnaeus, 1758) and *A. berbera* Fletcher, 1968, being the most frequent. Other moths commonly recorded were dark arches *Apamea monoglypha* (Hufnagel, 1766), large yellow underwing *Noctua pronuba* Linnaeus, 1758 and peach blossom *Thyatira batis* (Linnaeus, 1758). A single red underwing *Catocala nupta* (Linnaeus, 1767) was the only individual of this species recorded in the area over a period of 20 years: it is an uncommon moth in north Devon (McCormick 2001).

Fig. 7. Female *Fannia aequilineata* feeding on sap, 9 August 2014.

Rare and scarce species recorded. Eight species of fly and beetle currently considered nationally rare or scarce were recorded at the sap exudations, as listed in Table 4. In addition the ichneumon *Bioblapsis polita* has been very rarely recorded in the British Isles (Mark Shaw *pers. comm.*). Two further beetles, both sap exudation specialists, have rarely been recorded in Devon: *Thamiaraea cinnamomea* (Gravenhorst, 1802), known from one other site, and *Soronia grisea* (Linnaeus, 1758), known from three other sites (Luff and Wolton 2016).

Table 4. Rare and scarce species of Diptera and Coleoptera recorded at sap exudations.

Order	**Family**	**Species**	**British status**	**British status reference**	**Status in Devon (Luff and Wolton 2016, M. Drake *pers. comm.*)**
Coleoptera	Staphylinidae	*Velleius dilatatus*	Endangered (RDB1)	Hyman 1994	Recorded from one other site, probably in 1950s
Coleoptera	Nitidulidae	*Cryptarcha strigata*	Nationally scarce	Hyman 1994	Recorded from three other sites
Coleoptera	Nitidulidae	*Cryptarcha undata*	Nationally scarce	Hyman 1994	Not previously recorded
Coleoptera	Nitidulidae	*Epuraea guttata*	Nationally scarce	Hyman 1994	Recorded from one other site, in 1990

Diptera	Syrphidae	*Brachyopa bicolor*	Nationally scarce	Ball and Morris 2014	Recorded from 6 other sites
Diptera	Fanniidae	*Fannia aequilineata*	Nationally scarce	Falk and Pont in prep.	Recorded from one other site, in 2013
Diptera	Fanniidae	*Fannia speciosa*	Nationally scarce	Falk and Pont in prep.	Recorded from one other site, in 1900
Diptera	Muscidae	*Phaonia laeta*	Nationally scarce	Falk and Pont in prep.	Not previously recorded

Discussion

As noted by Cole and Streams (1970) and Godfrey and Whitehead (2001), different tree species and different types of sap exudation (e.g. brown or white) attract different suites of insect species. Comparing the results of this study with those of others, it appears that even within the same tree species (oak) and the same broad type of exudation (white), associated Diptera communities can differ considerably. Thus the list of fly species recorded by Godfrey and Whitehead (2001) over five years at two mature oaks with sap-flows at Brayton Barff in North Yorkshire, England, differs considerably from that in this study: although the total number of species found was similar (62 species in their study, 64 in this one), only 13 species were common to both studies. In both cases pedunculate oak was involved and the sap exudations were white: however, those at Brayton Barff were described as frothy and smelling of vinegar, while those in the current study were not frothy and smelled sweetly of the type of fermentation associated with making alcoholic drinks. The fly fauna recorded over several days by d'Assis-Fonseca (1952) at a *Cossus*-infested ancient oak in the New Forest was more similar to that reported here. Here too the oak had a sweet odour of fermentation. Of the 32 species he lists, 15 were found in this study. Just nine species were common to all three studies: *Ferdinandea cuprea*, *Drosophila tristis*, *Fannia aequilineata*, *F. scalaris*, *Muscina prolapsa*, *M. levida*, *Phaonia errans*, *P. pallida*, *P. subventa* and *Lucilia caesar*.

In all three studies drosophilids and calypterates were the most species-rich taxonomic groups. Fox Wilson (1926) also recorded *P. errans*, *P. pallida*, *M. prolapsa* and *L. caesar* among the 19 Diptera species he observed over a five-year period at white sap exudations on an oak growing in the Royal Horticultural Society's Gardens at Wisley, Surrey (England). These sap runs emanated from excrescences or burrs, were frothy and smelled of beer. Presumably the difference in odour between sap runs reflects differences in microbial communities.

It is curious that only adult *Sylvicola punctatus* were observed feeding on the sap yet only *S. cinctus* emerged from bark or soil samples taken from the tree. It seems probable that individuals of *S. cinctus* were missed among the numerous *Sylvicola* present at the sap; *S. cinctus* has previously been reared twice from sap runs on birch *Betula* (P. Chandler *pers. comm.*, Chandler 2010). Keilin (1921) reports finding the larvae and pupae of *S.* (as *Rhyphus*) *fenestralis* in decomposed sap in wounds in elm trees in Cambridge (England), and Cole and Streams (1970) reported finding larvae of this species (together with *S. alternatus* (Say, 1823)) within brown sap exudations on elms and oaks in New England (USA). However, the *S. fenestralis* specimens in these earlier papers may have been misidentified since confusion between this species and *S. cinctus* has been frequent (Hancock 1989, P. Chandler *pers. comm.*). Nevertheless, *S. fenestralis* larvae do occur in sap exudations, since both this species and *S. cinctus* have been reared from the same sap run (G. Hancock *pers. comm.*). The larvae of *S. punctatus* are thought to be strongly associated with cow manure (Skidmore 2010).

Single specimens of the sap exudation specialists *Ferdinandea ruficornis* and *Periscelis annulata* (Fallén, 1813) were caught in a Malaise trap set at a hedge 100m away in 2011 and 2012 (Wolton *et al.* 2014). As such, both may have been expected to be recorded at the oak: however, neither was. d'Assis-Fonseca (1952) recorded *F. ruficornis* at the *Cossus*-infested oak he observed in the New Forest, while *P. annulata* has been found at oak sap flows (Godfrey and Whitehead 2001, Ivan Perry *pers. comm.*) as well as on other trees such as ash *Fraxinus* and maple *Acer* (Rotheray and Robertson 1998), beech *Fagus* (Lamb 1904) and elm *Ulmus* (Rognes and Hansen 1996). A single *Phaonia cincta* (Zetterstedt, 1846), another species with larvae associated with sap exudations (d'Assis-Fonseca 1968), was caught in a Malaise trap 1km away in 2015.

No accounts of the oviposition behaviour of *Ferdinandea cuprea*, *Volucella inflata* and *Phaonia laeta* appear to have been published before. That all three species deposited their eggs on the surface of bark well away from the sap exudations is of interest, especially since in at least some places the bark was still firmly attached to the xylem beneath. Graham Rotheray (*pers. comm.*) has also observed that sap specialists oviposit some distance away from exuding sap. The first instar larvae, if feeding directly on sap exudations, would have to make a considerable journey across the bark surface to reach them. Perhaps this explains why *F. cuprea* and *V. inflata* at least lay large numbers of eggs (*pers. obs.*, Graham Rotheray *pers. comm.*) – mortality rates of young larvae could be high. Further research is warranted here. Despite at times being numerous around the tree, *Brachyopa* species were not seen ovipositing, suggesting either that eggs are laid out of sight under flaps of bark or that egg laying takes place early or late in the day.

Fig. 8. Female *Phaonia laeta*, 9 July 2015.

The only fly species with larvae found actually within sap exudations was *F. cuprea*. The flexible white and usually slow moving larvae of this species were well concealed within the thick white sap and only became apparent when escaping from the ichneumon *Bioblapsis polita* (see above) or once sap samples were examined *ex situ*. Only the massed and more mobile larvae of sap beetles (Nitidulidae) were at times obvious to the naked eye in sap formations *in situ*. It seems likely that larvae of smaller fly species such as of *Sylvicola* or drosophilids were overlooked. However, the brown larvae of *Brachyopa* and large larvae of *Volucella inflata* should have been obvious if feeding within the sap exudations. The forked setae which occur in rows across the dorsum of *Brachyopa* larvae would surely have caused them to become trapped in mature sap exudations since these were viscous: it seems probable that they were feeding on sap just released from the tree while it was still runny and clear, before turning white and thick with age. It is possible that *V. inflata* larvae occupy the same niche. The mouth parts of both *Brachyopa* and *V. inflata* larvae suggest they feed by filtering micro-organisms from fluids (Rotheray 1999). As Rotheray (1996) noted, the uneven integument of *Brachyopa* larvae frequently becomes coated with dried sap and other debris, making the larvae difficult to see and perhaps difficult to detect by gustatory or tactile clues. Martin Speight (*pers. comm.*) reports finding *Brachyopa* larvae on the edge of sap runs where they blend in with the wood colour.

The use of the tree's sap exudations by eight nationally rare or scarce beetle and fly species, and a rarely recorded ichneumon, confirms the importance of trees with sap runs or flows for insect conservation. The tree was of particular conservation significance within the context of Devon, three of the species recorded not currently known from any other sites in Devon (one beetle, one fly and one ichneumon), and four currently known from only one other site. The loss of this tree with its prolific sap exudations is likely to have a significant impact on at least local populations of species dependent on sap exudations.

At least seven other nationally scarce or rare Diptera are known to have larval stages associated with sap exudations. These are *Ferdinandea ruficornis*, *Periscelis annulata* and *Phaonia cincta*, species already mentioned as occurring in the vicinity of the oak examined in this study, and several which are not known to occur in Devon (M. Drake *pers. comm.*): *Xylota tarda* Meigen, 1822; *Aulacigaster leucopeza* (Meigen, 1830); *Phortica variegata* (Fallén, 1823) and *Phaonia pratensis* (Robineau-Desvoidy, 1830) (Ball and Morris 2014, Falk and Chandler 2005, Falk and Crossley 2005, Falk *et al*. 2016, Falk and Pont in prep.).

In 2015, a plan was conceived to try and inoculate nearby trees with sap taken from the oak. The receptor trees were to be stressed using a range of 'veteranisation' methods such as using climbing spikes to damage bark, hitting the tree base repeatedly with a sledgehammer, or even burning the base of the trunk (Bengtsson *et al*. 2015). The unexpected death of the donor tree before this could be tried is unfortunate.

Conclusions

This study confirms that the insect fauna associated with sap exudations is not only diverse but likely to vary considerably according to the type of the sap (e.g. white or brown), the tree species and geographic location. Individual trees with vigorous sap exudations that run for several years, like the one reported on here, are rarely encountered and likely to be of considerable conservation significance in the context of the local landscape, perhaps even in a regional context. These trees should be valued and protected. Field naturalists and those employed to assess the wildlife importance of sites should be trained to recognise sap exudations and encouraged to support landowners and managers to retain and care for the trees involved. Deliberately damaging trees (i.e. veteranisation) should be considered, where sap exudations are scarce, to promote continuity of habitat.

Acknowledgements

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References

d'Assis-Fonseca, E.C.M. 1952. Diptera attracted by a *Cossus*-infested Oak-tree. *The Entomologist's Record and Journal of Variation* **64,** 360-361.

d'Assis-Fonseca, E.C.M. 1968. Diptera Cyclorrhapha. Calyptrata. Section (b) Muscidae. *Handbooks for the Identification of British Insects* **10**(4b)**,** 119pp. Royal Entomological Society of London.

Ball, S.G. and Morris, R.K.A. 2014. A review of the scarce and threatened flies of Great Britain. Part 6: Syrphidae. *Species Status* **9,** 1-130. Joint Nature Conservation Committee, Peterborough.

Basden, E.B. 1954. The distribution and biology of Drosophilidae (Diptera) in Scotland, including a new species of *Drosophila*. *Transactions of the Royal Society of Edinburgh* **62,** 603-654.

Begon, M. and Shorrocks, B. 1978. The feeding- and breeding-sites of *Drosophila obscura* Fallén and *D. subobscura* Collin. *Journal of Natural History* **12,** 137-151.

Bengtsson, V., Niklasson, M. and Hedin, J. 2015. Tree veteranisation – using tools instead of time. *Conservation Land Management* **13**(2)**,** 14-17.

Chandler, P. 2010. Associations with Fungi and Mycetozoa. pp 417-441. **In** Chandler, P.J. (Ed). *A Dipterist's Handbook* (2nd edition). 525 pp. The Amateur Entomologists' Society, Orpington, Kent.

Cole, E.J, Jr. and Streams, F.A. 1970. Insects emerging from brown slime fluxes in southern New England. *The Canadian Entomologist* **102,** 321-333.

Eck, van A. and Zwakhals, C.J. 2015. *Bioblapsis polita* (Hymenoptera:Ichneumonidae) gekweekt uit *Ferdinandea*-puparia (Diptera: Syrphidae). *Entomologische Berichten* **75**(6)**,** 247-251.

Falk, S.J. and Chandler, P.J. 2005. A review of the scarce and threatened flies of Great Britain. Part 2: Nematocera and Aschiza not dealt with by Falk (1991). *Species Status* **2,** 1-189. Joint Nature Conservation Committee, Peterborough.

Falk, S.J. and Crossley, R. 2005. A review of the scarce and threatened flies of Great Britain. Part 3: Empidoidea. *Species Status* **3,** 1-134. Joint Nature Conservation Committee, Peterborough.

Falk, S.J. and Pont, A.C. (in preparation). A review of the scarce and threatened flies of Great Britain. Calyptratae. *Species Status*. Natural England.

Falk, S.J., Ismay, J.W. and Chandler, P.J. 2016. A Provisional Assessment of the Status of Acalyptratae flies in the UK. Natural England Commissioned Reports, Number 217.

Fox Wilson, G.D. 1926. Insect visitors to sap-exudations of trees. *Transactions of the Entomological Society of London* **74,** 243–254.

Frydenberg, O. 1956. The Danish species of *Drosophila* (Dipt.). *Entomologiske Meddelelser* **27,** 249–294.

Godfrey, A. and Whitehead, P.F. 2001. The Diptera, Coleoptera and other invertebrates recorded from oak sap-flows at Brayton Barff, North Yorkshire. *British Journal of Entomology and Natural History* **14,** 65-84.

Gross, P. 1993. Insect behavioral and morphological defences against parasitoids. *Annual Review of Entomology* **38,** 251-273.

Hancock, E.G. 1989. Notes on the window gnats, Genus *Sylvicola* (Diptera; Anisopodidae), in Scotland. *The Scottish Naturalist* **1989,** 3-13.

Hyman, P.S. (revised and updated by Parsons, M.S.). 1994. A review of the scarce and threatened Coleoptera of Great Britain. Part 2. *UK Nature Conservation* **12,** 1-248. Joint Nature Conservation Committee, Peterborough.

Keilin, D. 1921. On the life-history of *Dasyhelea obscura*, Winnertz (Diptera, Nematocera, Ceratopogonidae), with remarks on the parasites and hereditary bacterian symbiont of this midge. *The Annals and Magazine of Natural History*, 9th Series **8,** 576-590.

Lamb, C.G. 1904. *Periscelis annulata* Fall., a drosophilid new to Britain. *Entomologist's monthly magazine* **114,** 233-235.

Luff M.L. 1974. Adult and larval feeding habits of *Pterostichus madidus* (F.) (Coleoptera: Carabidae). *Journal of Natural History* **8,** 403-409.

Luff, M.L. and Wolton, R.J. 2016. *Velleius dilatatus* (Fabricius) (Staphylinidae) and other notable beetles from North Devon. *The Coleopterist* **25**(1)**,** 7-10.

MacGowan, I. 1991 (revised 1997). The entomological value of aspen in the Scottish Highlands. *Malloch Society* Report Number 1. 23 pp.

McCormick, R. 2001. *The moths of Devon*. 328pp. Roy McCormick, Buckfastleigh.

Perry, I. and Rotheray, G.E. 2010. Dead wood and sap runs. pp 144-157. **In** Chandler, P.J. (Ed). *A Dipterist's Handbook* (2nd edition). 525 pp. The Amateur Entomologists' Society, Orpington, Kent.

Rognes, K. and Hansen, L.O. 1996. Further records of rare flies from Norway (Diptera: Periscelididae, Stratiomyidae, Scathophagidae, Muscidae, Fanniidae, Calliphoridae, Rhinophoridae, Sarcophagidae, Tachinidae). *Fauna norvegica Serie B* **43**, 75-79.

Rotheray, G.E. 1993. Colour guide to hoverfly larvae (Diptera, Syrphidae) in Britain and Europe. *Dipterists Digest* (*First Series*) **9,** 1-156.

Rotheray, G.E. 1996. The larva of *Brachyopa scutellaris* Robineau-Desvoidy (Diptera: Syrphidae), with a key to and notes on the larvae of British *Brachyopa* species. *Entomologist's Gazette* **47,** 199-205.

Rotheray, G.E. 1999. Descriptions and a key to the larval and puparial stages of north-west European *Volucella* (Diptera, Syrphidae). *Studia dipterologica* **6**(1)**,** 103-116.

Rotheray, G.E., Hancock, G. Hewitt, S., Horsfield, D., MacGowan, I., Robertson D. and Watt. K. 2001. The biodiversity and conservation of saproxylic Diptera in Scotland. *Journal of Insect Conservation* **5,** 77–85.

Rotheray, G.E. and Robertson, D. 1998. Breeding habits and early stages of seven saproxylic acalypterates (Diptera). *Dipterists Digest* (*Second Series*) **5,** 96-107.

Skidmore, P. 2010. Dung. pp 157-165. **In** Chandler, P. J. (Ed). *A Dipterist's Handbook* (2nd edition). 525 pp. The Amateur Entomologists' Society, Orpington, Kent.

Smith, K.G.V. 1989. An introduction to the immature stages of British flies. *Handbooks for the identification of British insects* **10**(14). 163pp. Royal Entomological Society of London.

Stubbs, A.E. and Drake, M. 2014. *British soldierflies and their allies*. Second edition. 528 pp. British Entomological and Natural History Society, Reading.

Williams, S.A. 1969. *Velleius dilatatus* F. (Col., Staphylinidae) in the New Forest. *Entomologist's monthly magazine* **105,** 54.

Wolton, R. J., Bentley, H., Chandler, P. J., Drake, C. M., Kramer, J., Plant, A. R. and Stubbs, A. E. 2014. The diversity of Diptera associated with a British hedge. *Dipterists Digest* (*Second Series*) **21,** 1-36.

Dipterists Digest 2016 **23**, 137-140

The current status of *Chamaepsila unilineata* (Zetterstedt) (Diptera, Psilidae)

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Summary

Following recent European work, an examination of British *Chamaepsila unilineata* (Zetterstedt, 1847) confirms that it should be re-instated as a good species on the British list.

Chamaepsila unilineata (Zetterstedt, 1847) was described (as *Scatophaga*) from a male and female from Norway, and Becker (1905) listed *C. unilineata* as a good species in his Palaearctic Catalogue. According to Shatalkin and Merz (2010), Séguy (1934) inadvertently included *unilineata* in his *Faune de France* key under the name *debilis* (Egger).

Hennig (1941) stated that he found no differences in the hypopygium of *C. pallida* (Fallén, 1820) and *C. unilineata*, so included *C. unilineata* as a variety of *C. pallida*. He also noted that it occurred in the same localities as *pallida*.

Collin (1944) included *unilineata* in his table of British *Psila* as a good species, noting the long aristal pubescence, and the variability of the thoracic markings. He recorded it as 'not uncommon' in Woodditton Wood and Chippenham Fen (Cambridgeshire).

Soós (1985) examined the Zetterstedt collection and designated a lectotype male and paralectotype female of *C. unilineata*. He described the specimens in some detail but said that the genitalia of *C. pallida* and *C. unilineata* show no significant differences, so concluded that *C. unilineata* was a junior synonym of *C. pallida*. Wang (1988) included *C. unilineata* in her key to West Palaearctic species of *Chamaepsila*, but only as a variety of *C. pallida*. The current checklist of British Diptera (Chandler 1998) listed *C. unilineata* as a synonym of *C. pallida*.

Shatalkin and Merz (2010) produced a revised key to European species of the *Chamaepsila pallida* group, and demonstrated that *C. unilineata* is a good species based on external and genitalia characters. They also gave further details about the history of the species in this group. Examination of British specimens of *C. unilineata* confirm that it is a good species, distinct from *C. pallida*, and should be removed from synonymy with *C. pallida*.

Typical *C. unilineata* have distinctive stripes on the thorax, while that of *C. pallida* is unmarked (Fig. 1). However, *C. unilineata* sometimes lacks the typical markings, though the postnotum in *C. unilineata* always has a dark centre, whereas that of *C. pallida* is concolorous with the rest of the thorax (Fig. 2). Collin (1944) also noted that the occipital markings (Fig. 1) are retained in those *C. unilineata* which lack the thoracic markings. The aristal hairs of *C. pallida* are shorter than those of *C. unilineata* (Fig. 3).

Fig. 4 shows the cleared genital capsule of both species, and Fig. 5 shows lateral and ventral views of the postgonites (= parameres). The exceptionally large teeth on the postgonites of *C. unilineata* are easily visible even in the undissected preparation. *Chamaepsila unilineata* will key out readily using Collin's (1944) key, but it should be noted that its couplet partner (*C. nigrosetosa* Frey) is currently listed as a synonym of *C. pallida* (Chandler, 1988), although Shatalkin and Merz (2010) have suggested that it also may be a good species. Roháček *et al.* (2016) also consider it a good species, but note that most, if not all, of the *C. nigrosetosa*

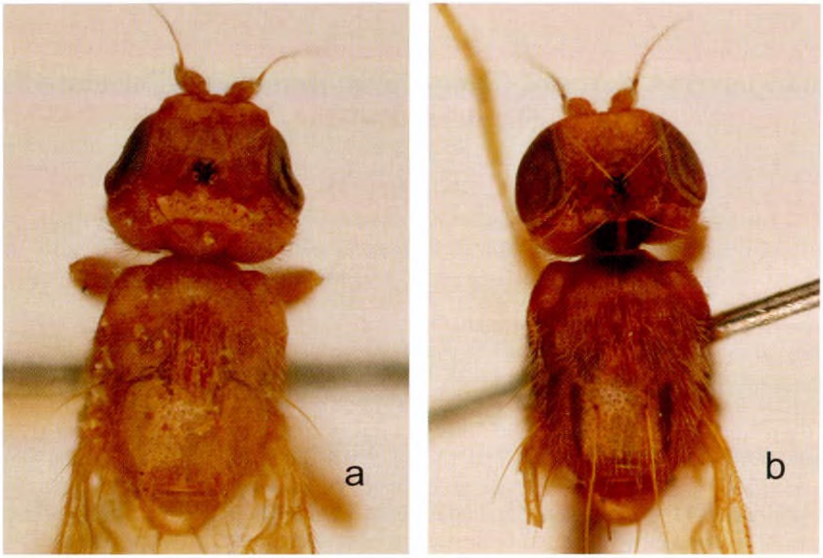

Fig. 1. Head and thorax of *Chamaepsila* species: a, *C. pallida*; b, *C. unilineata*.

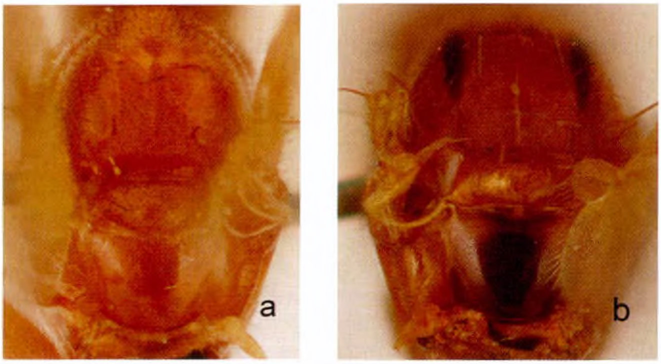

Fig. 2. Postnotum of *Chamaepsila* species: a, *C. pallida*; b, *C. unilineata*.

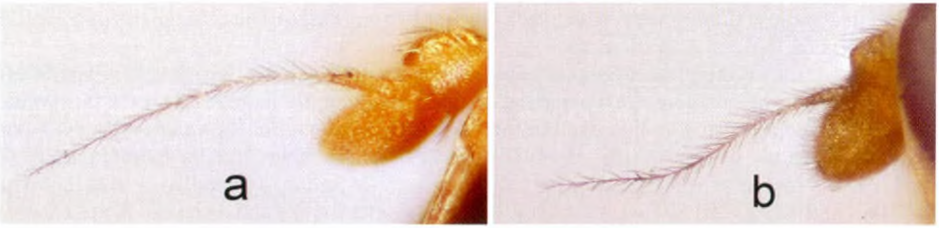

Fig. 3. Antenna of *Chamaepsila* species: a, *C. pallida*; b, *C. unilineata*.

Fig. 4. Cleared male genitalia of *Chamaepsila* species: a, *C. pallida*; b, *C. unilineata*. Scale line = 0.1mm.

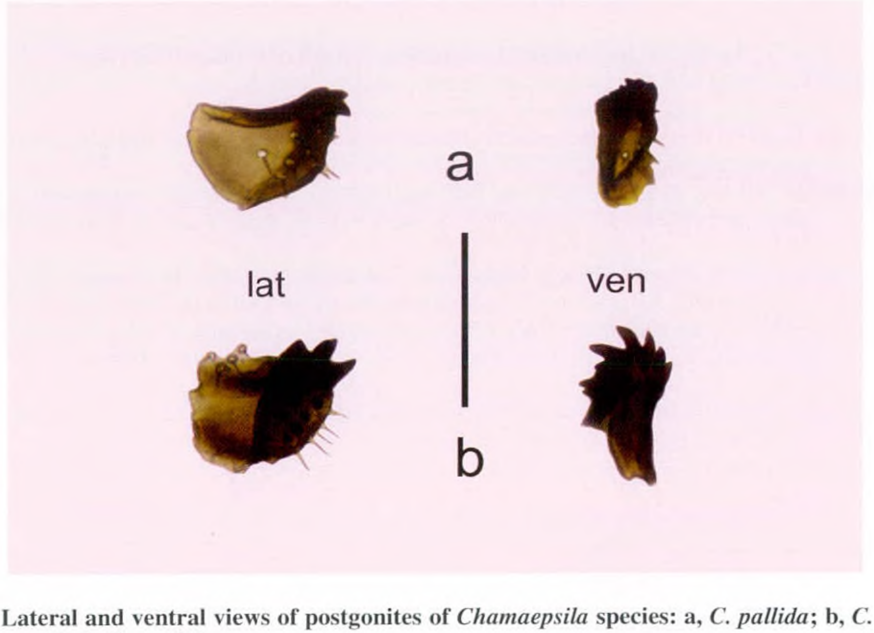

Fig. 5. Lateral and ventral views of postgonites of *Chamaepsila* species: a, *C. pallida*; b, *C. unilineata*. Scale line = 0.1mm.

records from the Czech Republic and Slovakia refer to *C. andreji* (Shatalkin, 1996) which leaves the identity of British *nigrosetosa* open to doubt, and requiring further investigation. Roháček (*pers. comm.*) considers the whole group in need of revision.

The distribution of *C. unilineata* in Europe extends from Britain to Slovakia and from Scandinavia to Switzerland. In Britain, it is known from Cambridgeshire (Chippenham Fen and Woodditton Wood), Gloucestershire (Cowley), Hereford (Howle Hill and Stoke Wood), Inverness (Aviemore, Loch Alvie, Loch Ussie and Nairn), Moray (Forres) and Ross (Kinrara), and the dates of capture are in June and July.

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References

Becker, T. 1905. *Katalog der paläarktischen Dipteren IV: Cyclorrhapha Schizophora: Holometopa.* 1-328. Budapest.

Chandler, P.J. (Ed.) 1998. Checklists of insects of the British Isles (New Series). Part 1: Diptera. *Handbooks for the Identification of British Insects* **12**(1), i-xix, 1-234. Royal Entomological Society, London [latest update available at *www.dipteristsforum.org.uk*].

Collin, J.E. 1944. The British species of Psilidae (Diptera). *Entomologists monthly Magazine* **80,** 214-224.

Hennig, W. 1941. 41. Psilidae. **In** Lindner, E. (Ed.) *Die Fliegen der palaearktischen Region* **5** (41), 1-38.

Roháček, J., Barták, M. and Preisler, J. 2016. New records of Psilidae, Piophilidae, Lauxaniidae, Cremifaniidae and Sphaeroceridae (Diptera) from the Czech Republic and Slovakia. *Acta Musei Silesiae, Scientiae Naturales* **65,** 51-62.

Séguy, E. 1934. Diptères (Brachycères) (Muscidae Acalypterae et Scatophagidae). *Faune de France* **28,** i-iv + 1-832.

Shatalkin, A.I. and Merz, B. 2010. The Psilidae (Diptera, Acalyptrata) of Switzerland, with description of two new species from Central Europe. *Revue Suisse de Zoologie* **117**(4), 771-800.

Soós, Á. 1974. Taxonomische und faunistische Untersuchungen über die Psiliden (Diptera) aus der Mongolei. *Annales Historico-naturales Musei Nationalis Hungarici* **66,** 241-250.

Soós, Á. 1985. Untersuchungen einiger Psilide-typen aus der Zetterstedt'schen Sammlung nebst Beschreibung einer neuen Art (Diptera: Psilidae). *Acta Zoologica Hungarica* **31,** 235-244.

Wang, X. 1988. Bestimmungstabelle der westpaläarktischen *Chamaepsila*-Arten (Diptera: Psilidae). *Stuttgarter Beiträge zur Naturkunde*. Ser. A. **417,** 1-13.

Zetterstedt, J.W. 1847 *Diptera Scandinaviae disposita et descripta*. Lund. **6,** 2163-2580.

Dipterists Digest 2016 **23**, 141-149

Amplified description of *Microtendipes brevitarsis* Brundin and *M. nigritia* sp.n. described from Scotland (Diptera, Chironomidae)

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Summary

Microtendipes sp. a in Langton and Pinder (2007) is formally validated as *M. nigritia* sp. n. after comparison with *M. brevitarsis* Brundin, 1947, a little-known species of similar adult coloration. Both species are described in full, incorporating new characters of use in the separation of species in this genus. A lectotype is designated for *M. brevitarsis* Brundin. The taxonomic diagnosis for adults in *Microtendipes* Kieffer is emended concerning a couple of morphological characters.

Introduction

Some *Microtendipes* specimens collected from a swarm on the bank of Loch Assynt on 28 May 1981 were initially considered to represent *M. chloris* 'var. *lugubris*' Kieffer sensu Edwards (1929). During the preparation of the key to adult male Chironomidae of Britain and Ireland (Langton and Pinder 2007), I realised that these specimens were quite distinct from *M. chloris* (Meigen, 1818) and incorporated the morphotype in the key as '*Microtendipes* sp. a'. No comment on this form has reached me through either personal communication or publication; thus I decided to investigate its specific identity. Martin Spies (ZSM, Munich, Germany) suggested to me that *M. brevitarsis* Brundin (1947) might be worth including in the investigation. *Microtendipes brevitarsis* was described from specimens collected from Lake Innaren (Sweden, Småland) 'auf Björkholmen und an den Ufern' (Brundin 1947: 62). Specimens collected by Brundin were borrowed from the Swedish Museum of Natural History Department of Entomology, including four original syntypes and five without type status. The species has been reported from Denmark, Finland, Norway and Sweden (Sæther and Spies 2013), thus is not unlikely to turn up in Scotland. Here, *M. brevitarsis* is redescribed to include characters not mentioned in the original description, *M.* sp. a is described fully as *M. nigritia* sp. n. and, for completeness, the very similar *M. chloris* (Meigen, 1818) and *M. pedellus* (De Geer, 1776) are considered as well.

Like so many other genera in Chironomidae, *Microtendipes* has been in need of thorough systematic revision. The reader is asked to appreciate that the scope of the present contribution was more limited, and that some taxonomic interpretations made below might be altered by a large-scale review.

Microtendipes brevitarsis **Brundin**, 1947

Material. Specimens from Sweden collected by Brundin, as follows: 1♂ (NHRS-BYWS000002071), Småland, Lake Innaren, Kråkenäs Bay (Brundin 1949: 755), 8.v.1945, here designated lectotype to promote the stability of nomenclature; 1♂ (NHRS-BYWS000002070), as previous, but paralectotype; 2♂ (NHRS-BYWS000002109, 2110), Småland, Lake Innaren, Björkholmen Island (Brundin 1949: 755), 6.v.1945, paralectotypes; 2♂ (NHRS-BYWS000002100, 2101), Jämtland, Lake Leipikvattnet, 6.vii.1946; 2 ♂ (NHRS-BYWS000002120, 2121), Jämtland, Lake Friningen, 7.vii.1946; 1♂ (NHRS-BYWS000002124), Jämtland, Lake Kallsjön, 14.vi.1946. All specimens returned to the Swedish Museum of Natural History, Department of Entomology.

Description. (For all the following descriptions the morphological terminology is as in Sæther 1980). The mean is given in parenthesis; n=9, unless otherwise stated. Total length 5.0-6.0 mm (m=5.46 mm, n=8). Wing length (arculus to wing tip) 3.14-4.10 (3.58) mm. Colour (after 70 years in alcohol/glycerin preservative) pale brownish yellow with thorax darker tan to brown (Brundin 1947, page 62: 'Thorax glänzend schwarz, nicht bereift, Abdomen braunschwarz, Beine heller oder dunkler schwarzbraun.'). Setae of abdomen and legs pale.

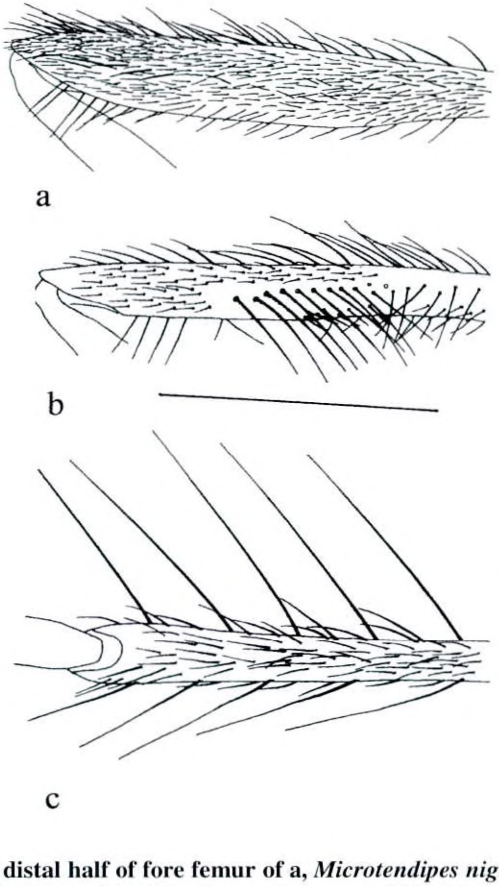


Fig. 1. Outer face of distal half of fore femur of a, *Microtendipes nigritia* and b, *M. chloris*; c, ventral aspect of distal quarter of the fore metatarsus of *M. chloris*. Scale line = 0.5 mm.

Head. Eyes bare, dorsally with a long inward narrowing projection more rapidly narrowed to the bluntly rounded tip, 5(6) ommatidia wide in mid section. Temporal setae 15-32 (22.2). Clypeals 28-35 (31.1, n=7). Frontal tubercles absent. Palp 5-segmented, palpomere lengths (µm): 48-80 (68), 60-80 (71.1), 220-300 (252), 200-288 (234.2), 248-300 (280.4).

Antenna with 13 flagellomeres, Fm 4-12 1.14-2.0 (1.5) times as wide as long. Antennal ratio (AR) 2.80-3.56 (3.06).

Thorax. Acrostichals situated on the anterior declivity of the thorax, difficult to see: up to 5 detected. Dorsocentrals: 14-27 (17.75, n=8), 0-2 situated anterior to the parapsidal suture (0.5, n=8). Supraalars 0. Prealars 6-10 (7.4, n=5). Scutellar setae visible only on one side 7-14 (10.4, n=7), so approximately twice this number in total.

Wing. Setation: R with 15, 25 setae; R_1 with 14, 22 and R_{4+5} with 5 (n=2). Squama with 19-22 (20.7, n=7) setae.

Legs. Fore femur without reflexed setae (Fig. 1a). Lengths and proportions (measurements in μm):

	fe	ti	ta1	ta2
p1	1500-1800 (1640)	1500-1800 (1642)	1260-1540 (1402)	700-900 (789)
p2	1500-1820 (1636)	1460-1820 (1598)	660-980 (762)	440-580 (480)
p3	1600-2000 (1740)	1600-2060 (1764)	1000-1400 (1118)	660-880 (736)

	ta3	ta4	ta5	BR	LR
p1	560-680 (638)	420-540 (467)	220-260 (247)	1.6-2.0 (1.81)	0.81-0.89 (0.85)
p2	340-440 (378)	220-300 (251)	180-240 (202)	1.7-2.7 (2.36)	0.44-0.56 (0.48)
p3	520-680 (569)	300-380 (316)	200-240 (238)	1.5-2.7 (2.35)	0.59-0.68 (0.64)

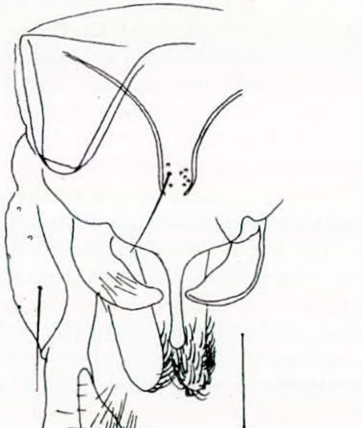


Fig. 2. ***Microtendipes brevitarsis*****: a, hypopygium; b, position of retractor muscle of the inner posterior border of tergite IX. mv = median volsella. Scale line = 0.1mm.**

Abdomen. Tergites and sternites covered with irregularly arranged setae that are erect dorsally, inclined posteriad ventrally, longest setae dorsally 0.33-0.44 (0.35, n=5) x length of tergite, ventrally 0.33-0.42 (0.34, n=4) x length of sternite.

Hypopygium (Fig. 2a). Central part of tergite IX with 2-8 setae on each side of mid-line, 6-14 in total (9.1, n=7). Anal point 90-104 µm long (98, n=7), narrow, narrowing a little towards the weakly spatulate apex. Superior volsella curved inward, widest near middle, broadly rounded apically. Volsella bare except for 6-10 (8.25, n=8) medio-dorsal setae; a single baso-ventral seta (32µm long) detected on one side of one specimen only. Median volsella very weak, rarely protruding even a little. Inferior volsella covered with microtrichia, the clubbed end bearing numerous setae that are curved basad. Laterotergite IX with 3-6 (4.6, n=8) setae; gonocoxite 160-200 µm long (172, n=8) with 6-19 (12.9, n=8) long setae, setae 0.84-1.06 (0.95, n=8) x length of gonocoxite. Gonostylus 208-240 µm long (218, n=8), plump, broadly rounded apically with numerous 32-44 µm long, very narrow setae mostly over apical half of inner face and 6-8 curved, more robust setae near distal-medial corner.

Notes: 1) Brundin preserved all his specimens in a glycerin/alcohol mixture. This makes them very difficult to macerate, as they take longer than usual to clear and then become so transparent as to be almost invisible. I had come across this before; nevertheless, I checked my memory by macerating the hypopygium of one of the specimens (2124 from Lake Kallsjön) in potassium hydroxide solution; regrettably the result is a nearly transparent collapsed hypopygium mount. The remainder of the hypopygia I mounted in Euparal after washing in absolute isopropanol; the years in preservative have partially cleared them to allow most of the hypopygial structures to be seen.

2) Fig. 2a shows a deep indentation in the anal tergite on either side of the base of the anal point; this feature has been observed on all *M. brevitarsis* specimens examined for the present study. In contrast, none of my hypopygial figures for the other species referred to here shows such an indentation. They are drawn from specimens preserved for a short time in 70% isopropanol, macerated in potassium hydroxide solution, neutralised in glacial acetic acid, dehydrated and mounted in Euparal with a cover slip on top. My dry-mounted specimens are glued on their side to a small rectangle of acetate sheet, and the hypopygium is prepared as above, then mounted in a drop of Euparal on a smaller rectangle of acetate on the same pin beneath the rest of the body (over 50 years such acetate sheets have neither discoloured nor bent). Five specimens in my dry-mounted *M. chloris* series show the same indentations (Fig. 4b) as in *M. brevitarsis*, suggesting that when macerated and depressed by a cover slip, the central part of the tergite may be extended posteriad, eliminating the indentations. To test this hypothesis, fresh adult males were collected on the banks of Lough Neagh near Ballyronan (H 947862) on 16 August 2016. Specimens killed with ethyl acetate, their hypopygia removed and cleared in lactic acid, showed the extended configuration. However, a specimen killed in 70% isopropanol and cleared in lactic acid showed deep indentations as illustrated for *M. brevitarsis*. When a cover slip was laid on the hypopygium from anterior to posterior, the central part of the tergite extended to the unindented form. Two large muscles (Fig. 2b), one on each side of the mid line are attached posteriorly to either side of the anal point base and extend as far laterad as the indentation; ventrally they are attached to the lateral sternapodeme. Contraction of these muscles would draw the mid part of the tergite in and bend the anal point downwards, possibly to separate the female's cerci during coupling and align the genitalia. Chemical processing of a hypopygium could cause these muscles to contract, but the effect may be nullified by subsequent actions. With Brundin specimens the muscles have been hardened in preservative over many years and extension is no longer possible. It is noteworthy that the original illustration of the hypopygium of *M. brevitarsis* (Brundin 1947, pl.17, fig.95) shows the extended form, presumably drawn before the retractor muscles had set and extended by the application of a cover slip. That the retractor muscles in life are in a permanent state of contraction is inconceivable; I conclude that the indentations are

artifactural, the result of perinatal contraction and subsequent chemical fixation, and not a characteristic of the species.

Diagnostic remarks. Neither *M. brevitarsis* nor *M. nigritia* sp.n. has reflexed setae on the outer face of the fore femur. Amongst the remaining British and Irish species *M. confinis* (Meigen) also lacks these setae, but is easily distinguishable by its short, sharp anal point (Fig. 218B in Langton and Pinder 2007, Vol. 2). Cranston *et al.* (1989: 391) commented that all adults in "*Microtendipes* can be distinguished from all other Chironomini by the two rows of stout, proximally directed setae on the fore femur". Consequently, specimens without such setae do not run cleanly to *Microtendipes* in the respective keys to genera in Cranston *et al.* (1989) and Sæther *et al.* (2000). However, Reiss (1997:275) remarked that those special fore femoral setae are present 'in most representatives of the genus' only. In the *Microtendipes* species known to the present author the median volsella is a small papilla (up to about 10µm long), situated half way along the inner margin of the junction of the superior volsella with the gonocoxite (Figs 2-5, m. v.). It is covered with microtrichia and usually bears 1-5 inwardly directed setae on its tip. In *M. brevitarsis* and *M. nigritia*, however, the volsella is very small and usually represented by a circular mark on the cuticle that either bears a few setae, which are distinctly thinner than is usual for the genus, or no setae at all. Reduction of the median volsella to a bare circular mark, or even its apparent absence, constitutes an extension to the diagnosis for *Microtendipes* males in Cranston *et al.* (1989).

The anal point of *M. brevitarsis* is long, narrow, nearly parallel-sided after the initial contraction from the anal tergite; the tip is rounded, occasionally a little swollen. In this *M. brevitarsis* is closer to *M. chloris* and *M. pedellus*, which have long, narrow anal points, than to *M. nigritia*, in which the anal point is strongly waisted with a bulbous apex. Both *M. brevitarsis* and *M. nigritia* have dense, relatively long, straight and fine setae on the apical half of the inner face of the gonostylus; in *M. chloris* and *M. pedellus* (De Geer) these setae are shorter, sparser and curved basad.

Microtendipes nigritia sp.n.

Etymology. The feminine Latin noun nigritia, a blackish colour, is used here in apposition, meaning 'the blackish one', referring to the specimens appearing as nearly black to the unaided eye.

Material. 13 specimens collected from a swarm on the bank of Loch Assynt, Sutherland, Highland Region, Scotland, British National Grid Reference NC235241 on 28 May 1981, all mounted on slides in Euparal. Holotype: ♂ (specimen code 81H27Im21) to be deposited in the University Museum of Zoology Cambridge. All paratypes (81H27Im10-16, 18-22), in the author's collection.

Description. (n=13, unless otherwise stated). Total length 4.8-6.3 mm (5.8 mm). Wing length 3.4-3.8 mm (3.6 mm). Colour dark brown with black median and lateral scutal stripes. Setae brown, including those of legs and abdomen. Antenna brown, plume conspicuously dark brown.

Head. Eyes bare, dorsally with a long inward narrowing projection more rapidly narrowed to the bluntly rounded tip, 5 ommatidia wide in mid-section. Temporal setae 20-30 (24.6, n=8). Clypeals 26-50 (36.3, n=8). Frontal tubercles absent. Palp 5-segmented, palpomere lengths: 68-80 (74.2, n=9), 32-80 (68.4, n=9), 220-280 (244, n=11), 132-272 (237.8, n=11), 232-300 (278, n=19). Antenna with 13 flagellomeres, Fm 3-12: 1.4-1.9 times as wide as long. Antennal ratio (AR) 2.6-3.0 (2.84, n=12).

Thorax. Acrostichals situated on the anterior declivity of the thorax 3-5. Dorsocentrals on pale spots, 22-39 (28.2, n=13), of which 0-5 (2.5) lie anterior to the parapsidal suture, very long: 190-260 µm (235.7 µm, n=6) long. Supraalars 0. Prealars 5-9 (6.8, n=12). Scutellum with setae visible on only one side: 11-16 (12.8, n=9), the total number being approximately twice this.

Wing. Setation: R with 25-37 (30.7, n=7) setae, R_1 with 18-29 (24.1, n=7) and R_{4+5} with 29-33 (30.4, n=5). Squama with 16, 21 setae (n=2).

Legs. Fore femur without reflexed setae. Lengths and proportions (measurements in µm) (n=12):

	fe	ti	ta1	ta2
p1	1440-1880 (1656)	1460-1860 (1688)	1300-1640 (1506)	740-900 (832)
p2	1520-1880 (1723)	1600-1800 (1719)	800-900 (843)	500-580 (531)
p3	1800-2040 (1897)	1720-2060 (1928)	1100-1240 ((1162)	660-880 (777)

	ta3	ta4	ta5	BR	LR
p1	600-720 (663)	300-540 (471)	200-280 (254)	1.7-2.9 (2.1)	0.82-0.91 (0.88)
p2	380-460 (420)	260-300 (275)	180-220 (208)	2.1-4.2 (2.9)	0.47-0.50 (0.49)
p3	460-620 (593)	300-380 (346)	200-240 (216)	2.3-3.2 (2.7)	0.57-0.62 (0.60)

Abdomen. Tergites and sternites covered with irregularly arranged setae that are erect dorsally, inclined posteriad ventrally, longest setae dorsally 0.4-0.57 (0.49, n=7) x length of tergite, ventrally 0.36-0.46 (0.4, n=4) x length of sternite.

Fig. 3. ***Microtendipes nigritia*** **hypopygium. mv = median volsella. Scale line = 0.1mm.**

Hypopygium (Fig. 3). Central part of tergite IX with 4-10 setae on each side of mid line, 10-19 in total (13.9). Anal point 80-104 µm long (93.8), strongly waisted. Superior volsella curved inward, widest near middle, and broadly rounded apically, bare except for 7-13 (9.4) medio-dorsal setae and one seta, 24-52 µm long (38) ventrally near base. Median volsella weak, generally not protruding in mounts, 0-8 µm long (2, n=11). Inferior volsella covered with microtrichia, the clubbed end bearing numerous narrow setae that are gently curved basad. Laterotergite IX with 4-13 (6.3, n=10) long setae; gonocoxite 180-280 µm long (211) with 14-31 long setae, setae 180-248 µm long (213, n=9), 0.84-1.06 (0.85, n=8) x length of gonocoxite. Gonostylus 176-240 µm long (220), plump, broadly rounded apically with numerous 24-40 µm long, narrow setae on inner face restricted mainly to the apical half, and with long, more robust, straight or slightly outcurved setae near distal-medial corner.

Diagnostic remarks. The lack of reflexed setae on the fore femur and the strongly waisted anal point will distinguish this species from all others currently recognised in *Microtendipes*. See also the Notes and Diagnostic remarks under *M. brevitarsis*.

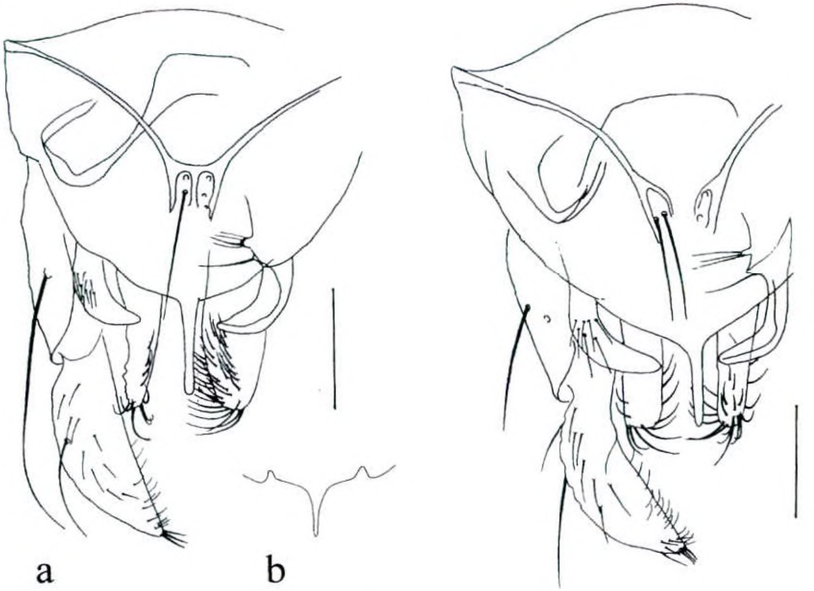
M. chloris (Meigen, 1818) and *M. pedellus* (De Geer, 1776)

These two common and widespread species differ from the two described above by having two rows of reflexed setae on the outer surface of the fore femur (Fig. 1b). (These setae are directed to the distal end of the femur on pharate adults and reverse on eclosion. Their function is unknown.) In *M. brevitarsis* and *M. nigritia* the hairs on the inner face of the apical half of the gonostyle are straight and dense, whereas in *M. chloris* and *M. pedellus* they are sparser, shorter and curved basad. The anal points in these two species are long, generally gradually narrowing to the rounded tip (Figs 4a and 5). *M. pedellus* and the pale form of *M. chloris* are morphologically and morphometrically very similar, however, are recognizable on live coloration, the former having abdominal segments I-V clear green, whereas in the latter these are dusky green; in mounts, those of the former are colourless, contrasting strongly with the heavily infuscated segments that follow, whereas those of the latter have the cuticle infuscated, but less so than on segments VI-IX.

Microtendipes pedellus resembles *M. brevitarsis* and *M. nigritia* in lacking the male fore tarsal beard, but adults of the latter two species are dark brown, whereas no dark form of *M. pedellus* is known. Specimens from my collection have relatively low LR values of 0.9-1.2 (1.14, n=6).

Amongst the species considered here *Microtendipes chloris* is the only one with the male fore tarsus bearded (Fig. 1c). However, it should be kept in mind that the beard may be overlooked when the beard hairs lie along the metatarsus in a slide mount, or, when bearded tarsomeres have been abraded, so that only one or two of the beard hairs remain.

Microtendipes lugubris Kieffer, 1921: Kieffer (1921) described what some authors have considered as a dark form of *M. chloris*. Edwards (1929: 397) included in his diagnosis for '*Chironomus (M.) chloris*' a 'var. *lugubris* Kieff.' with relatively darker abdomen. He gave the fore leg ratio (LR_1) in *M. chloris* as 1.05-1.25, but noted that the values averaged less in the darker specimens. Brundin (1947: 61-62) described a '*M. chloris* var. *lugubris* Kieff.' from Sweden, gave the LR_1 as 0.98-1.09 (M=1.03) and, commenting on Edwards' observation, suggested that *lugubris* might well be a species in its own right (as Kieffer 1921 had described it). In my collection the series of 'sp. a' collected from Loch Assynt includes two specimens with bearded fore tarsi, reflexed setae on the fore femora and narrow anal points. One has the LR_1 as 1.08, the other as 1.4. My initial conclusion was that the former is a specimen of *M. chloris* 'var. *lugubris*', the latter, something different. However, specimens of typical *M. chloris* in my collection show an LR_1 range of 1.00-1.46 (1.21, n=9), with the second and third highest values being 1.30, thus fit Edwards' rather than Brundin's results. It would appear that exceptionally high fore LRs occur occasionally in *M. chloris* and the dark form could be expected to reflect this. I cannot find any other character of my long-legged *M. chloris* 'var. *lugubris*' to justify specific separation, or for the 'var. *lugubris*' to be treated as distinct from nominotypical *M. chloris*. The dark form is likely to be mainly northern in distribution, so it is worth recording its occurrence as a distinct morphotype.



Figs 4-5. 4 (left), *Microtendipes chloris*: a, hypopygium; b, posterior margin of tergite IX in retracted position. 5 (right), *M. pedellus* hypopygium. mv = median volsella. Scale line = 0.1mm

M. nigellus Hirvenoja, 1963

This species also could turn up in northern Britain, although it has been described from northern Finland (Hirvenoja 1963) and not yet recorded from any other country (Sæther and Spies 2013). Dark in colour, with the fore tarsus bearded and the anal point long and narrow, it could be mistaken for *M. chloris* 'var. *lugubris*', but is distinguishable by having the posterior margins of abdominal tergites VI-VIII narrowly yellow.

The following key will serve to separate the species discussed in the present work, using couplet 7 in Langton and Pinder (2007) as a starting point. The names of species so far not recorded from the British Isles are given between square brackets.

7. Fore femur with all setae directed towards its apex. General body colour dark brown. Fore tarsus never with setal beard 8
\- Fore femur with some setae on the outer face variously reversed, directed towards its base. Abdomen with segments I-V usually green, when brown, the fore tarsus has a setal beard 9

8. Anal point strongly waisted. Body hairs dark .... ***Microtendipes nigritia*** sp. n.
\- Anal point, after the initial narrowing from the tergite, more or less parallel-sided, with at most a weak swelling at tip. Body hairs pale .... [***Microtendipes brevitarsis*** Brundin]

9. Fore tarsus without a setal beard. Abdominal segments I-V clear green, remainder black .... ***Microtendipes pedellus*** (De Geer)
\- Fore tarsus with a beard of usually very long setae. Abdominal segments I-V dull green or brown/black 10

10. Abdominal segments I-V dull green .... ***Microtendipes chloris*** (Meigen)
\- Abdominal segments I-V brown to black 11

11. Posterior margin of segments VII and VIII narrowly yellow .... [***Microtendipes nigellus*** Hirvenoja]
\- Posterior margin of segments VII and VIII concolorous with the rest of the segment .... ***Microtendipes chloris* 'var. *lugubris*'** Kieffer sensu Edwards

Acknowledgements

I thank Martin Spies for directing me to Brundin's *M. brevitarsis* and his detailed review of the manuscript, and Yngve Brodin for facilitating the loan of Brundin specimens from the Swedish Museum of Natural History, Department of Entomology.

References

Brundin, L. 1947. Zur Kenntnis der schwedischen Chironomiden. *Arkiv för Zoologi* **39,** 1-95.

Brundin, L. 1949. Chironomiden und andere Bodentiere der südschwedischen Urgbirgsseen. Ein Beitrag zur Kenntnis der Bodenfaunistischen Charakterzüge schwedischer oligotropher Seen. *Institute of Freshwater Research, Doittningholm, Report No*. **30,** 915 pp.

Cranston, P.S., Dillon, M.E., Pinder, L.C.V. and Reiss, F. 1989. The adult males of Chironominae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. **In** Wiederholm. T. (Ed.) Chironomidae of the Holarctic region. Keys and diagnoses. Part 3 – Adult males. *Entomologica scandinavica Supplement* **34,** 353-502.

Edwards, F.W. 1929. British non-biting midges (Diptera, Chironomidae). *Transactions of the Entomological Society of London* **77**(2)**,** 279-430.

Hirvenoja, M.1963. *Microtendipes nigellus* n.sp. (Dipt., Chironomidae). *Annales entomologici fennici* **29,** 247-249.

Kieffer, J.J. 1921. Chironomides nouveaux ou peu connus de la région paléarctique. *Bulletin de la Société d'histoire naturelle de la Moselle* **29,** 51-109.

Langton, P.H. and Pinder, L.C.V. 2007. Keys to the adult male Chironomidae of Britain and Ireland. Volumes 1 and 2. *Freshwater Biological Association Scientific Publications* No. **64**.

Sæther, O.A. 1980. A glossary of chironomid morphology terminology (Chironomidae: Diptera). *Entomologica scandinavica Supplement* **15,** 51 pp.

Sæther, O.A., Ashe, P. and Murray, D.E. 2000. A.6. Family Chironomidae. pp. 113-334. **In** Papp, L. and Darvas, B. (Eds) Contributions to a Manual of Palaearctic Diptera (with special reference to the flies of economic importance). Appendix. [the fourth of four volumes]. 604 pp. Science Herald, Budapest.

Sæther, O.A. and Spies, M. 2013. Fauna Europaea: Chironomidae. **In** Beuk, P. and Pape, T. (Eds) Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6. http://www.faunaeur.org/?no_redirect=1

Two records of *Mycetobia obscura* Mamaev (Diptera, Mycetobiidae) from Lanarkshire and Surrey – A single male *Mycetobia obscura* Mamaev, 1968 was taken in a flight interception trap hung from the base of a fallen mature oak which had extensive basal white-rotten heartwood caused by the bracket fungus *Ganoderma australe*. The tree was within an area of mature mixed woodland in an abandoned landscape park and garden around a Victorian mansion near Chertsey in Surrey (V.C. 17; SU9865), 3.viii.2015. A single female *Mycetobia obscura* was found in Cleghorn Glen NNR, Lanarkshire (V.C. 77; NS8944), 8.vi.2016. It was spotted hovering over an old cut stump of a mature beech tree. The NNR had been subject to a phase of clearance of beech trees in about 2012 and the stump is likely to date from then. No sign of any heartwood decay or rot-hole was apparent in the stump. Knowledge of the British distribution has been published relatively recently (Falk, S.J. and Chandler, P.J. 2005. A review of the scarce and threatened flies of Great Britain. Part 2: Nematocera and Aschiza. JNCC *Species Status* No.**2**): one site in England (Epping Forest: caught by a Malaise trap) and four in Scotland (Berwickshire, Perthshire, Aberdeenshire and Inverness-shire: all reared from rotten wood by the Malloch Society). Lanarkshire is a new county record but an earlier Surrey record had previously been identified (see note below by Scotty Dodd). Although the two new records arise from flying adults, each was associated with different types of wood-decay situations and it seems likely that the species is able to exploit a wide range of consistently damp or wet wood-decay situations. Its presence in beech woodland in Cleghorn Glen also demonstrates that it is able to exploit broad-leaved tree species growing outside of what is conventionally regarded as their native range.

The Cleghorn Glen survey work was commissioned by Scottish Natural Heritage; Diptera samples from both sites were identified by Peter Chandler – **KEITH N.A. ALEXANDER,** 59 Sweetbrier Lane, Heavitree, Exeter EX1 3AQ

A record of *Mycetobia obscura* Mamaev (Diptera, Mycetobiidae) from Surrey (V.C. 17) – A survey of the saproxylic invertebrates (Dodd, S.G. 2014. Saproxylic Invertebrate Survey report – Dawcombe, Betchworth, Surrey. Unpublished report. Pirbright: Surrey Wildlife Trust) associated with veteran trees was undertaken during 2013 and 2014 at Dawcombe, a component of the Mole Gap to Reigate Escarpment SSSI, near Betchworth, Surrey (TQ2152 and TQ2252). Several specimens of *Mycetobia obscura* Mamaev, 1968 were sorted from aerial interception trap material and subsequently identified by Peter Chandler. Traps were serviced approximately monthly. Single examples of both male and female *Mycetobia obscura* were recorded in an aerial trap positioned in a multi-stemmed veteran crab apple *Malus sylvestris* with moribund branches and various hollows and fissures (Tree 295; TQ2227152631) when the trap was emptied on 23 June 2014. A further male specimen was recorded when the same trap was emptied on 19 July 2014.

The Dawcombe Nature Reserve Veteran Tree Project was commissioned by Surrey Wildlife Trust with funding from SITA Trust. The project was managed and co-ordinated by voluntary reserve warden Simon Humphreys. Thanks to Peter Chandler for his assistance in determining a variety of Diptera samples – **SCOTTY DODD,** 11 Knowles Meadow, Hill Brow, Hampshire GU33 7QW

Dipterists Digest 2016 **23,** 151-152

Corrections and changes to the Diptera Checklist (36) – Editor

It is intended to publish here any corrections to the text of the latest Diptera checklist (publication date was 13 November 1998; the final 'cut-off' date for included information was 17 June 1998) and to draw attention to any subsequent changes. All readers are asked to inform me of errors or changes and I thank all those who have already brought these to my attention.

Changes are listed under families; names new to the British Isles list are in bold type. The notes below refer to addition of 15 species, resulting in a new total of **7141** species (of which 41 are recorded only from Ireland).

An updated version of the checklist, incorporating all corrections and changes that have been reported in *Dipterists Digest*, is available for download from the Dipterists Forum website. It is intended to update this regularly following the appearance of each issue of *Dipterists Digest*.

Limoniidae. The following change results from J. STARÝ and F. BRODO (2009. Arctic species of the subgenus *Symplecta* sensu stricto (Diptera: Limoniidae). *Canadian Entomologist* **130,** 1-30):
*Symplecta **scotica*** (Edwards, 1938 – *Erioptera*) [raised to species rank from subspecies of S. *novaezemblae* (Alexander, 1922) which is not a British species]

Mycetophilidae. The following species were added by P. CHANDLER (2016. Fungus Gnats Recording Scheme Newsletter 9. Autumn 2016. pp 1-6. *Bulletin of the Dipterists Forum* **82**.):
*Brevicornu **improvisum*** Zaitzev, 1992
*Mycetophila **hyrcania*** Laštovka & Matile, 1969
Mycomya (S. *Mycomya*) ***bicolor*** (Dziedzicki, 1885 – *Sciophila*)

Cecidomyiidae. The following genus and species were added by K.M. HARRIS, A. SALISBURY and H. JONES (2016. *Enigmadiplosis agapanthi* a new genus and species of gall midge (Diptera, Cecidomyiidae) damaging *Agapanthus* flowers in England. *Cecidology* **31,** 17-20, Plate 3 (p. 25)). It belongs to Tribe CLINODIPLOSINI:
ENIGMADIPLOSIS Harris, 2016
agapanthi Harris, 2016

Chironomidae. The following genus and species are added in the present issue:
BAEOTENDIPES Kieffer, 1913
*Baeotendipes **noctivagus*** (Kieffer, 1911 – *Halliella*) ++
*Chironomus **vallenduuki*** Ashe & O'Connor, 2015
*Microtendipes **nigritia*** Langton, 2017

Bombyliidae. The following genus and species, listed under Excluded Species in the checklist, is restored to the British list in the present issue:
Anthrax anthrax (Schrank, 1781 – *Musca*)

Dolichopodidae. The following species is added in the present issue:
*Dolichopus **calinotus*** Loew, 1871

Phoridae. The following species was added by R.H.L. DISNEY and D.A. SMITH (2016. New species of *Phalacrotophora* Enderlein (Diptera: Phoridae) from England. *Entomologist's monthly Magazine* **152,** 189-192):

Phalacrotophora ***harveyi*** Disney & Smith, 2016

The following species is added in the present issue:
Megaselia ***trinityensis*** Disney, 2017

Psilidae. The following species, treated as a synonym in the checklist, is recognised to be of specific rank in the present issue:
Chamaepsila ***unilineata*** (Zetterstedt, 1847 - *Scatophaga*)

Sciomyzidae. It was noted in the previous issue that Phaeomyiidae had been returned to subfamily rank as **PHAEOMYIINAE** within Sciomyzidae by J.-C. VALA, W.L. MURPHY, L. KNUTSON and R. ROZKOSNÝ (2012. A cornucopia for Sciomyzidae. *Studia dipterologica*, **19**(1/2), 67-137).

Agromyzidae. The following species was added by R.J. HECKFORD (2016. **In** Annual Exhibition – 2015 - Report. *British Journal of Entomology & Natural History* **29,** 23):
Cerodontha (*Poemyza*) ***unisetiorbita*** Zlobin, 1993

The following species are added in the present issue:
Liriomyza ***cannabis*** Hendel, 1931
Liriomyza ***intonsa*** Spencer, 1976

Changes to the Irish Diptera List (23) – Editor

This section appears as necessary to keep up to date the initial update of the Irish list in Vol. **10,** 135-146 and the latest checklist of Irish Diptera (Chandler *et al.* 2008). Species are listed under families, but with references listed separately (unless within the present issue). The additions cited here bring the total Irish list to 3407.

Mycetophilidae
Anatella dampfi Landrock, 1924 (added by Chandler *et al.* in the present issue)
Mycetophila stolida Walker, 1856 (added by Chandler *et al.* in the present issue)
Chironomidae
Baeotendipes noctivagus (Kieffer, 1911) (added by Murray in the present issue)
Hybotidae
Platypalpus interstinctus (Collin, 1926) (added by Chandler *et al.* in the present issue)
Dolichopodidae
Thrypticus divisus (Strobl, 1880) (added by Chandler *et al.* in the present issue)
Anthomyzidae
Anthomyza pallida (Zetterstedt, 1838) (added by Chandler *et al.* in the present issue)
Typhamyza bifasciata (Wood, 1911) (added by Chandler *et al.* in the present issue)
Anthomyiidae
Botanophila sonchi (Hardy, 1872) (added by Chandler *et al.* in the present issue)
Fanniidae
Fannia tuberculata (Zetterstedt, 1849) (added by Chandler *et al.* in the present issue)
Calliphoridae
Melanomya nana (Meigen, 1826) (added by Chandler *et al.* in the present issue)

Dipterists Digest 2016 **23,** 153-158

Scuttle Flies (Diptera, Phoridae) recorded in Bioblitz 2016 in Cambridge, including a new species of *Megaselia* Rondani

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Summary

The 2016 Bioblitz in Cambridge produced 13 species of Phoridae including *Megaselia trinityensis* sp. n.

Introduction

Bioblitz 2016 in Cambridge took place in the Fellows' Garden of Trinity College, 23-24 July. My input was the operation of a flight interception Malaise Trap in order to obtain Scuttle Flies (Diptera, Phoridae). The trap was set to the east of The Roundabout in a patch of unmown herb-rich grassland. The catch was smaller than expected, probably due to the hot, dry conditions (apart from the year's atypical weather pattern).

Results

A total of 36 Phoridae were caught. They represented 5 genera and 13 species. There were 8 females and the rest were males. The details are as follows.

Conicera dauci (Meigen) – 1 male
Larvae have been recorded in rotting plants and the sporophores of some fungi. Adults visit a wide range of flower species.

Diplonevra funebris (Meigen) – 3 males
Larvae feed on dead snails and insects and frequently exploit the refuse in wasp nests. Adult males only are common visitors to flowers.

Diplonevra pilosella Schmitz – 1 male
Has been reared from moribund earthworms.

Megaselia brevicostalis (Wood) – 12 males, 4 females
The larvae occur in dead snails and insects, rotting plant material and fungi. The adults visit a wide range of flowers.

Megaselia longicostalis (Wood) – 1 male
The larvae feed on a range of decaying materials ranging from rotting fungus sporophores, dead snails and insects to vertebrate corpses. The adults visit a variety of flowers for nectar but in one case two males had ingested pollen.

Megaselia oviaraneae Disney – 1 male
The larvae prey on spider eggs. Adults have been reported visiting flowers of *Narcissus pseudonarcissus*.

Megaselia paludosa (Wood) – 2 males
The larvae are parasites of the larvae of the cranefly pest of lawns, *Tipula paludosa* Meigen, there being several fly larvae per host larva, which survives the attack.

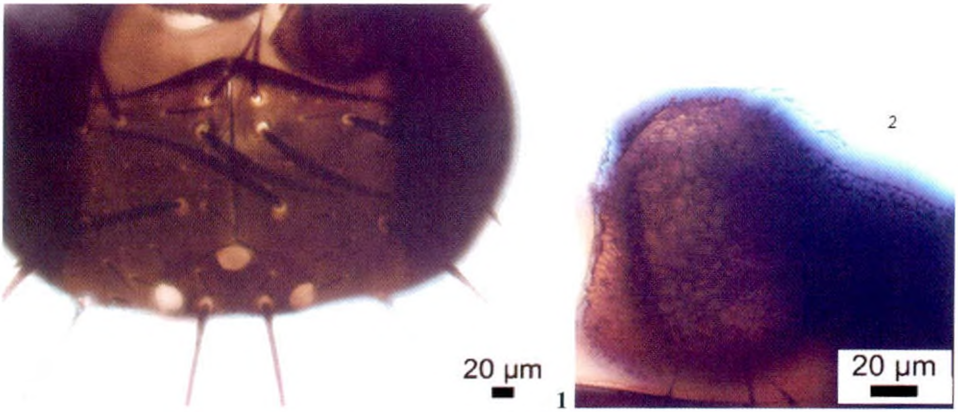
Megaselia stichata (Lundbeck) – 1 male
Larval and adult habits unknown.

Megaselia trinityensis n. sp.
Male. Frons as Fig. 1, with dense but very fine microtrichia. Postpedicels without SPS vesicles but with fields of external circular depressions (Fig. 2). Palps as Fig. 3. Proboscis as Fig. 4, the labella lacking short spinules below. Thorax brown. Two notopleural bristles and no cleft in front of these. Mesopleuron bare. Scutellum with an anterior pair of small hairs and a posterior pair of bristles. Abdominal tergites brown with hairs mainly posterolateral and at rear margin apart from those at rear of T6, which longer more robust (Fig. 5). Venter grey, and with hairs on segments 3-6, being longest on 6 (Fig. 5). Hypopygium as Figs 5-7. Legs with hind and mid coxae, base of front coxa and all femora brown, but not dark; rest of the legs being yellowish. Fore tarsus with posterodorsal hair palisade on segments 1-4 (Fig. 8). Dorsal hair palisade of mid tibia extends about 0.6 times its length. Hind femur as Fig. 9, the patch of hairs near tip of posterior face lacks microtrichia (Fig. 10). Hind tibia with about 15 fine differentiated posterodorsal hairs, without anterodorsals, and spinules of apical combs simple. Wings (Fig. 11) 1.60-1.65mm long. Costal index 0.50. Costal ratios 3.1-3.2 : 2.0-2.1 : 1. Costal cilia (of section 3) 0.13mm long. Hair at base of vein 3 only about 0.04mm long. With 3 axillary bristles, the outer being 0.12 mm long. Sc reaching R_1. Haltere knob pale grey.

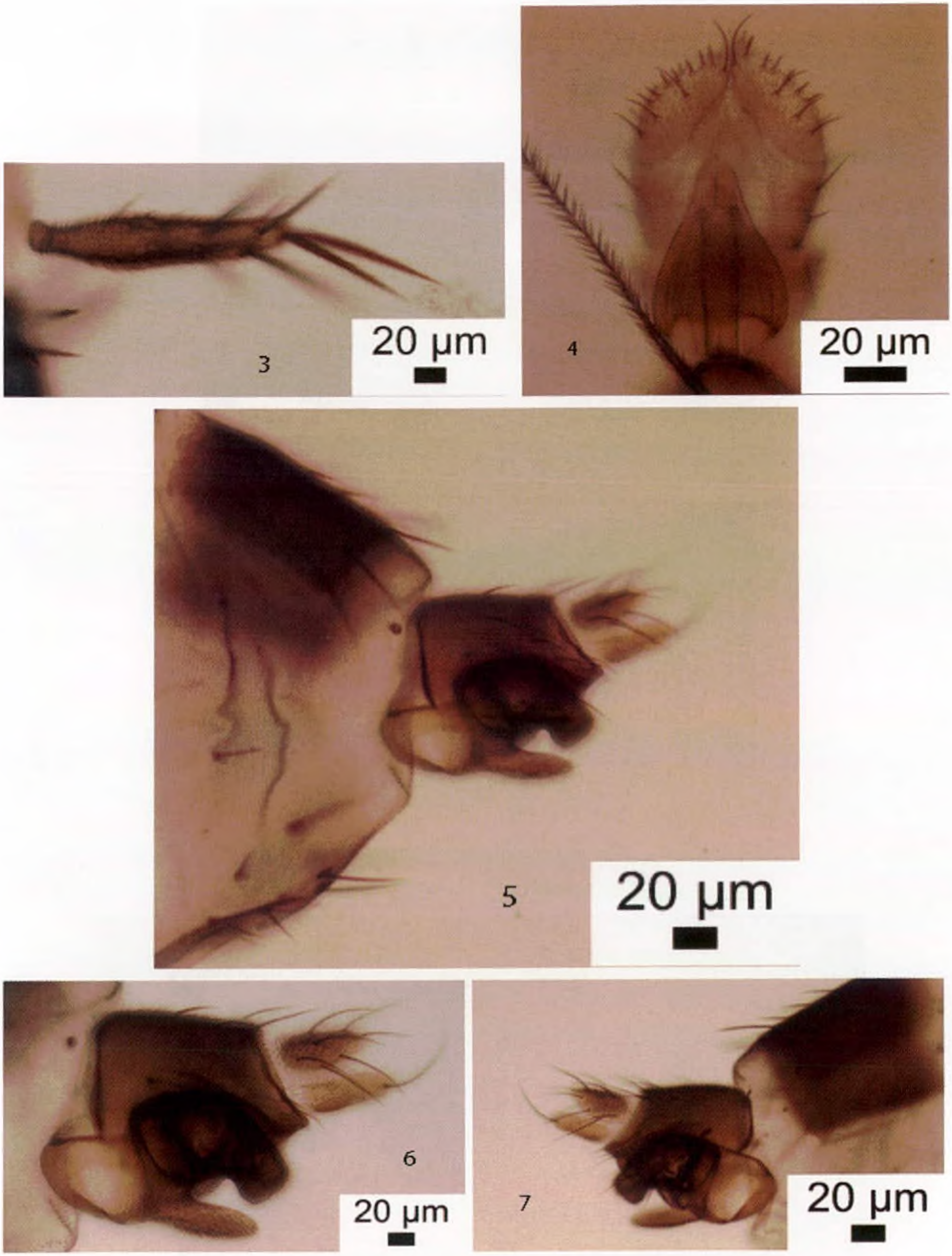
Female. Unknown.

Material. HOLOTYPE male, ENGLAND, Fellows' Garden, Trinity College, Cambridge (University of Cambridge Museum of Zoology, 42-41).

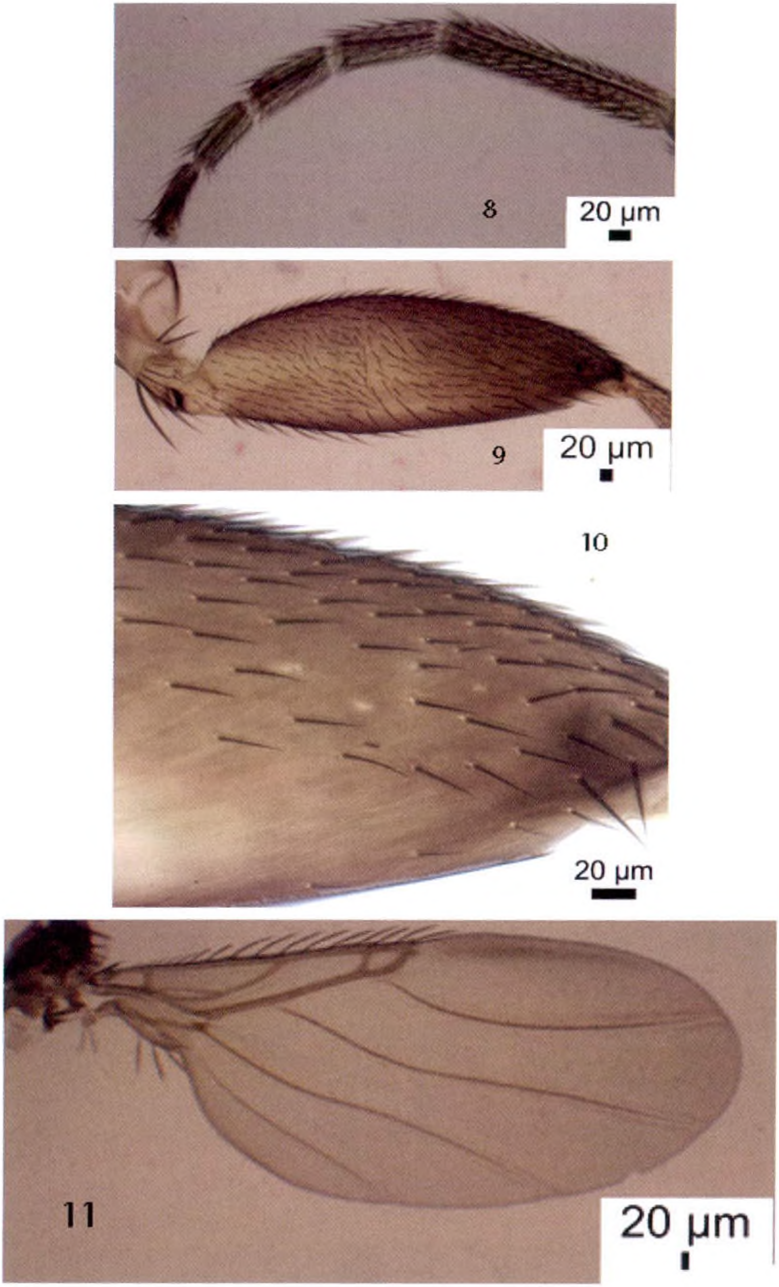
Etymology. Named after the type locality.



Figs 1-2. *Megaselia trinityensis* n. sp.: 1, frons; 2, postpedicel.

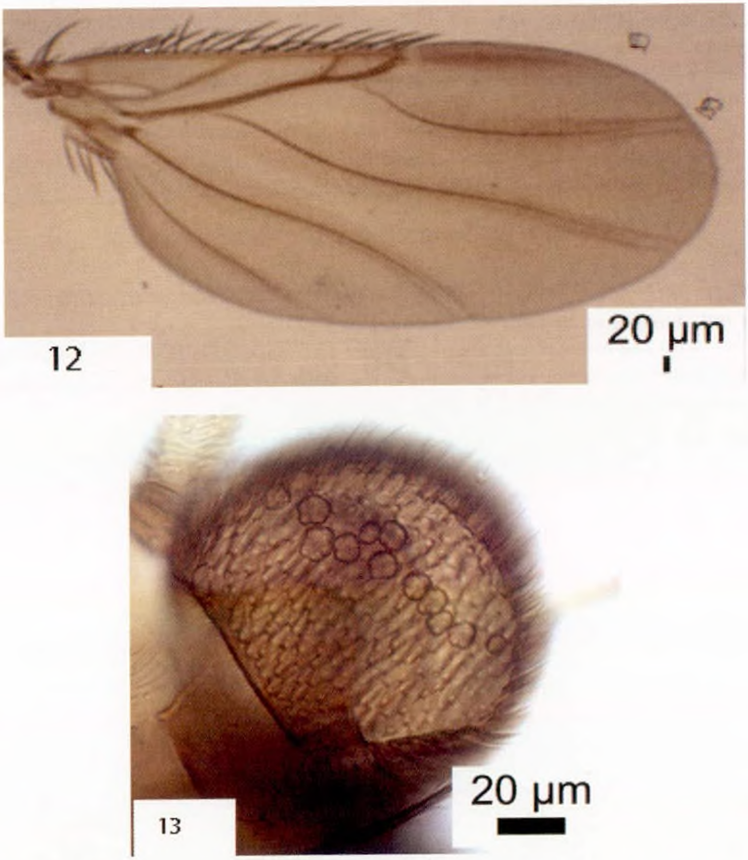


Figs 3-7. ***Megaselia trinityensis*** **n. sp.: 3, palp; 4, proboscis from above; 5-7, hypopygium.**



Figs 8-11. ***Megaselia trinityensis*** **n. sp.: 8, front tarsus; 9, hind femur; 10, patch of hairs near tip of posterior face of hind femur; 11, wing.**

Affinities. In a revision of species in the *Megaselia pulicaria* (Fallén) complex (Disney 1999) in the key to males it runs to couplet 17, lead 2, to *M. longifurca* (Lundbeck). While the hypopygium is very similar, the latter is immediately distinguished by the larger fork of vein 3 of its wing (Fig. 12) when compared with Fig. 11. In addition, the postpedicel has distinct SPS vesicles (Fig. 13).



Figs. 12-13. ***Megaselia longifurca*** **(Lundbeck), male: 12, wing; 13, postpedicel.**

Megaselia vestita (Wood) – 1 male
The first record for Cambridge! Larval and adult habits unknown.

Metopina oligoneura (Mik) – 3 males, 3 females
Larvae have been recorded in rotting plants, dead invertebrates, etc. Adults visit a wide range of flower species.

Metopina ulrichi Disney – 1 female
Larval habits unknown. Adults have been recorded visiting the flowers of *Heracleum sphondylium* (Apiaceae).

Pseudacteon formicarum (Verrall) – 1 female
The larvae are parasitoids of *Lasius* ants.

Comment

A number of expected genera were not caught. 86 species in 12 genera have previously been caught in gardens in Cambridge, with 74 of these species being recorded in my suburban garden in South Arbury (North Cambridge).

Acknowledgements

I am grateful to Thomas Pape (Natural History Museum of Denmark) for the loan of the holotype of *M. longifurca* in order to check its postpedicels. My work on Phoridae is currently funded by the Balfour-Browne Trust (University of Cambridge).

References

Disney, R.H.L. 1999. A troublesome sibling species complex of scuttle flies (Diptera: Phoridae) revisited. *Journal of Natural History* **33,** 1159-1216.

Lundbeck, W. 1921. New species of Phoridae from Denmark, together with remarks on *Aphiochaeta groenlandica* Lundb. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn* **72,** 129-143.

Dipterists Digest 2016 **23**, 159-161

Chironomus vallenduuki Ashe & O'Connor (Diptera, Chironomidae) new to Britain

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Summary

Chironomus vallenduuki Ashe & O'Connor, 2015, is recorded from Scotland. A key is provided to separate the morphologically similar *C. luridus* Strenzke, *C. parathummi* Keyl, *C. pseudothummi* Strenzke and *C. vallenduuki* Ashe & O'Connor.

Systematic note

The specific epithet *Chironomus vallenduuki* is a replacement name for *Chironomus uliginosus* Keyl, 1960, which has been found to be permanently invalid due to junior primary homonymy with *C. uliginosus* Meunier, 1904 (Ashe and O'Connor 2015).

Introduction

From his collections of Diptera made at the Trees for Life estate at Dundreggan in Glen Moriston, Peter Chandler passed some Chironomidae on to me for identification. In the collection made on 24 August 2016 from the margin of a small pond by the Lodge (NH3214) was a specimen of *Chironomus vallenduuki*, a species, widespread in central Europe, but previously unrecorded from Britain. Adult males in this species are so similar to those of *C. pseudothummi* Strenzke that some earlier misidentifications are not unlikely. A further species, *C. parathummi* Keyl, also has very similar males, is widespread in central Europe and could well be found in Britain; *C. luridus* is also parametrically very similar to these three species and is included in the key.

Identification

Males in the four species under consideration here are medium-sized for the genus (wing length 4-6mm; note that the wing lengths published for *C. uliginosus* in Vallenduuk and Langton (2010) and *C. parathummi* in Langton *et al*. (2011) are miscalculated and must be multiplied by 2 for the actual length). They have anal points narrowed in the mid-section, foot-shaped superior volsellae, high fore leg ratios (>1.55) and fore tarsi without a beard. A combination of characters serves to separate them. The following key has been designed to replace couplets 26-29 in Langton and Pinder (2007) to include the additional species here discussed.

25. Entirely blackish brown 26
\- Ground colour yellowish or greenish; abdominal tergites pale with dark markings 27

26. Thorax with distinct black scutal stripes. Hypopygium in Langton and Pinder (2007, fig. 205B) .... ***Chironomus* (*C.*) *lugubris*** Zetterstedt
\- Scutal stripes hardly discernible. Hypopygium in Langton and Pinder (2007, fig. 269) .... ***Chironomus* (*C.*) *holomelas*** Keyl
Note: Records of this species should be confirmed from sympatric pupal exuviae (Langton and Visser 2003).

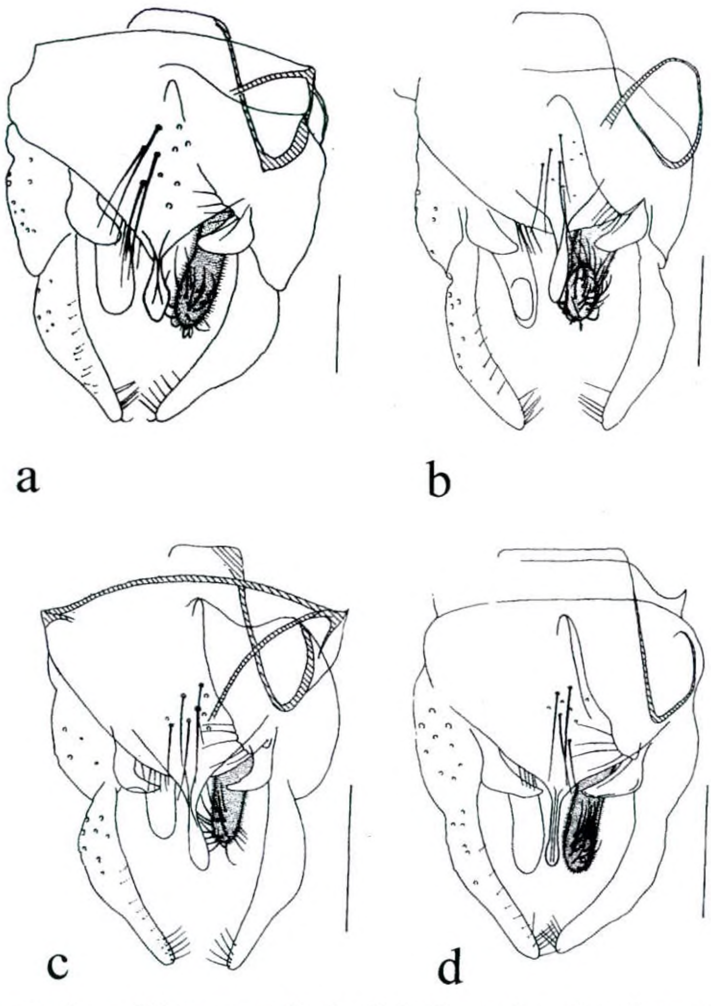

Fig. 1. Hypopygia: a, *Chironomus vallenduuki*; b, *C. parathummi*; c, *C. pseudothummi*; d, *C. luridus*. Scale lines = 0.1mm.

27. Fore-leg ratio (LR) >1.55 28
Fore-leg ratio <1.5 31

28. Anal point narrow, with long, parallel-sided 'waist' and moderately swollen apex. Abdominal tergite I entirely pale or occasionally with a small greyish spot centrally. Hypopygium as in Fig. 1d .... ***Chironomus* (*C.*) *luridus*** Strenzke
\- Anal point with broadly swollen apex and a short narrow 'waist'. Abdominal tergite I more extensively darkened 29

29. Antennae and palps pale; scutal stripes black. Hypopygium as in Fig. 1c; tergite IX with relatively few (<13), short median setae; median volsella with long setae; inferior volsella not swollen at tip and with few curved setae ...... ***Chironomus* (*C.*) *pseudothummi*** Strenzke

\- Antennae and palps dark; scutal stripes brownish or orange. Median volsella with shorter setae, inferior volsella at least a little swollen at distal end, with more curved setae 30

30. Scutal stripes brownish. Hypopygium as in Fig. 1a; median setae of tergite IX few (<13), very long, median volsella with setae intermediate in length between those of *C. pseudothummi* and *C. parathummi*, inferior volsella swollen only a little dorsally at distal end .... ***Chironomus* (*C.*) *vallenduuki*** Ashe & O'Connor

\- Scutal stripes orange. Hypopygium as in Fig. 1b; median setae of tergite IX many (usually >13), shorter, median volsella with short setae, inferior volsella strongly swollen dorsally at distal end .... ***Chironomus* (*C.*) *parathummi*** Keyl
Note: this species has yet to be recorded for the British Isles.

31. Postnotum black except for a yellow spot on each side anterolaterally. Hypopygium as in Langton and Pinder (2007, fig. 205C) .... ***Chironomus* (*C.*) *riparius*** Meigen

\- Postnotum black with anterior one-quarter to one-third yellow. Hypopygium as in Langton and Pinder (2007, fig. 205D) .... ***Chironomus* (*C.*) *piger*** Strenzke

Acknowledgements

I thank Peter Chandler for sending me the Scottish specimen for identification, Henk Vallenduuk for the reference specimens of karyotypically confirmed *C. vallenduuki* and *C. parathummi* in my collection, and Martin Spies for his comments on the original submission. Recording by Peter Chandler at Dundreggan was enabled by Alan Watson Featherstone of Trees for Life.

References

Ashe, P. and O'Connor, J .P. 2015. Three new replacement names for species in *Paraphaenocladius* Thienemann, *Chironomus* Meigen and *Polypedilum* Kieffer (Diptera, Chironomidae). *Spixiana* **37**(2)[2014]**,** 231-232.

Langton, P.H. and Pinder, L.C.V. 2007. Keys to the adult male Chironomidae of Britain and Ireland. Volumes 1 and 2. *Freshwater Biological Association Scientific Publications* No**. 64**.

Langton, P.H. and Visser, H. 2003. Chironomidae exuviae. A key to pupal exuviae of the West Palaearctic Region. Amsterdam: Biodiversity Center of ETI, CD ROM.

Langton, P.H., Kiknadze, I.I., Vallenduuk, H.J. and Istomina, A.G. 2011. Description of all stages and the cytology of *Chironomus parathummi* Keyl, 1961 (Diptera, Chironomidae). *Lauterbornia* **72,** 95-109.

Sæther, O.A. and Spies, M. 2013. Fauna Europaea: Chironomidae. **In** Beuk, P. and Pape, T. (Eds.) Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6. http://www.faunaeur.org/?no_redirect=1

Vallenduuk, H.J. and Langton, P.H. 2010. Description of imago, pupal exuviae and larva of *Chironomus uliginosus* and a provisional key to the larvae of the *Chironomus luridus* agg. (Diptera: Chironomidae). *Lauterbornia* **70,** 73-89.

A record of *Baeotendipes noctivagus* (Kieffer) (Diptera, Chironomidae) from Ireland - new to the British Isles – Whilst examining chironomid pupal exuviae collected on 30.viii.2016 from a saline pond at 3 m.a.s.l. in the grounds of the Fota Wildlife Park, Fota Island, County Cork, Ireland (Latitude 51.894N, Longitude 8.315W, Irish Grid Reference W782714) several exuviae were determined as *Baeotendipes noctivagus* (Kieffer, 1911) from Langton, P.H and Visser, H. (2003. Chironomidae exuviae - a key to pupal exuviae of the West Palaearctic Region. Interactive Identification System for the European Limnofauna. Biodiversity Centre of ETI. UNESCO Publishing, Paris).

Baeotendipes Kieffer clearly belongs within the *Chironomus* Meigen group of taxa but the generic status of *Baeotendipes* is questionable. J.H. Epler, T. Ekrem and P.S. Cranston (2013. The larvae of Holarctic Chironominae – Keys and diagnoses. **In** Anderson, T., Cranston, P.S. and Epler, J.H. (Eds) Chironomidae of the Holarctic Region: Keys and diagnoses, Part 1: larvae. *Insect Systematics and Evolution Supplement* **66,** pp 387-556) treated *Baeotendipes* within *Chironomus* in a new broader interpretation of the genus but refrained from formal synonymisation.

Larvae of *B. noctivagus* are halobiontic, grazing on detritus in soft sediments of polyhaline waters ranging from inland ponds to the marine littoral. On account of its close proximity (<100m) to the sea in the Cork tidal estuary, water level in the pond at Fota Wildlife Park is prone to fluctuation with rising and falling tide. Past random spot measurement indicates a salinity range between 6% and 26% (J. Kingston, Fota Wildlife Park, *pers. comm.*). In the current version of *Fauna Europaea* (Sæther, O.A. and Spies, M. 2013. Chironomidae. **In** Beuk, P. and Pape, T. (Eds.). Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6. http://faunaeur.org/) *B. noctivagus* is recorded from countries around the Mediterranean Sea and Black Sea only.

The new record from Ireland extends the known distribution range considerably northwards. Slide-mounted voucher material is deposited in the National Museum of Ireland, Dublin – **DECLAN A. MURRAY,** Freshwater Biodiversity, Ecology and Fisheries Research Group, School of Biology and Environmental Science, University College Dublin, Belfield, Dublin 4, Ireland; declan.murray@ucd.ie

***Paraphaenocladius exagitans* (Johannsen) ssp. *monticola* Strenzke in Northern Ireland** – *Paraphaenocladius exagitans monticola* Strenzke, 1950 is recorded once each for counties Donegal, Kerry and Meath (Murray, D.A., Langton, P.H., O'Connor, J.P. and Ashe, P.J. 2014. Distribution records of Irish Chironomidae (Diptera): Part 2 – Orthocladiinae. *Bulletin of the Irish Biogeographical Society* **38,** 61-246). It is thus widespread on the island, but infrequently encountered. Two specimens have occurred this year in stream drift, one on 30 March 2016 on Ballysally Blagh (C850344) and the other on 10 April 2016 on Loughan Burn (C877293), Coleraine, Co. Londonderry, Northern Ireland, both tributary streams of the River Bann, Hydrometric area 03. These are the most northerly records to date for the island and require to be recorded because Northern Ireland is considered a distinct geographical unit in Fauna Europaea (Sæther, O.A. and Spies, M. 2013. Fauna Europaea: Chironomidae. **In** Beuk, P. and Pape, T. (Eds.) Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6. http://www.faunaeur.org/?no_redirect=1) – **PETER H. LANGTON,** University Museum of Zoology, Downing Street, Cambridge (address for correspondence: 16 Irish Society Court, Coleraine, Co. Derry, BT52 1GX.)

Dipterists Digest 2016 **23,** 163-167

The first occurrences of *Liriomyza cannabis* Hendel (Diptera, Agromyzidae) in Great Britain

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Summary

Liriomyza cannabis Hendel, 1931 (Diptera, Agromyzidae), a monophagous leaf miner of *Cannabis sativa* Linnaeus (Cannabaceae), is here reported as a species new to Great Britain. A brief description of the circumstance of the findings is given, as well as a description of the species and the mines it produces.

Introduction

Liriomyza cannabis Hendel, 1931 (Diptera, Agromyzidae), a monophagous leaf miner of *Cannabis sativa* (Cannabaceae), is here reported as a species new to Great Britain. The species was found to be attacking two crops of hemp, both under glass and each the subject of plant breeding trials at secure sites licensed by the Home Office. One site is in the south of England, the other in the north of England, and there is a commercial connection between the two. In order to maintain appropriate confidentiality, certain information, including the localities of the findings, has been withheld from this paper.

Anecdotal reports from staff at the southern site suggest that leaf mining in the hemp crop was first noticed some eighteen months before the Plant Health and Seed Inspectorate (APHA) was informed in June 2016 (though it is likely to have been present before that). At that point, damage to the crop was extensive with typically three or four mines found on each plant (one mine per leaf) where the crop was dense, with even higher levels of mining observed in areas near pathways where the crop thinned out.

Sticky traps that had previously been hung over the affected crop at each site were sent to the Fera laboratory for examination. These were found to be covered with numerous adults of *L. cannabis*; no other agromyzid species was present. Forty-two male flies and eleven female flies were found on two traps from the southern site; thirty-one male flies and five female flies were found on three traps from the northern site. The flies were identified to species by reference to the key, species description, and line drawings of the male aedeagus (figs 407 and 408) in Spencer (1976) (line drawings re-published as figs 205 and 206 in Spencer 1990). Subsequently, ten leaves were obtained from the northern site enabling the mines, larvae, and a puparium to be examined. This allowed confirmation of the identification as *L. cannabis*, by reference to Ellis (2016).

It is not certain how the leaf miner arrived at the sites, but it is suspected that the introduction was mediated by man, possibly on plants brought in from the Netherlands, rather than this being a case of natural spread from the continent. It also seems most likely that the species was then accidentally transferred between the sites; however, it has been suggested by the staff that there has been no movement of plants between the sites, in turn suggesting that the species hitched a lift with either personnel or, less likely, equipment.

A biological control programme has been put in place at both sites in order to both reduce the level of damage to each crop and prevent further spread of the leaf miner.

Fig. 1. ***Liriomyza cannabis*****: head and thorax, dorsal aspect, of adult male still in place on the sticky trap.**

The purpose of this communication is to record the arrival of the species in Great Britain, and to provide information that will enable its identification, with photographs that may prove of particular value in that regard.

Distribution and biology

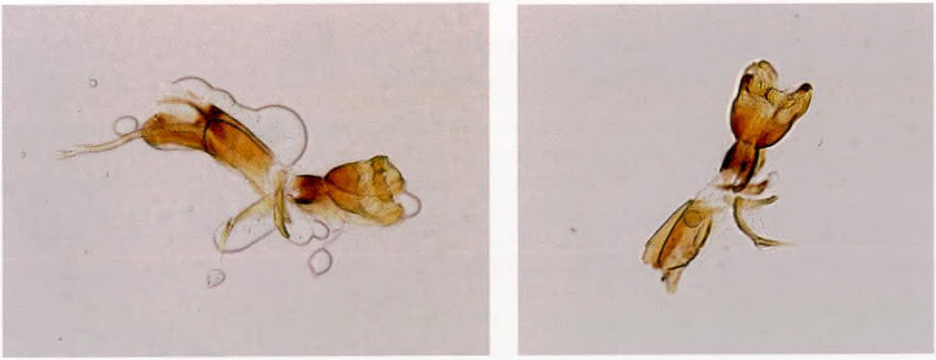
Liriomyza cannabis is a species that has been recorded from a number of countries on the continent of Europe: Denmark, Finland, Germany, Lithuania, the Netherlands, Poland, Romania, Slovenia, Turkey, and the former Yugoslavia (illustrated as Serbia and Montenegro) (Martinez 2013). Citation details for most of the individual country records can be found on-line (Ellis 2016) with Scandinavian records cited by Spencer (1976). The species was also recorded at two sites in Japan in the late 1950s (Sasakawa 1961). MvT has collected 110 articles and books that refer to *L. cannabis* and 297 references relating to its sibling species *L. eupatorii* (Kaltenbach, 1873), discussed below. They contain distribution data of *L. cannabis* for the following further countries: Afghanistan, Belgium, Czech Republic, Hungary, Italy, Kyrgyzstan, Macedonia, Norway, Russia, Sweden, and Ukraine.

Most of the information to be found in the literature on *L. cannabis* concerns its identification and taxonomic identity and history (see below). Very little seems to be known about its biology, although Hering (1957) followed the original description by Hendel (1931-1936) in stating that there are two generations per year; however, no further details were supplied in either case. At the southern site here, overlapping generations of *L. cannabis* without a seasonal break were observed; the crop is subjected to a constant temperature of 25°C and high light levels, both maintained throughout the year.

Identification

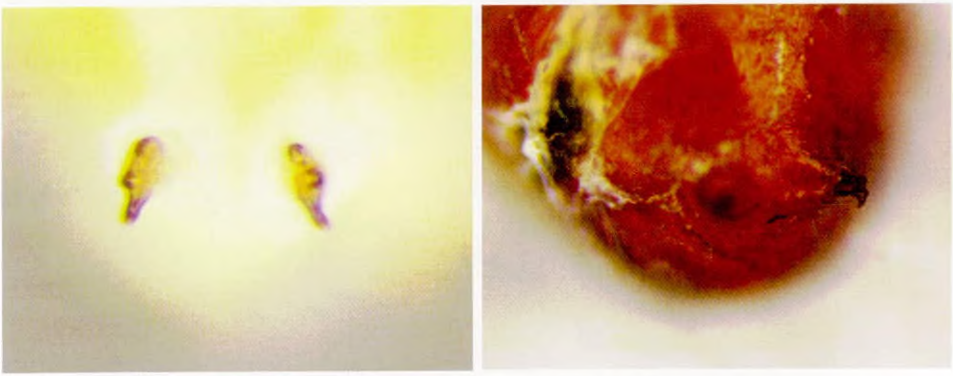
Liriomyza cannabis has the typical habitus of its genus, albeit at the paler end of the range of variation (Fig. 1). In detail: the frons, fronto-orbital plate, and third antennal segment are yellow, the latter rounded; the black of the eye hind-margin extends to very slightly beyond the outer vertical setae, the inner vertical setae sit on a yellow background; the anepisternum is smudged black at the lower anterior corner, the smudge extending halfway back along the lower margin and (more diffusely) halfway up the anterior margin (both extensions can vary in strength and extent), the rest of the plate is yellow; the scutum is shining black, but with reticulated microsculpture clearly visible even at quite low magnification, and with four rows of acrostichal setulae; the black of the scutum meets the scutellum along the central two-thirds of the joint margin, the lateral margins of the scutum and the postalar callus being yellow; the scutellum is entirely yellow; the femora are bright yellow, the tibiae and tarsi lightish brown.

The male aedeagus is as depicted in Figs 2 and 3.



Figs 2-3. *Liriomyza cannabis*: 2 (left), male aedeagus (glue from the trap still visible), slightly rotated lateral view (not the same rotational alignment as Fig. 407 in Spencer 1976); 3 (right), male aedeagus, with distiphallus aligned in dorsal view.

The larva is yellowish green, and each posterior spiracle is tricorn-shaped with three pores, the ventral pore on a slight extension (Fig. 4). The puparium is reddish-brown with similarly-shaped posterior spiracles (Fig. 5). In some individuals, the ventral extension has a little kink at a point along its length giving it a hook-like appearance.



Figs 4-5. *Liriomyza cannabis*: 4 (left), larva, posterior spiracles; 5 (right), posterior view of puparium showing the hook-like appearance of the ventral extension of the posterior spiracle.

The larva mines at the upper surface of the leaf, the mine typically beginning as a spiral before extending with a more linear appearance. In the limited material seen in the laboratory, the mines showed a tendency to follow the leaf margin (Figs 6 and 7). Prominent strings of frass are visible. As is characteristic of the genus, pupation occurs outside of the mine.

Discussion

Liriomyza cannabis is very similar to *L. eupatorii*; the male genitalia are similar and both produce mines that typically start with spirals. However, in *L. eupatorii* the hind margin of the eye is black to the base of the inner vertical setae. Nevertheless, the mine of *L. cannabis* was figured for the first time by Hering (1927) as *L. eupatorii*, before Hendel separated out the *Cannabis*-miner as a distinct species (Hendel 1931-1936). The most recent authors to report *L. eupatorii* as a *Cannabis*-miner were van Frankenhuyzen *et al.* (1982). Hering (1951) commented on the distinct mine morphology of these two species: "its formation is explained by the fact that the young larva is unable to cross the stronger leaf veins, with their many hard strengthening elements". Nowakowski (1962) discussed the transplantation experiments of Buhr (1937) who successfully transferred larvae of *L. eupatorii* from *Eupatorium* to *Cannabis* and *Galeopsis* (and in reverse), but did not formally synonymise the two species. In their overview of hemp pests, McPartland *et al.* (2000) remained ambiguous as to the true taxonomic status of the two species. Doubt, therefore, occurs over the validity of the separation, whether or not this is a possible case of "disjunctive oligophagy" in a single species. Investigation incorporating DNA sequence analysis might prove particularly instructive in this case.

The only other species of Agromyzidae that have been recorded by experts (Spencer 1990; Ellis 2016) producing predominantly corridor-like mines on the leaves of *Cannabis sativa* are the polyphagous species *L. strigata* (Meigen, 1830) and *Chromatomyia horticola* (Goureau, 1851). In general, *L. strigata* produces a linear mine following the mid-rib of the leaf, with short cul-de-sac corridors leading off laterally. Unlike species of *Liriomyza*, *C. horticola* pupariates within its mine. In addition, text and photographs can be found on the internet showing the polyphagous pest species *L. bryoniae* (Kaltenbach, 1858), *L. huidobrensis* (Blanchard, 1926), *L. sativae* (Blanchard, 1938) and *L. trifolii* (Burgess, 1880) mining *Cannabis* (e.g. in the Spanish "Cannabis Magazine"). However, none of these taxa are documented as hemp miners in Benavent-Corai *et al.* (2005).

Figs 6-7. *Liriomyza cannabis* leaf mines: 6 (left), mined leaf (also affected by powdery mildew); 7 (right), mined leaf, detail (mine and feeding punctures).

Acknowledgements
We are grateful to David Crossley (Fera) for the photography of the mined leaves. All photographs are copyright of Fera Science Limited.

References

Benavent-Corai, J., Martinez, M. and Peydró, R.J. 2005. Catalogue of the hosts-plants of the world Agromyzidae (Diptera). Part 1: List of Agromyzidae species and their hosts-plants. Part 2: List of hosts[sic!]-plants and Agromyzidae associated. *Bollettino di Zoologia agraria e di Bachicoltura, Università degli Studi di Milano, Serie II,* **37**(Supplementum), pp. i-ii, 1-97. Torino.

Buhr, H. 1937. Parasitenbefall und Pflanzenverwandtschaft. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **68,** 142-198, pls xxvi-xxvii.

Ellis, W.N. 2016. Leafminers and plant galls of Europe/Bladmineerders en plantgallen van Europa. http://www.bladmineerders.nl (last accessed 30 June 2016).

Hendel, F. 1931-1936. 59. Agromyzidae. **In** Lindner, E. (Ed.) *Die Fliegen der paläarktischen Region* **vi 2,** xi + 1-570, pls i-xvi.

Hering, M. 1927. Agromyzidae (80. Familie). **In** Dahl, F. (Ed.) *Die Tierwelt Deutschlands und der angrenzenden Meeresteile nach ihren Merkmalen und nach ihrer Lebensweise*. **6. Teil**, Zweiflügler oder Diptera **I**, iv + 172 pp., Gustav Fischer, Jena.

Hering, E.M. 1951. *Biology of the leaf miners*. iv + 420 pp, 2 plates. Dr. W. Junk's-Gravenhage.

Hering, E.M. 1957. *Bestimmungstabellen der Blattminen von Europa*. **1, 2,** 1-1185; **3,** 1-221. Dr. W. Junk's-Gravenhage.

Martinez, M. 2013. Fauna Europaea: Agromyzidae. **In** Pape, T. and Beuk, P. Fauna Europaea: Diptera. Fauna Europaea version 2.6, http://www.fauna-eu.org (http://www.fauna-eu.org) (last accessed 30 June 2016).

McPartland, J.M., Clarke, J.C. and Watson, D.P. 2000. Hemp Diseases and Pests. Management and Biological Control. An Advanced Treatise. xi + 251 pp., 12 colour plates (1-86), CABI Publishing, Wallingford.

Nowakowski, J.T. 1962. Introduction to a Systematic Revision of the Family Agromyzidae (Diptera) with some Remarks on Host Plant Selection by these Flies. *Annales zoologici* (*Warszawa*) **20**(8)**,** 67-183.

Sasakawa, M. 1961. A study of the Japanese Agromyzidae (Diptera). *Pacific Insects* **3**(2-3)**,** 307-472.

Spencer, K.A. 1976. The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* **5,** Part 1: 1-304; Part 2: 305-606.

Spencer, K.A. 1990. Host specialization in the world Agromyzidae (Diptera). *Series Entomologica Vol. 45.* xii + 444 pp. Kluwer Academic Publishers, Dordrecht.

van Frankenhuyzen, A., Houtman, G. and Kabos, W.J. 1982. Mineerders van bomen, struiken en kruiden. *Wetenschappelijke Mededelingen van de koninklijke nederlandse natuurhistorische Vereniging* **150,** 1-96.

***Sciophila varia* (Winnertz) (Diptera, Mycetophilidae) reared from *Hydnum repandum* at its old site at Logie in Morayshire –** While visiting the Logie Steading Visitor Centre near Forres (NJ0051, V.C. 95) on a wet day during an unofficial gathering of dipterists based in Kingussie, my wife and I chose to wander along a section of the Lower Findhorn Woods SSSI which adjoins the centre grounds. We came across impressive displays of mushrooms throughout the wooded river gorge and I picked up a large fruit body of *Hydnum repandum* to check my identification and, having already snapped it from the mycelium, and rather than just discard it, I broke it open to see if there were any insect larvae present. It immediately become obvious that the core of the fungal cap was riddled with Diptera larvae. The fungus was therefore placed into a container and taken home for rearing. The collection date was 28.viii.2016 and a group of adults emerged during September or October. These were then passed to Peter Chandler for identification. They proved to be 11 males and 8 females of *Sciophila varia* (Winnertz, 1863), a species known from just five localities in Britain, one of which was Logie, where it was found by Francis Jenkinson on 21.x.1910. So this great rarity has been rediscovered at a known site after more than 100 years. The habitat was mixed ancient woodland along the River Findhorn gorge, with mature beech, oak, ash, birch and hazel. It is a high quality site and has an impressive display of tree lungwort lichen *Lobaria pulmonaria*. The SSSI designation is about lichens and bryophytes; the citation sheet does not even mention invertebrates.

Although assessed as Endangered (Shirt, D.B. (Ed.) 1987. *British Red Data Books 2 Insects*. Nature Conservancy Council; Falk, S. 1991. A review of the scarce and threatened flies of Great Britain (part 1). *Research & survey in nature conservation* **No.39**) *S. varia* was downgraded to Data Deficient by S. Falk and P.J. Chandler (2005. A review of the scarce and threatened flies of Great Britain Part 2: Nematocera and Aschiza. *Species Status* **No. 2,** Joint Nature Conservation Committee). At that time only two other widely scattered British records in addition to Logie were known. It had been reared by Peter Chandler from *Hydnum repandum* at Holne Wood in Devon in 1980, and he also found it at Auchmore Wood by Loch Tay in Perthshire in 1988. An old Suffolk record by Claude Morley at Monk's Soham in 1940 has since been discovered, and this year Peter caught a male on the Trees for Life Estate at Dundreggan on 21.viii.2016, by the Lower Allt an Lagain Bhain, a small stream fringed by birch (at NH3065 1373) (Peter Chandler *pers. comm.*).

In addition to the two British rearings, *S. varia* has also been reared from *Hydnum repandum* in both Estonia (Kurina, O. 1994. New records of Mycetophilidae (Diptera) reared from macrofungi in Estonia. *Proceedings of the Estonian Academy of Sciences, Biology* **43,** 216-220) and the Czech Republic (Ševčík, J. 2010. *Czech and Slovak Diptera associated with fungi.* 112 pp. Slezské Zemské Muzeum Opava), so that seems a regular host. A.I. Zaitzev (1982. *Fungus gnats of the genus Sciophila Meig. of the Holarctic.* Akademia Nauk SSSR, Izdatelistvo Nauka, Moscow, 75 pp), when he revised the genus, recorded it as developing internally in chantarelles *Cantharellus cibarius*, and pupating in loose cocoons in soil or moss. Chantarelles are abundant at Dundreggan, so may be the host there. The other fungus hosts mentioned in the review (Falk and Chandler *op. cit.*) are from earlier literature and are possibly misidentifications.

My thanks to Peter Chandler for identifying the specimens, providing supplementary information, and for suggesting this short note be written. Peter is grateful to Alan Watson Featherstone of Trees for Life for the opportunity to record at Dundreggan, and to Vladimir Blagoderov for translating the relevant passage in Zaitzev (1982) – **KEITH N.A. ALEXANDER**, 59 Sweetbrier Lane, Heavitree, Exeter EX1 3AQ

Dipterists Digest 2016 **23,** 169-175

The rarer British species of the genus *Tasiocera* Skuse (Diptera, Limoniidae) in the Natural History Museum, London

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Summary

The British holotype specimen of *Tasiocera collini* Freeman, 1951 in the NHM collection was photographed and compared with a photograph of a paratype of *T. halesus* (Schmid, 1949) in the Museum of Zoology, Lausanne. The comparison supports the conclusion of Starý that these are the same species. A specimen of *T. laminata* Freeman, 1951 in the NHM collection was also photographed. Comparison with Bangerter's illustration supports the conclusion of Savchenko *et al*. that *T. laminata* is a synonym of *T. robusta*. Photographs are also provided of *T. jenkinsoni* Freeman, 1951.

Introduction - the history of the genus *Tasiocera* Skuse, 1890 in Britain

In the key by Coe (1950) the only species given for *Tasiocera* was *T. murina* (Meigen, 1818) but Freeman (1951) revised the British species of *Tasiocera* and added 4 species to the British list, which was then as follows:

1. T. collini Freeman, 1951
2. T. fuscescens (Lackschewitz, 1940)
3. T. jenkinsoni Freeman, 1951
4. T. laminata Freeman, 1951
5. T. murina (Meigen, 1818)

Since then, questions have been raised regarding the status of two of these Freeman species, *T. collini* and *T. laminata,* and the species *T. collini* was included in the Cranefly Recording Scheme Test Key to species with an Open Discal Cell (Stubbs 2001). The purpose of the work described here is to contribute to resolving these questions.

Inversion of the hypopygium

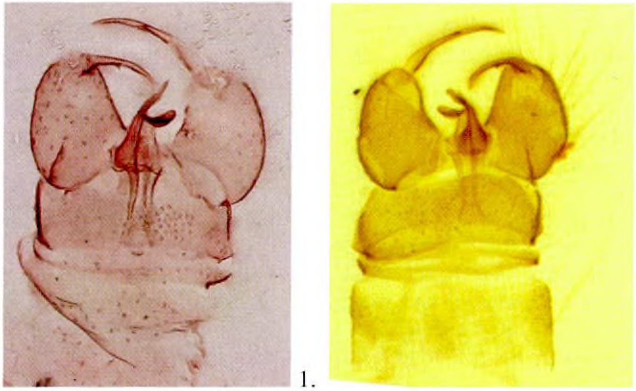
Freeman (1951) stated: *The male hypopygium is of the inverse type. ..... The aedeagus is formed of two parts - the sternal (actually dorsal) median penis and the tergal (actually ventral) 'phallosomic structure'.* This observation is based on the work of F.W. Edwards (Edwards 1936) who wrote: *Many years ago I called attention to the fact that in the Tipulid Genera Molophilus and Rhypholophus, as in all mosquitoes, the hypopygium of the fully developed male occupies an inverted position, the anal parts being ventral and the genital parts being dorsal; the rotation takes place shortly after emergence from the pupa and once it has taken place the organs remain in their new position .... A recent re-study of the genera of the Eriopterini shows that the phenomenon of inversion is of somewhat wider occurrence in the tribe than I thought at first. Thus it occurs in all species (so far as I have seen) of Molophilus, Dasymolophilus, Tasiocera, Ormosia (including Rhypholophus), Ilysia, Empeda, Cheilotrichia and Styringomyia.*

This means that in this paper, the photographs, viewed as in live specimens, present the tergal, anatomically ventral parts upper-most.

There are five species of *Tasiocera* on the current British Checklist (Chandler 2016):

1. *T. fuscescens* (Lackschewitz, 1940)
    muscula (Schmid, 1949) (Syn. Starý *pers. comm.* to Oosterbroek 2006)
2. *T. halesus* (Schmid, 1949)
    collini Freeman, 1951 (Syn. Starý *pers. comm.* to Oosterbroek 2006)
3. *T. jenkinsoni* Freeman, 1951
4. *T. murina* (Meigen, 1818)
5. *T. robusta* (Bangerter, 1947)
    laminata Freeman, 1951 (Syn. in Savchenko *et al.* 1992)

The genus *Tasiocera* is one of the most difficult genera of craneflies to work with since, in order to be certain of the identification of most species, the tiny genital apodeme has to be examined under high power. It must be said that this is standard practice with some other genera of craneflies and many other families of small flies, but this has perhaps led to an under-recording of *Tasiocera* relative to other genera of larger craneflies. Over the past 50 years records of *Tasiocera* have slowly accumulated, giving us a glimpse of the distribution and ecology of these flies in Britain. Some specimens of the common *T. murina* identified prior to 1951 may well be incorrectly identified.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Figs 1-2: 1, *Tasiocera collini* holotype, male hypopygium, ventral view. Photo JK, ©NHM London; 2, *Tasiocera halesus* paratype, male hypopygium, ventral view. Photo M. Podolak, Museum of Zoology, Lausanne.

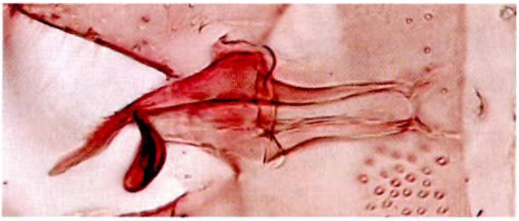


Fig. 3. *Tasiocera collini* holotype, male genital apodeme, ventral view. Photo JK, ©NHM London.

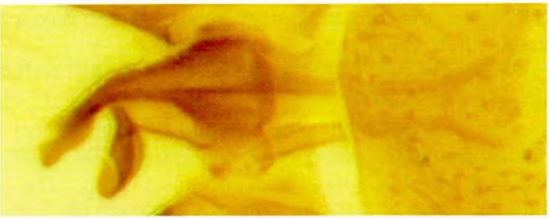
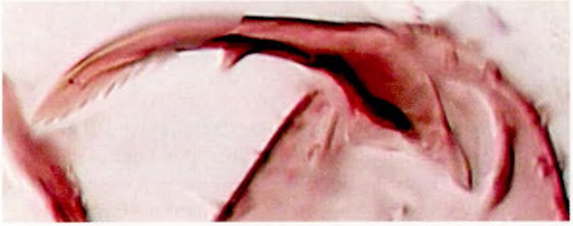


Fig. 4. ***Tasiocera halesus*** **paratype, male genital apodeme, ventral view. Photo M. Podolak, Museum of Zoology, Lausanne.**

Table 1.

Name	No. of Records	Phenology	Distribution
T. fuscescens	100	April – June with peak in May	England, Scotland, Wales
T. halesus	3	June, July	England
T. jenkinsoni	4	August	Southern England, S Wales
T. murina	300	April – June with peak in May	England, Scotland, Wales
T. robusta	30	May – June with peak in June	England, Wales

They are all species of wet woodlands. It can be seen from Table 1 that the two species *T. halesus* and *T. jenkinsoni* are very rarely recorded. These species, and their synonyms, will be examined here.



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Figs 5-6: 5, ***Tasiocera collini*** **holotype, style. Photo JK, ©NHM London; 6,** ***T. halesus*****, paratype, style. Photo M. Podolak, Museum of Zoology, Lausanne.**

Materials and methods.
All of the holotype specimens of *Tasiocera,* described below, are stored in Drawer 232 of the NHM World Collection.

Specimens examined:
T. collini**, male holotype:** (Figs 1, 3, 5) Specimen labelled: Suffolk, Chippenham Fen, 25.vii.1950, J.E. Collin. The terminalia are mounted in Canada balsam on a celluloid strip and were photographed at magnifications of x10, x20, and x40 using Helicon Focus stacking software. The genital apodeme is slightly distorted, the ventral apodeme being bent, but the structure is

clearly visible (Fig. 1). [Note that the structures shown were photographed through Canada balsam, which is somewhat discoloured and distorted.]

In addition, two paratypes of *T. collini* are present in the NHM British Collection: Limoniidae, Drawer 11, tray labelled: *T. halesus* Schmid, 1949 syn. *T. collini* Freeman, 1951. There are a male and a female specimen, each labelled: 'Chippenham Fen, 25.vii.1950, J.E. Collin. Freeman, Paratype. Found in numbers on a poplar tree trunk.' As with the holotype, the male terminalia are mounted in Canada balsam on a celluloid strip. The female terminalia are similarly mounted. There is some distortion of Canada balsam but cerci are visible

T. halesus (Schmid, 1949): male paratype.

This specimen was photographed by Marion Podolak at the Museum of Zoology, Lausanne (Figs 2, 4, 6). It has two labels. The location label is uppermost and says: Suisse-Vaud, Belmont, 4.VII.1948. F. Schmid. The words Belmont, and the date are hand-written. Below that on the pin is the det. label which states: 'Tasiocera halesus, F. Schmid, paratype'. Both the name and 'paratype' are hand-written. The specimen is staged and micro-pinned dorso-ventrally through the thorax. The male post-abdomen is mounted in Canada balsam on a celluloid strip beneath the labels. In addition to this paratype there are two other specimens present in the Museum of Zoology, Lausanne. There are two known Swiss sites near Lake Geneva (Podėnas *et al.* 2006)

T. laminata Freeman 1951

One male specimen in the NHM World Collection, labelled as Holotype and collected 1.viii.1949 by J.E. Collin from Woodditton Fen, pinned in a tray now labelled *T. robusta* (Bangerter, 1947) = *laminata* Freeman, 1951 Syn. in Savchenko *et al.* 1992. The post-abdomen is mounted in Canada balsam on a celluloid strip on the pin, beneath the specimen. This specimen was photographed (Fig. 7) and compared with Bangerter's illustration for *T. robusta* (Fig. 8, from Bangerter 1947). Another specimen is present in the NHM British Collection: Limoniidae Drawer 11, labelled '*T. laminata* det. P.S. Cranston 1974, S. Devon, Nanny's Stream, Eastleigh, 14.vii.1974'. This is undissected.

T. jenkinsoni Freeman, 1951

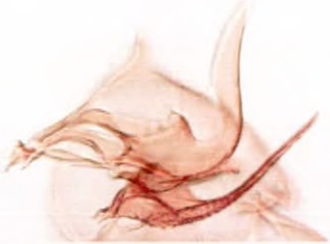
This is another very rare species in Britain. The only specimens in the NHM are from Crowborough, Sussex, caught by Francis Jenkinson. His father and sister Eleanor lived at Ocklye House (TQ501311) on the western edge of the town. The earliest British specimen collected, a single whole specimen, is in the British Collection dated 14.08.1906. Jenkinson's diaries show that he was collecting in 'the ghyll', a wooded ravine below the house, on that day (Perry 2007). Freeman determined these specimens some 40 years later and presumably identified this paratype from the unique style since it is not dissected.

The male holotype and a female specimen are in the NHM World Collection, dated 1.8.1912 (NMH 235058). The male and female genitalia preparations, are in good condition although there is some crumpling of the Canada balsam. The style and genital apodeme of the male holotype, was photographed through the balsam (Figs 9 and 11).

Discussion

Tasiocera halesus (Schmid, 1949) syn. *T. collini* Freeman, 1951

From a comparison of the relevant papers, Jaroslav Starý recommended that *T. collini* be synonymised with *T. halesus* (Fauna Europaea 2002) and this change was accepted for the British Checklist (Chandler 2016). Without a comparison of the specimens themselves some doubt remained about validity of the synonymy. To resolve this doubt and since the author had the opportunity to photograph the holotype of *T. collini* at the NHM it was decided to compare these photographs with a photograph of a paratype of *T. halesus* at the Museum of Zoology, Lausanne, the holotype being no longer available. Figures from the papers of both authors were also compared. The genital apodemes and styles are very similar. Freeman describes the style of *T. collini* as having one strong tooth near the apex, and 2-3 smaller between it and the apex, which is quite broad. When the photographs of the specimens from London and Lausanne are compared, the similarity is clearly visible, including the very unusual 'feathered' ends to the styles (Figs 3 and 4). Since the NHM specimen of *T. collini* was embedded in Canada balsam a lateral view of the genital apodeme was not possible without dissolving out the specimen.



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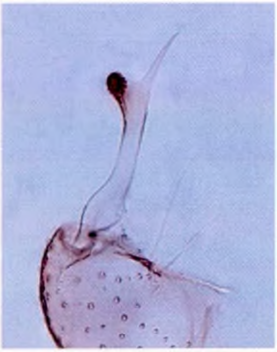
Figs 7-8: *Tasiocera laminata*, genital apodeme. Photo JK, ©NHM London; 8, *Tasiocera laminata*, genital apodeme, from Bangerter (1947).



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Figs 9-10: 9, *Tasiocera jenkinsoni*, style. Photo JK, ©NHM London; 10, *Tasiocera jenkinsoni*, style from Freeman (1951).

Fig. 11. *Tasiocera jenkinsoni,* holotype, male genital apodeme, dorsal view. Photo JK, ©NHM London.

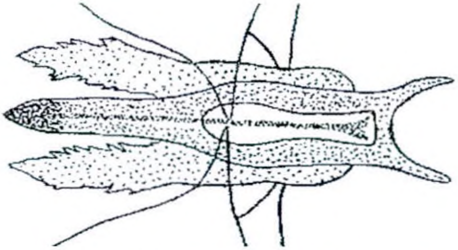


Fig 12. ***Tasiocera jenkinsoni*****, male genital apodeme, from Freeman (1951).**

The only other British records of *T. halesus* are from I. Perry (Ashberry Pastures, Rievaulx, V.C. 62, 16 July 1996) and from M. Edwards (Barlavington Estate, V.C. 13, 29 July 2000). These specimens have not been seen by the author.

T. laminata Freeman, 1951

When the photograph of the genitalia of *T. laminata* (Fig. 7) is compared with the illustration by Bangerter of the genital apodeme of *T. robusta* (Fig. 8) the similarities are clear. On the apodemes of both specimens there are single upper and lower pointed structures, unlike the tongue-like ventral structure of *T. halesus*, and the thick rounded knob of *T. murina*. There is also a deep notch on the dorsal apodeme unlike the smooth curve of *T. fuscescens* with its lateral processes. Note also that in lateral view the photograph of *T. laminata* (Fig. 7) shows a much thinner lower process than that shown in Bangerter's illustration (Fig. 8), the thinner process being typical of the species (J. Starý *pers. comm.*)

T. jenkinsoni Freeman, 1951

The 'feathering' of the internal edges of the genital apodeme is reminiscent of the distal part of the styles of *T. halesus*. The unique structure of the apodeme but especially of the male style of *T. jenkinsoni* makes this species one of the easiest of the *Tasiocera* species to identify, since a preparation of the apodeme is not needed for identification. Freeman did not provide a lateral view of this apodeme. In addition to Jenkinson's specimens from Crowborough, Sussex, captured on 14 August 1906 and 1 August 1912, there is also a record determined by Alan Stubbs, of a specimen from Fyning Moor SSSI, Rogate, Sussex, on 25 August 1974. Peter Chandler also found a male of *T. jenkinsoni* at Ninewells Common, on the western edge of the Forest of Dean in Monmouthshire on 12 August 1984.

Conclusions

This work supports the proposals made by Jaroslav Starý that *T. collini* Freeman, 1951 is a junior synonym of *T. halesus* (Schmid, 1949). It also supports the proposal by Savchenko *et al.* (1992) that *T. laminata* Freeman, 1951 is a junior synonym of *T. robusta* (Bangerter, 1947). *Tasiocera jenkinsoni* is clearly supported as a distinct species.

Acknowledgements

Thanks to Erica McAlister and Duncan Sivell for their permissions and help in photographing the *Tasiocera* specimens from the collection. My thanks go also to Anne Freitag for information, and to Marion Podolak for the photograph of the *T. halesus* paratype, both of whom are at the Museum of Zoology, Lausanne. I am grateful to Jaroslav Starý and Geoff Hancock for comments on a draft of this paper.

References

Bangerter, H. 1947. Neue Eriopterini (Diptera, Tipulidae). *Mitteilungen der schweizerischen entomologischen Gesellschaft* **20,** 367-368.

Chandler, P.J. (Ed.) 1998. Checklists of insects of the British Isles (New Series). Part 1: Diptera. *Handbooks for the Identification of British Insects* **12**(1), i-xix, 1-234. Royal Entomological Society, London.

Chandler, P.J. (Ed.) 2016. [latest checklist update available at *www.dipteristsforum.org.uk*].

Coe, R.L. 1950. Tipulidae. **In** Coe, R.L., Freeman, P. and Mattingley, P.F. 1950. Handbooks for the Identification of British Insects. Vol. 9. Part 2. Diptera 2. Nematocera: families Tipulidae to Chironomidae. Royal Entomological Society, London.

Edwards, F.W. 1936. Inverted male hypopygia in Eriopterine Craneflies. *Entomologist* **69,** 243

Freeman, P. 1951. The British species of *Tasiocera* Skuse. (Diptera, Tipulidae). *Proceedings of the Royal Entomological Society of London* (B) **20,** 29-36.

Perry, I. 2007. Francis John Henry Jenkinson, his life and legacy. *Dipterists Digest* (*Second Series*) **14,** 49-73.

Savchenko, E.N., Oosterbroek, P. and Starý, J. 1992. Family Limoniidae. **In** Soós, A. and Papp, L. (Eds) Catalogue of Palaearctic Diptera **1,** 294-5

Schmid, F. 1949. Notes sur quelques Limnobiides du genre *Dasymolophilus*. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* Band XXII Heft **2,** 235-242.

Starý, J. 1992. Phylogeny and Classification of Tipulomorpha with special emphasis on the family Limoniidae. *Acta Zoologica Cracoviensis* **35,** 11-36.

Stubbs, A.E. 2001. Test Key to Species with an Open Discal Cell. Published with the Bulletin of the Dipterists Forum. March 2001.

***Dorycera graminum* (Fabricius) (Diptera, Ulidiidae) in Hampshire and Middlesex** – The phoenix fly *Dorycera graminum* (Fabricius, 1794) is a relatively large and distinctive member of family Ulidiidae. It is listed as a Species of Principal Importance under the Natural Environment and Rural Communities Act (2006). It has recently been assessed as provisionally Near Threatened by S. Falk, J.W. Ismay and P.J. Chandler (2016. A Provisional Assessment of the Status of Acalyptratae flies in the UK. *Natural England Commissioned Reports*, no. 217), who list 21st century records from Berkshire, Buckinghamshire, Cambridgeshire, Essex, Hampshire, Kent, Northamptonshire, Surrey and Sussex. This note details the first Middlesex record, along with a further record for Hampshire.

On 29 May 2016, I was carrying out an entomological survey at Tom Tiddlers Ground, a Site of Importance for Nature Conservation on the South Hampshire coast near Calshot. The site was formed from the deposition of spoil and dredged material derived from the construction of the adjacent Fawley Power Station in the early 1960s. In the subsequent decades a mix of acid grassland, fen, reedbed, scrub and saltmarsh has developed (Cox, J. 2015. Tom Tiddlers Ground & Solent View Valley SINC Vegetation Survey).

I first noticed *Dorycera graminum* while sweeping in tall grassland in a transitional area between shorter acid grassland and willow/hawthorn scrub (area around SU47780198). The fly was very hard to observe by eye in the vegetation, but almost every sweep of the net produced between one and six specimens, and I estimate that I saw well over 100 individuals in about half an hour of sweeping along approx. 200 metres of path.

An association with umbellifers (Apiaceae) has been suggested for this fly, and there were plenty of umbellifers such as wild carrot *Daucus carota* in the vicinity, but the flies did not appear to be taking a particular interest in the umbellifers on this occasion, and none were swept from nearby hogweed *Heracleum sphondylium* flowers. Sweeping in the same area on 24 June produced no further examples of *Dorycera* at Tom Tiddlers Ground, which supports the observation that its main flight period is in late May and early June (Ismay, J.W. 2000. The status, distribution and biology of *Dorycera graminum* (Fabricius) (Diptera, Ulidiidae). *English Nature Research Reports* no. 395).

On 11 June 2016, I was visiting my parents in Cowley, Middlesex (TQ05348216), and on walking into their garden was surprised to see a recently dead (still relaxed) specimen of *D. graminum* on the leaf of a garden hollyhock. Since it was just two weeks since I had seen the fly in Hampshire I did wonder whether I could have transported it to Middlesex by accident, but I took no entomological equipment to Cowley and the fly was in front of me as I walked into the garden, so I cannot see any realistic way in which it could have been carried there. The location is a small suburban garden, adjoining other gardens on two sides and backing on to a recreational park with mown amenity grassland – **MARTIN C. HARVEY,** Evermor, Bridge Street, Great Kimble, Aylesbury, HP17 9TN, kitenetter@googlemail.com

Dipterists Digest 2016 **23,** 177-183

Observations of *Lispocephala* species (Diptera, Muscidae) in Highland

MURDO MACDONALD
'Tigh nam Beithe', Strathpeffer, Ross & Cromarty IV14 9ET

Summary

Casual observations of five species of *Lispocephala* in N Scotland between 2012 and 2016 are described. The most frequent was *L. pallipalpis*, generally considered to be a rare fly in Britain. *Lispocephala alma*, *L. spuria*, *L. brachialis* and *L. falculata* were also recorded. Some records from other sources are described for *L. erythrocera* and *L. verna*.

Introduction

In March 2012, at Strathpeffer (NH45, V.C. 106) I found a small muscid basking on a tree-trunk and identified it as *Lispocephala pallipalpis* (Zetterstedt) (Diptera, Muscidae). As this was my first attempt to key any of the Coenosiinae, and the species seemed highly improbable in this location, the specimen was sent to and confirmed by Steven Falk and the record published as the first for Scotland (Horsfield *et al.* 2013a). I have subsequently discovered that the fly had previously been taken in NJ62 (V.C. 93, N Aberdeen) by Del Smith (*pers. comm.*) in August 2011. Continued collecting has determined that it is well established, and at least locally common, in Highland (the local authority area covering V.C.s 96, 97, 104-109 and parts of V.C.s 95 and 98; see Fig. 2).

As little is known of *L. pallipalpis* and its congeners, a summary of my observations, even though very incomplete, would appear worthwhile.

Methods

All my encounters with *Lispocephala* species were recorded. Recording effort was casual and opportunistic, not systematic, though it was targeted on the genus. A few specimens were provided by Jimmy McKellar and identified by me. Older records identified by Peter Skidmore, Del Smith, Bill Ely, and A.C. Pont in the Highland Biological Recording Group (HBRG) database were included.

Flies were easily found by scanning pale- and smooth-barked trees (ash *Fraxinus excelsior*, sycamore *Acer*, beech *Fagus sylvatica*), stumps and fenceposts in reasonably sheltered situations, in dry and sunny weather, even when the air temperature was as low as 4.5°C and after frosts. They can be detected from some metres away, and a little experience allowed recognition of the genus in the field from its 'jizz' with a high degree of accuracy, allowing the fly to be potted for detailed examination. Size and 'chunky' build, the greyish thorax, reddish legs, and the inflated abdomen when seen from the side are good field markers which exclude most other muscids and anthomyiids which might be present. Potting the flies directly by placing a 1cm diameter plastic tube over them was much more effective than using a net in these situations.

Most effort was in the area around Inverness and East Ross (V.C.s 96, 106), centred on NH45. Identification was confirmed from Collin (1963) and d'Assis-Fonseca (1968). Most of the records used in this paper are available in full on NBN Gateway in datasets managed by HBRG.

Results

The species

I encountered five species in the genus: *Lispocephala pallipalpis*, *L. alma* (Meigen, 1826), *L. spuria* (Zetterstedt, 1838), *L. brachialis* (Rondani, 1877) and *L. falculata* Collin, 1963 in descending order of frequency (Fig. 1). *Lispocephala brachialis* is designated IUCN (pre 1994) – Rare, while *L. pallipalpis* and *L. spuria* are Nationally Scarce and *L. falculata* is listed as IUCN (pre 1994) – Rare, and Nationally Scarce. In addition, the HBRG database has five records each of *L. erythrocera* (Robineau-Desvoidy, 1830) and *L. verna* (Fabricius, 1794)

Lispocephala pallipalpis was encountered far more often than the others, and was more likely to be found other than singly (Fig. 1). Frequently two or three species would be found together, a few centimetres apart.

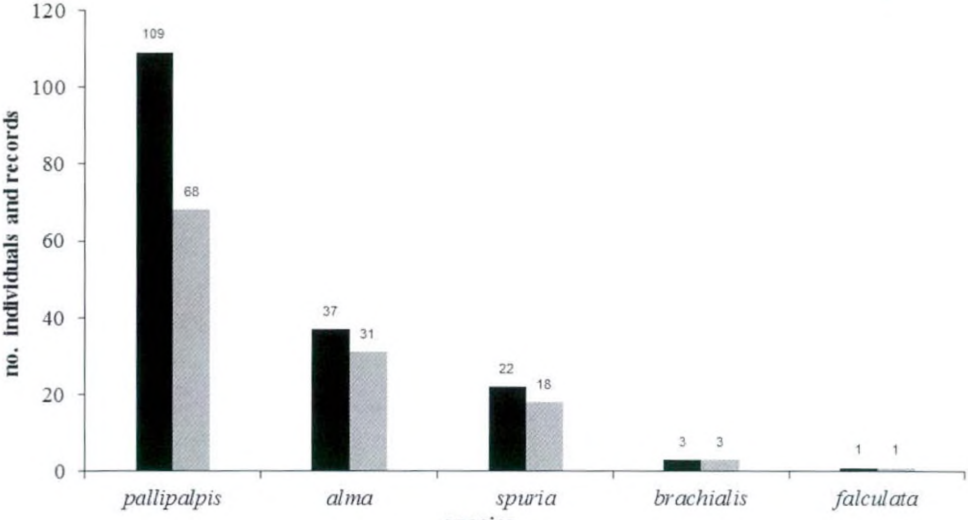


Fig. 1. Numbers of individuals (black) and records (grey) of *Lispocephala* species found in Highland, 2012-16.

Behaviour

Almost all the flies encountered were basking on tree-trunks, often in small dispersed groups of both sexes which surprisingly frequently contained two or three species within a small space. Of 86 samples taken by me, 23 (27%) contained two species, and 3 (3.5%) three species. There was often obvious interaction between flies, where one would land close to another, the second would fly off a short distance on the trunk, and the movement would be repeated. My impression was that this was mainly between males, but the small size and rapid movements allowed little opportunity for detailed observation. Even single flies are typically quite active. Only twice was feeding observed: a female *pallipalpis* and another *Lispocephala* of undetermined species and sex, each with a 1.5mm long unidentified gnat.

Habitat

There was nothing distinctive about the habitat in which any of the flies was found. The method of observation made it inevitable that woodland edge, clearings and rides dominated. *Lispocephala pallipalpis* has also been taken five times in a garden in suburban Inverness, and once indoors, so should be expected in any lowland open habitat.

Phenology

The earliest dates recorded for *L. pallipalpis* ranged from 17 February to 9 March in different years. For the scarcer (and so less easy to detect) *L. alma* first dates were 26 February to 28 April. In my immediate area around NH45, *L. pallipalpis* is the one of the earliest muscids to appear, typically around the same time as the first *Eudasyphora cyanella* (Meigen, 1826) and much easier to find. The genus, at least in some years, was the most often encountered of any muscid genus in March and April. Records of *L. alma* extend throughout the year, while *L. pallipalpis* is primarily a spring flier (Table 1). The other species were recorded in numbers too small to make conclusions.

Species		**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**
Lispocephala pallipalpis	all	8	17	24	14	2				1	2
	males	5	13	16	7					1	
	females	5	6	10	9	1				1	2
Lispocephala alma	all	2	3	13	8	1		1	2		1
	males	2	2	9	6		1	1	1		1
	females	1	1	5	3	1			1		
Lispocephala spuria			4	8	3					3	
L. brachialis				2	1						
L. falculata					1			2*			
L. erythrocera						3*		1*			
L. verna								2*	2*		

Table 1. Phenology of *Lispocephala* spp. in N Scotland. The number of records is shown. Male + female records sum to more than total records as the sexes frequently occurred together. *Records in the HBRG database but not from this study.

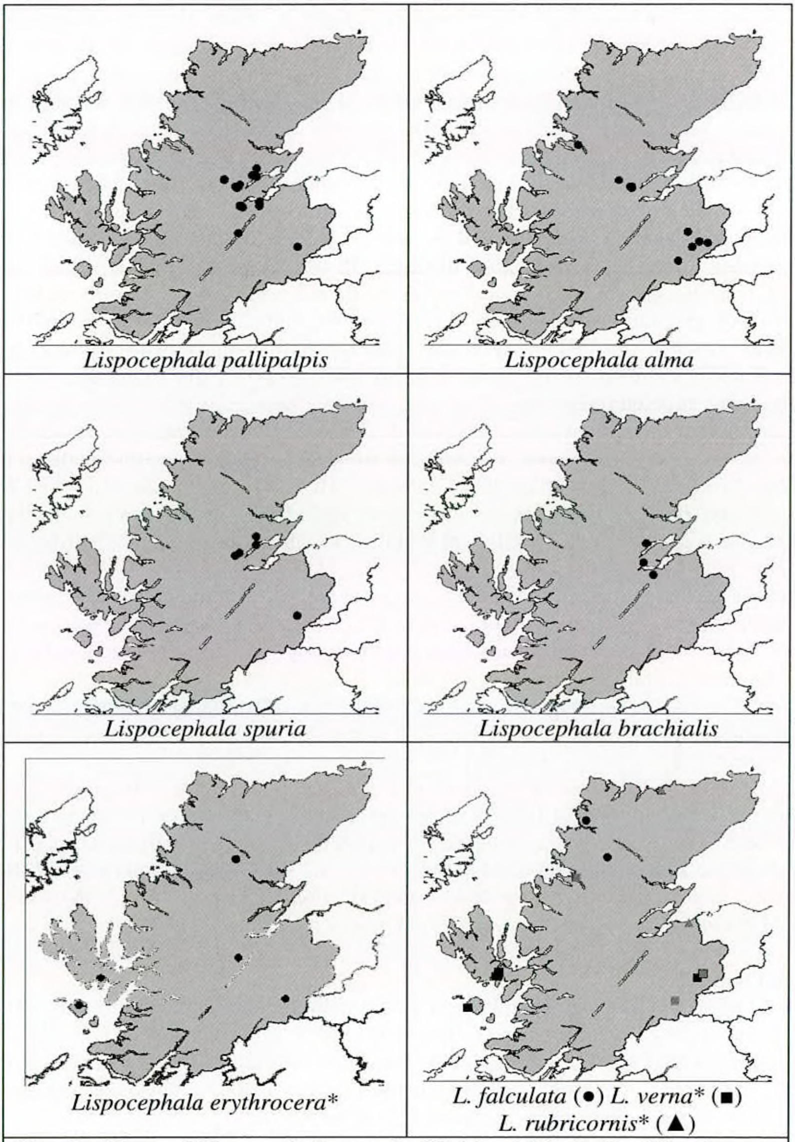
While most records are from spring, from March to May, a few *L. pallipalpis* and *L. spuria* fly in autumn (Table 1).

Distribution and abundance

There was insufficient spatial effort to describe the distribution with any precision, and assessment of abundance can only be subjective and relative. Current maps are shown in Fig. 2, and an assessment of their status in Highland appears in Table 2.

Species	This study	Other sources	Likely status in Highland
L. pallipalpis	Frequent in E Ross (V.C. 106) and Easterness (V.C. 96); commonest of the genus there.	D. Smith (*pers. comm.*): N Aberdeen (VC 93).	Common and widely distributed in the eastern part of the area at least.
L. alma	Fairly frequent across Highland.	Collin (1963): 'not at all uncommon throughout Scotland'. d'Assis-Fonseca (1968): Sutherland, Ross, Inverness (VCs 107/108, 105, 95, 96). D. Smith (*pers. comm.*): N Aberdeen (VC 93).	Frequent and found widely.
L. spuria	Rather scarce in E Ross (V.C. 106).	d'Assis-Fonseca (1968): S Scotland only. D. Smith (*pers. comm.*): N Aberdeen (VC 93).	Scarce in the eastern part of the area at least.
L. brachialis	Very scarce in E Ross (V.C. 106) and Easterness (V.C. 96).		Very scarce in the eastern part of the area at least.
L. falculata	W Ross (V.C. 105), W Sutherland (V.C. 108)		Very scarce, and perhaps commoner in the NW.
*L. erythrocera**		d'Assis-Fonseca (1968): Ross, Inverness (V.C.s 105/106, 96). Wormell (1982) (V.C. 104), D. Smith (*pers. comm.*): Elgin (V.C. 95).	Scarce across Highland.
*L. verna**		d'Assis-Fonseca (1968): Ross, Inverness (V.C.s 105, 96). Wormell (1982), Whiteley (1994): Rum (V.C.104).	Scarce in the southern part of Highland at least.
*L. rubricornis**		Collin (1963): Culbin (V.C.s 95/96). d'Assis-Fonseca (1968): Sutherland, Moray (V.C.s 108, 95)	Scarce across Highland, though specialised habitat may reduce encounters.

Table 2. Distribution of *Lispocephala* spp. in Highland. Records elsewhere in N Scotland are included for context. *Species not encountered in this study.



Lispocephala pallipalpis

Lispocephala alma

Lispocephala spuria

Lispocephala brachialis

*Lispocephala erythrocera**

L. falculata (●) *L. verna** (■) *L. rubricornis** (▲)

Fig. 2. Maps of *Lispocephala* spp. in Highland (shaded). *Species not encountered in this study. Grey symbols are records from d'Assis-Fonseca (1968).

Discussion

The current study has confirmed the presence in Highland of four species of *Lispocephala* and has added a little to our knowledge of a poorly-studied genus. Four other species recorded in the past were not encountered, but that might reflect temporal, ecological and geographical bias in the essentially opportunistic recording method. Conclusions must be tentative, as the results might be affected by possible unknown differences in behaviour or ecology between species or over the year. We can be most certain about the two most frequently recorded species, *L. pallipalpis* and *L. alma*.

Lispocephala pallipalpis is obviously a very common spring flier in the eastern part of Highland. All other British records are from England south of the Wash. d'Assis-Fonseca (1968) cited records from Devon, Hampshire and Somerset. Horsfield *et al.* (2013a) referred to others in Herefordshire, Somerset, Surrey and Wiltshire. The NBN Gateway shows records, only three since 1980, from Berkshire, Devon, Hertfordshire, Suffolk and Sussex. More recently, Wolton *et al.* (2014) found it in Devon in 2011-12, and another from Essex in 2015 was posted on the iSpot website (Richardson 2015). Whether this apparent disjunct distribution is real, or a consequence of inadequate recording of a small undistinctive early-flying fly, will only be resolved by more targeted recording.

Lispocephala alma shows a quite different phenology from *L. pallipalpis*, and its British distribution is wider. d'Assis-Fonseca (1968) described it as frequent, and distributed throughout England and Wales as well as from the Highlands. There is a gap through most of Scotland, which again may be a consequence of inadequate recording, but the contrast in distribution between the two species increases the probability of an actual disjunct distribution for *L. pallipalpis*.

Data for the other species encountered, *L. spuria* and *L. brachialis*, is severely limited and conclusions must be very tentative. Both, especially *L. brachialis*, seem to be scarce, but if they have particular ecological requirements they might simply have been missed by the recording method. The same applies to the species recorded by others in Highland, but not by me (*L. erythrocera*, *L. verna*, *L. rubricornis*). The only indication of specialised ecology in the genus is for *L. rubricornis*, said by Collin (1963) to be a species of coastal sand-hills, a habitat not well surveyed in this study.

The discovery of a strong population of *L. pallipalpis* in Highland highlights the gaps in knowledge of the distribution of Diptera in the less-popular taxa created by the lack of resident dipterists there. The deficit of recording affects especially those flies active early and late in the year, for example *Botria subalpina* (Horsfield *et al.* 2013b), *Thereva handlirschi* (Macdonald 2010), *Bibio johannis*, *B. longipes*, and *B. clavipes* (Macdonald 2016), as well as the bees *Andrena ruficrus* (Macdonald 2009) and *A. marginata* (Bowman and Macdonald 2007).

Acknowledgements

I am grateful to Steven Falk and David Horsfield for help with initial identification, to Del Smith for permission to quote his records, and to Jimmy McKellar who contributed specimens. Richard Lyszkowski at the National Museum of Scotland helped with access to SIRI and literature. Data providers and the NBN Trust bear no responsibility for any further analysis or interpretation of data on NBN Gateway. Maps were prepared with DMAP.

References

d'Assis-Fonseca, E.C.M. 1968. Diptera Cyclorrhapha Calyptrata. Section (b) Muscidae. *Handbooks for the Identification of British Insects* **10**(4b)**,** 1-119.

Bowman, J. and Macdonald, M. 2007. Discovery of a Scottish population of *Andrena marginata*. *BWARS Newsletter* Autumn **2007,** 12-14.

Collin, J.E. 1963. The British species of *Lispocephala* (Diptera, Anthomyiidae). *The Entomologist* **96,** 277-283.

Horsfield, D., Falk, S. and Macdonald, M. 2013a. *Lispocephala pallipalpis* (Zetterstedt) (Diptera, Muscidae) new to Scotland from Easter Ross and Easterness. *Dipterists Digest* (*Second Series*) **20,** 51.

Horsfield, D., Raper, C. and Macdonald, M. 2013b. *Botria subalpina* (Villeneuve) (Diptera, Tachinidae) new to Britain from Scotland. *Dipterists Digest* (*Second Series*) **20,** 63-68.

Horsfield, D. 1999. *Lispocephala brachialis* (Rondani) (Dipt., Muscidae) new to Scotland. *Entomologist's monthly Magazine* **135,** 42.

Horsfield, D. 2013. First records of *Lispocephala brachialis* (Rondani) (Diptera, Muscidae) from northern Scotland. *Dipterists Digest* (*Second Series*) **20,** 140.

Macdonald, M. 2009. Notes on *Andrena ruficrus* in Scotland. *BWARS Newsletter* Autumn **2009,** 24-26.

Macdonald, M. 2010. *Thereva handlirschi* Kröber, 1912 (Diptera, Therevidae) and other notable Diptera in N Scotland. *Dipterists Digest* (*Second Series*) **17,** 47-49.

Richardson, J. 2015. *Lispocephala pallipalpis*. http://www.ispotnature.org/node/772345. Accessed 30 March 2016.

Whiteley, D. (Ed.) 1994. A survey of Diptera on the isle of Rum - 1990. *Dipterists Digest* (*First Series*) **14,** 2-27.

Wolton, R.J., Bentley, H., Chandler, P.J., Drake, C.M., Kramer, J., Plant, A.R. and Stubbs, A.E. 2014. The diversity of Diptera associated with a British hedge. *Dipterists Digest* (*Second Series*) **21,** 1-36.

Wormell, P. (Ed.) 1982. The entomology of the Isle of Rhum National Nature Reserve. *Biological Journal of the Linnean Society* **18**(4), 291-401.

The second record of *Metriocnemus inopinatus* Strenzke (Diptera, Chironomidae) for Ireland, the first for Northern Ireland – In surface skims for chironomid pupal exuviae of the lower River Bann in Coleraine, Co. Londonderry, Northern Ireland, C854304, hydrometric area HA03, on 8 October 2016, was a drowned adult male of *Metriocnemus inopinatus* Strenzke; the very thin, pale wing macrosetae are diagnostic (keyed in Langton, P.H. 2015. *Metriocnemus ephemerus* sp. nov. (Diptera, Chironomidae) from Northern Ireland, *Dipterists Digest* (*Second Series*) **22,** 35-42). This species has been recorded only once before for Ireland, from Co. Leitrim, hydrometric area HA26, by Declan Murray (Murray, D.A. 2010, Records of Chironomidae (Diptera) in Ireland – twenty additions and notes on four morphotypes. *Bulletin of the Irish Biogeographical Society* **36,** 3-7). Declan Murray has kindly confirmed that he knows of no other Irish records – **PETER H. LANGTON**, University Museum of Zoology, Downing Street, Cambridge (address for correspondence: 16, Irish Society Court, Coleraine, Co. Derry, BT52 1GX)

Notes on the house-fly *Musca domestica* Linnaeus (Diptera, Muscidae) and two Bibionidae on Fair Isle (HZ27, vice-county 112) – I am prompted by the perceptive observations of Murdo Macdonald on the status of the house-fly (2015. The house-fly *Musca domestica* Linnaeus (Diptera, Muscidae) in Scotland. *Dipterists Digest* (*Second Series*) **22**, 180) and Bibionidae (2015. Observations of *Bibio* and *Dilophus* species (Diptera, Bibionidae) in north Scotland. *Dipterists Digest* (*Second Series*) **22,** 183-191) to provide notes on the status of these flies on Fair Isle.

The house-fly has been recorded twice on Fair Isle (HZ27, vice-county 112): a teneral male, in house, Schoolton, 25 August 2002, *leg*. N.J. Riddiford, *det*. B.R. Laurence; female, *loc. cit*., 3 August 2013, *leg./det*. N.J. Riddiford; both retained as voucher specimens in the Fair Isle collection at Schoolton.

Both house-fly intercepts were in the home of the author. However, I am 'infamous' for checking out and intercepting specimens in other houses on the isle and am confident that the status of this species should be considered as 'exceptional casual' rather than 'overlooked'. B.R. Laurence (*in litt*.) considered the 2002 individual as "possibly emerged from a recently imported puparium", a feasible explanation for both records.

Musca domestica appears to be a true rarity throughout the Northern Isles. None has been reported elsewhere in Shetland (*per* P.V. Harvey, Shetland Biodiversity Records Centre) and there is just one for Orkney: n=1, May-June 1988, locality not cited, OS square HY53 – which covers Eday and its offshore islands – recorder B.R. Laurence (*per* S. Gauld, Orkney Wildlife Information & Records Centre).

The Fair Isle Bibionidae list comprises two species. *Dilophus femoratus* Meigen appears in a large synchronised emergence of very short duration in the first half of June, extreme dates 2 June (2014), 16 June (2010, 2013). The flight period for *Bibio longipes* Loew is more extended but still relatively short, concentrated in the second half of October, extreme dates 28 September (♂, 2011), 7 November (2009). Voucher specimens of both species are held in the Fair Isle collection at Schoolton.

Dilophus femoratus is abundant in the gardens and rough grassland of the crofting township (in-bye) and is attracted in numbers to light. I have only one record for the common grazing zone of Fair Isle's dry heath and coastal Special Area of Conservation, a male taken in a burn-side pitfall 15m asl in June 2011. By contrast, *Bibio longipes* is relatively scarce in the in-bye but common in the heathland parts of the SAC at higher levels including Fair Isle's highest point, the summit of Ward Hill at 217m asl (based on pitfall captures).

I gratefully acknowledge Brian R. Laurence (*Musca domestica*, *Dilophus femoratus*), Alan Stubbs and David J. Gibbs (*Bibio longipes*) for verification of specimens, Paul Harvey (SBRC) and Sydney Gauld (OWIRC) for house-fly records in Shetland and Orkney – **NICK J. RIDDIFORD**, Schoolton, Fair Isle, Shetland ZE2 9JU, taibnick@gmail.com

Dipterists Digest 2016 **23,** 185-204

The use by Diptera of the floral resource on an English grazing marsh with implications for site management

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Summary

From May to September 2012, Diptera were surveyed by counting recognisable taxa on open flowers along transects in field centres and margins of old and new pasture. Counts were dominated by Syrphidae; the next group of significance was Muscidae + Anthomyiidae. The flower resource was quantified by a simple index derived from the abundance of flowers. Abundance and species-richness of flies were strongly correlated to the flower index and to a lesser extent to plant species-richness; pasture type and position within the pasture were relatively unimportant factors. Five flower-visiting preference groups were recognised, four of which showed strong preferences for particular plants and avoidance of others. About three-quarters of plants were rarely visited by flies. Management suggestions to enhance populations of flies include retention of the 'weeds' marsh ragwort and buttercups, providing flower-rich refuges close to one another, and including plants known to be visited by Diptera when establishing new swards.

Introduction

An extensive literature describes the use that flies, and in particular hoverflies, make of flowers (summarised by Rotheray and Gilbert 2011, Larson *et al.* 2001, Speight 2010). It is increasingly apparent that that the relationship is often two-way, with flies being recognised as important pollinators while they are feeding (Gibson *et al.* 2006), and this role is sometimes taken as axiomatic for entire suites of species, such as Syrphidae (Bates *et al.* 2011, Carvalheiro *et al.* 2013, Kohler *et al.* 2008), or assumed on the basis of contact with stamens or stigmas in the case of Empididae (Lefebvre *et al.* 2014). A number of studies have quantified the extent of fly visitation to flowers in terms of visits by individuals to single flowers. In southern England, 67% of visits were by flies (Baldock *et al.* 2015), and in northern France syrphids contributed 27% and 'other flies' 9.4% of visits (Geslin *et al.* 2013) which exceeded other orders except bees, while in the Alps flies contributed 62% of visitors of which over half were empidines (Lefebvre *et al.* 2014).

However, even supposing that the relationship is one-way, from flowers to flies with no reciprocal benefit to plants, a decline in plants is potentially troublesome for flies, since flowers provide them with essential food. A parallel decline in both the plants that depend on insect pollination and their bee and syrphid pollinators has been shown by Biesmeijer *et al.* (2006) although Carvalheiro *et al.* (2013) suggest that changes in plants and their pollinators did not occur in tandem, so there is no causal link in the declines. Both these studies agree that there have been declines in plants and insects but Carvalheiro *et al.* (2013) show that there has a been a slowing of declines since 1990 compared to the period between 1950 and 1990, which they attribute to conservation measures. Regardless of the nature of any link between flies and plants, more information on the use that flies make of flowers may be helpful in understanding how nature reserves may be managed to maintain or even enhance potentially valuable dipteran pollinator populations.

As part of the Flowering for Life Initiative, the Brue Valley Living Landscapes Project commissioned a survey to provide baseline information on the abundance and diversity of Diptera using flowers at Somerset Wildlife Trust's Catcott Nature Reserve. The aims were to provide a description of the use of flowers by flies and to establish whether this use was influenced by the types of pasture or proximity to ditches. The reserve is mainly grazing marsh with strongly contrasting examples of wet grassland, which are old unimproved pasture and relatively new pasture on fields that were previously arable, and within each field the vegetation differs between the centres and the margins next to the ditches that separate fields. The site therefore provided scope for examining the flower-visiting preferences of flies across a range of plant communities and situations. The study gathered quantitative data on flies visiting flowers but made no attempt to show whether either party benefitted from the relationship, as this would have required considerably greater resources (Elberling and Olesen 1999). Despite their artificial origin and need for constant management, British grazing marshes support a diverse wetland dipteran fauna (Drake 1988, 2016) so a better understanding of this fauna should help managing these habitats.

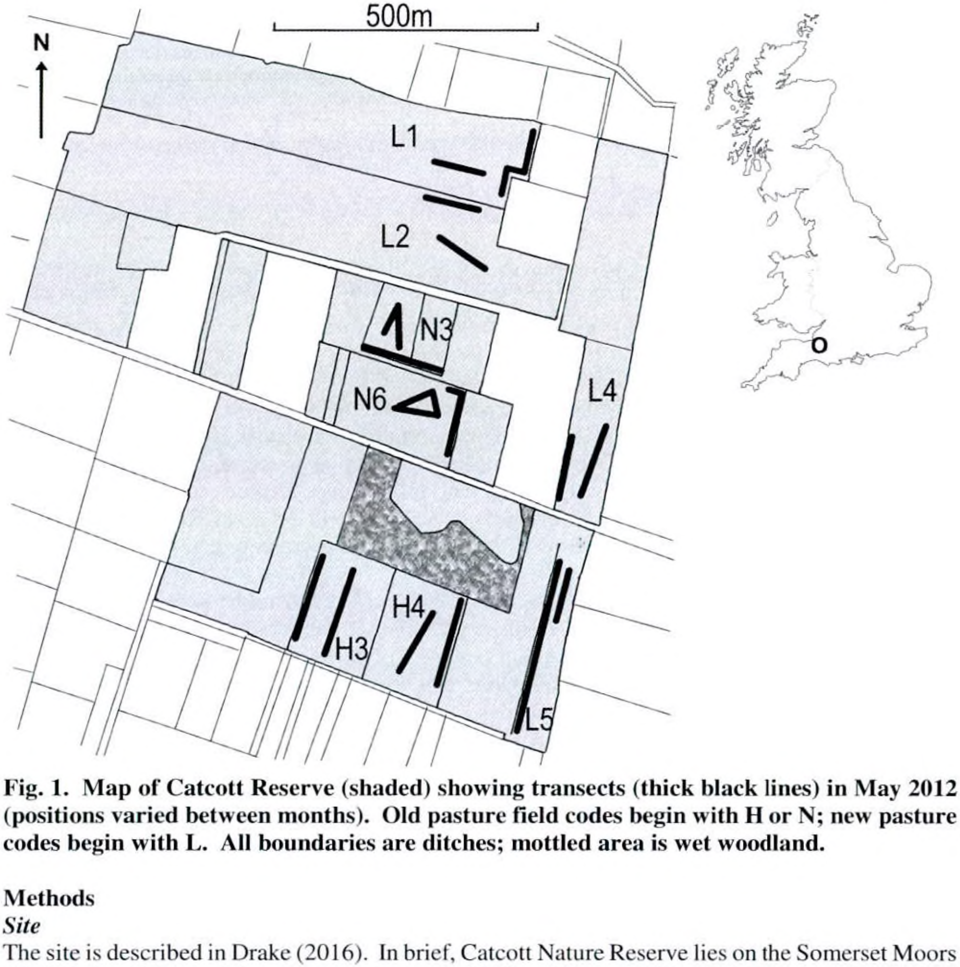

Fig. 1. Map of Catcott Reserve (shaded) showing transects (thick black lines) in May 2012 (positions varied between months). Old pasture field codes begin with H or N; new pasture codes begin with L. All boundaries are ditches; mottled area is wet woodland.

Methods

Site

The site is described in Drake (2016). In brief, Catcott Nature Reserve lies on the Somerset Moors (ST4041) within the Catcott, Edington and Chilton Moors SSSI. It is grazing marsh (wet grassland) with ditches on peat. Two contrasting types of pasture were sampled in 2012, old relatively undisturbed fields with a species-rich neutral fen-grassland flora, and slightly wetter less species-rich pasture that was reclaimed from arable land in 1990. Cattle were turned out to graze in August, which was later than normal because the summer had been exceptionally wet so that the new pasture remained flooded with at least 5cm of water throughout its extent in all visits until the final one in September, and the herb-rich old pasture fields were often similarly flooded in midsummer.

Sampling

Sampling was undertaken by a visual search along transects. Each transect was walked slowly for 10 minutes, usually in a straight line; sometimes the transect doubled-back in a 'V' shape, especially in small fields (Fig. 1). A feature in the distance was used to keep a straight course. The length of the transect was measured by taking a GPS reading at the start and end or estimated from a map. All flies sitting on flowers within about 2m either side of the path were noted, together with the plant species on which they sat. Close-focus binoculars were often used to check identifications. Behaviour was not considered; each observation merely recorded the presence of a fly on a flower.

Two transects were made in each of four fields of old and new pasture respectively (Fig. 1). In each field, one transect ran along a ditch and the other across the field's centre, starting and ending well away from ditches and avoiding shallow drainage depressions (grips) where possible. The same ditch was walked on all visits, although sometimes another section or side was used if emergent vegetation became too dense to survey. The position of the central transects was more haphazardly chosen on each visit. Transects varied greatly in length, being far shorter when flies were abundant and took more time to record, and longer when flowers were scarce. The median length was 120m (interquartile range 95-150m, range 49-335m).

Six visits were made between May and mid-September 2012, mostly at approximately 3-4 week intervals. An initial visit in early May was made to test the method, and these results have been included in some analyses. Visits after May each took two days. Sampling took place on 2 May, 16 May, 17+18 June, 29 June + 1 July, 17+19 July, 9+10 August and 13+15 September. Exceptionally poor weather in late June resulted in only 14 transects being walked; 16 were made on all other visits.

As so many individuals had to be noted in a short time, not many flies could be reliably identified to species, even those that, with more careful inspection, can be identified in the field. Most syrphids were identified to genus or groups, and Muscidae and Anthomyiidae were lumped together. Many flies were identified only to family. Non-dipterous insects were also noted but not consistently in the May visits.

Flowers

When a transect had been completed, the abundance of flowers (not the plants) of each species was estimated by eye using the ACFOR scale:– Abundant: over 100, Common: 51-100, Frequent: 26-50, Occasional: 11-25, Scarce: 1-10. Common names of plants referred to by their Latin name are given in Appendix 1.

Analysis

The association of flies with flower taxa was investigated using cluster analysis. As there is a wide choice of methods and no recognised way of selecting the most appropriate one, the method chosen was the commonly used Ward's with Bray-Curtis similarity index which is appropriate for quantitative data (Zuur *et al*. 2007). The validity of the resulting groups was tested using ANOSIM which compares the results with random permutations of the data (Henderson and Seaby 2008). Data were combined for all samples in the four visits from mid-June to August. May and September data were not included as they were very strongly skewed by large numbers of *Rhingia campestris* Meigen and *Cheilosia* on *Cardamine pratensis* or *Ranunculus*, respectively, in May, and large numbers of *Eristalis abusiva* Collin and *Helophilus pendulus* (Linnaeus) on *Mentha aquatica* or *Succisa pratensis*, respectively, in a few fields in September when cattle had removed much of the flower resource in other fields. Diptera and plant taxa with very few representatives were excluded.

A simple measure of the floweriness of each site was estimated from the ACFOR values. These values were converted to 5, 4, 3, 2 and 1, and the flower index was the sum of the square of the values for a transect. The square of the values was a close representation of the relative abundance of flowers if each ACFOR class had been accurately applied in the field. It led to distortion under some circumstances, for instance when one plant flowered particularly prolifically and far out-numbered many other species represented by just a few flower-heads. Despite the possible over-use of 'Common', the index was normally distributed on all dates. Comparisons between samples using all plant taxa were made using means as the data were normally distributed but, for individual flower taxa, medians were compared with Mann-Whitney U tests, as the run of data was often short owing to the flowering period being shorter than for all taxa combined.

Generalised linear modelling was used to investigate the significance of associations between Diptera taxon-richness or abundance and five explanatory variables: position in the fields (centre or margin), pasture type (old or new), number of flower taxa and two variants of the flower index. The two indices were for 'popular' plants which received at least two visits in the season, and the second for 'unpopular' plants for which only one or no visit was recorded. Tests were undertaken for all sampling occasions combined and for separate occasions (both June visits were combined), using all Diptera taxa. Poisson errors with log link function were assumed for counts of Diptera taxon-richness for which dispersion parameters were less than or close to 1.0, and quasi-poisson errors for abundances as these showed high dispersion, with dispersion parameters often greater than 10. The use of a quasi-poisson distribution has the effect of strongly reducing the significance of the influence of explanatory variables, and hence gives a more stringent test of the reality of any effect. Models were run starting with all variables and all two-way interactions, and sequentially removing the least significant variables. Final models for individual months were sometimes rejected as the data did not fit well, for example when they included outliers with high leverage or influence but which could not be justifiably excluded from the analysis. Two outliers were removed from the large sample of all the season's samples combined. Strongly correlated variables, indicated by variance inflation factors greater than 3, were not included. Tests were made using R in the package Brodgar (Highland Statistics 2013).

A preference by Diptera flower-preference groups for a particular pasture type was tested with chi-squared on the hypothesis that the abundances would be the same in both field types. As the test was repeated six times (once for each visit), a Dunn-Sidák correction was applied to reduce the chance of detecting a significant difference merely due to undertaking many tests. For six tests, this required a significance level of close to $p \leq 0.01$.

Results

The flower resource

A description of the flower resource helps to put the Diptera results into context. The total number of plants recorded was 56 taxa, of which nearly all (52 taxa) were found at the field margins and 32 taxa in field centres. The apparently greater species-richness of margins was mainly due to the inclusion of aquatic and wetland plants confined to ditch margins, and which unavoidably fell within the 4m corridor of the search.

There were marked differences between pasture types in the dominant flowers at any one time when expressed using the flower index for all visits combined (Table 1).

Table 1. Flower index of plants for all sampling dates combined, ranked by the dominant plants in either old and new pastures. The relative importance to Diptera (+ weak, ++ strong) is derived from Table 3.

Plant taxon	Importance to Diptera	Total flower index Old pasture	 New pasture
Dominant in old pasture			
Cirsium palustre	++	339	9
Filipendula ulmaria	++	234	0
Stellaria graminea	+	224	3
Lotus pedunculatus		182	40
Succisa pratensis	++	66	0
Plantago lanceolata		56	0
Trifolium pratense		47	0
Hawkbit / Hawkbeard	+	34	2
Hypericum	+	32	0
Rhinanthus		32	0
Centaurea nigra	++	31	0
Dactylorhiza praetermissa		30	1
Rumex acetosa		21	0
Epilobium hirsutum		18	0
Lythrum salicaria		17	0
Silene flos-cuculi		16	0
Dominant in new pasture			
Ranunculus	++	265	610
Galium palustre		37	219
Mentha aquatica	++	3	126
Cardamine pratensis	++	52	115
Myosotis laxa		0	87
Hydrocharis morsus-ranae		0	25
Trifolium repens		2	10
No marked difference in dominance			
Taraxacum	+	5	3
Senecio aquaticus	++	91	94

Of the 25 species of herbs that contributed most to the flower resource, all but two were present on old pasture where most of them made a moderate to large contribution, and many of them were almost confined to these fields. Of the plants that were commoner on old pasture, only *Lotus pedunculatus* was also widespread on new pasture. The plant community was a fairly typical example of damper *Alopecurus pratensis – Sanguisorba officinalis* (MG4) grassland (Rodwell 1992). By contrast, on new pasture only two species were unique to samples taken here and three of the commonest plants (*Ranunculus* spp, *Galium palustre* and *Cardamine pratensis*) were also moderately frequent on old pasture. Only three plants of the ditches and their margins

(*Mentha aquatica*, *Myosotis laxa* and *Hydrocharis morsus-ranae*) were markedly more frequent on the new pasture and this probably reflected the generally wetter conditions here. *Senecio aquaticus* was the only common species to show no preference for field type

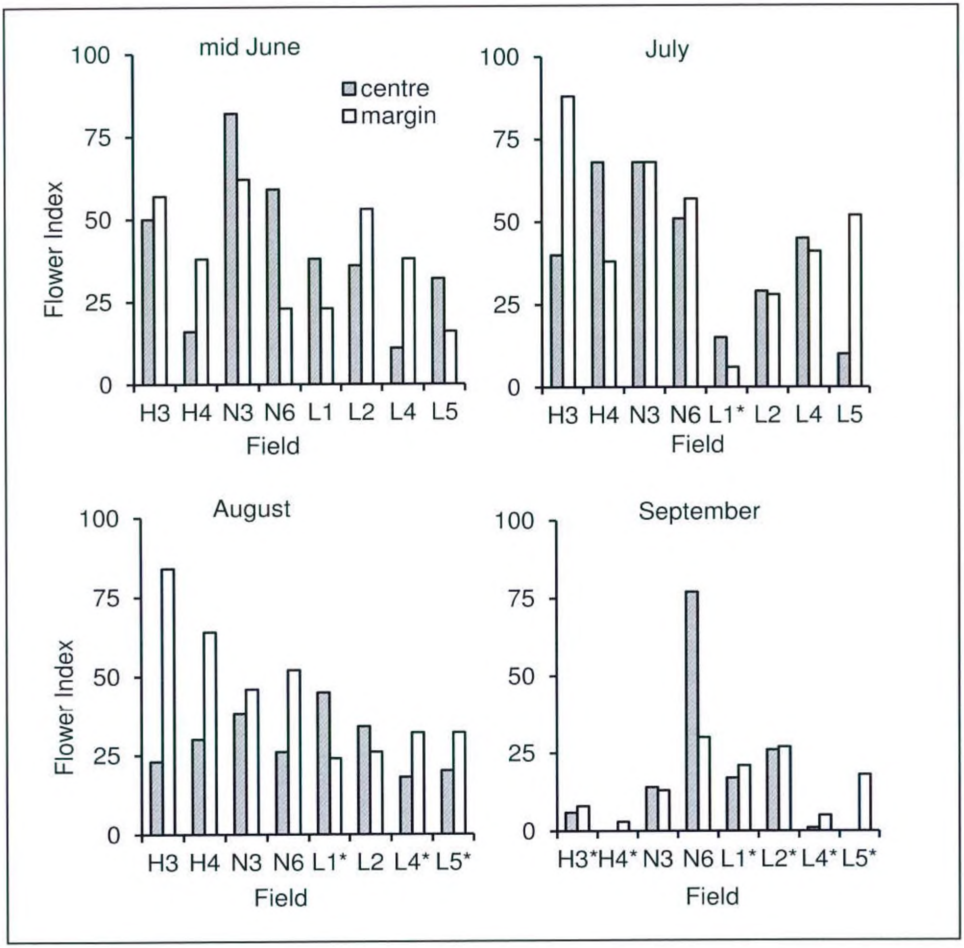

Fig. 2. Flower Index for each sample on four visits to the four old (H and N) and four new (L) pastures, at field centres (shaded) and margins (white); * at the right of site label indicates cattle grazing.

Although permanent water in the ditches might have been expected to influence the plant community, there were only small differences between the centres and margins of fields in the contribution to the flower resource. Whereas Table 1 shows extreme ratios between old and new pasture in the flower resource of nearly all species, a similar tabulation comparing centre with margin (not presented) showed very few plants being more than four times as floriferous in one position than the other. Those clearly more frequent at margins were *Hypericum tetrapterum*, *Hydrocharis morsus-ranae*, *Epilobium hirsutum* and *Myosotis laxa*, and those clearly more frequent in centres were *Silene flos-cuculi* and *Succisa pratensis*. Among the more abundant species, only *Ranunculus* spp had a significantly greater median flower index for the entire season at centres than at margins, and *Stellaria graminea* was more abundant at the margins from June to August (it was not recorded earlier or later). Thus the flower resource varied markedly between field types but very little within fields.

As well as these differences for individual plants, the flower index for all species combined changed through the season and between treatments. Values of the total flower index (summed for all sites) were low in May and September (361 and 266, respectively), which reflected the normal less flower-rich start to the season and the loss of flowers due to grazing in many fields in September. From June, the flower resource increased (634), peaked in July (705) and fell slightly in August (594), partly because cattle were now being turned out. The flower resource varied from field to field and between the centres and margins of each field, as shown by the examples for four visits (Fig. 2). However, differences between old and new pasture were far less marked for all plants combined than for individual species and, while old pasture had a higher mean flower index than new pasture (except in May), this was significant only during July and August. There was no consistency in whether the centres were more or less flowery than the margins, and only the comparison for August showed a significant difference. With very few exceptions, the amount of the flower resource in any field was unpredictable; the rank order of fields' floweriness showed no trends through the year.

Flower visitors

A total of 2,254 observations were made of flies feeding or sitting on flowers. Syrphidae accounted for 91% of the observations and small Anthomyiidae or Muscidae comprised 5%; other families were rare (Table 2).

Table 2. Number of individuals of each family or group recorded on flowers on each visit, and the percentage these form of all individuals.

Family	early May	mid May	mid June	late June	July	August	September	Total (and %)
Syrphidae	164	224	253	77	293	429	621	2061 (91.4)
Anthomyiidae / Muscidae	3	3	34	21	19	31	3	114 (5.1)
Stratiomyidae			13	11	8			32 (1.4)
Scathophagidae		1	9	10				20 (0.9)
Chloropidae		5	2			3		10 (0.4)
Tachinidae		4	1		1			6 (0.3)
Ephydridae		1	2	1				4 (0.2)
other families*	1		4	2				7 (0.3)
Total flies								2254
Non-Diptera	–	7	10	21	57	31		126

* other families were Dolichopodidae, Bibionidae, Drosophilidae, Empididae, Rhagionidae and Sepsidae.

Table 3. Number of the most frequent Diptera on the most frequently visited flowers, with the total and cumulative number of individuals per fly taxon and flower. Both plants and Diptera are ranked by cumulative abundance of flower-visits. Authority names given as footnote.

	Ranunculus	*Mentha aquatica*	*Succisa pratensis*	*Cardamine pratensis*	*Filipendula ulmaria*	*Senecio aquaticus*	*Cirsium palustre*	*Centaurea nigra*	*Angelica sylvestris*	*Oenanthe crocata*	*Taraxacum*	hawkbit/beard	*Matricaria*	*Hypericum*	*Stellaria graminea*	Total	Cumulative %
Eristalis abusiva group	65	319	75	2	60	48	7	16	28	0	1	0	1	1	0	626	28
Helophilus pendulus	35	47	138	23	42	7	32	4	1	2	1	1	0	2	0	343	43
Cheilosia	213	0	0	0	0	3	0	0	0	0	1	0	0	0	0	217	53
Platycheirus / Melanostoma	129	3	2	18	22	1	1	0	0	0	1	0	0	1	4	184	61
Rhingia	3	0	0	117	0	0	1	0	0	0	2	0	0	0	0	125	66
Anthomyiidae / Muscidae	92	0	0	0	1	6	0	0	9	3	1	2	0	0	0	111	71
Neoascia	102	1	0	4	0	0	0	0	0	0	0	0	0	0	0	107	76
Melanogaster	80	0	0	4	0	1	0	0	0	0	0	1	1	0	0	88	80
Lejogaster	47	0	0	0	1	3	0	0	2	0	0	0	0	0	0	53	82
Eristalis tenax	0	6	8	0	9	3	7	12	0	0	0	1	0	0	0	46	84
Anasimyia	34	2	0	1	0	4	0	0	0	1	0	0	0	0	0	36	86
Sphaerophoria	31	0	0	1	0	3	0	0	0	0	0	1	0	0	0	35	87
Eristalis intricaria	0	3	1	6	1	0	14	6	0	0	0	0	0	0	0	31	89
Helophilus spp	1	3	0	0	4	1	20	0	0	0	0	0	0	2	0	31	90
Oplodontha viridula	6	0	0	0	0	17	0	0	0	0	0	0	5	0	0	28	91
Eristalis pertinax	5	5	0	0	3	11	0	0	0	2	0	0	0	0	0	26	93
Helophilus trivittatus	2	12	3	0	0	0	6	3	0	0	0	0	0	0	0	26	94
Scathophaga	6	0	0	0	0	9	0	0	0	4	0	0	0	0	0	20	95
Eristalis arbustorum	3	1	0	0	9	6	0	0	0	0	0	0	0	0	0	19	95
Eristalinus sepulchralis	5	4	0	0	0	2	0	0	0	0	0	0	0	0	0	11	96
Eristalis horticola	2	2	3	0	1	2	0	0	0	0	0	0	0	0	0	10	96
Number of flies	898	408	233	179	154	141	89	42	41	15	8	8	7	6	5		
Cumulative % flies	40	58	68	76	83	89	93	95	97	98	98	98	99	99	99		
Number of non-flies	8	7	0	4	2	5	75	8	0	0	1	0	0	0	0		

Names with authority: *Eristalis abusiva* Collin, *E. horticola* (De Geer), *E. intricaria* (Linnaeus), *E. pertinax* (Scopoli), *E. tenax* (Linnaeus), *Eristalinus sepulchralis* (Linnaeus), *Helophilus pendulus* (Linnaeus), *H. trivittatus* (Fabricius), *Oplodontha viridula* (Fabricius).

Families other than syrphids became relatively more numerous in June but early and late in the year syrphids were by far the most abundant flies. This may have been partly explained by the weather in June being particularly inclement, thus favouring families other than syrphids.

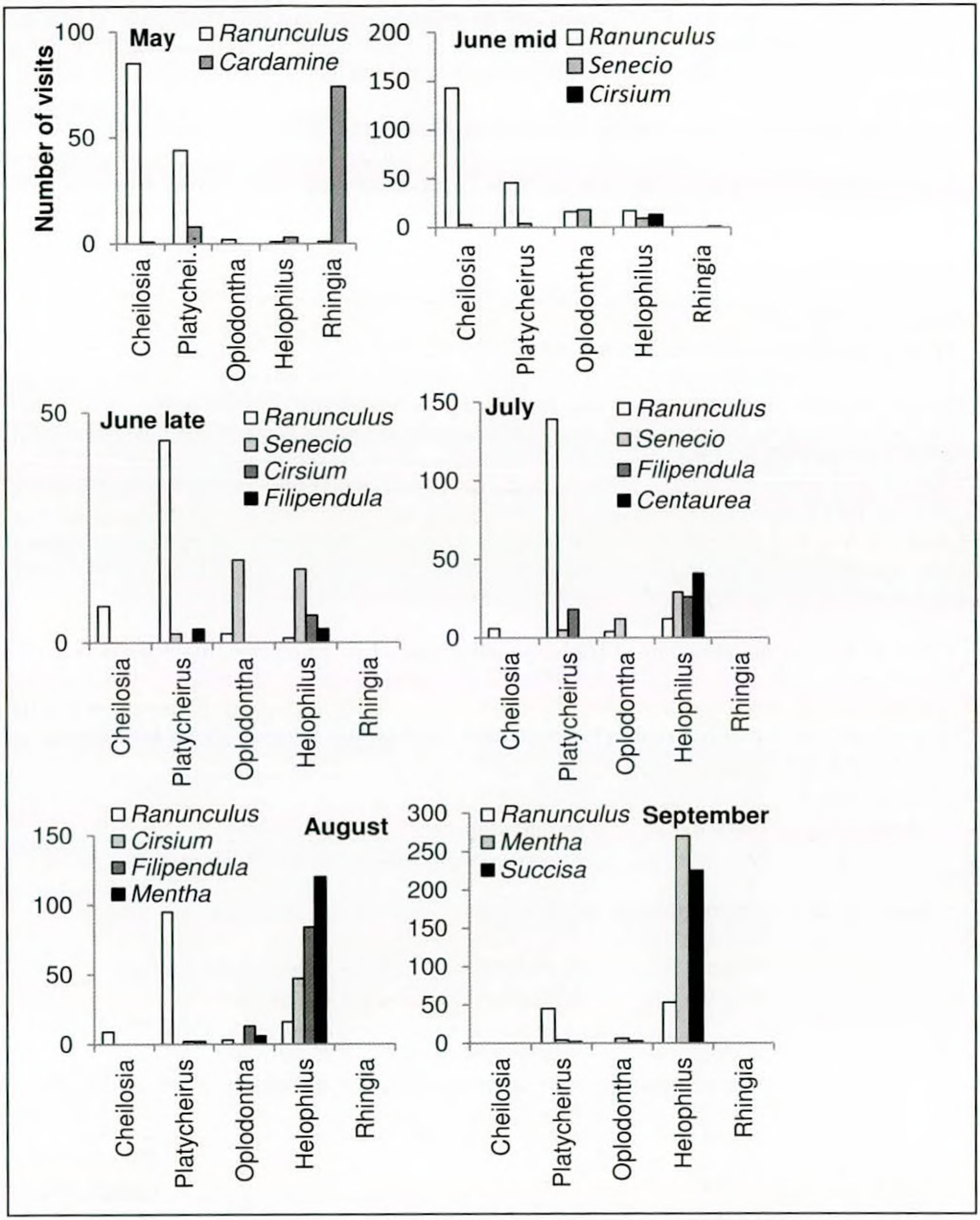

Fig. 3. Number of visits by Diptera groups to dominant flowers in six visits (note that the Diptera names are flower-preference groups in Table 4, not just single genera except *Rhingia*).

Thirty-two taxa of syrphids were distinguished but these included some broad groups, for example, *Melanostoma* plus *Platycheirus*, and an *Eristalis* group that included mostly *E. abusiva* and *E. arbustorum* (Linnaeus) as well as a small number of *E. nemorum* (Linnaeus) and, in spring, some *E. pertinax* (Scopoli). These were identified from netted material taken in a parallel exercise (Drake 2016).

Non-dipterous insects formed a small proportion of all insects, consisting of only 126 observations of a wide range of taxa comprising mainly butterflies, day-flying moths, bumblebees, honey bees, beetles and crickets. This small proportion of observation of non-Diptera (5% of all observations) emphasised that Diptera, and especially syrphids, were by far the most important group of flower-visitors. Non-Diptera became relatively more important from late June to August.

Flower preferences

Most of the observations were of just a few Diptera taxa and a few plants. Almost all (98%) Diptera observations were made from visits to 13 of the 56 plant taxa recognised, and 95% of the records were of 18 Diptera taxa (Table 3). Some plants probably received more visits because they were abundant, for example *Cardamine pratensis* in spring, *Ranunculus flammula* and *R. repens* through much of the year, and *Senecio aquaticus* and *Cirsium palustre* in high summer. Some scarce plants and those with short flowering periods had disproportionately high numbers of visits, for example, *Centaurea nigra* in midsummer, *Succisa pratensis* in autumn, and the large Apiaceae *Angelica silvestris* and *Oenanthe crocata*. At the other extreme were a few widespread and sometimes abundant plants that were visited by scarcely any flies, notably *Lotus pedunculatus*, *Trifolium pratense*, *Stellaria graminea* and *Galium palustre*.

Table 4. Group membership of Diptera taxa obtained using cluster analysis (Ward with Bray-Curtis similarity index), and ANOSIM R-statistic with its significance (* p≤0.05, *** p<0.001) for the pair-wise comparisons of the reality of the difference between the groups (lower matrix). Authority names for previously unmentioned species given as footnote.

Group name				
Cheilosia	***Platycheirus***	***Oplodontha***	***Helophilus***	
Cheilosia	*Anasimyia*	*Eristalis arbustorum*	*Eristalis intricaria*	
Melanogaster	Anthomyiidae / Muscidae	*E. horticola*	*E. nemorum*	
	Lejogaster	*E. pertinax*	*E. tenax*	
	Neoascia	*Eristalinus sepulchralis*	*Helophilus pendulus*	
	Platycheirus	*Odontomyia tigrina*	*H. trivittatus*	
	Sphaerophoria	*Oplodontha viridula*	*Helophilus sp*	
		Scathophaga		
0.53 *				***Platycheirus***
0.84 *	0.74***			***Oplodontha***
0.84 *	0.82***	0.72***		***Helophilus***

Names with authority: *Eristalis arbustorum* (Linnaeus), *E. nemorum* (Linnaeus), *Odontomyia tigrina* (Fabricius)

The marked preferences for particularly flowers shown in Table 3 did not distinguish seasonal changes which may have accounted for differences. To disentangle the seasonal influences of flower availability, a few flower-preference groups were compared. Four significantly different groups of flies were derived using cluster analysis on the combined data from the four visits from June to August, and by simple perusal of the data for May and September when the data were skewed by a few species of flies on just a few flowers (Table 4). Finer divisions of these broad groups seemed inadvisable since cluster analysis can produce widely varying results depending on the method and similarity index used. In addition to these groups, *Rhingia* stood alone on the basis of its strong preference for *Cardamine* in May and near-absence through the rest of the year.

Clear preferences were apparent on each visit (Fig. 3):

- *Cheilosia* and *Melanogaster* (the *Cheilosia* group) visited almost exclusively *Ranunculus* even when other flowers were abundant.

- The *Platycheirus* group was closely related to the *Cheilosia* group, and was similarly strongly associated with *Ranunculus* throughout the year. Early in the summer, this group was dominated by the mixed Anthomyiidae / Muscidae taxon whereas later *Platycheirus* itself with *Melanostoma* were the dominant taxa. These two larger taxa occurred on another flower, *Filipendula ulmaria* in the case of *Platycheirus* and *Melanostoma* in late summer, and *Angelica sylvestris* in the case of the Anthomyiidae / Muscidae, but these visits formed a relatively small proportion of the total.

- The *Oplodontha* group was another taxonomically mixed assemblage in which no member was frequent. It was characterised by far less reliance on *Ranunculus* than shown by the previous two groups, and a preference for *Senecio aquaticus* and, among the *Eristalis* species in this group, for *Filipendula ulmaria* and *Mentha aquatica*.

- The *Helophilus* group was by far the largest in terms of visits to flowers, and was composed of just species of *Eristalis* and *Helophilus*. These species showed the least specificity in their choice of flower and far less skew in their distribution across the range of abundant flowers at any time. In comparison to the other groups, these species were far less likely to be found on *Ranunculus* and were much more prevalent on Asteraceae, particularly *Cirsium palustre*, *Centaurea nigra*, *Mentha aquatica* and *Succisa pratensis*. However, *Senecio aquaticus* was apparently avoided by nearly all the flies in this group apart from *E. abusiva*. This contrasts with several species in the *Oplodontha* group for which this ragwort was an important flower.

Diptera in relation to flower abundance, position and field type

There was relatively little 'redundancy' in the floral resource used by flies. On most visits, between about one third and half of the plant taxa were visited, so the flies were ignoring what seemed to be a large proportion of the resource (Fig. 4a). But when the resource was expressed as the sum of the flower index for the flowers visited by flies compared with the flower index for plants not visited, there was far less unused resource (Fig. 4b). This result also showed that floweriness was a better measure of available resource than plant species-richness.

Generalised linear modelling results that were regarded as acceptable were found for the season's combined data for both Diptera taxon-richness and abundance (Table 5). Both these variables were highly significantly and positively influenced by the flower index of popular plants (FI_pop). Both Diptera variables also showed significant interactions although the ecological significance of these is not clear, and it is not possible to disentangle the separate effects of the plant variables in this test. Diptera taxon-richness was influenced by interactions between flower taxon-richness and the position in fields, so position (edge or centre of field) did have a small influence on the flies. Diptera abundance was influenced by the interaction of flower taxon-richness and the 'popular' flower index, and presumably this result identified trivial cross-correlation between the two flower variables. The lack of significance of 'unpopular' flowers was clearly established in this analysis.

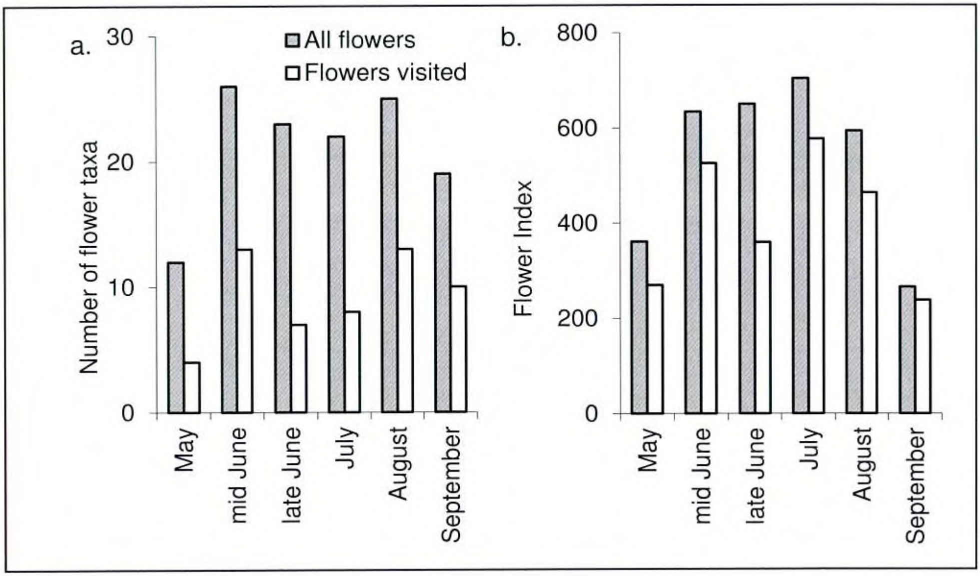

Fig. 4. The flower resource used by Diptera at Catcott Reserve for each visit: a) Number of flower taxa; b) Flower index for all flower taxa (shaded) and for those visited by flies (white).

Individual visits did not generate reliable models for May, June or July, but for August and September there were possibly significant models. There is uncertainty about how useful these are given the small sample size and, in the case of Diptera abundance in August, the complex nature of the model. However, in all three models, the 'popular' flower index was significant, usually highly so, and in August, significantly but negatively influenced by 'unpopular' flowers, either as a single variable or through an interaction with flower richness and field type. Thus fly abundance increased with the amount of 'popular' flower resource.

Flies had strong preferences for particular flowers and the plants were distributed markedly differently on new and old pasture, so it would be expected that flies in different flower-preference groups may show differences in their abundance between the two pasture types. If there was a difference, it would indicate that fly assemblages can be altered by managing the plant regime. The preference for a particular pasture type was tested with chi-squared on the hypothesis that the abundance would be the same in both field types. All five groups showed a significantly greater abundance on at least one occasion but there was only a small level of consistency over the season (Table 6). Groups showing greater preference for new pasture on most occasions when the difference was significant were the *Cheilosia* group, *Oplodontha* group and *Platycheirus* group, the last being most consistent in its response. The *Helophilus* group and *Rhingia* were significantly more abundant on old pasture although there was some inconsistency with the *Helophilus* group in September. This may have been caused by extremely large numbers of *Eristalis* on *Mentha aquatica* in the wet margins of new pasture in this month.

Table 5. Generalised linear modelling for the abundance and taxon-richness of all Diptera on each visit and for all visits combined. Explanatory variables are listed if they are significant in one of the models for a visit. FI_pop - Flower Index of plants visited by Diptera; FI_unpop - Flower Index of plants not or scarcely visited by Diptera; Position - centre or margin of field; Type - old or new pasture. Interactions indicated by colon (:). The test statistics are z for Poisson and t for quasi-poisson distributions. p - significance of test statistic. No information is given where models were deemed to have failed. N=86 for all visits (84 for Diptera abundance), 16 for August and 13 for September.

	Variable	Diptera richness			Diptera abundance		
		Estimate (SE)	z	p	Estimate (SE)	t	p
All visits	FI_pop	0.012 (0.003)	4.121	0.000***	0.051 (0.012)	4.241	0.000***
	F_sp	-0.034 (0.019)	-1.767	0.077			
	F_sp: Position	0.032 (0.032)	2.235	0.025*			
	FI_pop: F_sp				-0.005 (0.001)	-3.91	0.000***
	FI_unpop						
	FI_unpop: F_sp						
August	FI_pop	0.018 (0.009)	2.040	0.041*	0.136 (0.020)	6.904	0.000***
	FI_unpop	-0.054 (0.020)	-2.756	0.006**	0.037 (0.020)	1.611	0.142
	F_sp				0.280 (0.089)	3.132	0.012*
	Type				-0.062 (0.236)	-0.264	0.798
	FI_pop: F_sp				-0.016 (0.003)	-5.462	0.000***
	FI_unpop: Type				-0.121 (0.052)	-2.302	0.047*
September	FI_pop	0.021 (0.005)	4.314	0.000***			

Table 6. Total number of individuals in the five flower-preference groups in all samples from new or old pastures on each visit. Counts in bold are significantly higher than for the other field type in each pair of comparisons at p<0.01 that takes account of Dunn-Sidak correction for repeated tests.

	May		Mid June		Late June		July		August		September	
Flower-preference group	new	old	new	old	new	old	new	old	new	old	new	old
Cheilosia group	43	44	**95**	53	8	0	4	2	5	6	0	0
Oplodontha gp.	2	0	28	16	**21**	1	13	3	9	13	6	3
Platycheirus gp.	28	25	29	36	31	19	**122**	46	**94**	24	**36**	17
Helophilus group	2	2	11	**37**	15	12	35	**95**	134	171	306	254
Rhingia	25	**53**	0	1	0	0	0	0	0	0	0	0

A similar analysis comparing the abundance at the margins and centres of fields gave fewer significant differences and these were inconsistent, with a group being sometimes more abundant at margins but on another occasion more abundant in the centres (results are not presented). The lack of consistency suggested that there was unlikely to be a real ecological pattern.

Discussion

This study set out to describe the use made by flies of the flowers at Catcott Reserve, and to investigate whether there were differences in the response of flower-visiting flies to old and new pasture. It was shown that flies were by far the most numerous visitors to flowers, although at any one time only about half to a third of plants were visited, and over the entire season only a quarter were visited.

Although many plants were not visited, it was shown that preferred plants were very well used and that there was little under-used resource. Floweriness was a better predictor of fly abundance and species-richness than plant species-richness. By use of an index that reflected the abundance of flowers, it was shown that both the number of fly taxa and their abundance were strongly correlated with the preferred flower resource, whereas the size of the unused resource of rejected plants had no effect on fly richness or abundance.

Flowers could therefore be regarded as very important or completely irrelevant to flies. Preferences for particular plants by different fly species are well known, and in this study flies were combined into taxonomically disparate feeding-preference groups. The species could have been grouped using other characteristics, such as taxonomic affinity or larval feeding types, as used by Ouin *et al.* (2006), but it was judged ecologically more realistic to define groups according to the observed adult visiting preferences. The five groups were defined as much by which plants were avoided as by those that were visited. Marked differences were particularly apparent in almost total to trivial reliance on *Ranunculus* (buttercups) and *Senecio aquaticus* (marsh ragwort), and in the spectrum from conservative to catholic in the range of plants visited. Given the strength of these results, it might have been expected that the feeding-preference groups would show clear differences between the old and new pastures, which had markedly different plant assemblages, but only small and inconsistent differences were found.

A number of limitations resulted from the small budget, reflected in the low sample size and the necessity for long field days that may have extended beyond the flower-visiting period of some flies. There was a small error in estimating the abundance of flowers, which may have affected the flower index that was central to some analyses. While the ACFOR scale usually gave a realistic representation of the vegetation, it worked less well in sparse stands when, owing to the infrequency of flowers, the transect was far longer than usual so that more flowers were seen but were present at very low density. The 'Common' category was under-used and the 'Abundant' category may have been over-used, as shown by the number of times each category was reported during the whole survey: A – 50; C – 44; F – 74; O – 101; R – 240.

Identifying flies to species in the field will result in more errors than during transect counts of butterflies or dragonflies, which are the model groups for the method, and the inevitable necessity to lump species into larger recognisable taxa may have weakened some results. Field searches underestimated the true species-richness considerably, as shown by the results obtained during concurrent sweep-netting of the same transects when 57 species of syrphids were collected compared to 32 taxa recognised during the transect walks (Drake 2016). Small flies were probably overlooked on plants with small flowers held relatively low in the swards, such as *Stellaria graminea* and *Galium palustre*, which Speight (2010) lists as genera 'popular' with Diptera. And in high summer even large obvious flies were difficult to count accurately in the hectic buzz of a flower-rich meadow.

Flower-visiting

Syrphidae were shown to be the most important visitors to flowers at Catcott. They far outnumbered other families of flies and all non-Diptera. Anthomyiidae and Muscidae together formed the only other group of some importance. Families such as Stratiomyidae and Empididae, which would have been expected to be well recorded on flowers, were scarce. Concurrent sweep-sampling showed syrphids to be the most consistently species-rich family, rarely matched by Dolichopodidae, Ephydridae or Sciomyzidae which were the next best represented families (Drake 2016) and usually infrequent flower visitors (Larson *et al.* 2001).

The prevalence of syrphids at flowers was therefore due to their high abundance and richness, and to the relative scarcity of other flower-visiting groups at Catcott. Thus, while the study had not set out to concentrate on syrphids, the results overwhelmingly refer to this family. The results agreed with the well-documented importance of syrphids as the dominant flower-visitors among flies, and contributed to the growing recognition that flies are likely to be among the most important insect pollinators (Kearns 2001, Larson *et al.* 2001, Ssymank *et al.* 2008). The prevalence of syrphids among flower visitors is widespread in temperate and subtropical regions (e.g. Souza-Silva *et al.* 2001), although at high altitudes and latitudes Muscidae and Empididae are more important (Elberling and Olesen 1999, Lefebvre *et al.* 2014). However, non-syrphid flower-visitors have been shown to be as important as syrphids in temperate climates (Orford *et al.* 2015). Although it seems improbable, the scarcity of non-syrphid flower-visitors in the present study may indicate that wetlands are a special case in which syrphids predominate.

Strong preferences by different syrphids for particular plants have been well documented. In the Catcott study, several widespread plants were particularly frequently visited by syrphids: *Ranunculus* spp, *Mentha aquatica*, *Succisa pratensis*, *Cardamine pratensis*, *Filipendula ulmaria* and *Senecio aquaticus*. But underlying this generalisation were clear preferences. For instance, eristalines were indeed fairly catholic in their choice but most *Eristalis* avoided *Ranunculus* species, whereas *Cheilosia*, chrysogasterines (*Melanogaster*, *Lejogaster*) and bacchines (*Melanostoma*, *Platycheirus*) far preferred *Ranunculus*. When *Cheilosia* and *Rhingia* were abundant in May, they were found almost exclusively on different dominant flowers, *Ranunculus* and *Cardamine pratensis*, respectively. No doubt *Rhingia* would have been seen at other plants had it followed its usual extended bimodal flight period (Ball *et al.* 2011). *Platycheirus* and *Melanostoma* feed mainly on grass pollen (Goot and Grabandt 1970) so their prevalence on *Ranunculus* flowers may be unrelated to feeding; nevertheless, they were still far more closely associated with this flower than any other.

There is less published information on which plants are actively avoided, even when such plants are abundant and used by other flies. Literature that compares the preferences of syrphids with the undoubtedly more specific preferences of bees often cites syrphids as unspecialised foragers (e.g. Memmott 1999, Branquart and Hemptinne 2000, Hegland and Boeke 2006) but this is a simplification often made from the perspective of pollination studies. By lumping all syrphid species together, these studies overlook that flies discriminate between flowers and that some abundant flowers are completely ignored. This effect was shown by Ssymank (2004) who recorded a very large proportion of visits by syrphids to *Heracleum sphondylium*, fewer to *Cirsium arvense*, and very few to all other plants, even though *Heracleum* was a relatively uncommon plant in the study area.

Similarly, Ssymank and Krause (2007) recorded disproportionately more syrphid species (not individual visits) at infrequent *Silaum silaus* and fewer at *Ranunculus repens* which was by far the most abundant plant in their study area. The results of the present study are therefore of interest in showing how few plants contributed to the resource used by flies; many species of plants were rarely visited. If syrphids are taken as a proxy for many other families, particularly those with small species that may have been overlooked, then about three-quarters of the plants were of low importance to Diptera, even when their flowers were abundant. Some avoidance is due to inadequate mouthparts for gaining access to closed flowers, as well documented by Gilbert (1981), but the most ecologically satisfying explanation is that the flies show strong behavioural preferences. The present results appear to be the first to show that fly abundance and species-richness are not affected by, or even negatively influenced by the suite of flowers that are not visited. This may seem a trivial result but it may partly explain why plant taxon-richness has a smaller effect than flower abundance on the numbers of flies.

The use of a flower index was a simple but effective representation of the food resource which could be correlated with the abundance and taxon-richness of flies. For all flies combined, the index was successful in explaining the abundance of individuals, and to a lesser extent their taxon-richness. While it is self-evident to any field naturalist that more flowers attract more flies, it is only recently that in-depth studies have demonstrated it. Several studies have shown that the diversity and abundance of bees increases with the diversity and abundance of the flower resource (e.g. Potts *et al.* 2003) but there are fewer reports of how flies respond to the resource. Often these studies lump all species together into a single unit. For example, Blaauw and Isaacs (2014) showed that the abundance of syrphids showed a strong response to wildflower richness and bloom richness, estimated by counting flowers in bloom in quadrats. Similar results were obtained by Kohler *et al.* (2008) and Sajjad and Saeed (2010). In contrast, Hegland and Boeke (2006) found that syrphid abundance showed no relationship with the number of open-blossomed species and was negatively related to total plant species-richness (but not to blossom density), and they concluded that floral resources may be a poor predictor of syrphid activity.

Movement

Movement of flies between flowers was not investigated and there was no direct evidence for it. However, constant movement of flies around the site in search of their preferred flowers is the simplest explanation that marries the strong correlation of flies and flowers with the flower resource's location being unpredictable. As one patch of the site becomes especially floriferous, the flies move to it. This also explains why position in the field had so little effect on fly abundance or taxon-richness. In the concurrent study at Catcott investigating the distribution of flies within fields, species in several well represented families were usually more numerous at the margins than at centres of fields; syrphids and muscids, which dominated the present study, were the only families to show no consistent preference for position (Drake 2016). This result supports the suggestion that species in these families were influenced more by the flower resource than proximity to water.

Syrphids travel considerably while foraging, and several studies have shown that they move distances similar to the separation of contrasting field types at Catcott. For example, *Episyrphus balteatus* (De Geer) and *Eupeodes corollae* (Fabricius) moved c. 200m over a period of one week in agricultural landscapes (Wratten *et al.* 2003), *Eristalis cryptarum* (Fabricius) could exceptionally move 500m in 8 days (Drake and Baldock 2013), and Kohler *et al.* (2008) imply movements of at least 300m from nature reserves into agricultural landscapes, but with a rapid decline in abundance and richness with distance from the reserve. In that study, syrphids located isolated planted flower patches up to 50m from reserves and were more abundant in these than in surrounding agricultural landscape, implying ability to locate such patches.

Management

Three suggestions for improved sward management on conservation sites can be drawn from these results. Firstly, when a new pasture is being established, the herb mix should include species known to be favoured by flies even to the exclusion of attractive plants that flies do not visit. Visual attractiveness or value to bees are often selling points for wild-flower seed mixes, yet how we see a meadow may be a poor measure of resource value for Diptera; an apparently rich flowery field, seen from afar, could be completely useless if composed solely of 'unpopular' plants. Such plants were often abundant at Catcott, not just closed Papilionaceae such as *Lotus pedunculatus* and *Trifolium pratense*, but small open flowers such as *Galium palustre* and *Stellaria graminea*. Even if several species of *Ranunculus* were added to the mix, many *Eristalis* and *Helophilus* would struggle to find appropriate food. This is very unlikely to be an issue on well-managed old pasture.

Some species are clearly catholic feeders, able to switch between plants as they become available. Others are more restricted in their choice and may be adversely affected by the loss of just a few plant species. In particular, loss of *Senecio aquaticus* may influence local abundance of species in the *Oplodontha* group and the loss of *Ranunculus* may affect those in the *Platycheirus* group, both of which included a wide taxonomic range. Grazing animals dislike common *Ranunculus* species and avoid *Senecio aquaticus* as it is toxic, so these plants are often controlled in pastures. Advice to land managers usually aims at near-eradication of ragworts, including *Senecio aquaticus* (e.g. Davies 2005), although advice for conservation sites acknowledges the importance of ragworts to insects and that their complete eradication would be detrimental (RSPB, no date). Buttercups are of less concern to stock managers, and in practice it is not possible to radically alter buttercup abundance in wildlife sites since they are favoured by grazing and mowing so their removal requires widespread application of herbicides. 'Weeds' need to be tolerated if Diptera are to thrive.

Flies actively seeking flowers has implications for mowing and grazing. Both activities must be undertaken sufficiently patchily across a site to leave good stands of key flowers within a few hundred metres of pasture that has been cut or grazed. On a well-managed site such as Catcott reserve, this is easily achieved but more extensive semi-improved grasslands where a spring flush of buttercups is followed by a relative dearth of flowers can present few feeding opportunities within easy flying range. Refuges of mixed flower-rich patches become more important in such landscapes.

This study provided evidence to suggest how flies can be included in management regimes for wet grasslands. Even though such advice is probably acceptable only as a result of the current concern with a decline in the pollination of plants, it is nevertheless welcomed that any advice can be suggested for one of the publicly least popular groups of organisms.

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References

Baldock, K.C.R., Goddard, M.A., Hicks, D.M., Kunin, W.E., Mitschunas, N., Osgathorpe, L.M., Potts, S.G., Robertson, K.M., Scott, A.V., Stone, G.N., Vaughan, I.P. and Memmott, J. 2015. Where is the UK's pollinator biodiversity? The importance of urban areas for flower-visiting insects. *Proceedings of the Royal Society B* **282,** 20142849.http://dx.doi.org/10.1098/rspb.2014.2849.

Ball, S.G., Morris, R.K.A., Rotheray, G.E. and Watt, K.R. 2011. *Atlas of the hoverflies of Great Britain (Diptera, Syrphidae).* Wallingford, Biological Records Centre.

Bates, A.J., Sadler, J.P., Fairbras, A.J., Falk, S.J., Hale, J.D. and Matthews, T.J. 2011. Changing bee and hoverfly pollinator assemblages along an urban-rural gradient. *PLoS ONE* **6,** e23459. doi:10.1371/journal.pone.0023459.

Biesmeijer, J.C., Roberts, S.P.M., Reemer, M., Ohlemüller, R., Edwards, M., Peeters, T., Schaffers, A.P., Potts, S.G., Kleukers, R., Thomas, C.D., Settele, J. and Kunin, W.E. 2006. Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science* **313,** 351-354.

Blaauw, B.R. and Isaacs, R. 2014. Larger patches of diverse floral resources increase insect pollinator density, diversity, and their pollination of native wildflowers. *Basic and Applied Ecology* **15,** 701-711.

Branquart, E. and Hemptinne, J.-L. 2000. Selectivity in the exploitation of floral resources by hoverflies. *Ecography* **23,** 732-742.

Carvalheiro, L.G. *et al*. 2013. Species richness declines and biotic homogenisation have slowed down for NE-European pollinators and plants. *Ecological Letters* **16,** 870-878.

Davies, K. 2005. Ragwort poisoning in livestock: prevention and control. *SAC Technical Note* 570. ISSN 0142 7695.

Drake, C.M. 1988. Diptera from the Gwent Levels, South Wales. *Entomologist's monthly Magazine* **124,** 37-44.

Drake, C.M. 2016. The relative importance to Diptera of pasture and ditch margins on an English grazing marsh. *Dipterists Digest* (*Second Series*) **23,** 1-22.

Drake, C.M. and Baldock, N. 2013. Phenology, population size and dispersal of the rare hoverfly *Eristalis cryptarum* (Diptera: Syrphidae) on Dartmoor, England, and implications for future surveillance. *British Journal of Entomology and Natural History* **26,** 129-143.

Elberling, H. and Olesen, J.M. 1999. The structure of a high latitude plant-pollinator system: The dominance of flies. *Ecography* **22,** 314-323.

Geslin, B., Gauzens, B., Thébault, E. and Dajoz, I. 2013. Plant pollinator networks along a gradient of urbanisation. *PLoS ONE* **8**, e63421. doi:10.1371/journal.pone.0063421.

Gibson, R.H., Nelson, I.L, Hopkins, G.W., Hamlett, B.J. and Memmott, J. 2006. Pollinator webs, plant communities and the conservation of rare plants: arable weeds as a case study. *Journal of Applied Ecology* **43,** 246-257.

Gilbert, F.S. 1981. Foraging ecology of hoverflies: morphology of mouthparts in relation to feeding on nectar and pollen in some common urban species. *Ecological Entomology* **6,** 245-262.

Goot, V.S. van der and Grabandt, R.A.J. 1970. Some species of the genera *Melanostoma, Platycheirus* and *Pyrophaena* (Diptera, Syrphidae) and their relation to flowers. *Entomologischen Berichten, Amsterdam* **30,** 135-143.

Hegland, S.J. and Boeke, L. 2006. Relationships between the density and diversity of floral resources and flower visitor activity in a temperate grassland community. *Ecological Entomology* **31,** 532–538.

Henderson, P.A. and Seaby, R.M.H. 2008. A practical handbook for multivariate methods. Pisces Conservation, Lymington.

Highland Statistics. 2013. Brodgar v.2.7.4.

Kearns, C.A. 2001. North American dipteran pollinators: assessing their value and conservation status. *Conservation Ecology* **5**(1): 5. [online] http://www.consecol.org/vol5/iss1/art5/

Kohler, F., Verhulst, J., Klink, R. van and Kleijn, D. 2008. At what spatial scale do high-quality habitats enhance the biodiversity of forbs and pollinators in intensively farmed landscapes? *Journal of Applied Ecology* **45,** 753-762.

Larson, B.M.H., Kevan, P.G. and Inouye, D.W. 2001. Flies and flowers: the taxonomic diversity of anthophiles and pollinators. *Canadian Entomologist* **133,** 439-465.

Lefebvre, V., Fontaine, C., Villemant, C. and Daugeron, C. 2014. Are empidinae dance flies major flower visitors in alpine environments? A case study in the Alps, France. *Biology Letters* **10,** *20140742. http://dx.doi.org/10.1098.rsbl.2014.0742.*

Memmott, J. 1999. The structure of a plant-pollinator food web. *Ecological Letters* **2,** 276-280.

Orford, K.A., Vaughan, I.P. and Memmott, J. 2014. The forgotten flies: the importance of non-syrphid Diptera as pollinators. *Proceedings of the Royal Society B* **282,** 20142934.http://dx.doi.org/10.1098/rspb.2014.2934.

Ouin, A., Sarthou, J., Bouyjou, B., Deconchat, M., Lacombe, J. and Monteil, C. 2006. The species-area relationship in the hoverfly (Diptera, Syrphidae) communities of forest fragments in southern France. *Ecography* **29,** 183–190.

Potts, S.G., Vulliamy, B., Dafni, A., Ne'eman, G. and Willmer, P. 2003. Linking bees and flowers: how do floral communities structure pollinator communities? *Ecology* **84,** 2628-2642.

Rodwell, J.S. (Ed.). 1992. *British Plant Communities. Volume 3. Grasslands and montane communities.* Joint Nature Conservation Committee, Peterborough.

Rotheray, G.E. and Gilbert, F. 2011. *The natural history of hoverflies*. Forrest Text, Ceredigion.

RSPB no date. *Farming to benefit wildlife. Managing marsh ragwort.* The Royal Society for the Protection of Birds. [leaflet]

Sajjad, A. and Saeed, S. 2010. Floral host plant range of syrphid flies (Syrphidae: Diptera) under natural conditions in southern Punjab, Pakistan. *Pakistan Journal of Botany* **42,** 1187-1200.

Souza-Silva, M., Fontenelle, J.C.R. and Martins, R.P. 2001. Seasonal abundance and species composition of flower-visiting flies. *Neotropical Entomology* **30,** 351-359.

Speight, M.C.D. 2010. Flower-visiting flies. **In**. Chandler, P.J. (Ed.) *A dipterist's handbook. 2nd Edition, The Amateur Entomologists' society.* **15,** 469-479.

Ssymank, A. 2004. Hoverfly communities (Diptera, Syrphidae) in vegetation complexes of river valleys near Bonn (Germany). *Volucella* **7,** 157-183.

Ssymank, A. and Krause, T. 2007. Hoverflies (Diptera, Syrphidae) in the Urdenbacher Kämpe near Düsseldorf (Northrhine-Westfalia, Germany). [in German] *Volucella* **8,** 185-217.

Ssymank, A., Kearns, C.A., Pape, T. and Thomson, F.C. 2008. Pollinating flies (Diptera): a major contribution to plant diversity and agricultural production. *Tropical Conservancy* **9,** 86-89.

Wratten, S.D., Bowie, M.H., Hickman, J.M., Evans, A.M., Sedcole, J.R. and Tylianakis, J.M. 2003. Field boundaries as barriers to movement of hover flies (Diptera: Syrphidae) in cultivated land. *Oecologia* **134,** 605-611.

Zuur, A.F., Ieno, E.N. and Smith, G.M. 2007. *Analysing ecological data*. Springer Science & Business Media, LLC. 672 pp.

Appendix 1. English names and binomials for plants mentioned in the text.

Alopecurus pratensis meadow foxtail, *Angelica silvestris* angelica, *Cardamine pratensis* cuckooflower, *Centaurea nigra* common knapweed, *Cirsium arvense* creeping thistle, *Cirsium palustre* marsh thistle, *Dactylorhiza praetermissa* southern marsh orchid, *Epilobium hirsutum* great willowherb, *Filipendula ulmaria* meadowsweet, *Galium palustre* marsh bedstraw, *Heracleum sphondylium* hogweed, *Hydrocharis morsus-ranae* frogbit, *Hypericum tetrapterum* square-stalked St John's-wort, *Lotus pedunculatus* greater bird's foot trefoil, *Lythrum salicaria* purple loosestrife, *Mentha aquatica* water mint, *Myosotis laxa* tufted forget-me-not, *Oenanthe* *crocata* hemlock water-dropwort, *Plantago lanceolata* ribwort plantain, *Ranunculus flammula* lesser spearwort, *Ranunculus repens* creeping buttercup, *Rhinanthus minor* yellow rattle, *Rumex acetosa* common sorrel, *Sanguisorba officinalis* great burnet, *Senecio aquaticus* marsh ragwort, *Silaum silaus* pepper saxifrage, *Silene flos-cuculi* ragged robin, *Stellaria graminea* lesser stitchwort, *Succisa pratensis* devil's bit scabious, *Trifolium pratense* red clover, *Trifolium repens* white clover.

A record of *Lasiambia baliola* (Collin) (Diptera, Chloropidae) from Shropshire – During 2015 I have made regular collecting trips to The Hollies, Haughmond Hill near Shrewsbury in Shropshire. Haughmond Hill has been extensively planted with conifers, but on steep slopes along its western flank there remains an area of intact deciduous woodland – The Hollies. This is dominated by ash *Fraxinus excelsior* and oak *Quercus* spp, with numerous beech *Fagus sylvatica*, sycamore *Acer pseudoplatanus* and birch *Betula* spp. The outstanding feature of The Hollies is the presence of numerous large, aged, dying and dead trees. This is a rare feature in Shropshire woodlands and is the reason I have surveyed the site for Diptera.

A single female *Lasiambia baliola* (Collin, 1946) was collected from the Hollies (SJ5414) by sweep netting low vegetation on 19 September and determined with reference to John Ismay's manuscript key to British Chloropidae. This species is new to Shropshire and is very infrequently recorded in Britain. Collin reared it from an ulcerous elm tree and classed it as a rare species (Collin, J.E. 1946. The British genera and species of Oscinellinae. *Transactions of the Royal Entomological Society of London* **97,** 117-148), although in reality it is probably under-recorded on account of its small size and the sparsity of Dipterists recording Chloropidae.

I thank John and Barbara Ismay for kindly confirming the identification of the above specimen from photographs – **NIGEL P. JONES,** 22 Oak Street, Shrewsbury, SY3 7RQ; nipajones@tiscali.co.uk

A further British record for *Phaonia tiefii* (Schnabl) (Diptera, Muscidae) – Ivan Perry and Peter Chandler reported their discovery of *P. tiefii* from three localities in southern England and provided recognition details to enable the separation of *P. tiefii* from its closely related congener *P. palpata* (Perry, I. and Chandler, P.J. 2016. *Phaonia tiefii* (Schnabl) (Diptera, Muscidae) new to Britain. *Dipterists Digest* (*Second Series*) **23**, 116-118). I held three specimens in my personal collection of Muscidae, determined as *P. palpata* and re-determined these with reference to the foregoing paper.

All three of the putative *P. palpata* specimens were taken from the same site – Hollies Wood, Haughmond Hill, Shropshire (SJ5313). This is an ancient woodland site, dominated by large and old oak, beech and ash trees, with considerable quantities of decaying timber. Two of the specimens are males of *P. palpata* taken on 20 May 2015 and the third specimen, taken on 19 September 2015 is a male of *P. tiefii*. This record extends the known range of *P. tiefii* In Britain to the north-west Midlands.

I would like to thank Georgina Sharp of the Forestry Commission for permission to survey Hollies Wood for Diptera – **NIGEL P. JONES**, 22 Oak Street, Shrewsbury SY3 7RQ

Dipterists Digest 2016 **23,** 205-210

A second British site for the robberfly *Neomochtherus pallipes* (Meigen) (Diptera, Asilidae)

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Summary

Neomochtherus pallipes (Meigen, 1820) is reported at its second British site, this one in Shropshire. Its habitat requirements and flight season are discussed.

Introduction

Neomochtherus pallipes was first discovered in Britain, by Mike Edwards, at Woodcoombe Point, north-east of Prawle Point, South Devon (in the vicinity of grid reference SX79493649) on 9 August 1990, when several specimens were seen (Stubbs and Drake 2014; Mike Edwards via Martin Harvey *pers. comm.*). Since that single record no further sightings have been made in Britain, despite subsequent searches having been undertaken by members of the Devon Fly Group along the coast near Woodcoombe Point (Rob Wolton and Martin Harvey *pers. comm.*).

Neomochtherus pallipes is widespread in Europe, ranging across an area from Spain and Greece in the south to western Russia in the north (Lehr 1988, Geller-Grimm *et al.* 2011). Nearer to Britain it occurs across France (Tsacas 1968, Erica McAlister *pers. comm.*) and across Germany (Wolff 2016), but is reported as rare in Belgium and Holland (van den Broek and Schulten 2013).

Discovery in Shropshire

On 3 July 2016, NJ and BW visited Haughmond Hill, near Shrewsbury, Shropshire to prospect the site for insects and with the rather hopeful aim of finding the bee-fly *Bombylius canescens* Mikan, 1796, which had been recorded in the area in 1918 by the Shropshire dipterist R.F.L. Burton (Bury 1920). It was a hot sunny day and although *B. canescens* was not found, a greater prize was unwittingly picked up by BW, when he nearly trod on a robberfly, which he duly tubed for inspection (SJ53651376). Being unfamiliar with the orange-legged robberfly presented, NJ took the specimen home and was extremely surprised to determine it as a female *N. pallipes.* Fearing that a fundamental error in determining the specimen must surely have been made, photographs of the specimen were emailed to MS for a second opinion. MS confirmed that the specimen did indeed look like *Neomochtherus*. Consequently, amid a deal of excitement, both NJ and MS visited the site the next day – 4 July. Conditions were not promising. It was not particularly warm and a strong wind blew across the site, so the search was centred on sheltered slopes (SJ53651375), immediately below the spot from where the previous day's specimen had been collected. Most fortuitously a male *Neomochtherus* actually landed on the rim of MS's insect net, and soon afterwards a further male and female were seen and photographed on rocks nearby. Weather conditions deteriorated, so the day's search was drawn to an end in the knowledge that a most unlikely colony of *N. pallipes* had been discovered in Shropshire, around 250km north and well inland from its only other known British site on the Devon coast.

Four days later – 8 July, a warm sunny day was forecast, so NJ visited the site again, in the company of fellow entomologist Bob Kemp. In bright sunshine with temperatures around 20 °C, searching commenced on rocky ground at the top of the hill above the area where the previous specimens had been encountered. Around an hour was spent with no success, so the search moved down slope, where further searching was proving fruitless, until on the point of resigning the search, NJ decided to move onto a very steep slope even further down the hillside to an area characterised by loose stones, rocks and dry grassland on shallow sandy soils. Within minutes a male was spotted resting on an old brick and soon another nine specimens (5♂ and 5♀ in total) were found and photographed (Figs 1 and 2), within the same small open area. This area was well sheltered from wind by the presence of short trees around its perimeter (Figs 3 & 4). Searching outside this compact, sheltered area failed to discover any further *Neomochtherus*.

Figs 1-2. *Neomochtherus pallipes* at Haughmond Hill: 1, male (above); 2. female (below).

Fig. 3. Enclosed and sheltered situation frequented by *Neomochtherus pallipes*.

Fig. 4. Exposed rocks where several *Neomochtherus pallipes* were seen.

On 18 July, NJ and MS made a further visit to the site. Conditions were very warm and sunny with temperatures of around 25°C. Extensive searching of the core area, where *Neomochtherus* had previously been seen, resulted in the discovery of a single moribund female. This specimen was very inactive and fell to the ground appearing unable to fly, suggesting that it was near the end of its life. As weather conditions continued to be favourable, the search was extended across a wider area of open slopes with rocky ground and thin soils. Over much of this area no further sightings were made, but within one small area (SJ53721373), also enclosed by low growth of trees, two more females were swept from herbage dominated by wood sage *Teucrium scorodonia*. Finally, in the same area, on 30 July, John Bingham, who was searching for *Neomochtherus*, found a single female (J. Bingham *pers. comm.*).

On 8 July NJ and Bob Kemp also explored Lyth Hill near Shrewsbury (SJ4706), where somewhat similar sandy and rocky situations to those at Haughmond Hill are found, but no *N. pallipes* were found at that site.

Habitat requirements and flight period

In continental Europe, *N. pallipes* is widespread on sandy soils (Tsacas *op. cit.*). Wolff (*op. cit.*) summarised over 30 observations from Germany, by various authors, of habitat associations for *N. pallipes*. These observations frequently describe warm and sandy locations, with a presence of trees and rocks, including Wolff's own observation that *N. pallipes* shows a clear preference for dry and warm habitats in contact with sparse forests, and Drees' (2008) suggestion that rocks are apparently essential for this species, because a few immature, still soft imagines, were found in the immediate vicinity of a rocky promontory. This strongly mirrors the situations frequented by *N. pallipes* at Haughmond Hill, described below.

Observations of the species at Haughmond Hill indicate that its habitat requirements in Britain may be narrowly confined, as in Germany, comprising warm, exposed sandy soils with rocks and shelter provided by nearby trees. At Haughmond Hill the soils are thin, being formed on "Late Precambrian sediments, turbidites (submarine landslide deposits), that are platy in character" (Shropshire Geological Society 2016). This erodes to form soils characteristic of those overlying sandstone. Apart from the first specimen taken on 3 July, all sightings of *N. pallipes* were made in areas containing patches of exposed soils and protruding rocks, surrounded by low growth (approx. 5-10 metres height) of mainly oak *Quercus* trees. On a north-west facing slope, the tree growth provided a strong element of shelter from wind in an otherwise exposed hillside situation. Searching across more open areas, in close proximity to the two core enclosed areas, did not find further specimens. The single specimen from outside the core areas was found about 10 metres or so outside an enclosed, sheltered area. We suggest that in the cooler regions of North West Europe, *N. pallipes* may only occur at sites that provide high levels of warmth, possibly arising out of favourable aspect and the presence of rocks, which heat up readily in sunshine and retain heat for longer than surrounding vegetated areas. The presence too of sheltering tree growth may also be important. The habitat patches frequented by *N. pallipes* at Haughmond Hill are not currently subject to specific habitat management measures. Rabbit grazing over stressed, short grassland probably helps to maintain open areas. In the longer term though, steps may need to be taken to ensure that tree and scrub growth does not eventually overshadow key open areas on the hill slopes.

On the European mainland, *N. pallipes* flies from late May to Early September, strongly peaking in July and early August (Wolff *op. cit.*). The records from Haughmond Hill indicate that *N. pallipes* flies at least during July in Britain, with a short peak emergence, when both males and females are present, of around two weeks. Outside the peak emergence, very few individuals may be encountered. Future observations will hopefully clarify its full flight period in Britain.

Prospecting for *N. pallipes* in Britain

It is highly unlikely that *N. pallipes* will prove to be confined to just two widely separated sites in Britain and it must surely occur on other sites where sandy soils with rocks and sheltering trees occur. Rather exacting niche requirements may mean that this species only occurs in very small areas, so that it might easily be missed.

Fortunately, in regard to finding *N. pallipes* at further British sites, this is a very distinctive species. At Haughmond Hill, a female of the widespread *Machimus atricapillus* was photographed sitting on a rock beside a male *N. pallipes.* The *N. pallipes* was instantly recognisable with its extensively orange legs (Fig. 5).

Fig. 5. ***Neomochtherus pallipes* ♂ (left) on a rock next to a *Machimus atricapillus* ♀ (right).**

We suggest that searches on candidate sites across southern Britain should be undertaken from late June till the early part of August. Sweeping in vegetation on sandy soils in well-sheltered situations may offer the best chance of discovering the species at other sites. A number of the specimens seen at Haughmond Hill were basking on rocks, so searching sunbathed rocks within sheltered patches of ground may also maximise the chances of finding new sites for *N. pallipes.*

Acknowledgements

Martin Drake and Martin Harvey kindly reviewed this paper and provided several helpful comments. We would like to thank Rob Wolton, Martin Harvey and Mike Edwards for information relating to *N. pallipes* at Prawle Point; Erica McAlister (Natural History Museum, London) for details of French specimens in the NHM collection; Cecile Vaughan for assistance translating from German texts; Georgina Sharp (Forestry Commission) for permission to survey for insects at Haughmond Hill.

References

Bury, H. 1920. Diptera in South Shropshire 1913-1920. *Entomologists monthly Magazine* **56,** 249-256.

Drees, M. 2008. Die Raubfliegen des Hagener Raumes (Diptera: Asilidae). *Entomologische Zeitschrift* **18,** 27-32.

Geller-Grimm, F., Dikow, T. and Lavigne, R.J. 2011. Catalogue of Species *Robberflies (Asilidae)* [online] Available at: http://www.geller-grimm.de/catalog/species.htm [accessed 10 November 2016].

Shropshire Geological Society 2016. *Haughmond Hill* [online]. Available from: http://www.shropshiregeology.org.uk/shropgeol/haughmond/haughmondmain.html [accessed 10 November 2016].

Lehr, P.A. 1988. Family Asilidae. pp 197-326. **In** Soós, A. and Papp, L. (Eds) 1988. *Catalogue of Palaearctic Diptera. Vol. 5, Athericidae – Asilidae.* Akadémiai Kiadó, Budapest.

Stubbs, A.E. and Drake, M. 2014. *British Soldierflies and their Allies*. 2nd edition. BENHS.

Tsacas, L. 1968. Révision des espèces du genre *Neomochtherus* Osten-Sacken (Diptères Asilidae): I. Région paléarctique. *Mémoires du Muséum national d'Histoire naturelle, Paris, Sér. A. Zoologie* (1950-1992) **47**(3)**,** 129-328.

van den Broek, R. and Schulten, A. 2013. *Fotogids Roofvliegen van Nederland en België (Diptera – Asilidae)* [online]. Available from: http://www.iwg.njn.nl/sites/www.iwg.njn.nl/files/tabellen/Fotogids%20Roofvliegen%20(Asilidae)%201.0-2013.pdf [accessed 10 November 2016].

Wolff, D. 2016. *Atlas der Raubfliegen Deutschlands* [online]. Available from: www.asilidae.de [accessed 10 November 2016]

Dipterists Digest 2016 **23**, 211-214

Nine species of Diptera new to Ireland from Lough Neagh, Northern Ireland

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Summary

Nine species of Diptera belonging to the families Mycetophilidae, Hybotidae, Dolichopodidae, Anthomyzidae, Anthomyiidae, Fanniidae and Calliphoridae are recorded as new to Ireland from the shore of Lough Neagh in Northern Ireland.

Introduction

Malaise traps were set at sites on the shore of Lough Neagh in Northern Ireland by MA and TB, and operated from June to September 2016. The trap samples were sorted by CWP and the majority of the Diptera was passed to PJC for identification. Altogether 272 species of Diptera were identified, and these included nine species that had not been previously recorded in Ireland.

All of the species new to Ireland were from one of these locations, Quay 1 at Emerson's Sand Quarry, Ardmore Road, Lurgan (Irish grid reference J01219 63396), situated at the south of Lough Neagh in County Armagh.

The photographs (Figs 1-6) show the trap location. Fig. 1 shows the track on the small quay that projects north into the lake; to the right is the sand quay itself and the dock for the dredgers (Fig. 2). The Malaise trap (Fig. 3) was positioned on the left beyond a row of immature sallows *Salix* and alders *Alnus*, down a small bank and separated from the track by a 10-metre strip of rank grassland. Figs 4 and 5 show the area selected for the trap prior to its installation, both taken from beyond the trap location, looking back to the south, the red X marking its location in Fig. 5.

Fig. 6 is taken from the same position as Fig. 1, but facing west. It shows a small stream running into Lough Neagh, a sandy 'beach' with a mown area of amenity grass behind it and a small area of woodland beyond that consisted of large birches *Betula* (some fallen, some dead standing with ivy) and some sallows and alders. The small stream enters the lake about 30 metres or so from the trap position and had no significant emergent vegetation along its bank, although the edges were dominated by Himalayan balsam *Impatiens glandulifera* later in the year. The lakeshore in the vicinity is rocky, consistent with a man-made quay. The water level in the lake fluctuates slightly and creates strand lines on the sandy shores with Diptera larvae making up a large amount of this material.

Species new to Ireland

Mycetophilidae

The material included 22 species of fungus gnats, most probably originating from the small area of woodland adjacent to the trapping location. A little over half of the British species of fungus gnats have been recorded in Ireland, but they are under-recorded there leaving plenty of scope for additions. The two species added here bring the total for Irish species of Mycetophilidae to 254 and all fungus gnat families to 287.

Anatella dampfi Landrock, 1924. 1♂, 3-30.viii.2016.
Widespread in Britain, with records from more than 60 hectads but most of these were obtained by trapping in surveys of wetlands carried out in the 1980s in Wales, Oxfordshire and East Anglia, when it was found in great numbers at many sites. Otherwise there are a few records from upland woods and moorlands in the Pennines and the Scottish borders. Occurrence in Ireland is not therefore surprising. The biology is unknown; some other members of the genus develop in small saproxylic ascomycetes.

Figs 1-6. Views of the trapping site on the shore of Lough Neagh (photos MA).

Mycetophila stolida Walker, 1856. 1♂, 28.vi-6.viii.2016, 1♂, ix.2016.
Widespread in Britain and frequent in southern England and south Wales, with scattered records further north and a few in Scotland, so it is another species that is not unexpected in Ireland. It usually occurs in woodland, but its biology is unknown.

Hybotidae
Platypalpus interstinctus (Collin, 1926). 1♂, 5♀, 3-30.viii.2016; 2♀, ix.2016.
This is a widespread but local species in Britain. *Platypalpus* is a large genus with 89 species now known from Britain, of which only 32 have hitherto been recorded in Ireland, so many other additions could be expected. The predaceous adults of this genus are commonly found on the foliage of trees and shrubs, but little is known of their larval biology.

Dolichopodidae
Thrypticus divisus (Strobl, 1880). 1♂, 3-30.viii.2016.
Widespread in England and there are also Scottish records including the Western Isles, but it was considered sufficiently local for Falk and Crossley (2005) to designate it as Nationally Scarce.

Members of the genus *Thrypticus* mine stems of aquatic plants and the adults are found at water margins. Of the nine species on the British list, only *T. bellus* Loew, 1869 and *T. nigricauda* Wood, 1913 have previously been recorded in Ireland; *T. bellus*, the most frequently recorded British species, was also present at the Lough Neagh site, 1♂, 28.vi-6.viii.2016.

Anthomyzidae
This family is under-recorded in Ireland and only six of the 21 British species have previously been recorded there, so addition of two species from this locality is interesting.

Anthomyza pallida (Zetterstedt, 1838) 1♂, 3-30.viii.2016.
Widespread in Britain, with most records from the south but also a number of Scottish records. It probably develops in leaf sheaths of grasses or sedges like other members of the genus, and is found in various grassland and wetland habitats, as well as glades in woodland (Roháček 2006).

Of the 10 British species of *Anthomyza*, only the three most common mainly grey-bodied species *A. collini* Andersson, 1976, *A. elbergi* Andersson, 1976 and *A. gracilis* Fallén, 1823 have previously been recorded in Ireland. This is the first Irish record of one of the several mainly yellow species.

Typhamyza bifasciata (Wood, 1911) 1♂, 28.vi-6.viii.2016.
This species develops within leaf sheaths around dead stems of reed-mace *Typha latifolia and T. angustifolia*, usually those already damaged by other insects and larvae are considered saprophagous (Roháček 2006). It was listed as Notable in Falk (1991), and is proposed as Nationally Scarce in the recently published Acalyptratae review (Falk *et al*. 2016).

Although a distinctive species with brown wing bands, it is easily overlooked because of close association with its host plant. It was originally discovered in Herefordshire (Wood 1911) and the circumstances were described by Chandler (2015), where photographs of the type specimens are also included. There are scattered records throughout England and Wales, the most northerly being in Durham. It has not yet been recorded in Scotland so its presence in Northern Ireland is interesting.

Anthomyiidae

Botanophila sonchi (Hardy, 1872) 1♂, 28.vi-6.viii.2016.

The larvae of this species develop in the flower heads of sow-thistles *Sonchus arvensis* and *S. oleraceus*. It is widespread in England, and there are Welsh records including Anglesey and scattered Scottish records including Galloway. As there were relatively few recent records it is proposed as Nationally Scarce in the unpublished Calyptrate review (Falk and Pont in preparation), although the common host plants suggest that it may be more frequent than the existing records suggest.

Fanniidae

Fannia tuberculata (Zetterstedt, 1849) 1♂, 3-30.viii.2016.

Like most Fanniidae this species is probably saprophagous as a larva and has been reared from decaying vegetation; it occurs in wet woodland, bogs and marshes. In Britain, it is a mainly northern species, with most records from Scotland but extending southwards to Warwickshire and Norfolk. It was listed as Notable in Falk (1991), and is proposed as Nationally Scarce in the unpublished Calyptrate review (Falk and Pont in preparation).

Calliphoridae

Melanomya nana (Meigen, 1826) 1♂, 24.v-30.vi.2016.

This is a common and widespread species in Britain, mainly in wetland habitats, so it is surprising that it has not previously been recorded in Ireland. Its biology is unrecorded but it belongs to a subfamily of which other members are parasitoids of snails (Rognes 1991), so such an association is likely.

References

Chandler, P.J. 2015. Dr John Henry Wood and Colonel John William Yerbury – their different lives as dipterists. *Dipterists Digest* (*Second Series*) **21 Supplement** (2014), 1-118.

Falk, S.J. and Crossley, R. 2005. A review of the scarce and threatened flies of Great Britain. Part 3: Empidoidea. *Species Status* **3,** 1-134. Joint Nature Conservation Committee, Peterborough.

Falk, S.J. and Pont, A.C. (in preparation). A review of the scarce and threatened flies of Great Britain. Part 5: Calyptratae. *Species Status*. Natural England.

Falk, S.J., Ismay, J.W. and Chandler, P.J. 2016. A Provisional Assessment of the Status of Acalyptratae flies in the UK. Natural England Commissioned Reports, Number 217.

Rognes, K. 1991. Blowflies (Diptera, Calliphoridae) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* **24,** 1-272.

Roháček, J. 2006. A monograph of Palaearctic Anthomyzidae (Diptera) Part 1. *Časopis Slezského zemského Muzea, Opava* (A) **55,** suppl. 1, 1-328.

Wood, J.H. 1911. A new species of *Anthomyza* (*A. bifasciata*). *Entomologist's monthly Magazine* **47,** 40-41.

Dipterists Digest 2016 **23,** 215-218

Further observations of *Calliphora uralensis* Villeneuve (Diptera, Calliphoridae) in Scotland

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Summary

Current knowledge of the status and distribution of *Calliphora uralensis* Villeneuve, 1922 in Scotland is described, including recent observations from Orkney. The fly is common on Shetland, Orkney and the Western Isles, less so on the NW mainland, and apparently very scarce at least in the Inner Hebrides.

Introduction

Macdonald (2014) presented a summary of recent records of the northern blowfly *Calliphora uralensis* Villeneuve, 1922 with some detailed description of occurrence in Shetland. In that paper, I had overlooked the accounts by Laurence (1991, 1997) whose conclusions about its status in Shetland were very close to my own. This current paper updates my own observations, including some from Orkney in May 2016.

Methods

An attempt was made to catch and identify all *Calliphora* encountered in north Scotland. Catches were non-systematic, but a special effort was made to catch blowflies whenever they were seen. The visit to Orkney was made between 20 and 28 May 2016, and covered North Ronaldsay, Westray, Papa Westray, with less intensive observations on Mainland (the main island in the Orkney archipelago, distinguished from the Scottish mainland by the capital letter), Burray and South Ronaldsay. Two records from the mainland were provided by Ian Andrews. Casual collections of *Calliphora* were made by Stephen Bungard on Raasay close to the shore.

Results

Distribution in Orkney

Calliphora uralensis was found frequently on the north isles of N Ronaldsay, Westray and Papa Westray, but only on Glimps Holm in the south (Fig. 1). Little time was spent on Mainland, so the apparent absence there is unlikely to be real. The only congener found was *Calliphora vicina* Robineau-Desvoidy, 1830, in the same range with the addition of South Ronaldsay. All *C. uralensis* and most *C. vicina* were within 500m of the shore, but on the smaller islands there is little land far from the sea, and there is considerable bias towards the coast inherent in the methods. The numbers recorded are shown in Table 1.

Island	*C. uralensis*	*C. vicina*
N. Ronaldsay	18	18
Westray	11	9
Papa Westray	8	17
South isles	2	8
Total	**39**	**52**

Table 1. Number of individuals of *Calliphora* found in Orkney, 20-27 May 2016.

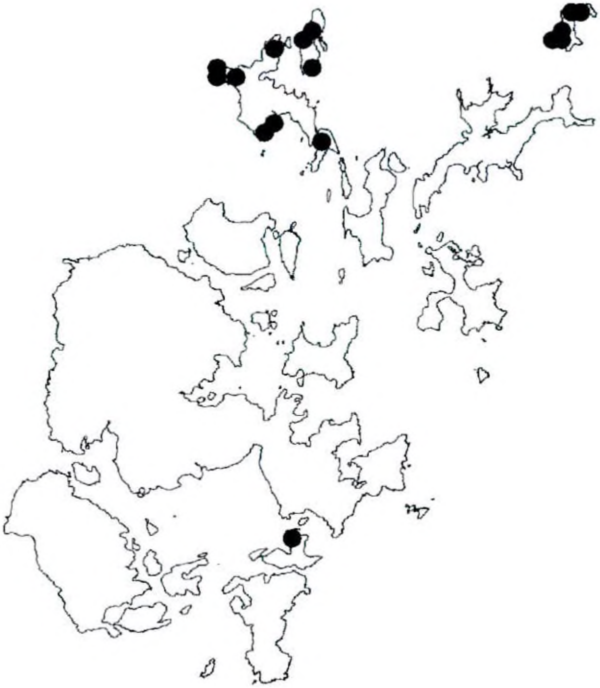

Fig. 1. Distribution of records of *Calliphora uralensis* in Orkney, May 2016.

Distribution elsewhere

Ian Andrews found *C. uralensis* at two places in Sutherland in July 2016: Oldshoremore (NC25) and near Durness (NC36). These are the only recent records from that area. *Calliphora uralensis* was absent in a sample of 105 *Calliphora* from Skye and Raasay (V.C. 103). Species composition was 89 *C. vicina*, 13 *C. vomitoria* (Linnaeus, 1758), 2 *C. subalpina* (Ringdahl, 1931) and 1 *C. loewi* Enderlein, 1903, confirming previous conclusions that *C. uralensis* is very scarce or even absent in that area. Little has been added to our knowledge of distribution on the mainland and Inner Hebrides since my 2014 paper, but the distribution of records since 2000 is shown in Fig. 2. It may be assumed that because of lack of recent recording, it is found throughout Shetland, Orkney and the Western Isles (V.C.s 112, 111, 110), and is very likely to be present along the whole north coast of the mainland in Sutherland and Caithness (V.C.s 108, 109) and at least on part of the east coast of Caithness.

Behaviour

It was common to find *C. uralensis* basking on walls, rocks, and bare ground. On N. Ronaldsay it was taken from carcases of sheep and a cormorant *Phalacrocorax carbo* close to the shore. Along with *C. vicina*, it will take nectar from a variety of plants: thrift *Armeria maritima*, dandelion *Taraxacum*, ivy *Hedera helix*, and sweet cicely *Myrrhis odorata*. On two occasions, on Eriskay (Western Isles) and N Ronaldsay (Orkney) it was found indoors.

Phenology

Observations being non-random in time, seasonal pattern of activity is impossible to describe. Extreme dates from all dated records available are 6 May and 6 August. Laurence (1991) had records on unspecified dates from May to August. It may be significant that at the two sites in Sutherland where *C. uralensis* had been taken in July, only *C. vicina* and *C. vomitoria* were taken in late October (Ian Andrews *pers. comm*).

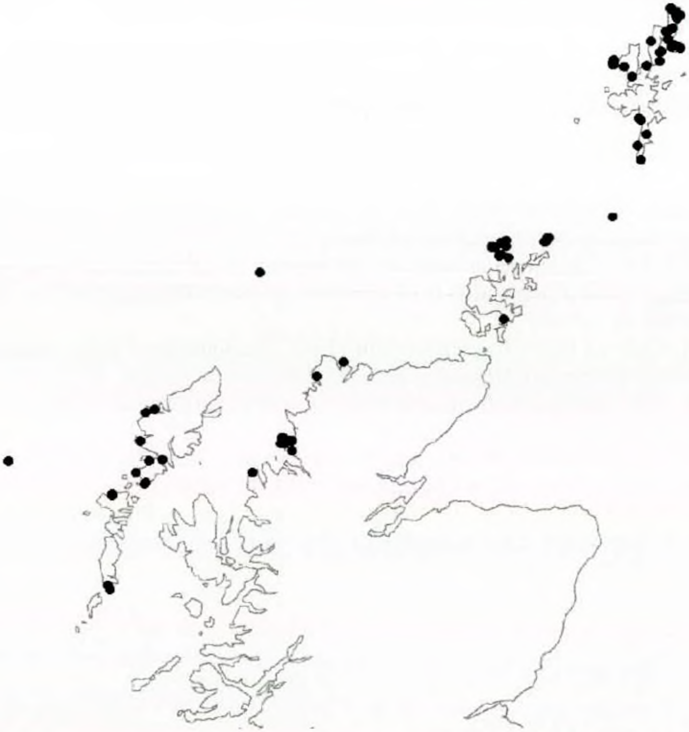

Fig. 2. Distribution of records of *Calliphora uralensis* in Scotland since 2000 (N Uist records from Bratton 2010).

Discussion

Casual observations of calliphorids over much of the north of Scotland since 2010 have confirmed that one of our rarest Scottish species, *C. uralensis*, is well established in the Shetland, Orkney and the Western Isles and on the west coast mainland at least south to NG79 near Gairloch (V.C. 105).

Its distribution >2000 shows little change from that evident from the earlier works of MacLeod and Donnelly (1956), Davies (1987) and Laurence (1991), and the numbers recorded since 2013 in the island groups give little cause for concern. They are very easily found. The strong association with the coast seems clear. Encounters even 500m from the coast are rare in an area of W Ross where the fly is not uncommon.

The areas of uncertain current status are the Inner Hebrides (V.C.s 103, 104), and the coasts of Sutherland and Caithness (V.C.s 108, 109). It is not obvious why conditions there should be less suitable than in the areas where we know it is abundant, but the reason for the characteristic northern distribution more widely in Greenland, Iceland, Scandinavia, N Scotland and W Ireland is obscure. Entomologists visiting north and west Scotland are encouraged to examine any *Calliphora* carefully, especially if found on or close to the shore.

Acknowledgements

I am grateful to Ian Andrews for permission to use his records from Sutherland, to Stephen Bungard for his sampling on Raasay, and to Hugh Insley for a specimen from N Rona. Lee Johnson and Ian Andrews commented on a draft. Maps were prepared with DMAP, and Alan Morton kindly provided the boundary file for Orkney.

References

Bratton, J.H. 2010. Miscellaneous invertebrates recorded from the Outer Hebrides, 2010. *The Glasgow Naturalist* (online 2012) **25,** Part 4.

Davies, L. 1987. The distribution in Scotland and Ireland of *Calliphora uralensis* and its occurrence with and separation from *C. vicina* (Insecta : Diptera). *The Irish Naturalists' Journal* **22,** 241-244.

Laurence, B.R. 1991. *Calliphora uralensis* Vill. (Dipt., Calliphoridae) in the northern isles. *Entomologist's monthly Magazine* **127,** 139-143.

Laurence, B.R. 1997. Diptera in the northern isles. *Entomologist's monthly Magazine* **133,** 225-232.

Macdonald, M. 2014. Observations of *Calliphora uralensis* Villeneuve (Diptera, Calliphoridae) in Scotland. *Dipterists Digest (Second Series)* **21,** 197-200.

MacLeod, J. and Donnelly, J. 1956. The geographical distribution of blowflies in Great Britain. *Bulletin of Entomological Research* **47**(3)**,** 597-619.

Dipterists Digest 2016 **23,** 219-224

Liriomyza intonsa Spencer (Diptera, Agromyzidae) new to Britain, with new European data and a literature overview

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Summary

The discovery of the agromyzid fly *Liriomyza intonsa* Spencer, 1976 from "brownfield" land in Newport, South Wales, Great Britain is reported. New findings in Croatia, Germany, and Greece are added. The literature on the species is listed and includes the host plant clarification and all records from further European countries.

Introduction

During a survey of land within Newport Docks, South Wales, ST3285, in 2015 DG collected a single male *Liriomyza* using a vacuum sampler, which, once dissected, proved to be a species he had not encountered before. Reference to the illustrations in Spencer (1976) enabled its identification as *Liriomyza intonsa* Spencer, 1976, a species not previously reported from Britain.

Identification

Liriomyza intonsa is a small, black and yellow agromyzid fly, with yellow on scutellum, mesonotum black right up to scutellum, yellow antennae and femora and largely yellow anepisternum. In Spencer (1972) it will key to couplet 33 where it fits best with *L. centaureae* Hering, 1927 with a wing length of 1.4mm and shining mesonotum. In Spencer (1976) the specimen from Newport runs very readily to couplet 27 after which the characters become difficult to see or interpret. The long pubescence on the dorsal and apical margin of the third antennal segment needs high power but under transmitted light is clear. The degree to which the mesonotum is matt or shiny is not always easy to judge, and if in spirit or mounted in DMHF, impossible to see. At this point, reference to the illustrations of the aedeagus clearly distinguish *L. intonsa* from similar species, the distiphallus being one of the more distinctive in the genus, especially in ventral view (see figs 447 and 448, p. 253 in Spencer 1976, and Plate 1).

The type description is based on a single male that was not in perfect condition (Spencer 1976). The Newport specimen differs slightly in having hind margin of eye not entirely yellow, but with the black of the occiput reaching the eye margin in the upper third, but not reaching the base of the outer vertical bristle.

Two species possess extremely similar male genitalia: *Liriomyza centaureae* Hering, 1927 and *L. anthemidis* Pakalniškis, 1994. A paratype of the latter in the collection of MvT has a slightly longer and completely symmetric mesophallus and in lateral as well as dorsal view a slightly less rounded distiphallus with longer divergent hyaline terminal openings for the sperm release. *Liriomyza intonsa* has a slightly asymmetric mesophallus with the left tip longer than the right one (Plate 1, "left" is above in the photo).

Biology

Very little is known of the biology or habitat preferences of this fly which appears to be rare throughout its range (Černý *et al.* 2001). Pakalniškis (1986) was successful in discovering pineapple weed *Matricaria discoidea* (= *Chamomilla suaveolens*, *Matricaria matricarioides*) as the host plant of this species. In as far its description by Vlk (2001) as "a species on weeds" agrees with this host and as well with the data on flies collected by S. Prescher during her investigations on agricultural crops and their treatments (Prescher and Büchs 1997 and 2000). Most specimens documented in Table 2 were also caught along road sites and on waste ground, e.g. the rock island of Heligoland in the North Sea.

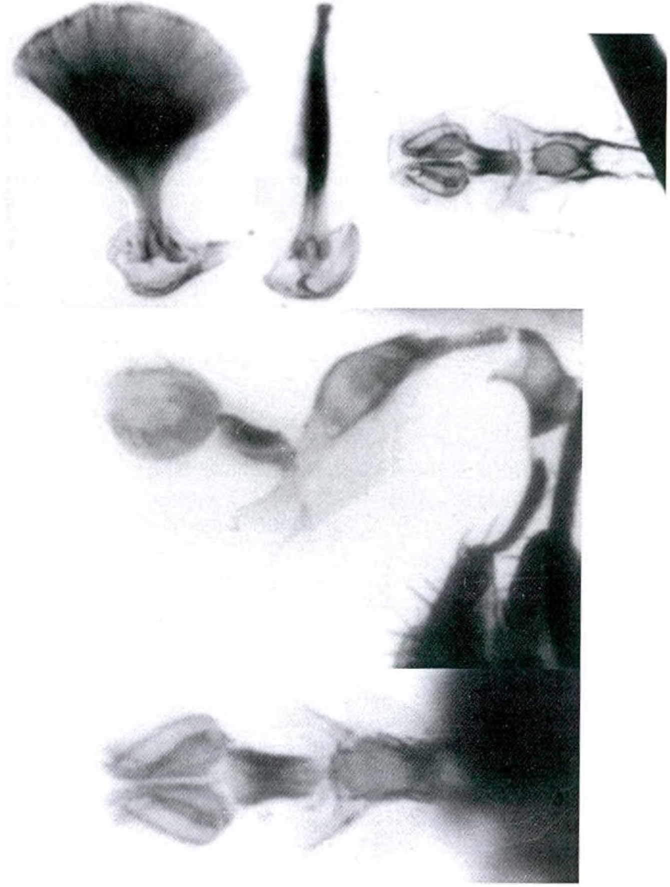

Plate 1. Male genitalia of *L. intonsa*; above: (left) ejaculatory apodeme from the left side, base of ductus ejaculatorius at right; (centre) the same from anterior view, movable foot bulb artificially bent to the right; (right) aedeagus from below (which is morphological dorsal), minutia pin oblique on the right edge; middle: naturally expanded aedeagus incl. phallophorus in left lateral view, tip of phallapodeme touching phallophorus and demonstrating the morphology of the pushing-out function; epiphallus bent downwards toward the tip of the epandrium, length of aedeagus (without phallophorus) 0.24 mm; below: enlarged aedeagus from below, width of sclerotised tip 0.075 mm.

In greenhouses in Lithuania, specimens have been taken in association with peppers *Capsicum*, cucumber *Cucumis* and tomato *Lycopersicon* (Ostrauskas *et al*. 2005). However, plant associations found in greenhouses do not necessarily indicate the host plant in natural situations and the ubiquitous and cosmopolitan host plant would be likely to be growing close by. The single male from Newport was taken in a vacuum sample on 28 August 2015. The sample site is a linear compartment either side of a railway line between a road and the saltmarsh on the west bank of the River Usk. The habitat is primarily flower-rich grassland with ruderal and sparsely vegetated areas, some exposed substrate and some buddleia *Buddleia* and sallow *Salix* scrub along the eastern side. Although this sparsely vegetated site has a range of plant species, no *Capsicum*, *Cucumis* or *Lycopersicon* was present.

The abdomen of the male from Koutsounari (Crete) (Table 2) is filled with golden droplets of oil, which are not soluble in ethanol. This has also been noted in other agromyzid species, e.g. *Phytomyza sedi* Kaltenbach, 1869 caught by MvT in early April 1980 around Barcelona, Spain. The origin and function of these droplets is enigmatic.

Distribution and Status in Britain

Liriomyza intonsa was first described from a single male found in Denmark in 1960 (Spencer 1976) and has subsequently been recorded from the Czech Republic, France, Germany, Lithuania and Spain (Martinez 2011). Further references for these countries and for Bulgaria, Greece, Sweden and Switzerland are listed in Table 1, a first record for Croatia in Table 2. So far, the Newport specimen is the only one known from Britain. The fact that the collecting location is within the boundary of a working port raises the probability that it has been imported with plant material or foodstuffs. Only further sampling will elucidate if the species has established a colony in South Wales.

Acknowledgements

Permission to access the sampling locations was given by Associated British Ports. DG would also like to thank Costain/Vinci Grands Projets and the Welsh Government for commissioning the invertebrate survey and RPS for assisting in the field work.

References

Benavent-Corai, J., Martinez, M. and Peydró, R.J. 2005. Catalogue of the hosts-plants of the world Agromyzidae (Diptera). Part 1: List of Agromyzidae species and their hosts-plants. Part 2: List of hosts[sic!]-plants and Agromyzidae associated. *Bollettino di Zoologia agraria e di Bachicoltura, Università degli Studi di Milano, Serie II,* **37**(Supplementum), pp. i-ii, 1-97. Torino.

Brunel, E. and Martinez, M. 1986. Inventory of Agromyzidae (Diptera) in two cereal crops in Brittany between 1974-1984. pp 1-14. *Paper distributed on the First International Congress of Dipterology, Budapest, 17th-24th August, 1986.*

Černý, M. 1999. Faunistic Notes: Agromyzidae. *Dipterologica bohemoslovaca* **9,** 200-207. Bratislava.

Černý, M. 2001. Faunistic records: Agromyzidae. *Acta Universitatis Carolinae, Biologica* **45** (= *Dipterologica bohemoslovaca* **10**)**,** 193-197.

Černý, M. 2001. Příspěvek k poznání Agromyzidae (Diptera) Chráněné krajinné oblasti Bílé Karpaty. [A contribution to the knowledge of Agromyzidae (Diptera) of the Bílé Karpaty Protected Landscape Area]. *Sborník přírodovědného klubu v Uherskem Hradišti* **6,** 244-258. Uherské Hradiště.

author	year	pages	country	shortened published information
Benavent-Corai et al.	2005	22,59	Lithuania	secondary information: host plant after Pakalniškis ("1993: 44-49" [wrong citation for 1986])
Brunel & Martinez	1986	3	France: Brittany	Le Rheu, 1974-1984 on wheat fields 122 specimens, on corn fields 8 specimens, yellow traps
Černý	1999	204	Czech Rep.	1st record for Czech Republic, 22.vii.1991, 1♂
Černý	2001	251	Czech Rep.	White Carpathian Mts 24.vi.1999, 1♂
Černý	2011	338	Greece	Kerkini area, 13.viii.2007, 1♂; Ano Paroia, 5.vi.2005, 3♂1♀
Černý	2013	285	Switzerl. 1st rec.	5.iv.2007, 1♂; Bulgar., Czech R., Denm., France, Germ., Greece, Lithuan., Spain, Swed., Switzerl.
Černý & Merz	2006	94	Bulgaria	12.vii.1970, 1♂
Černý & Vlk	2001	194	Czech Rep.	Moravia, 26.vii.1995, 1♂2♀; 28.vii.1995, 2♂; 20.vii.1995, 3♂
Černý, Valá & Barták	2001	353	Czech Rep.	Bohemia, May, rare
Martinez	1984	109	France	Le Rheu, 1.viii.1977, 1♂; ix.1977, 3♂; viii.1979, 3♂; 4.x.2002, 1♂
Martinez	2011	www	6 countries	Czech Republic, Denmark, France, Germany, Lithuania, Spain
Ostrauskas et al	2005	23,25	Lithuania	sticky traps near greenhouses, 25 specimens
Ostrauskas et al.	2005	325	Lithuania	secondary information: abstract for otherwise published data
Pakalniškis	1986	61,64,65	Lithuania	*Chamomilla suaveolens*(= *Matricaria discoidea*), 1st record of a host plant, 20.viii.1984, 1♂
Pakalniškis	1989	63	Lithuania	checklist, secondary information
Pakalniškis	1994	22,25	Lithuania	morphology compared with *anthemidis* sp. n.; *Chamomilla*
Pakalniškis et al.	2000	39	Lithuania	checklist, secondary information
Petersen & von Tsch.	2001	181	Denmark	checklist, secondary information
Prescher & Büchs	1997	387	Germany	Braunschweig (= Brunswick), 3 specimens without data identified by M.v.T.
Prescher & Büchs	2000	351	Germany	Brunswick (see above), host after Spencer (1976) *Matricaria*, which is a wrong citation
Spencer	1976	226,254,558	Denmark	North East Zealand, Bagsvært, 29.v.1960, 1♂ holotype
Vlk	2001	31-32	Czech Rep.	secondary information: repeated as "new" for the Czech Rep., a species on weeds
von Tschirnhaus	1981	33,41,50-51	Germany	coast of the North Sea, 1♂; [genitalia see this article Plate 1]
von Tschirnhaus	1994	495	Germany	2nd record for Germany, Rheinland-Pfalz, Eifel, 5♂2♀, see two data in Tab. 2
von Tschirnhaus	1999	12	Germany	checklist, secondary information
Zlobin	2005	181,187	Sweden	new to Sweden, records of together 3♂1♀, 4.vii.1987, 18.vi.1989, 18.viii.1978, 29.??1988

Table 1. Abbreviated information of all cited references.

♂♀	country	collector, date, locality
1♂	Germany	M.v.T., 14.-31.viii.1970, Schleswig-Holstein, coast close to Danish border, 54°54'N, 8°38'E
2♀	Greece	M.v.T., 15.iii.1987, Isle of Crete (east), 6 km SSW of Ziros, 35°01'33"N, 26°06'38"E
1♂	Greece	M.v.T., 18.iii.1987, Isle of Crete (east), Koutsounari, 8 km E Ierapetra, 35°00'35"N, 25°49'47"E
1♂	Germany	M.v.T., 23.-25.ix.2010, Schleswig-Holstein, isle of Heligoland/North Sea, 54°11'10"N, 7°52'56"E
1♂	Greece	M.v.T., 2.v.1988, Isle of Crete, km 24 of road Hania-Rethimno; on flowers of *Spartium junceum*
1♂	Germany	M.v.T., 27.viii.1991, Rheinland-Pfalz, 3 km SSW Daun, 50°09'N, 6°49'E
1♂1♀	Germany	M.v.T., 25.viii.1991, Rheinland-Pfalz, 6 km W Bad Münstereifel, 50°33'24"N, 6°40'28"E
4♂1♀	Germany	M.v.T., 24.viii.2011, Schleswig-Holstein, shore of Baltic Sea near Howacht, 24°20'37"N, 10°38'34"E
3♂	Germany	S. Prescher, 8.-21.vii.1992, Niedersachsen, Vordorf near Brunswick, 52°21'46"N, 10°29'29"E
1♂	Germany	M.v.T., 3.ix.1977, Niedersachsen, river Elbe, 1.5 km W Gorleben, 53°03'14"N, 11°20'09"E
1♂	Germany	J. Franzen, 13.viii.1992, Niedersachsen, Wolfenbüttel-Ahlum, 52°10'06"N, 10°34'50"E
1♂	Croatia	E. Thormählen, 30.ix.1986, Isle of Pag, Matajna, 44°30'30"N, 15°00'45"E

Table 2. Collecting data of *L. intonsa* in the collection of MvT.

Černý, M. 2011. Agromyzidae (Diptera) in the vicinity of the Kerkini Lake with descriptions of eight new species from Greece. *Acta entomologica Musei nationalis Pragae* **51,** 299-347.

Černý, M. 2013. Additional records of Agromyzidae (Diptera) from the West Palaearctic Region. *Časopis slezského zemského Muzea Opava* (A) **62,** 281-288.

Černý, M. and Merz, B. 2006. New records of Agromyzidae (Diptera) from the Palaearctic Region. *Mitteilungen der schweizerischen entomologischen Gesellschaft* **79,** 77-106.

Černý, M. and Vlk, K. 2001. Faunistic records: Agromyzidae. *Acta Universitatis Carolinae, Biologica* **45** (= *Dipterologica bohemoslovaca* **10**)**,** 193-197.

Černý, M., Vála, M. and Barták, M. 2001. Agromyzidae. **In** Barták, M. and Vaňhara, J. (Eds) Diptera in an Industrially Affected Region (North-Western Bohemia, Bílina and Duchkov Environs) II. *Folia Facultatis Scientiarum Naturalium Universitatis Masarykianae Brunensis - Biologia* **105,** 349-364, 2 pp. Appendix 1-2 (*in* 241-514 + 2 pp.).

Martinez, M. 1984. Contribution à l'étude des *Agromyzidae* de France [*Diptera*] (3^e note). Considérations faunistiques, premières additions et corrections. *Revue française d'Entomologie (nouvelle Série)* **6**(3)**,** 105-111.

Martinez, M. 2011. Fauna Europaea. Version 2.4. Diptera: Agromyzidae. World wide web electronic publication in www.faunaeur.org/.

Ostrauskas, H., Pakalniškis, S. and Taluntytė, L. 2005. Bionomics of mining dipterans (Insecta, Diptera). p. 325. **In** XIII Pasaulio lietuvių mokslo ir kūrybos simpoziumas. Vilnius, 30 June - 4 July, 2005. Teziu rinkinys [Conference abstract], Vilnius.

Ostrauskas, H., Pakalniškis, S. and Taluntytė, L. 2005. Dipterous miners collected in greenhouse areas in Lithuania. *Ekologija* **2005**(2)**,** 22-28.

Pakalniškis, S.A. 1986. 19 novych dlja SSSR i 26 novych dlja Litovskoj SSR vidov minirujuššich mušek, obnaružennych v 1980-1986 gg. [Species of Agromyzidae, 19 new for the USSR and 26 new for the Lithuanian SSR Agromyzidae (Dipt.) species, found in 1980-1986]. pp. 58-66. **In** Jonajtis, V. and Petrauskas, V. (Eds): Novye i redkie dlja Litovskoj SSR vidy nasekomych. Soobšženija i opisanija 1986 goda. - 87 pp. Institut zoologii i parasitologii Akademii nauk Litovskoj SSR, Vil'njus (= Vilnius).

Pakalniškis, S. 1989. Spisok dvukrylych Litvy (do 1988 g. vključitel'no). [The list of the Lithuanian Diptera (to 1988 inclusive)]. pp. 32-85. **In** Jonajtis, V. *et al.* (redakcionnaja kollegija): Novye i redkie dlja Litovskoj SSR vidy nasekomych. Soobščenija i opisanija

1989 goda. 88 pp. Institut zoologii i parasitologii Akademii nauk Litovskoj SSR, Vil'njus (= Vilnius).

Pakalniškis, S. 1993. Some Agromyzidae (Diptera) species found in Lithuania for the first time. pp. 44-49. **In** Jonaitis, V., Kazlauskas, R., Pileckis, S., Rakauskas, R. and Zajančkauskas, P. (Eds) New and rare for Lithuania insect species. Records and descriptions of 1993. 67 pp. Institute of Ecology, Lithuanian Entomological Society, Vilnius.

Pakalniškis, S. 1994. The Lithuanian *Agromyzidae* (Diptera). Descriptions of 6 new species and other notes. *Acta entomologica lituanica* **12,** 5-34.

Pakalniškis, S., Rimšaitė, J., Sprangauskaitė-Bernotienė, R., Butautaitė, R. and Podėnas, S. 2000. Checklist of Lithuanian Diptera. *Acta zoologica lituanica* **10**(1)**,** 3-58.

Petersen, F.T. and von Tschirnhaus, M. 2001. Agromyzidae. pp 179-182. **In** Petersen, F.T. and Meier, R. (Eds): A preliminary list of the Diptera of Denmark. *Steenstrupia* **26**(2)**,** 119-276 + Errata. Copenhagen.

Prescher, S. and Büchs, W. 1997. Zum Einfluß abgestufter Extensivierungsmaßnahmen und selbstbegrünender Dauerbrache im Ackerbau auf funktionelle Gruppen der Brachycera (Diptera). [Effects of different levels of extensification in arable crops and a set-aside area with natural succession on functional groups of Brachycera (Diptera)]. *Verhandlungen der Gesellschaft für Ökologie* **27,** 385-391.

Prescher, S. and Büchs, W. 2000. Der Einfluß abgestufter Extensivierungsmaßnahmen im Ackerbau auf die Struktur der phytophagen Brachycerazönose [Effects of different levels of extensification in arable land on the Brachycera with phytophagous larvae]. **12,** 347-352. Giessen.

Spencer, K.A. 1972. Diptera, Agromyzidae. *Handbooks for the Identification of British Insects.* X, 5(g)**,** 1-136. Royal Entomological Society, London.

Spencer, K.A. 1976. The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna entomologica scandinavica* **5**(in 2 parts)**,** 1-304, 305-606. Scandinavian Science Press.

Vlk, R. 2001. Intensity of adult occurrence and species diversity of leaf mining fly taxocenoses (Diptera: Agromyzidae) in the field and in glasshouse crops in the Czech Republic. *Dipteron* **17,** 31-32. Gdánsk and Łódź.

von Tschirnhaus, M. 1981. Die Halm- und Minierfliegen im Grenzbereich Land-Meer der Nordsee. Eine ökologische Studie mit Beschreibung von zwei neuen Arten und neuen Fang- und Konservierungsmethoden (Diptera: Chloropidae et Agromyzidae). *Spixiana Supplement* **6,** 1-405, pls 1-11.

von Tschirnhaus, M. 1994. [Kapitel 4.11]. Minierfliegen (Diptera: Agromyzidae) aus Malaise-Fallen in spezifischen Pflanzengesellschaften: Ein Weinberg der Ahr-Eifel in Entwicklung zu einem Felsenbirnen-Gebüsch (*Cotoneastro-Amelanchieretum*). [Chapter 4.11. Leaf miner flies (Diptera: Agromyzidae) caught in Malaise traps in specific vegetation types: a vineyard in the Ahr-Eifel progressing towards *Cotoneastro-Amelanchieretum*]. *Beiträge zur Landespflege in Rheinland-Pfalz* **16**(1993)**,** 481-534.

von Tschirnhaus, M. 1999. Agromyzidae. pp 118-130. **In** Schumann, H., Bährmann, R. and Stark, A. (Eds): Entomofauna Germanica 2. Checkliste der Dipteren Deutschlands. - 354 pp. - *Studia dipterologica Supplement* 2. Ampyx-Verlag, Halle an der Saale.

Zlobin, V.V. 2005. A revised checklist of the Swedish Agromyzidae. *International Journal of dipterological Research* **16**(3)**,** 175-189.

Anthrax anthrax (Schrank) (Diptera, Bombyliidae) found in Britain

– On 5 August 2016, RM found and photographed an unfamiliar and distinctive fly in his garden in Sutton, Cambridgeshire (V.C. 29, TL444787). The fly (Fig. 1) was sitting on a birch log in a 'bee hotel' and was seen at about 1.30p.m. Although it remained in place for about ten minutes while photographs were taken, it then flew off before it could be netted. The photographs were circulated via Twitter, and were identified as the bee-fly *Anthrax anthrax* (Schrank, 1781), a determination subsequently confirmed by David Gibbs.

Fig. 1. ***Anthrax anthrax*** **from Sutton, Cambridgeshire, 2016 (© Rob Mills).**

Specimens of *Anthrax anthrax* reputed to be from Britain exist, labelled as having been found in Leicestershire in 1929 and 1930, but their provenance is doubted. These dubious specimens are described in A.E. Stubbs and M. Drake (2014. *British Soldierflies and their allies: an illustrated guide to their identification and ecology*. British Entomological and Natural History Society), and the species is listed as "Excluded" in the British checklist (Chandler, P.J. (Ed.) 1998. Checklists of Insects of the British Isles (New Series) Part 1: Diptera. *Handbooks for the Identification of British Insects* **12,** 1-234).

The bee hotel in Sutton had been constructed in spring 2015, and consists of a wooden framework containing a mix of birch logs with drilled holes, and bamboo tubes (Fig. 2). It is positioned at about 1.5 metres height on a south-facing wall, close to plentiful nectar plants in the surrounding garden. Nesting bees took up residence shortly after construction, including the common red mason bee *Osmia bicornis* (Linnaeus, 1758), along with *O. caerulescens* (Linnaeus, 1758) and species of *Megachile* and *Hylaeus*. *Anthrax anthrax* has larvae that are parasitoids of various hole-nesting bees, including *O. bicornis*.

In the Netherlands *Anthrax anthrax* has been spreading in recent years and has become much more frequent, especially in urban areas. This is believed to be associated with the increasing popularity of bee hotels, providing new nesting opportunities for solitary bees and their parasitoids (John Smit *pers. comm.* and see *www.naturetoday.com/intl/nl/nature-reports/message/?msg=18653*). The bee-fly is widespread in continental Europe (www.faunaeur.org/full_results.php?id=130025) and, if it does become established in Britain, could become a familiar sight in many gardens.

Fig. 2. The bee hotel in Sutton to which *Anthrax anthrax* was attracted (© Rob Mills).

The rather alarming name "anthrax" derives from the Greek word for "coal", and refers to the dark colour of the bee-fly's body and wings (in the context of anthrax as a bacterial infection the name refers to the dark skin lesions that can occur). We propose "Anthracite Bee-fly" as a suitable English name for this species, as it both describes the colour and helps explain the innocuous derivation of the scientific name.

We are grateful to David Gibbs for confirming the species determination based on the photographs, and to John Smit for information on the occurrence of *Anthrax anthrax* in the Netherlands – **ROB MILLS,** 12 Stewards Close, Sutton, Ely, Cambridgeshire, CB6 2NQ **and MARTIN C. HARVEY,** Evermor, Bridge Street, Great Kimble, Aylesbury, HP17 9TN; kitenetter@googlemail.com

Dipterists Day Exhibits 2016
– compiled by Editor from exhibitors' notes

Details are given here only of exhibits that did not also appear at the 2016 Exhibition of the British Entomological and Natural History Society.

BILLKER, J. A female of *Callicera aurata* (Rossi) (Syrphidae) observed ovipositing at Burnham Beeches, Buckinghamshire on 11.vii.2016 (Fig. 1), with a slow-motion film of it searching for a suitable spot for oviposition. It was laying its eggs on a beech *Fagus* stump, that was dead but not showing any signs of decay.

Fig. 1. ***Callicera aurata*** **(Rossi) ovipositing on a beech stump at Burnham Beeches.**

BLOXHAM, M.G. Display boards illustrating an invertebrate survey in the Sandwell Valley in the West Midlands, with special reference to dipterous assemblages found in the Park Farm grey poplar woodland (SP020913). Several facets of invertebrate survey in the Sandwell Valley in recent times (by members of the Sandwell Valley Naturalists' Club) were examined. Some of the key naturalists, together with their fields of expertise, were introduced, showing the capacity of those involved to continue in their work to maximise knowledge of the local flora and fauna. Consideration of the dipterous fauna appeared both at a general and specific level.

With regard to conservation at a general level, attention was drawn to a raft of species that might well be under threat, having no recent records. Of 138 species of hoverfly (Syrphidae) recorded in the Valley, 52 fell into this category- including several normally regarded as fairly common. Of the Nationally Scarce species, only two are still regularly recorded. A photograph of *Meligramma guttatum* (Fallén) was included as an example of a once frequent insect not seen for fifteen years. There have been new records, but some were added by survey on different sub-sites and habitat types (*Tropidia scita* (Harris) was photographed in the RSPB marshes) and were almost certainly long-term residents. *Volucella zonaria* (Poda) has been recorded two miles away in Smethwick, but has yet to be seen here.

A photograph of the horse bot-fly *Gasterophilus intestinalis* De Geer (Oestridae), last recorded in a paddock here on 13 August 1991, was included as an example of a fly unlikely to appear again in the Valley.

Attempts to conserve the very small but most interesting grey poplar dominant Park Farm Wood adjoining the M5 motorway were described. It continues to host a diverse dipterous fauna. *Xylota tarda* Meigen larvae develop in its fallen grey poplar trunks whilst *Chalcosyrphus* *nemorum* (Fabricius) is found in standing water locations within the wood. *Xylota segnis* (Linnaeus) (photo of a pair *in copula*) and *Xylota sylvarum* (Linnaeus) are still regularly seen. A Nationally Scarce resident around trunks and logs is *Brachyopa pilosa* Collin. Also flourishing in this setting are *Xylophagus ater* Meigen (Xylophagidae) and *Solva marginata* (Meigen) (Xylomyidae). The former does not seem to have been reported from elsewhere in Birmingham and the Black Country but the latter has been regularly reared from beneath grey poplar bark and a line drawing of an adult, together with the pupa from which it emerged, was included in the exhibit. A Nationally Scarce soldier fly also reared from this substrate was *Neopachygaster meromelas* (Dufour) (Stratiomyidae). The clusiid *Clusia tigrina* (Fallén, once frequent here and in the neighbouring woodland between 1983 and 1992, seems to have vanished in recent times.

Of particular interest was the lonchaeid assemblage consisting of *Lonchaea fraxina* MacGowan & Rotheray, *L. hackmani* Kovalev (reared from bark debris of fallen grey poplar), *L. scutellaris* Rondani, *L. serrata* MacGowan & Rotheray and *Silba fumosa* (Egger). The Sandwell Valley Naturalists' Club was grateful to Iain MacGowan for checking the identifications.

An impressive Turkey oak *Quercus cerris* stood in the centre of the wood for many years. Extensive sap runs yielded a typical suite of flies including *Aulacigaster leucopeza* (Meigen) (Aulacigastridae), *Leucophenga maculata* (Dufour) (Drosophilidae) and the rarely recorded muscid *Phaonia laeta* (Meigen). The very scarce tachinid *Wagneria gagatea* Robineau-Desvoidy has also been recorded here.

Active survey continues on this important site, as does collective effort to preserve the old leaning trees from the ever present threat of mass felling for health and safety reasons.

DRAKE, C.M. (1) Laboratory devices. Three home-made pieces of equipment were shown, of which more detail will be published in *Bulletin of the Dipterists Forum*. A hotplate for macerating small genitalia was based on the idea of Michael Ackland (2015. *Bulletin of the Dipterists Forum* No **80,** 15-16) of using a bedside lamp to warm jelly for temporary slide-mounts of genitalia. A 40W halogen lamp was mounted upright in a small plywood box. The water bath consists of a 5ml glass tub (21mm diameter, 24mm tall), which is half-filled with water (2ml) and the specimen is put in a 1ml neoprene tube in a few drops of KOH. For viewing specimens and holding them still for drawing and measuring, a holder was made which can be rotated in three planes so the specimen can be viewed from most angles while moving only slightly in the field of view, and remains roughly in focus with minimum re-adjustment. For quickly staging many specimens on micropins, a pinning block was made using a 3mm stiff foam top 130 x 80mm in size supported on a shallow wooden box. The front half has a depth of 20mm from the foam to the bottom of the box, to set the plastazote stage at the correct level, and the rear half has a depth of 15mm to set the locality label correctly. The advantage over a conventional pinning block is that the process is far quicker.

(2) *Dolichopus calinotus* Loew (Dolichopodidae), new to Britain. One male, swept from upper saltmarsh at Pegwell Bay, Kent TR346638, on 4 July 2016 (see article in present issue on this species).

PAINTER, D. After her recent exhibition at Rainham Marshes RSPB reserve, Duncan Sivell asked Dawn to bring some of her work to display at the AGM. A small selection of paintings (including that of the tachinid *Tachina fera* (Linnaeus) shown in Fig. 2), as well as a sample of the scientific drawings she has been working on for the Royal Entomological Society, were shown. She has spent almost two years at the Natural History Museum identifying to family Diptera samples from a Malaise Trap that has been run in the Museum Wildlife Garden, and to species in the case of Dolichopodidae, Muscidae and Sphaeroceridae. She has also been slowly digitising the British Dolichopodidae, building a growing photographic reference collection of images for the museum, using many of Roy Crossley's donated specimens, as they are in such fine fettle. All of this activity had added to her increased fascination with flies, and had greatly assisted their illustration. Although the project is in its infancy, she has been drawing for James McGill's key to British Muscidae (example shown in Fig. 3), as well as providing illustrations for Gavin Broad's upcoming Key to British Ichneumonidae. She is grateful for the support and feedback received from attendees of the AGM.

Fig. 2. Gouache painting of *Tachina fera* (Linnaeus) by Dawn Painter - collected and recorded from her East Finchley Allotment, London, September 2015.

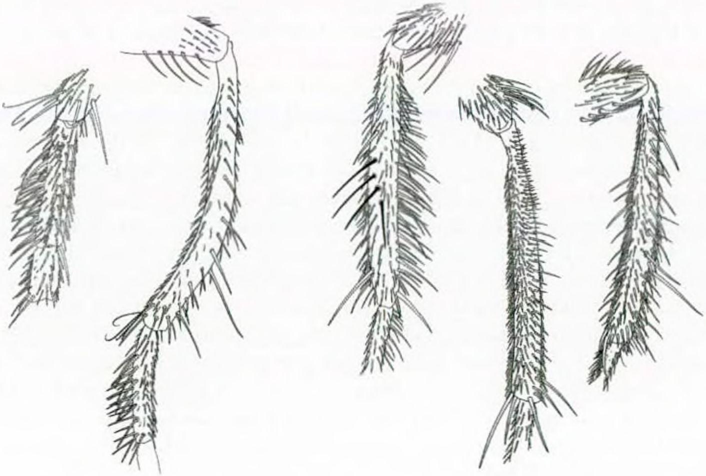

Fig. 3. A selection of *Morellia* leg characters, drawn by Dawn Painter for inclusion in a key to British Muscidae in preparation by James McGill.

WOLTON, R. Flies collected between 2012 and 2016 from an oak with copious sap runs in Devon (see article in present issue), featuring adults of the syrphids *Ferdinandea cuprea* (Scopoli), *Brachyopa bicolor* (Fallén) and the muscid *Phaonia laeta* (Fallén) together with the puparia from which they had emerged, and adults of *Volucella inflata* (Fabricius) (Syrphidae), *Tabanus sudeticus* Zeller (Tabanidae) and *Fannia aequilineata* Ringdahl (Fanniidae) taken while feeding on the sap.

The report on exhibits at the 2014 Dipterists Day included some errors concerning the exhibit by Roger Hawkins. A corrected version is provided below:

HAWKINS, R. (1) *Tipula hortorum* Linnaeus, south-east France, 7 June 2014, on a high limestone ridge in the pre-Alpine massif of the Vercors, at Vallée de Combau, Drôme, 1690 m altitude. The few records of this species in Britain suggest an association with lowland woodland, often on calcareous soils. It flies in April and May.

(2) *Bombylius fimbriatus* Meigen, France, Jansac and Col de Penne, Drôme, 5 June 2014. On the Continent, flies are not always what they seem – what appeared at first to be *Bombylius major* Linnaeus was named from a French key as *B. fimbriatus*. For recognition it should be noted that it has black femora (not reddish) and black bristles on the thorax around the base of the wings (*B. major* from England was shown for comparison).

Dilophus bispinosus Lundström (Diptera, Bibionidae) in Leigh Woods National Nature Reserve, Bristol – A single female *Dilophus bispinosus* was taken by one of ten flight interception traps operated in Leigh Woods NNR over the 2016 field season. The traps are of the four-bottle design and the trap which took the specimen was set over a large volume of compacted wood mould in the top of an ancient oak pollard relatively close to the Avon Gorge (ST560736). This appears to be a new county record for Somerset, which is interesting considering the Bristol area has been one of the more closely studied areas for Diptera and this site is in easy walking distance from the city centre. The species is otherwise only known in Britain from six counties: Surrey, Hertfordshire, Berkshire, Suffolk, Midlothian and Fife. No obvious distribution pattern is discernible other than the range being broadly eastern. The species is reported to have a submediterranean distribution (Haenni J.-P., Barták M. and Kubík Š. 2005. Bibionidae. pp. 41-43. **In** Barták M. and Kubík Š. (Eds) *Diptera of Podyjí National Park and its environs*. Česká zemědělská univerzita v Praze, Praha, 432 pp) and so it might be expected to be confined in Britain to relatively warm and dry sites. The Avon Gorge does fit this supposition as does the relatively recent Surrey record from Denbies Hillside on the North Downs (Perry, I. 2010. A selection of uncommon Diptera found during 2009. *British Journal of Entomology & Natural History* **23,** 198), both sites being on limestone geology. Indeed, the single Slovakian record fits well with this pattern: warm open habitat (beech forest margin) on the south-eastern margin of a limestone rocky formation (Mantič, M., Sikora, T., Roháček, J. and Ševčík, J. 2015. New and interesting records of Bibionomorpha (Diptera) from the Czech and Slovak Republics. *Acta Musei Silesiae, Scientiae Naturales* **64,** 141-149). Interestingly the species is associated with oak forest in Israel (Skartveit, J. and Kaplan, F. 1996. The Bibionidae (Diptera) of Israel. *Israel Journal of Entomology* **30,** 71-90), which fits the Leigh Woods situation remarkably closely.

However, the two recent Scottish records immediately cause problems (Skartveit, J., Whittington, A.E. and Bland, K.P. 2013. The distribution of Bibionidae (Diptera) in Scotland, United Kingdom. *Studia dipterologica* **20**(2)**,** 335–364). The Midlothian record is from a small area of fairly open deciduous woodland along a lowland river, and the Fife site is described as a meadow.

The specimen was identified by Peter Chandler and the Leigh Woods survey was commissioned by the local National Trust ranger team – **KEITH N. A. ALEXANDER,** 59 Sweetbrier Lane, Heavitree, Exeter EX1 3AQ

Dipterists Digest 2016 **23**, 231-236

Dolichopus calinotus Loew (Diptera, Dolichopodidae) new to Britain and Belgium

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Summary

Dolichopus calinotus Loew, 1871 was recorded from a saltmarsh in Kent, south-east England, in the summer of 2016. It is here also recorded for the first time from Belgium, where it is known from three different sites. Its habitat preference in Europe is uncertain but in north-western Europe it seems to be confined to coastal brackish marshes and saltmarshes at the coast or along tidal rivers. The species is rare across its range and this may account for it not having been previously detected in Britain. Modifications to the standard British identification guide are given for both sexes.

Introduction

About one fifth of British dolichopodids are in the genus *Dolichopus*. The rate at which new species in this genus have been found in Britain is low, considering that several additional species are widespread on the near continent; the two most recent additions were *D. subpennatus* d'Assis-Fonseca (d'Assis-Fonseca 1976) and *D. excisus* Loew (Gibbs 2006). It is pleasing to be able to add another to the list, obtained during a Dipterists Forum summer field meeting based in Kent.

Site description

Three males and three females were found at the north end of Pegwell Bay, Kent, part of the Sandwich and Pegwell Bay National Nature Reserve. Two specimens were found by sweep-netting at each of three nearby locations: middle saltmarsh at the junction of a stand of *Limonium vulgare* and *Aster tripolium* with the *Atriplex portulacoides* zone where pools were frequent, an extensive stand of *Phragmites australis* and *Bolboschoenus maritimus* just inland of the first area, and within a reedbed at the top of the shore against a low cliff from which weak freshwater seepages arose and ran through the reedbed. The cliffs are sandy clays of the Cenozoic Thanet Sands overlying Chalk, so the seepage is almost certainly base-rich. All four areas investigated were within about 350m of each other (TR346638 to TR348639).

Identification

The specimens were identified initially using Grichanov (2006) and males confirmed using Becker (1917), Stackelberg (1930) and Parent (1938). A photograph showing the male's golden face and bright antennae is given in Grichanov *et al.* (2015), and the hypopygium, antenna and wing are illustrated by Pârvu (1995).

Using the standard British identification guide (d'Assis-Fonseca 1978), the male of *D. calinotus* runs to couplet 45, where it cannot be forced into any of the four species from here onwards. Females run to couplet 46 where again they do not comfortably fit either species at this couplet. The key is most simply modified as follows:

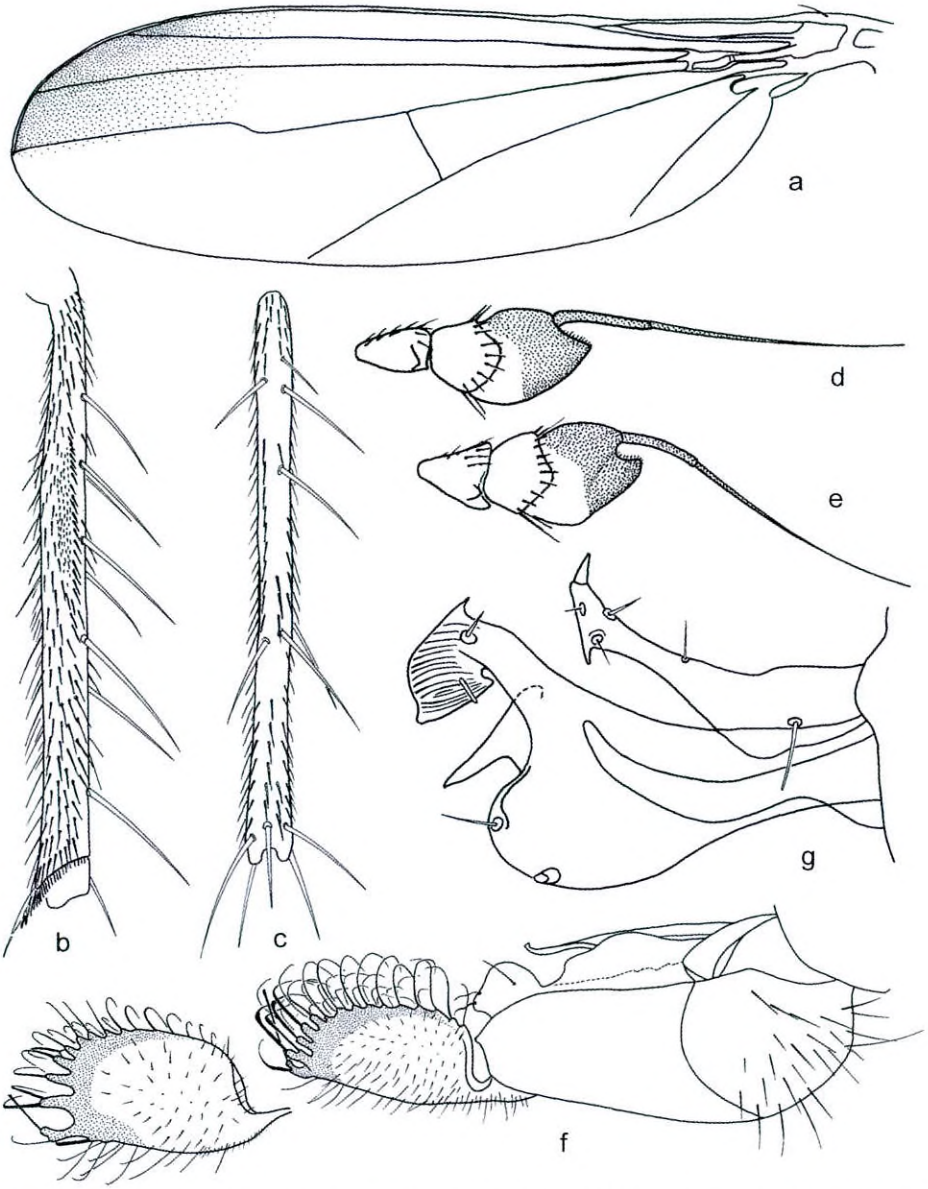

Fig. 1. ***Dolichopus calinotus*****: a, male wing; b, male hind tibia, anterior face showing tibial organ; c, female mid tibia, dorsal face; d, male antenna, inside face; e, female antenna, inner face; f, hypopgygium and cercus (left lateral view); g, ventral and dorsal surstylar lobes and postgonite.**

Males

45 Face yellow or brownish 45a
\- Face glistening white 46

45a Hind tibia black on the apical fourth to third, somewhat dilated at apex; antenna almost entirely black, postpedicel nearly twice as long as deep; wing tip without darker apical mark. .... *notatus* Staeger
\- Hind tibia slender, not swollen distally, entirely pale; antenna largely yellow, black only on dorsal and apical area of postpedicel, latter scarcely longer than deep; wing tip with dark apical mark. .... *calinotus* Loew
46 as in d'Assis-Fonseca

Females

44 2nd antennal segment at least partly, and 3rd segment entirely, black 45
\- 2nd antennal segment entirely, or almost entirely, and 3rd segment partly, yellow. 45a
45a Anal lobe of wing narrow so that the anal angle is much greater than a right-angle (similar to Fig. 1a for males); mid tibia with three long anterodorsal setae (ignoring a small basal one); mid metatarsus and about half of second segment pale; small species, wing length less than 4.5mm .... *calinotus* Loew
\- Anal lobe broad so the anal angle is acute, much less than a right angle (see d'Assis-Fonseca, Fig. 78 for the similar wing of *D. atripes* Meigen); mid tibia with four long anterodorsal setae (ignoring the small basal one); mid metatarsus pale in basal third at most, second segment entirely dark; larger species, wing length about 5mm or more 46
46 as in d'Assis-Fonseca .... *plumipes* (Scopoli) and *wahlbergi* Zetterstedt

Dolichopus calinotus is a small species noteworthy for its golden face and apical wing mark in the male. The wing is darkened in the apical quarter in front of vein M (Fig. 1a), although in one of the Kentish specimens the mark is faint. Although the keys mentioned above state that there is no costal stigma, there is a weak one that is clear but only when viewed from below. The male's hind tibia has a tibial organ on the posterior (inner) face in the proximal third, consisting of an elongate patch of tiny black points bounded on its outer edge by a line of short stout setae that are clearly thicker and longer than the normal setulae on the rest of the tibia (Fig. 1b). In both sexes the antennae are short and bright yellow on the scape, pedicel and basal half of the postpedicel, which has a strongly contrasting black apex (Fig. 1d, e). The cercus is ovoid, white with a black margin, and with apical teeth bearing long curled bristles, which are also dense on the inner face (Fig. 1f).

The male resembles *D. sabinus* Haliday in having a dark-marked wing but that species has an obvious costal stigma and a small oval tibial organ of pale yellow pile in the basal quarter of the hind tibia, with all the black setae on the rest of the posterior face similar in size. Having mainly yellow antennae, it could be taken for one of the *D. plumipes* species group *sensu* Meuffels and Grootaert (1989), but *D. calinotus* is the only species with mainly yellow antennae among the species with a long posteroventral apical seta on the front tibia (used as a character in couplet 39 of d'Assis-Fonseca 1978). The internal appendages of the genitalia do not seem to have been illustrated before, although the dorsal surstylar lobe in Pârvu's (1995) illustration has a similar outline to that shown in Fig. 1g. Females, with their mainly yellow antennae, run unsatisfactorily to *D. plumipes* or *D. wahlbergi* in the keys by Parent and Stackelberg. Female *D. calinotus* can be separated from *D. plumipes* and *D. wahlbergi* by the arrangement of the setae on the dorsal face of the mid tibia; in *D. calinotus* these have the arrangement 'pair, single, pair' from the top quarter outward (ignoring the small anterodorsal close to the base), whereas representatives of the *D. plumipes* species group have a basal pair followed by three longer anterodorsal setae, none of which forms a close pair with the posterodorsal in the middle of the shaft, as illustrated, for instance, for *D. simplex* Meigen in Drake (2015).

Habitat and species associations

Other dolichopodids recorded at Pegwell Bay included a suite typical of British saltmarshes. At the middle saltmarsh zone with *Limonium*, *Aster* and *Atriplex portulacoides*, *Machaerium maritimae* Haliday was abundant, *Hydrophorus oceanus* (Macquart) was frequent on the pools, and also present were *Dolichopus clavipes* Haliday, *D. strigipes* Verrall, *Rhaphium consobrinum* Zetterstedt, *Sciapus laetus* (Meigen), *Syntormon pallipes* (Fabricius), *Thinophilus flavipalpis* (Zetterstedt) and some common freshwater species. Within the upper saltmarsh stand of *Bolboschoenus* with *Phragmites*, *D. strigipes* was the dominant species, together with several of the species just mentioned and *D. diadema* Haliday, *Argyra vestita* (Wiedemann) and a few freshwater species. Within the reedbed with freshwater seepages were only a few saltmarsh species, although *Poecilobothrus principalis* (Loew) was an addition to those above, and the assemblage was more typical of fen, reedbeds and swamp, including abundant *Teuchophorus spinigerellus* (Zetterstedt), frequent *Hercostomus plagiatus* (Loew) and small numbers of other fen species such as *Gymnopternus assimilis* (Staeger), *Ethiromyia chalybea* (Wiedemann) and *Poecilobothrus chrysozygos* (Wiedemann). These distinctly different assemblages of upper saltmarsh and fen or reedbed do not help identify to which *D. calinotus* belongs as it was found in both. In view of its presence in the more stringent conditions of the open saltmarsh where relatively few freshwater species were found, it seemed possible that, at least in England, it is associated with this habitat. There is little information in the literature to suggest what its preferred habitat might be. A recent record from Crimea was close to the coast but the photograph of the site suggests that the capture was somewhat inland in grassland with sparse woodland (Grichanov *et al.* 2015), as may reflect its habitat in Turkey where it was recently recorded "in humid grassland near clean slack with willow on the banks" but at altitudes over 850m (Tonguç and Barlas 2011). Pârvu's (1995) locality in Romania was "marshes on calcareous substratum" in the Danube floodplain at a considerable distance from the Black Sea. The single Finnish site is coastal shoreline (Kahanpää and Grichanov 2006).

More quantitative information was obtained in the Netherlands, and Belgium in particular. In Flanders (northern Belgium) a single male was first collected in 1988 in De Kuifeend Nature Reserve, Antwerpen, a marshland within the harbour of Antwerpen. It was not included in Pollet (2000), who examined the samples only later, and is the first formal record for Belgium. More recently, the species was discovered in two brackish marsh sites in the province of Antwerpen: in Putten Weiden Nature Reserve in 2012 and in Schor Ouden Doel Nature Reserve. In the latter site, the species appeared numerous (over 200 specimens) in Malaise trap samples. In the Netherlands, apart from one male specimen collected in Amsterdam in 1914 (Meuffels 1978), all recent observations (2010: 4 males, 2 females, leg. Wouter van Steenis) originate from Saeftinghe in the province of Zeeland, a site adjacent to an extensive saltmarsh called the Verdronken Land van Saeftinghe. All Belgian and the recent Dutch observations were made at the mouth of the tidal river Schelde within a 20 km radius. As in Britain, in these countries the species seems to prefer halophilous habitats.

Status

Dolichopus calinotus is an unlikely addition to the British fauna. It occurs in countries from Ukraine and Turkey to the Netherlands and in Spain (Pollet 2011) but appears to be scarce everywhere in its range, although it can be abundant where it occurs (see above). Published accounts of its occurrence in several countries indicate very low numbers of records: it is stated to be rare in Russia and found for the first time in Crimea in 2012 (Grichanov *et al.* 2015); there is only one Finnish specimen collected in 2003 (Kahanpää and Grichanov 2006), one specimen in important Danish museum collections (Pollet and Petersen 2001), and it is recorded from just one German state, Sachsen-Anhalt (Meyer and Stark 2015); it has been recorded only twice in Romania (Pârvu 1995, 2001) and at three nearby sites in Turkey in 2009-2010 (Tonguç and Barlas 2011). In Belgium, it has a relative current rarity of 1.1% (3/269 UTM 5km squares with the species), which makes it a very rare species (Pollet, unpubl. data). Its status in the Netherlands could not yet be estimated accurately, but as it has been recorded from only two localities out of over 1,000 Dutch localities with dolichopodid records, it is very likely that it is very rare here too.

It remains very hard to know whether *D. calinotus* is a recent immigrant or has existed in Britain at an undetectably low population level. The latter is more probable as the species is rarely reported elsewhere in Europe, and the southern English coast is climatically benign so favours rare species at the northern edge of their range in Europe.

British material examined

Kent, Pegwell Bay V.C. 15, TR348639, 2♂; TR347639, 1♂, 1♀; TR346638, 2♀; all 4 July 2016, leg. C.M. Drake. A male and female are deposited at the Natural History Museum, London; the remaining four specimens are in the author's collection.

Acknowledgements

We thank Duncan Sivell for establishing that there were no specimens of *D. calinotus* in the NHM, London. Thanks are also due to Luc De Bruyn and Frank van de Meutter (INBO, Brussels, Belgium) who provided MP with the Belgian samples, and Wouter van Steenis (The Netherlands) who put Dutch samples at MP's disposal.

References

d'Assis-Fonseca, E.C.M. 1978. Diptera Orthorrhapha Brachycera Dolichopodidae. *Handbooks for the Identification of British Insects* **9**(5). Royal Entomological Society, London.

Becker, T. 1917. Dipterologische Studien, Dolichopodidae, Nova Acta. Part 1 *Abhandlungen der Kaiserlich Leopoldinisch-Carolinischen Deutschen Akademie der Naturforscher* **52,** 113-361.

Drake, C.M. 2015. *Dolichopus 'pectinitarsis'* Stenhammar, a parasitised form of *D. plumipes* (Scopoli) (Diptera, Dolichopodidae), found in Britain. *Dipterists Digest* (*Second Series*) **22,** 173-178.

Gibbs, D. 2006. *Dolichopus excisus* Loew, 1859 (Diptera, Dolichopodidae) new to Britain discovered in southern England. *Dipterists Digest* (*Second Series*) **13,** 5-10.

Grichanov, I.Ya. 2006. A checklist and keys to North European genera and species of Dolichopodidae (Diptera). VIZR RAAS, 2006, 1-120. *Plant Protection News Supplement.* St Petersburg.

Grichanov, I.Ya., Kustov, S.Yu. and Gladun, V.V. 2015. New records of Dolichopodidae from Crimea (Diptera, Empidoidea). *Cesa News* **112,** 9-14.

Kahanpää, J. and Grichanov, I.Ya. 2006. Dolichopodidae (Diptera) new for the fauna of Finland. *Entomologica Fennica* **17,** 73-78.

Meuffels, H.J.G. 1978. Nieuwe gegevens over Nederlandse Dolichopodidae (Dipt.). *Entomologische Berichten, Amsterdam* **38,** 65-70.

Meuffels, H.J.G. and Grootaert, P. 1989. The relatives of *Dolichopus plumipes* (Scopoli, 1763), with the description of a new species from Belgium (Diptera Dolichopodidae). *Bulletin et Annales de la Société royale belge d'Entomologie* **125**, 83-98.

Meyer, H. and Stark, A. 2015. Verzeichnis und Bibliografie der Tanzfliegenverwandten Deutschlands (Diptera: Empidoidea: Atelestidae, Brachystomatidae, Dolichopodidae s.l., Empididae, Hybotidae, '*Iteaphila*-Gruppe', Oreogetonidae). *Studia dipterologica Suppl.* **19,** 1-376.

Parent, O. 1938. Diptères Dolichopodidae. *Faune de France* **35**. Lechevalier, Paris.

Pârvu, C. 1995. New data on the distribution, systematics and phenology of the flies with long legs (Diptera: Dolichopodidae) from Romania (IX). *Travaux du Muséum d'Histoire Naturelle "Grigore Antipa"* **35,** 387-406.

Pârvu, C. 2001. Dolichopodidae (Diptera) from Romania (XIX). Additional data from the Maramures Depression, Romania. *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"* **43,** 249-262.

Pollet, M. 2000. A documented Red List of the dolichopodid flies (Diptera: Dolichopodidae) of Flanders [in Dutch with English summary]. *Communications of the Institute of Nature Conservation* **8,** 1-190. Brussels.

Pollet, M. 2011. Fauna Europaea: Dolichopodidae. **In** Pape, T. and Beuk, P. (Eds) Fauna Europaea: Diptera, Brachycera. *Fauna Europaea version 2.4*, http://www.faunaeur.org.

Pollet, M. and Petersen, F.T. 2001. Dolichopodidae. **In** Petersen, F.T and Meier, R. (Eds). A preliminary list of the Diptera of Denmark. *Steenstrupia* **26,** 200-201.

Stackelberg, A. 1930. 29. Dolichopodidae. **In** Lindner, E. *Die Fliegen der Palaearktischen Region* **51,** 1-64.

Tonguç, A. and Barlas, M. 2011. First record of Xanthochlorinae and new records of Dolichopodinae in the Turkish Dolichopodidae (Diptera) fauna. *Journal of Entomological Research Society* **13,** 117-121.

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