

Dipterists Digest



2017 Vol. 24 No. 2

Cover illustration: a female of *Agathomyia collini* Verrall (Platypezidae) (photo: Thomas Legrand; found on 25 September 2015, on low vegetation in a garden, at Oxelaere, Nord, in northern France, a small village located near some small woods).

Another photograph by Thomas Legrand of the same insect illustrates an account of this species in *Flat-footed Fly Recording Scheme Newsletter 2*, to appear in the Spring 2018 Dipterists Forum Bulletin. That note concerns the most recent British record of *A. collini*, a female found by David Notton on 15 July 2012 in his garden at Lewisham (TQ376762) in South London and deposited in the collection of the Natural History Museum, London.

Previous records of this rare species from gardens and orchards have suggested that its host may be a fungus growing on fruit trees. The host of *A. collini* remains unknown but all known hosts of *Agathomyia* species are polypore fungi (now known for eight of the eleven British species of the genus), and most species are specific to particular fungus hosts.

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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;
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- 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 CD in Word or compatible formats.**

Articles should be in A5 format with text in 9-point and Times New Roman font, title 12 point and author's name 10.5 point, with 1.27cm (narrow) side margins. Figures should be drawn in clear black ink, about 1.5 times their printed size and lettered clearly. Colour photographs will also be welcomed. Figures and photographs should be supplied separately as hard copy or as jpegs at 300dpi.

Style and format should follow articles published in recent issues. 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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The British species of *Lamprochromus* Mik (Diptera, Dolichopodidae) including *L. kowarzi* Negrobov & Chalaja new to Britain

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Summary

The British fauna of *Lamprochromus* includes three species: *L. bifasciatus* (Macquart) which is a widespread species of freshwater sites, *L. semiflavus* Strobl (= *L. strobli* Parent) which is very rare and found at freshwater marshes, and *L. kowarzi* Negrobov & Chalaja, 1988 which is new to the fauna but has been found at brackish coastal sites from East Anglia to South Wales. Illustrations and a key to both sexes are given, and more details of the distinctions between females of *L. bifasciatus* and *L. semiflavus* should overcome problems in identifying them.

Introduction

A series of unexpected consequences led to the discovery of a third species of *Lamprochromus* Mik in Britain. Following Rob Wolton's re-discovery of the dolichopodid *Rhaphium pectinatum* (Loew) (Wolton and Drake 2015), together we visited estuarine reedbeds near the *Rhaphium* site on the River Exe in Devon in the hope of finding more specimens and establishing its required habitat. A narrow muddy gully between dense reeds seemed a promising site to examine. Among large numbers of small dolichopodids was *Lamprochromus semiflavus* (Strobl) (= *L. strobli* Parent), but no *R. pectinatum*. A return visit a few days later showed the *L. semiflavus* population to be large. The abundance of both sexes provided the opportunity to establish the difference between females of *L. semiflavus* and *L. bifasciatus* (Macquart) (= *L. elegans* (Meigen)), as the standard British work (d'Assis-Fonseca 1978) uses the same couplets to separate both males and females, and this has caused confusion for British recorders (Hodge 1992, Perry 2016). In the process of examining specimens in my collection, I found six females and a male from three British sites, which I had either misidentified as *L. bifasciatus* or left as problematic. They had characters in common with *L. speciosus* (Loew) and *L. kowarzi* Negrobov & Chalaja but failed to run satisfactorily to any species in the keys by Parent (1938) and Negrobov and Chalaja (1988). I had prepared a draft paper describing the species as new when the coincidental review of Palaearctic *Lamprochromus* by Grichanov and Ahmadi (2017) caused me to re-evaluate this decision. On reflection, it is most likely that the species is *L. kowarzi*, and this paper gives more details to distinguish it since the original description does not agree with several characters.

Lamprochromus are tiny dolichopodids about 1.5-2mm long and characterised by two pairs of matt black, copper-edged spots on the side and front corner of the mesonotum. Males of British species have yellow second and third tergites so they are quickly noted as different from most small dolichopodids.

Parent (1927, 1938) provided keys to the five species he knew from Europe. Negrobov and Chalaja (1988) revised the Palaearctic species and described three new species from Europe. They provided a key to the nine known species which included *L. amabilis* Parent, known only from a single female from China, and thus they muddled males and females in a single key. Grichanov and Ahmadi (2017) described another species and provided a revised key to the nine species known as males and to seven species known as females.

A recent name change needs to be explained here before readers become confused, since the names *L. elegans* and *L. strobli* used by d'Assis-Fonseca (1978) are now both regarded as junior synonyms. Grichanov and Ahmadi (2017) revived the name *L. semiflavus* (Strobl, 1880) for Parent's *L. strobli* which they considered an unnecessary new name. They appear to be correct in this decision since Parent (1925) gave his species, which he had previously described as "Species A" (Parent 1924), a new name only because he could not be entirely sure that Strobl's species was identical to his, the male type being lost and only female cotypes being available to him. However, during more than a century since Strobl described his *semiflavus*, only two other species resembling it have been described – *L. moraviensis* and *L. buchtojarovi*, both by Negrobov and Chalaja (1988) and both known only from the few specimens used in the descriptions. Their genitalia illustrated by Negrobov and Chalaja appear almost identical to that of *semiflavus*, raising the possibility that these are all the same species. The likelihood that either Strobl or Parent had one of these two scarce species seems slender, so Parent's own clear exposition that his *strobli* was the same as Strobl's *semiflavus* should be accepted, as proposed by Grichanov and Ahmadi (2017). An argument for retaining *strobli* on the grounds of stability may be difficult to sustain for an uncommon or at least little-reported species.

These new discoveries allowed a reliable key for both sexes, and this may stimulate more records of these attractive little flies. Information on habitat and localities was obtained mainly from my own and published records, and for *L. semiflavus* additionally from the Empidid and Dolichopodid Recording Scheme.

***Lamprochromus kowarzi* in Britain**

I had much trouble persuading myself that my specimens were *L. kowarzi*, but eventually decided that they are this species since both sexes run to *kowarzi* in the new key by Grichanov and Ahmadi (2017), which also clarifies some apparent errors in the original description by Negrobov and Chalaja (1988). The description was based on a single male collected in Lučenec, Slovakia, in 1866, so may not have been in perfect condition. Here I emphasise the differences in the event that the British specimens are indeed a new species:

- frons is brilliant purple (green in the description);
- postpedicel is black, pedicel varying from entirely black to obscurely paler below, and scape usually dark yellow on the lower half; the colouring is no more obvious in specimens in alcohol which usually show colour more clearly than in dry specimens (postpedicel yellow in the key but not mentioned in the description; the key by Grichanov and Ahmadi states 'at least scape and pedicel yellow');
- katepisternum, meron and metepimeron are conspicuously yellow, having the same shade as the yellow legs (Fig. 4) ('brown with a green tint' in description (бурые с зеленым оттенком); Grichanov and Ahmadi amend this to yellow-brown in their key to females);
- front tibia with only 1 or 2 weak dorsal setae at the basal quarter (Fig. 1b) (2 strong and several small dorsal bristles in the description);
- mid tibia with 2 strong anterodorsal setae twice the shaft's width at one third and two thirds along the shaft, and two shorter posterodorsals, at about one quarter and half way along the shaft (Fig. 1c) (one dorsal seta in description, and used as a defining character in the key);

- legs mainly yellow but the hind tibia of the male is sometimes clearly darker, becoming brown in the distal quarter, although in other specimens it remains yellow to the tip along with the metatarsus, and the hind femur sometimes has a dark smudge dorsally in the distal quarter (legs yellow in the description);
- small differences in the ratio of veins (Fig. 1a) (ratios are given in detail in the description).

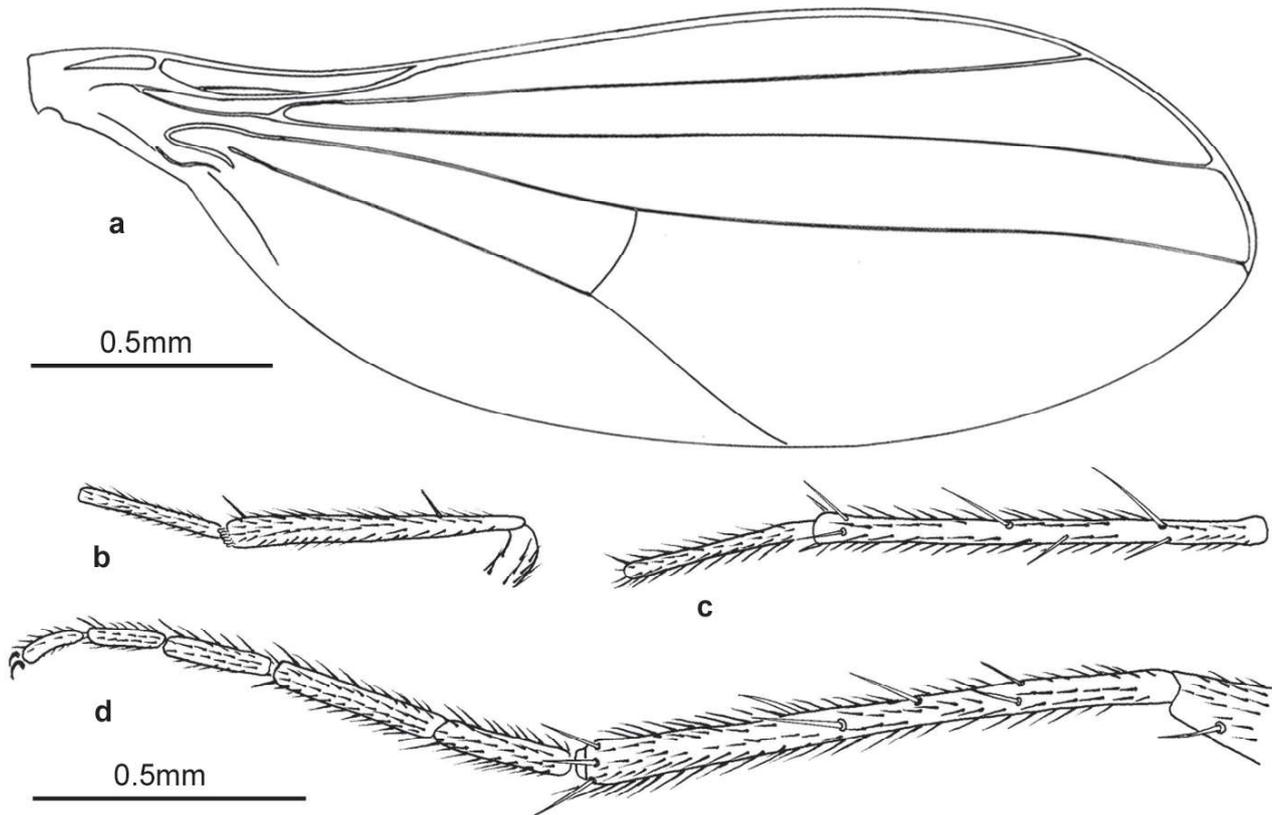


Fig. 1. *Lamprochromus kowarzi*: a, female wing b-d, male tibiae: b, front, anterior face; c, mid, dorsal face; d, hind, anterior face.

Another species similar to the British *kowarzi* is *L. speciosus* (Loew) which differs in having a slightly flattened and expanded brown hind tibia, illustrated by Parent (1938) and Weber (1989); the British *kowarzi* have cylindrical unmodified hind tibiae (Fig. 1d). Its hypopygium, which is illustrated by Negrobov and Chalaja (1988), is somewhat similar to that of *kowarzi*, and the mesonotal pattern, described in detail by Parent (1924), resembles that of the British specimens, but the conspicuously yellow lower pleura are not mentioned in any description, thus ruling out this possible misidentification.

Lamprochromus kowarzi is included in the key presented later, but a summary of the key characters is given here. It is conspicuous among its Palaearctic congeners in having a yellow lower half to its thorax, large shiny yellow patches on the second and third tergites in both sexes, and a partly or entirely pale basal antennal segment. The mesonotum has a vivid pattern of brilliant purple on the midline between the dorsocentral bristles flanked outside the dc row by a

sub-shining metallic green and purple-tinged line, and on the occiput is a pair of conspicuous white dust spots. The strong apical setae on the front coxae are black.

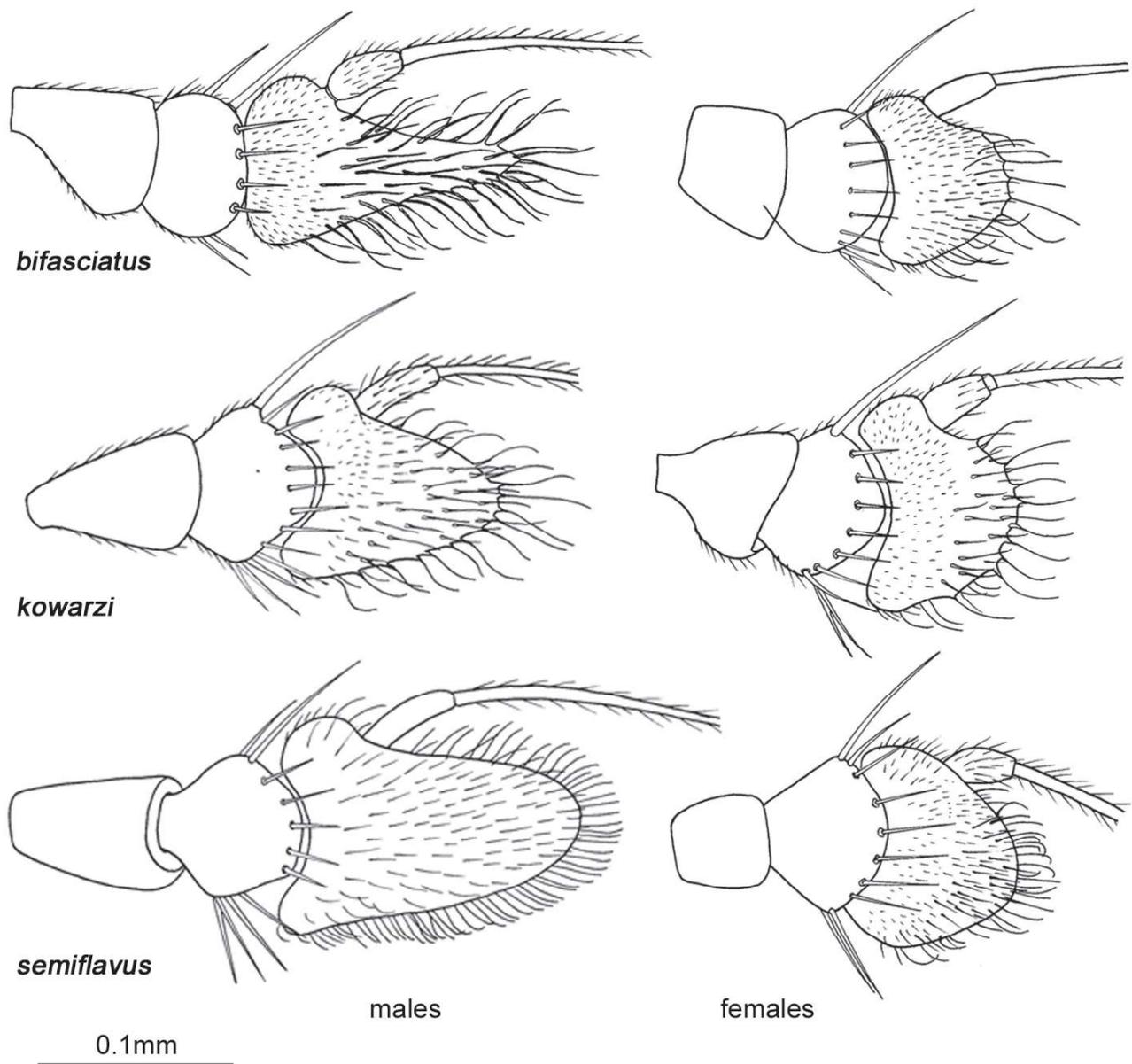


Fig. 2. Antennae of *Lamprochromus bifasciatus*, *L. kowarzi* and *L. semiflavus*, males on the left, females on the right.

Material examined

England: 1♀, Devon: Colyford Common, SY253918, 2 August 2010, C.M. Drake, small pools on sheltered estuarine brackish marsh; 1♀, same site, 26 July 2014, brackish ditch dominated by *Bolboschoenus maritimus*; 5♂ and 9♀, same site at three points SY253921, SY253922, SY252919, 23 June 2017, shallow grassy ditch dominated by *B. maritimus* and *Agrostis*, channel edged by *Phragmites australis* and grasses, lumpy trampled marsh with water between tussocks with diverse brackish flora. 1♂, Budleigh Salterton, Otter Estuary SY075829, 1 July 2017, C.M. Drake, reedbed by tidal river. 1♂, 2♀, Dorset: Studland, SZ023847, 12 July 1999, C.M. Drake, estuarine saltmarsh with short *Spartina* and *Limonium*, and freshwater seepage from adjacent

heath with bare peat, *Scirpus tabernaemontani*, and marsh with *Juncus effusus* and *Molinia caerulea*. 1♀, Hampshire: Tom Tiddler's Ground, SU476017, 24 June 2016, M. Harvey, *Phragmites* swamp with *Puccinellia* – *Spergularia* saltmarsh. 1♂, Suffolk: Dingle Marshes, TM480714, 30 June 2015, 1♀, same site, 20 June 2015, I. Perry, swept from short *Juncus gerardii* and *Plantago maritima* around shallow pools in brackish *Phragmites* marsh. 1♀, Suffolk: Butley Decoy, TM389519, 11 July 1908, G.H. Verrall, brackish marsh at head of Butley River estuary. This specimen in the Verrall-Collin collection at Oxford University Museum standing under 'elegans' had been separated out by the late C.E. Dyte who recognised that it was not *bifasciatus*, as noted in his records which I have in my possession. Wales: 2♀, Dyfed: Nicholaston Burrows, SS515878, 7 July 2009, C.M. Drake, wet depressions with *Juncus* at the edge of dune grassland close to shore, probably inundated at high tides.

Other records examined by the specimens' collectors: England: 2♀, Dorset: Poole Harbour, Coombe Heath, SY9787, 8 July 2005, D.J. Gibbs (the same site as Drake's Studland record); 1♀, Poole Harbour, Brand's Bay, SZ0284, 8 July 2005, D.J. Gibbs; further specimens from Dingle Marshes - 1♀, 1 July 2014; 4♂, 30 June 2016; 2♂ and 4♀, 6 July 2016, I. Perry.

Specimens of *L. kowarzi* and *L. semiflavus* have been deposited in the Natural History Museum, London (NHM).

Key to British species of *Lamprochromus*

I provide a key for our impoverished British fauna that makes use of unambiguous characters, and in the females avoids complete reliance on the shape, colour and pubescence of the antennae which may be difficult to see in such small species, especially when the face contorts so that the basal segments are obscured. Obviously, this key is of no use when the whole Palaearctic fauna is considered until all species are evaluated against the characters used here. The male genitalia of British specimens of the three species are shown in case further species come to light. Characters that appear consistent for the genitalia are the shape of the cerci in lateral view, particularly the truncate tip of *L. bifasciatus* and tapered tip of *L. kowarzi*, and the presence and shape of a 'spine' on the aedeagus which can be seen to be a pair of curled appendages when viewed ventrally (Fig. 3). The genitalia of *L. bifasciatus* were illustrated by Buchman (1961), Pârvu (1984) and Negrobov and Chalaja (1988), and in their figures the aedeagus, if not the cerci of Pârvu, resembles that shown in Fig. 3.

Males

1. Lower half of pleura (katepisternum, meron, metepimeron) mainly yellow; yellow bands on tergites 2 and 3 broadly interrupted by black on midline and narrowly on anterior margins; hind tibia often dark yellow, sometimes becoming black at tip and on metatarsus; front coxa with apical setae black ***kowarzi* Negrobov & Chalaja**
- Lower half of pleura entirely green with pale grey dusting; tergites 2 and 3 entirely yellow; hind tibia and metatarsus yellow; front coxa with apical setae pale 2

2. Postpedicel elongate triangular with acute tip, its pubescence sparse and straggly, longer than length of basal arista segment; mesonotum as in female ***bifasciatus* (Macquart)**
- Postpedicel not markedly triangular, always broadly rounded at tip, its pubescence dense, even and shorter than basal arista segment; mesonotum as in female ... ***semiflavus* Strobl**

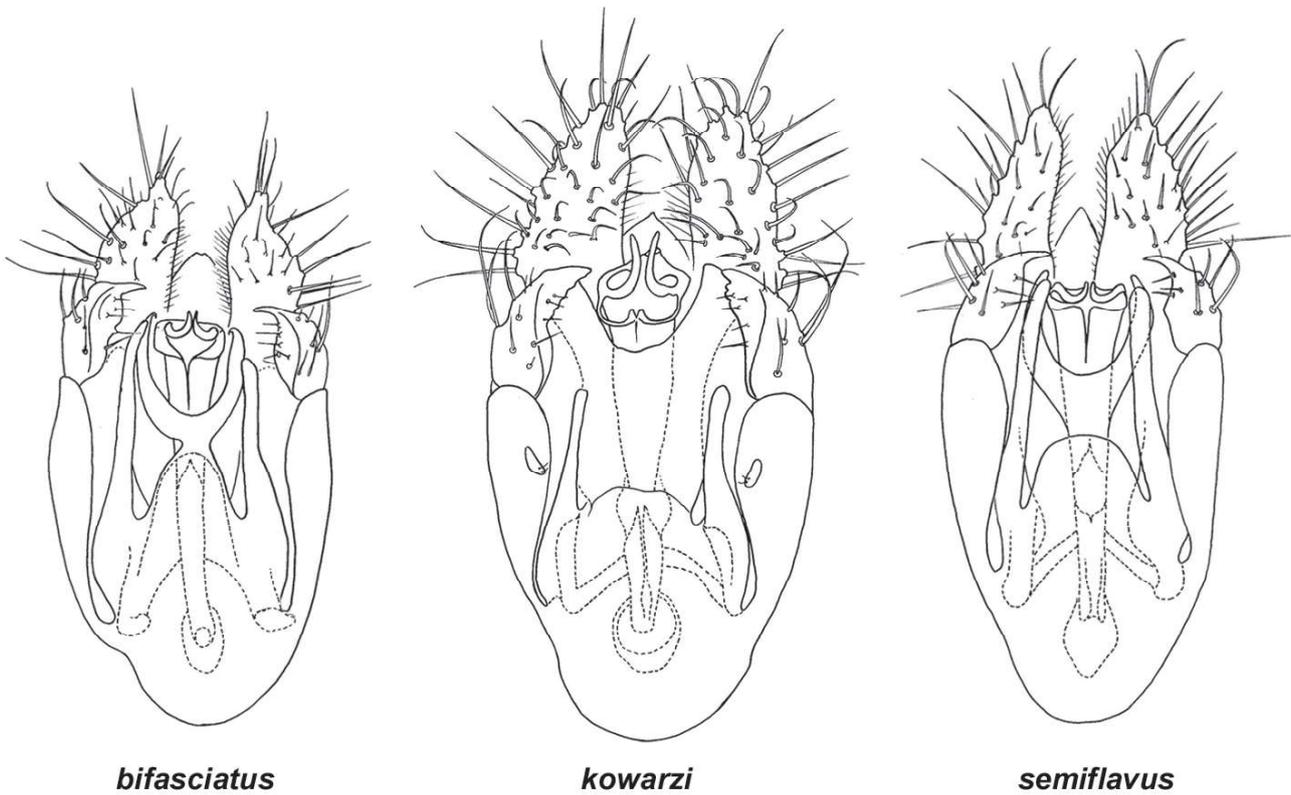
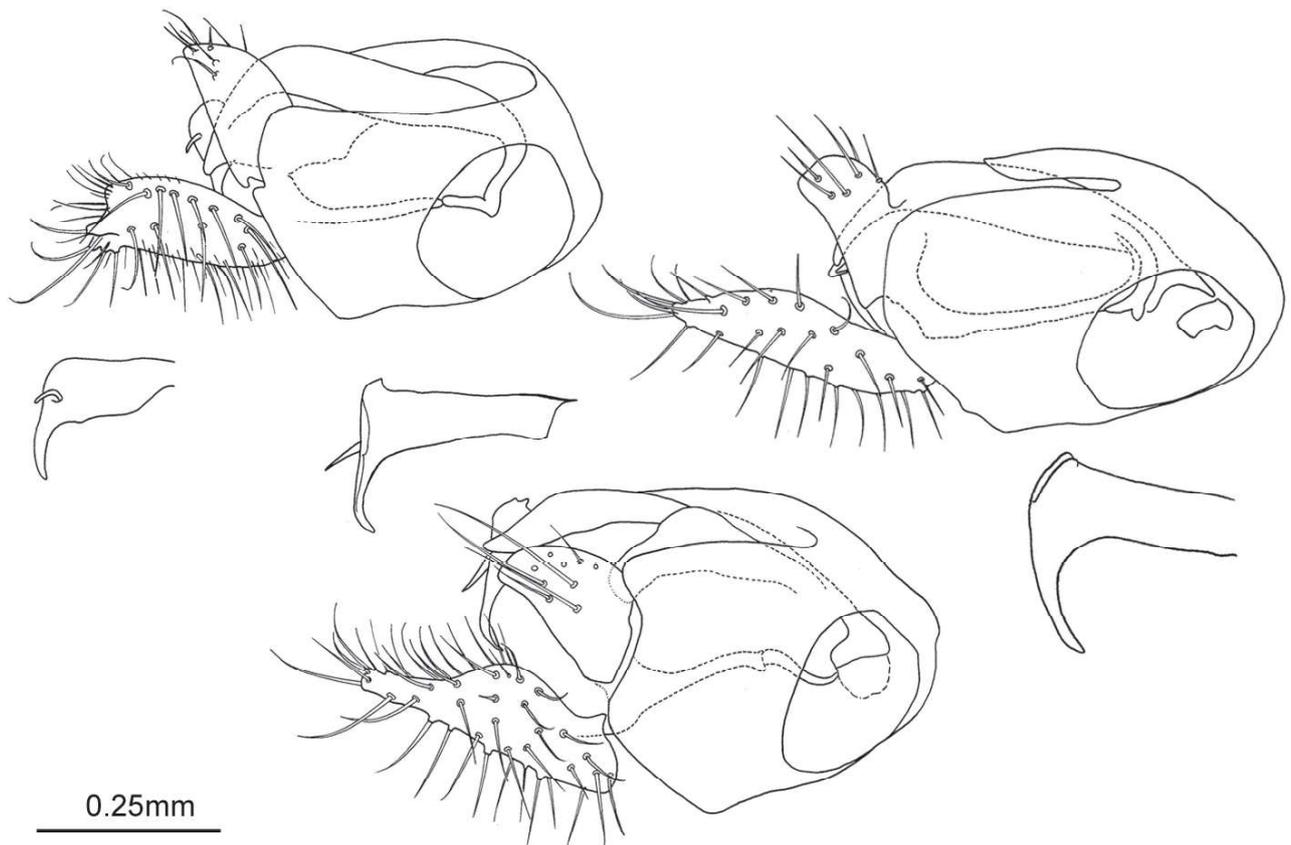


Fig. 3. Male hypopygium of *Lamprochromus bifasciatus*, *L. kowarzi* and *L. semiflavus* in lateral and morphologically ventral views, and aedeagus tip.

Females

1. Lower half of pleura (katepisternum, meron, metepimeron) mainly yellow; tergites 2 and 3 mainly yellow; front coxa with apical setae black *kowarzi*
- Pleura and tergites entirely green; front coxa with apical setae pale 2

2. Occiput in posterodorsal view more or less uniformly thinly dusted and dark; pubescence of third antennal segment as long as length of basal segment of arista, longest hairs almost twice basal arista diameter; meron usually with a narrow triangular yellow streak from base along anterior suture; mesonotum in dorsal view with distinct more shining purple mid-stripe; no clearly distinct dark narrow stripe along row of anterior ac setae, any darker patch here merging with antero-lateral dark patches; front tarsus almost entirely yellow, last segment sometimes darker *bifasciatus*
- Occiput in posterodorsal view with two oval pale grey dust spots above neck; pubescence of third antennal segment shorter than length of basal segment of arista, about equal to its diameter; meron rarely with a yellow anterior margin along suture; mesonotum in dorsal view almost uniformly subshining grey-green, no differentiated mid-stripe filling space between dc rows; a distinct narrow dark mid-stripe along ac rows from front of mesonotum to about 2nd dc seta; front tarsus often with last 2-3 segments dark, but may be all pale ...
..... *semiflavus*

Separation of female *L. bifasciatus* and *L. semiflavus*

The characters used in the key are based mainly on a single population of *L. semiflavus*, albeit a large one from which many specimens were examined, although it may not include the range of variation expected in disjunct populations spread over a wide geographic range. Characters are listed in order of decreasing reliability, with later characters being less consistent but still found in a large proportion of specimens. It is clear, however, that previous keys relying on the shape of the antenna are unreliable since the differences are trivial. Pubescence length and density are more useful but difficult to see clearly under a binocular microscope. The meron colour and mesonotal pattern of dusting and colour appear to be moderately constant, although both species can have a more obviously sub-shining purple midline (usually indistinct in *semiflavus*), but the fine central dark line does appear to be more consistently visible in *semiflavus* than in *bifasciatus*. The most useful character, then, is the presence in *semiflavus* of white dust spots on the occiput. These spots are present in all *semiflavus* from Devon (over 20 specimens examined) and absent in over 30 specimens of *bifasciatus* in my collection from ten localities from Devon to Yorkshire and also in those in the NHM and the Oxford University Museum of Natural History (OUM). The mesonotal pattern and occipital dust spots of *kowarzi* are more prominent than in either *bifasciatus* or *semiflavus*.

Size has been used as an adjunct to characters in some keys. This is unreliable. Body length in pinned specimens is highly variable and misleading as the females curl up, so wing length is a better measurement. Following Bickel (1994), wing lengths were measured from the humeral cross-vein to the wing tip, thus avoiding the sometimes-kinked base of the wing, although this length is about 10% shorter than that taken to the base of the wing. The average wing-length of *L. bifasciatus* is marginally shorter than that of *L. semiflavus* but the overlap in measurements of all three species makes it a poor differentiator.



Fig. 4. Female thorax and head of *Lamprochromus bifasciatus*, *L. kowarzi* and *L. semiflavus* in lateral and dorsal views.

	Wing length mm		Body length mm	Number measured
	mean	range	mean	
Males				
<i>bifasciatus</i>	2.0	(1.9 - 2.2)	1.8	15
<i>kowarzi</i>	2.1	(1.9 - 2.2)	2.1	6
<i>semiflavus</i>	2.2	(2.0 - 2.3)	2.2	10
Females				
<i>bifasciatus</i>	2.3	(1.9 - 2.4)	1.9	9
<i>kowarzi</i>	2.3	(2.1 - 2.5)	2.2	15
<i>semiflavus</i>	2.4	(2.2 - 2.6)	2.1	11

Habitat and distribution of British *Lamprochromus*

Lamprochromus kowarzi

I have now seen material from seven sites across the southern part of Britain, from Suffolk to Dyfed (Fig. 6). All sites are coastal marshes, as detailed above in 'Material examined'. These records indicate that the preferred habitat is brackish marsh with water margins of pools, ditches or remnant saltmarsh channels now subsumed within grazed marsh, at the transition of upper saltmarsh to non-saline pasture. Most of the sites are next to estuarine saltmarsh but the fly appears to be on brackish marsh, not true upper saltmarsh. This narrow zone is often eliminated by sea walls, and survives in Britain mainly in sheltered estuaries where a natural transition from saltmarsh to freshwater marsh is not truncated by sea defences. Such an environmental constraint may partly explain the lack of records, but more importantly highlights the threat from rising sea levels to the suite of species adapted to this zone. Another dolichopodid in this assemblage is *Campsicnemus magius* (Loew) (Drake 2015). Sampling at a fine scale at Colyford Common showed that *L. kowarzi* was present at grassy water-margins, but not found at open muddy pools with short-grazed margins or in ditches dominated by *Bolboschoenus maritimus* (sea club-rush) alone, where abundant *Scathophaga stercoraria* (Linnaeus) and *S. litorea* (Fallén) may have reduced the populations of small flies.

Other dolichopodids at Colyford Common, which lies adjacent to estuarine saltmarsh of the River Axe, included those normally associated with brackish marsh or upper saltmarsh, with abundant *Dolichopus nubilus* Meigen and often moderately large numbers of *Argyra vestita* (Wiedemann), *Campsicnemus armatus* (Zetterstedt) and *Dolichopus sabinus* Haliday, and small numbers of the true saltmarsh species *Dolichopus diadema* Haliday, *Rhaphium consobrinum* Zetterstedt and *Thinophilus ruficornis* (Haliday). That this marsh was not particularly saline was indicated by an abundance of *Dolichopus plumipes* (Scopoli) and sometimes *Syntormon pumilus* (Meigen). A single male found at the nearby Otter estuary was in reedbed next to the uppermost tidal reach, where *Teuchophorus spinigerellus* (Zetterstedt), *Hercostomus plagiatus* (Loew) and *S. pumilus* dominated the dolichopodid fauna, and only a few *C. armatus*, and *Dolichopus clavipes* Haliday and more numerous *A. vestita* and *D. nubilus* indicated brackish conditions. At Nicholaston Burrows, species associated with wet coastal habitats were *Dolichopus notatus* Staeger, *D. nubilus* and *Tachytrechus notatus* (Stannius), none of which are reliable indicators of brackish habitat. The Studland upper saltmarsh had *A. vestita*, *C. armatus*, *R. consobrinum* and *T. notatus* as well as the true saltmarsh species *Hydrophorus oceanus* (Macquart), *Machaerium maritimae* Haliday and *T. ruficornis* although these species may not have been present in the exact microhabitat occupied by *L. kowarzi* as collecting at this site probably ranged over a wide area of diverse habitats.

Elsewhere, *L. kowarzi* is known from Azerbaijan, Israel, Russia (Chechnya) and Slovakia (Grichanov and Ahmadi 2017). Several localities are close to the sea but cannot be associated with any particular habitat, whereas other records are well removed from coasts. This apparent difference in habitat affinity may suggest a second species is involved. Its occurrence at widely separated places in southern Britain is remarkable, and cannot be the result of recent immigration as the earliest known record is that of Verrall in 1908.

Lamprochromus semiflavus

There are few records of this rare species (Fig. 6). The population that stimulated this paper was found at Countess Wear, Devon (SX952889 and SX951889) in a reedbed on the muddy bank of the River Exe, on 21 and 25 June 2016, in two tiny creeks about 1m below the land level and about 2m wide at their tops, with a narrow (c. 30cm wide) trickle of apparently freshwater. The larger of the two reached about 80m into the reedbed with the trickle sometimes running below a dense thatch of leaf litter from the reeds, and with the brackish-water alga *Enteromorpha*, *Callitriche* (star-wort) and occasional *Ranunculus scleratus* (celery-leaved crowfoot) in the gully, and *Oenanthe crocata* (hemlock water-dropwort) along the top of the bank. The only dolichopodids that were more numerous than *L. semiflavus* were *Syntormon pumilus* and *Teuchophorus spinigerellus*; the 17 other species recorded here were found in low numbers and no more than ten individuals, after a considerable time of collecting. Uncommon species among them were *Hercostomus plagiatus*, *Rhaphium laticorne* (Fallén) and *Syntormon aulicus* (Meigen), and those associated with saltmarsh or are most abundant in this habitat were *Argyra vestita*, *Campsicnemus armatus*, *Dolichopus nubilus* and *Rhaphium consobrinum*. Species associated with reedbeds or tall-herb fen were *T. spinigerellus* and *H. plagiatus*. One female was found on the same expedition at the nearby Exminster Marshes (SX952886, 21 June 2016) at a well-vegetated freshwater ditch on grazing marsh; this is interpreted as a stray from the reedbed population 300m away. A single female was found together with *L. kowarzi* at Colyford Common, Devon, SY253921, 23 June 2017.

There are only four other undoubted British records of *L. semiflavus*: 2♂, Lewes, East Sussex (Hodge 1992); 2♂, Wendlebury Meads, Oxfordshire, SP564173, 19 May - 27 June 1989, Malaise trap operated by K. Porter, det. R. Crossley, confirmed by D.J. Gibbs; 1♀, Nene Washes RSPB Reserve, Cambridgeshire, TL2899, 30 July 1995, C.M. Drake, originally identified as *L. bifasciatus*; 1♀, Devon: Colyford Common, SY253921, ditch on brackish marsh lined with *Phragmites*, C.M. Drake. A female caught in a Malaise trap at Otmoor range, Oxfordshire (SP572213) in 1989, in the same survey as the Wendlebury Meads trap, is likely to be *semiflavus*. The record published as *semiflavus* from Dingle Marshes, Suffolk (Perry 2015) is *kowarzi*, one of which is photographed here (Fig. 5).

In his Handbook, d'Assis-Fonseca (1978) says 'Reputedly British but no British specimens or authentic British records have been found', but there are two female specimens collected by him before the Handbook was published, now in the Natural History Museum, London and standing under '*strobli*' in the British collection (Somerset: Failand, 22 July 1956; Hampshire: Hatchet Pond, 8 July 1974). Presumably he was uncertain of his own identifications, hence his caution in the Handbook. I have examined these and they appear to be *L. bifasciatus*.

Some information is available on the habitats where these records were made. The Lewes specimens were found in short vegetation under *Salix fragilis* (crack willow) in a small woodland with calcareous springs, and among uncommon dolichopodids from the whole site (not just the *L. semiflavus* location) were *Orthoceratium lacustre* (Scopoli) and *Sciapus longulus* (Fallén). Apart from *O. lacustre*, this assemblage contained no species suggesting brackish conditions, nor would they be expected here, and only *T. spinigerellus* suggested reedbed or fen. No conclusions

about habitat affinity could be drawn from dolichopodid records from this site. The Oxfordshire sites were wet pasture with ditches at Otmoor, and the edge of a ridge-and-furrow field at Wendlebury Meads, whose medieval origin suggests that this site may have been wet grassland continuously for many centuries. The Nene Washes specimen was swept from a well-vegetated freshwater ditch in the washland floodplain of the River Nene.



Fig. 5. *Lamprochromus kowarzi* male.

There appears to be little published on the habitat where *L. semiflavus* has been found outside Britain, despite it having a wide distribution in Europe, Russia and Turkey (Pollet 2011, Grichanov and Ahmadi 2017). Kahanpää and Grichanov (2006) recorded *L. semiflavus* only from reedbeds although their two recent sites are coastal. Vockenhuber *et al.* (2011) recorded a single specimen in a woodland dominated by *Fagus*, *Tilia* and *Fraxinus* (beech, lime and ash, respectively) and the described ground flora suggested that the site was probably moderately dry. In Bulgaria, Kechev *et al.* (2014) found it at three points along the Omurovska River spanning a stretch where a large stream with well vegetated banks becomes a shallow river as it enters the Thracian floodplain; it was one of the more frequently occurring species on this river (Kechev and Ivanova 2015). Marc Pollet (*pers. comm.*) has found it in reedbeds in Belgium.

In contrast to *L. semiflavus* and *L. kowarzi*, *L. bifasciatus* is widespread in England north to North Yorkshire and Lancashire, with sparse Welsh records (Fig. 6). It is associated mainly with seepages, swampy water margins, tall reedbeds and fen scrub or carr, and most sites are shaded.

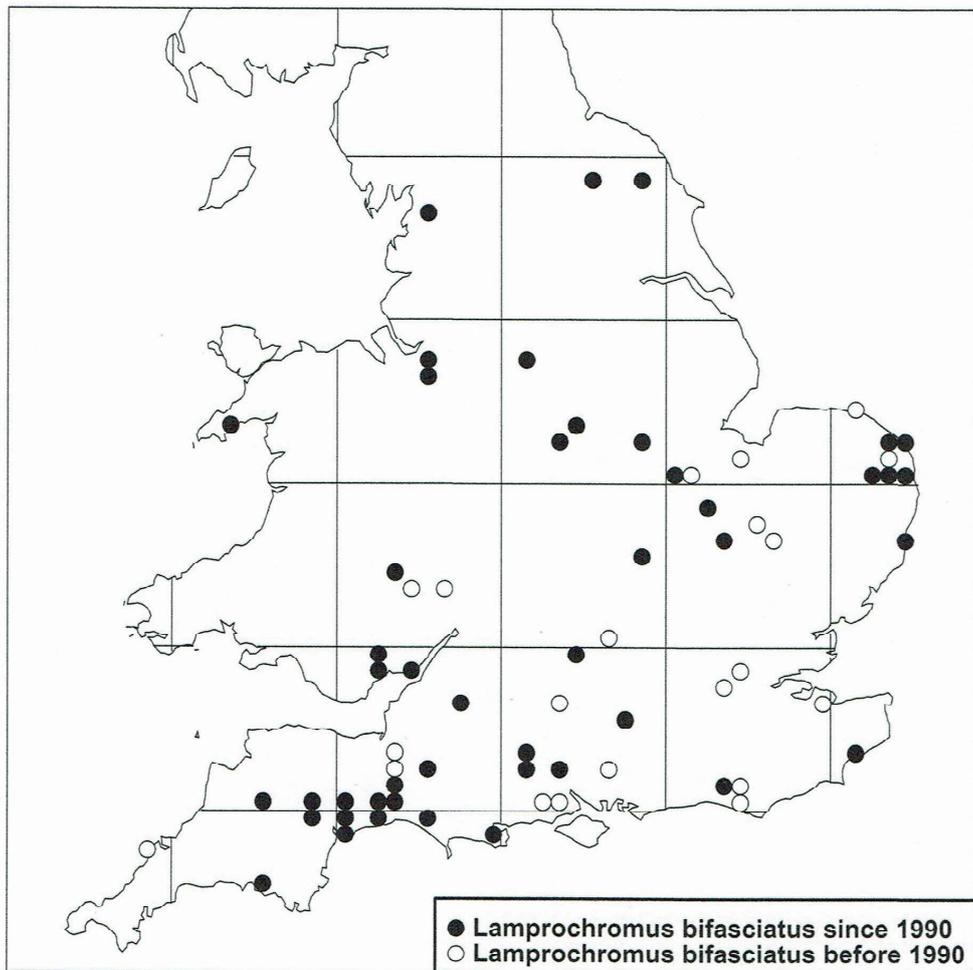
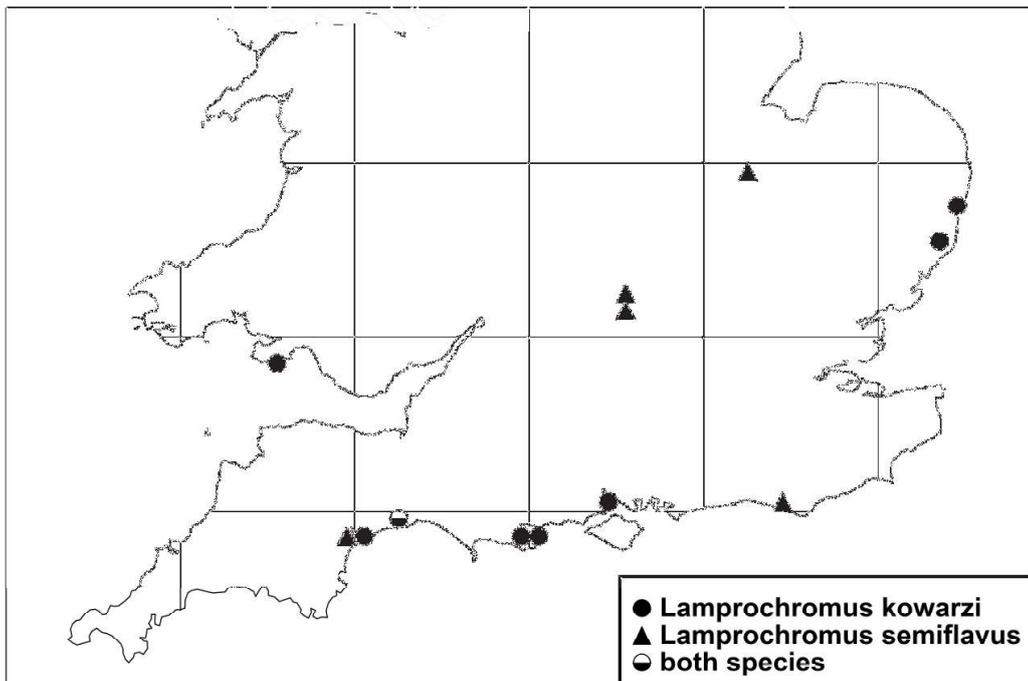


Fig. 6. British distribution of *Lamprochromus bifasciatus*, *L. kowarzi* and *L. semiflavus*. A record of *L. bifasciatus* in north-east Scotland (at NH66) has been omitted to save space. Maps were produced using DMAP.

Acknowledgements

I would like to thank fellow dipterists for essential help: Ivan Perry kindly donated a tidy male specimen of *L. kowarzi*; David Gibbs re-identified his Dorset material which is *L. kowarzi* and the Oxfordshire specimens (genuine *L. semiflavus*); Peter Hodge confirmed the identity of his Sussex *L. semiflavus* specimens; Keith Porter provided additional information on his trapping sites in Oxfordshire; Martin Harvey sent me his Hampshire specimen of *L. kowarzi* which he realised was odd. I am grateful to Rob Wolton for organising the expedition to find *Rhaphium pectinatum*, where this study originated, and to Edric Hopkinson of Devon Wildlife Trust for ferrying us to isolated reedbeds in the Exe estuary. I also thank Andrew Cunningham who took the photographs and arranged the plates, Duncan Sivell (NHM) and Zoe Simmons (OUM) for access to the Diptera collections at these museums, and Ivan Perry, Andrew Godfrey and Igor Grichanov for comments on the draft.

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***Sarcophaga sinuata* Meigen (Diptera, Sarcophagidae) found in**

Scotland – A single male of *Sarcophaga sinuata* Meigen was taken at Cambus Pools (NS8493, V.C. 87) on 27 June 2015. Cambus Pools is a Scottish Wildlife Trust (SWT) reserve consisting of wetland with open water and surrounding *Phragmites* reed-beds. The specimen of *S. sinuata* was swept from an embankment rich in flowering herbs that separated the reed-beds from the River Forth.

The specimen was identified by examining the structure of the male genitalia and comparing it with photographs and drawings provided by R. Richet, R.M. Blackith and T. Pape (2011. *Sarcophaga of France (Diptera: Sarcophagidae)*. Pensoft, Sofia-Moscow). The keys by F.I. van Emden (1954. Diptera Cyclorrhapha. Calyptrata (1) section (a). Tachinidae and Calliphoridae. *Handbooks for the Identification of British Insects* **10**(4a), 1-133) were also utilised. Van Emden (*op. cit.*) gave records from Sussex to Cornwall to Anglesey to Cheshire to Norfolk from marshes and notes the species as scarce. The distribution map provided by the NBN Atlas (available <https://data.nbn.org.uk>, accessed 21 November 2016) shows scattered records across England and Wales northwards to the Solway in Cumbria and the Humber. There were no published records in the Scottish Insects Records Index and no Scottish specimens were located in the Diptera collection, both kept at the National Museums of Scotland at West Granton.

D. Povolný and Y. Verves (1997. The Flesh-Flies of Central Europe (Insecta, Diptera, Sarcophagidae). *Spixiana Supplement* **24**, 1-260) stated that the species is found in hygrophytic plant associations near rivers and swamps or on sea shores. They added that the larvae are parasitoids of grasshoppers, but have also been reared from a noctuid caterpillar, a dead frog and on animal liver; they are also commonly found living in dead young in the nests of coastal birds.

I am grateful to Roy Sexton of SWT for permission to collect insects at Cambus Pools – **DAVID HORSFIELD**, National Museums Collection Centre, 242 West Granton Road, Edinburgh EH5 1JA

Diagnostic definitions and figures of male and female *Tetanocera punctifrons* and *T. latifibula*, new records of *T. punctifrons* in Ireland, and notes on biology (Diptera, Sciomyzidae)

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Summary

New records of *Tetanocera punctifrons* Rondani, 1868 in Ireland are presented. Distinguishing characters from the very similar *T. latifibula* Frey, 1924 are discussed. The female abdomens of both species are described for the first time. The distributions of both species are summarised. The history of type examinations and of taxonomists' conceptions of the two species is tracked, especially the relative reliability of published figures of diagnostic features. We emphasise the need for such analyses of rare and closely related species, even if apparently disjunct in distribution. Habitats of *T. punctifrons* and *T. latifibula* are described, and the biology and morphology of the immature stages are compared.

Introduction

Collection of the Palaearctic *Tetanocera punctifrons* Rondani, 1868 in Ireland has led us to analyse the features of the adults of that species and the closely related Holarctic *T. latifibula* Frey, 1924.

Considering the importance of *Tetanocera* Duméril, 1800 to the study of cladistics and behavioural evolution of Sciomyzidae (snail-killing flies), we believe it is useful to thoroughly document the range extensions and identities of such relatively poorly known and similar species. We also describe the habitats and summarise the biology and morphology of the two species in the hope of expediting further studies.

Tetanocera is one of the best-known genera of Sciomyzidae. Extensive biological information is available on 26 of the 39 species, in most cases complete life cycles (Foote 1961, 1996a, b, 1999, 2008, 2011; Knutson 1963; Knutson *et al.* 1965; Rozkošný 1965, 1967; Trelka and Berg 1977; Trelka and Foote 1970). The morphology of the immature stages has been described for 21 species and, in most cases, all stages (Knutson 1963; Foote 2013; Rozkošný 1965, 1967). Some of the information on biology and immature stages of European species, along with adult taxonomy, has been presented in regional studies by Rivosecchi (1992: Italy), Rozkošný (2002: Central Europe) and Vala (1989: Mediterranean Europe). The larvae range from overt predators of snails in open water to predators of shoreline or otherwise exposed aquatic snails to parasitoid-predators of Succineidae, slugs, or terrestrial snails. *Tetanocera ferruginea* Fallén, 1820, is one of the best-known species in the family, a result of extensive laboratory experimental studies on development, overwintering, competition, food consumption, fecundity,

survival, etc. (reviewed by Knutson and Vala 2011 and Foote 1996a). Recently Chapman *et al.* (2006) used phylogenetic methods, including molecular and larval morphological data, in exploring morphological adaptations of North American *Tetanocera* species to both aquatic and terrestrial habitats, one of the first attempts to do so within a dipteran lineage. In a subsequent publication, Chapman *et al.* (2012) built on those findings by examining feeding behaviour evolution, as feeding behaviours are dependent on both larval morphological adaptations to different environments and specific requirements related to finding and subduing different prey species. *Tetanocera latifibula*, but not *T. punctifrons*, was included in those studies.

Tetanocera is the fourth-largest genus in the family Sciomyzidae [12 Holarctic species, 8 Palearctic species (with *T. chosenica* Steyskal, 1951 ranging from Japan and Korea to Yunnan, Kwangsi, and Fukien, China in the Oriental Region); 18 Nearctic species (with *T. plumosa* Loew, 1847 extending from Alaska to Venezuela); and one strictly Oriental species, *T. nigrostriata* Li, Yang & Gu, 2001 (Yunnan)].

All species of Sciomyzidae occurring in Ireland were included in Rozkošný (1987) and Vala (1989). Stephenson and Knutson (1970) listed 26 species in 13 genera of Sciomyzidae from Ireland. They included seven species of *Tetanocera*, by counties, but without detail, based on their review of only some of the literature, some collections, and records provided by 22 colleagues in the British Isles (*T. ferruginea*, *T. fuscinervis* (Zetterstedt, 1838) [as *T. unicolor* Loew, 1847], *T. phyllophora* Melander, 1920, *T. elata* Fabricius, 1781, *T. hyalipennis* Roser, 1840, *T. punctifrons* and *T. silvatica* Meigen, 1830]. Chandler (1972) provided a much more detailed summary of the distribution of 40 species in 17 genera in Ireland, including six of the species of *Tetanocera* listed by Knutson & Stephenson (1970) but omitting *T. silvatica* and adding *T. freyi* Stackelberg, 1963 and *T. arrogans* Meigen, 1830. In Chandler (1972) a female *T. punctifrons* from Cratloe, County Clare, 1895 (Dublin Museum) served as the first detailed record of the species from Ireland; it was noted that the presence of this species in Ireland needed confirmation. The Holarctic *T. silvatica* was reinstated by Speight and Nash (1977). Speight (2001, 2004) reported collecting 1 male and 1 female of *T. punctifrons* (and 6 other *Tetanocera* species) in County Cork, but without discussion of identifying features. Speight (2007) added *T. montana* Day, 1881 to the Irish fauna with a detailed comparison of the adult to the related *T. arrogans* and including the geographical and habitat distribution of *T. montana*. Recent extensive collections of *Tetanocera* species in Ireland have been documented fully by Speight (2004: County Cork) and Williams *et al.* (2007: County Clare, County Galway, County Mayo, County Roscommon, and County Westmeath). Speight (1979) provided a list of 45 species in 19 genera, without details, and subsequently published records of six additional species. The most recent list was by McLean (1998), including 51 species. Six additional species were recorded recently (Staunton *et al.* 2008). Despite recent extensive collecting in a few areas, the Irish Sciomyzidae are still not well known; major range extensions of Sciomyzidae in the Palearctic are being reported. Currently Ireland has 60 recorded species of Sciomyzidae in 19 genera.

We report here collection of adults of *T. punctifrons* by C. Maher, C. Mulkeen, and J. Carey in Ireland (Table 1). Identifications were confirmed by LVK. The specimens, in perfect condition, were transferred from alcohol and glued to a pin; the abdomens were removed, processed in NaOH and subsequently in slightly acidic alcohol, and then placed in a microvial of glycerine pinned below the rest of the specimen. They are deposited in the Natural History Museum, Dublin.

Table 1. Date-locality and collection data for the specimens of *Tetanocera punctifrons* (Rondani, 1868) reported in the present paper.

Locality	Co-ordinates	Number/sex	Date	Collector	Collection method	Depository
Skealaghan turlough	53°36'35"N – 9°08'29"W	1 ♀	5/8/2005	C. Maher	Sweep-net	LVK collection, Gaeta
Annagh East	53°24'29"N – 9°02'45"W	1 ♀	4/9/2014	J. Carey	Malaise trap	Natural History Museum Dublin
Corgar Lough	54°3'38"N – 7°45'38"W	1 ♀	1/7/2014	C. Mulkeen	Malaise trap	Natural History Museum Dublin
Corgar Lough	54°3'38"N – 7°45'38"W	1 ♀	7/8/2014	C. Mulkeen	Malaise trap	Natural History Museum Dublin
Lough Down	53°20'57"N – 9°10'58"W	1 ♂	2/7/2014	C. Mulkeen	Malaise trap	Natural History Museum Dublin
Lough Meelagh	54°3'24"N – 8°9'3"W	1 ♂	7/8/2014	C. Mulkeen	Malaise trap	Natural History Museum Dublin

Identification and distribution

Ostensibly, with only two of the Western European species of *Tetanocera* – the central and southern *T. punctifrons* and the northern *T. latifibula* – sharing the very distinctive feature of a single strong seta on the posterior surface of the mid femur, near the apex, one might think that it should be relatively easy to confirm the identity of *T. punctifrons* in Ireland. However, some of the features traditionally used for distinguishing *T. punctifrons* from *T. latifibula* are either variable or difficult to evaluate, especially when a series of specimens of both species are not at hand for comparison, as noted below.

Rozkošný and Knutson (2011) recorded *T. punctifrons* from Ireland (based on Speight 1979), across Wales, Scotland, and England to Denmark and southern Sweden, then across central and southern Europe to Spain, Italy, Poland, Romania, Bulgaria, and Turkey and across Central European Russia, but it was absent from Norway and central and northern Sweden and Finland. They recorded *T. latifibula* from northernmost Sweden and Finland, through north-east, north-west, and Central European Russia (Kaliningrad region) and eastwards across Mongolia and Siberia, but it was absent from England to Belgium to France to Denmark and south. Foote (1999) mapped the distribution of *T. latifibula* in North America, showing it ranging from coastal and north-central Alaska just below the Arctic Circle south in mountainous areas to north-eastern California, northern Utah, central Colorado, and northern-most New Mexico as well as into the plains of southern-most Manitoba to north-western Iowa.

Tetanocera punctifrons and *T. latifibula* can be placed with about 11 other, mainly Nearctic, *Tetanocera* species in which the surstylus is quite similar in lateral view (scoop-like and more or less short) and somewhat similar in ventral view. Eight of the Nearctic species also have a pre-apical seta on the posterior surface of the mid femur, whereas all other species lack this seta. The shape of the posterior surstylus varies within some of the Nearctic species; there are few figures of them other than in Steyskal's (1959) taxonomic revision and in regional studies by Fisher and Orth (1983: California), Foote *et al.* (1999: Alaska), and Foote and Keiper (2004: Ohio). It cannot be excluded that *T. punctifrons* is the senior synonym of a species in North America.

When documenting the presence of rare species, especially in the Palaearctic, where many of the earlier described species were inadequately described and where there are often many synonyms within a genus, it can be useful, primarily for the sake of future researchers, to refer to studies of type specimens and to track the record of examination of characters and understanding of the species concepts by the leading taxonomists. We do this here for *T. punctifrons* and *T. latifibula*, the only species of this group of *Tetanocera* likely to be confused in Western Europe.

***Tetanocera punctifrons* Rondani, 1868 (Fig. 1, a-e; from Rozkošný 1984, figs 536-540)**

Rondani's type specimens of *T. punctifrons* (two males and one female from Parma, Italy) in the Florence Museum were studied by Verbeke (1964), who designated a male (No. 1512) as "type" (= lectotype). He illustrated the antenna and a posterior view of the surstyli of a cotype male (from slide preparations; these slides probably were made in Verbeke's laboratory and perhaps are in the Institut royal des Sciences naturelles de Belgique, Brussels). Verbeke (1964) also described other characters of the species and stated that Sack (1939) had correctly interpreted Rondani's concept of the species. Sack included both *T. punctifrons* and *T. latifibula* but did not mention the setae on posterior surface of the mid femur (Sack's publication was used extensively for identification of Palaearctic Sciomyzidae until Rozkošný's 1987 monograph). Under *T. punctifrons*, Verbeke (1964) synonymised *T. collarti* Verbeke, 1948 (from Belgium) and, with a question mark, *T. marginella* Robineau-Desvoidy, 1830 (from France), noting that Robineau-Desvoidy's specimens had been destroyed. Collin (1960) commented on the confused history of the name *T. marginella* (listed as a synonym of *T. elata* Fabricius by Hendel 1900) and used that

name for what we consider to be *T. punctifrons* in his key to nine British species of *Tetanocera* based in part on presence of one pre-apical seta on the posterior surface of the mid femur. For further clarification of Collin (1960), Verbeke (1968) placed *T. elegans* Collin as a synonym of *T. phyllophora* Melander, 1920. Rozkošný and Elberg (1984) listed *T. marginella* as a “doubtful species”. Verbeke (1964) noted in his detailed description – based on the three syntype specimens and 29 other specimens from England, Wales, Belgium, Luxembourg, Austria, Italy, Denmark, and Bulgaria as one of the “principaux caractères” of *T. punctifrons* the presence of a posterior pre-apical seta on the mid femur, a character which “existe également chez *T. latifibula*.” Subsequent authors followed this interpretation of the species and have presented figures of the male genitalia and other features.

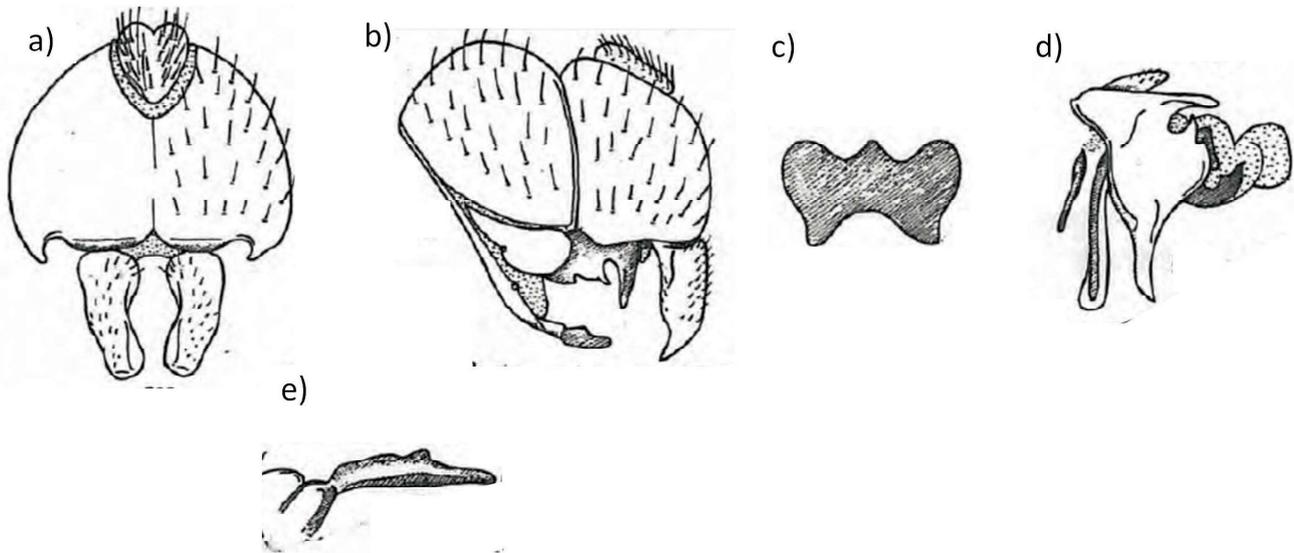


Fig. 1. Male genitalia of *Tetanocera punctifrons* (after Rozkošný 1984).

Mayer (1953), in his key to 19 species of *Tetanocera* in the Palearctic region (in German), included *T. punctifrons* and *T. latifibula* easily separated by the length of the arisal hairs and thickness of the hind femur, and with characters of the fronto-orbital setae, frons, hind femur setae, and wing in the terminal couplets, but without figures. Rivosecchi and Santagata (1979) presented poor outline figures of the surstylus and hypandrium. Rozkošný's (1984, 1987) figures of the surstylus agree well with specimens we have seen except that in lateral view the anterior margin is more evenly and gently excavated in our specimens. Vala's (1989) figures agree with our specimens except that one of his two lateral views of the surstylus (his fig. 119 l) shows the posterior margin as slightly indented in the upper two-thirds, not straight as in our specimens. Vala (1989) and Rivosecchi (1992) presented figures of the sixth sternum of *T. punctifrons*. Vala showed two approximate protuberances on the right side, with a median protuberance; Rivosecchi showed three weak protuberances. Our specimens have a right and a left protuberance, with a weakly sclerotised median protuberance. Rozkošný's (1984) figure of *T. latifibula* and our specimens of *T. latifibula* display three equally separated, sclerotised protuberances. Rozkošný (1984, 1987) and Vala (1989) figured the “ix sternum” (epandrium) with a straight ventral margin in *T. punctifrons* and a slightly inwardly curved ventral margin in *T. latifibula*; in our specimens the margin is only slightly curved inwards in both species. Rivosecchi (1992) provided figures of the surstylus and other characters of specimens of *T. punctifrons* from Lazio, central Italy; those of the surstylus and antenna generally agree with Verbeke's (1964) figures. However, as with many of Verbeke's published figures, most of Rivosecchi's figures were made from slide preparations and thus include considerable distortion.

***Tetanocera latifibula* Frey, 1924 (Fig. 2, a-d; from Rozkošný 1984, figs. 519-522)**

Tetanocera latifibula was proposed by Frey (1924) for three males and four females from Munio and Enontekis, Finland and from “Beresow”, western Siberia; he presented a few characters of *T. latifibula* in his key to 14 *Tetanocera* species and a lateral, outline view of the epandrium and surstylus of the male. His only reference to *T. punctifrons* was in a list of four species, “...not known to me but to all appearances are probably distinct.” Sack (1939) gave a slightly more detailed description, without figures. Of subsequent authors, apparently only Stackelberg (1963) and Rozkošný (1984) studied the syntype specimens. Steyskal (1959) did not recognise *T. latifibula* from North America, but he described *T. hespera* from Alberta, Canada and from Alaska, Utah, and South Dakota, U.S.A. on the basis of a few characters, presented outlines of the posterior and lateral views of the postabdomen, and (1965) synonymised it under *T. latifibula*. It cannot be discounted that *T. hespera* is a valid species. Verbeke (1964) mentioned a few characters of *T. latifibula* and presented a posterior view of the epandrium and surstylus (specimen: “T4: Asie, Altai, Ularak”, not part of the type series), drawn from a slide preparation that apparently has been lost. Stackelberg (1963) reproduced Frey’s (1924) figure of *T. latifibula*, included it with additional characters in his key, and recorded specimens from the Kola Peninsula and from Leningrad, Russia. Fisher and Orth (1983) – an overlooked source by most European authors, of excellent figures of Holarctic species – figured the male and female postabdomens of specimens from California, U.S.A. and mentioned other characters (noted below). Apparently only Rozkošný (1984) subsequently examined Frey’s (1924) type specimens; he (1984, 1987) figured the male genitalia in detail.

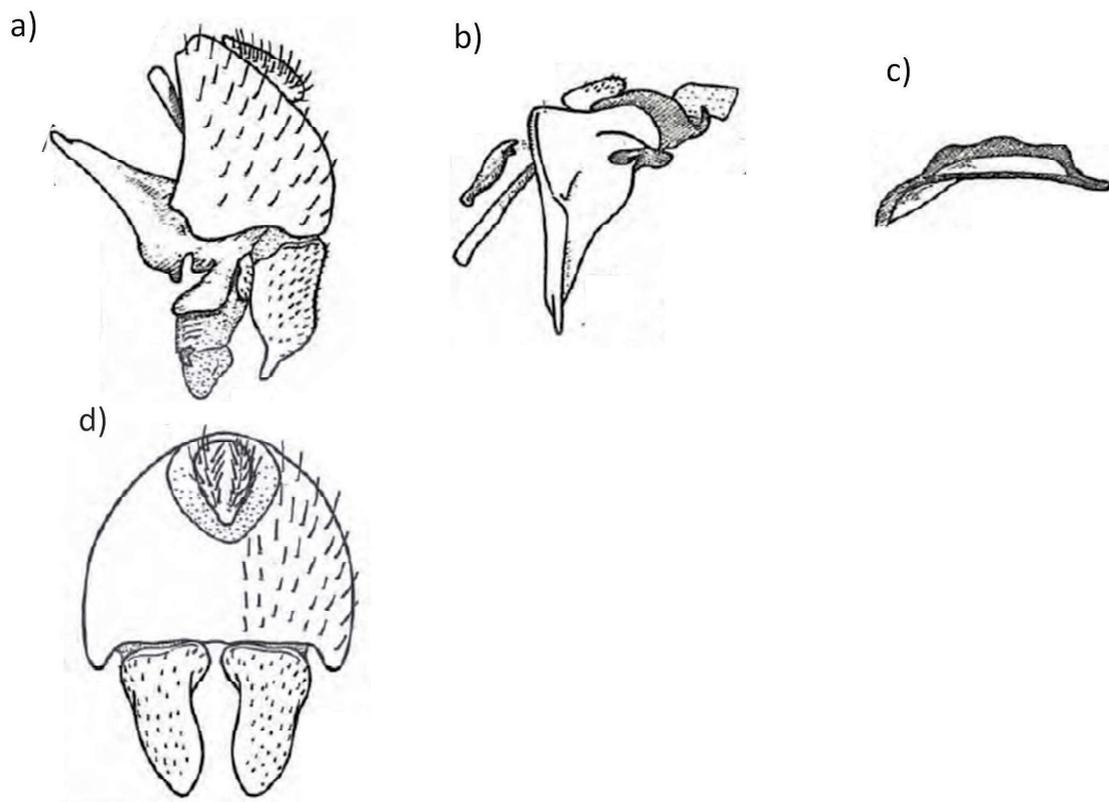


Fig. 2. Male genitalia of *Tetanocera latifibula* (after Rozkošný 1984).

Although it is difficult to reconcile some differences in the drawings (there are no photographs) of the male postabdomen in the publications noted above – the best are in Rozkošný (1964, 1987) and Verbeke (1964), the shape of the surstylus in lateral view seems to be the best feature for distinguishing males of the two species. The surstylus of *T. latifibula* seems to be shorter than that of *T. punctifrons*, is slightly curved inward in the upper half posteriorly, whereas

that of *T. punctifrons* is straight, and the anterior margin of *T. latifibula* is deeply excavated, whereas that of *T. punctifrons* is more shallowly and gently excavated towards the apex. The other characters traditionally used to separate the species, and a few other characters, seem to vary somewhat and are difficult to compare without a series of both species in hand.

We have seen the following 45 specimens:

T. punctifrons: Ireland, 2♂ 4♀; Belgium, 4♂ 2♀; France, 1♂; Spain, 1♂; Italy, 2♂; Bulgaria, 1♂; Denmark, 4♂ 4♀.

T. latifibula: Sweden, 1♂, 1♀ plus 1♀ (laboratory reared, F¹ pinned with puparium); Finland, 2 specimens; Mongolia, 1 specimen; Siberia, 1 specimen. Canada: Northwest Territories, 1♂; British Columbia, 1♂; Manitoba, 3♂ 3♀; Alberta, 1♂. U.S.A.: Alaska, 1♂; Colorado, 2♂; Nebraska, 1♂; Washington, 1♂.

We have focused above on the more recent literature of primary importance concerning these two species. However, we have also surveyed other major, older publications, e.g., by H. Loew (1841-1876), F. Hendel (1900-1938), etc. *Tetanocera punctifrons* appeared as a valid species in Hendel's (1903) key; he did not mention *T. latifibula*. Becker (1902), in his review of Meigen's collection in Paris and Vienna, did not mention *T. punctifrons*. Becker, in Becker *et al.* (1905), listed only the original description of *T. punctifrons*. Séguy (1934) did not include either species, but included *T. marginella*, which he confused with *T. elata* or *T. phyllophora*; he did not use the character of a seta on the posterior surface of the mid femur.

Additional comments on external features

- a. Plumosity of arista: a fairly reliable character, well-figured for *T. punctifrons* by Verbeke (1964) and Rivosecchi (1992) from slide preparations. Recorded as broader than pedicel in *T. punctifrons*, narrower in *T. latifibula*. In addition, the plumosity is less dense and more brownish in *T. latifibula*.
- b. As noted by Rozkošný (1984), in *T. latifibula* the pedicel is usually distinctly longer than half the length of the basal flagellomere (= postpedicel) but is slightly shorter in *T. punctifrons*.
- c. Rozkošný (1984) also pointed out that in *T. latifibula* the second aristal segment is slightly longer than broad, whereas in *T. punctifrons* it is, at most, as long as wide.
- d. We could see no differences between the species in extent of facial hairs or colour of antennae at insertion of arista, as noted by Fisher and Orth (1983) in distinguishing *T. latifibula* from other species in California.
- e. Orbito-antennal spot: one of four key characters used in separating the two species by Rozkošný (1984, 1987) but apparently an unreliable character in these species. Traditionally regarded as present in *T. punctifrons* but present or absent in our Irish specimens; absent in *T. latifibula* but present or weak in our three specimens from Sweden.
- f. Hind femur anterodorsal setae: traditionally recorded as two in *T. punctifrons*, and 3–4 in *T. latifibula*, as in our specimens.
- g. As noted by Verbeke (1964), the antero- and posteroventral setae on the hind femur are very strong in the female of *T. punctifrons*; we noted that they are weaker and sparser in *T. latifibula*.

Female abdomen: Characters of the female abdomen have not been used extensively in taxonomic studies of Sciomyzidae; the relatively few published descriptions have been reviewed by Knutson and Vala (2011) and Murphy *et al.* (in prep). With regards to *Tetanocera*, on the

basis, in part, of study of the female terminal abdominal segments, Verbeke (1964) resolved the status of several Palaearctic names. Fisher and Orth (1983) figured the abdominal sterna of 10 species of *Tetanocera*, including *T. latifibula*, from California. Rivosecchi (1992) figured and described various features for seven species of *Tetanocera* from Italy, including, for *T. punctifrons*, the habitus, head, antenna, mid femur, abdominal terminal segments and spermathecae of the female, male postabdomen – sternite 6, ventral and lateral views, internal genitalia, and wing.

In a cladistic analysis and taxonomic revision of the related genus *Renocera* Hendel (Knutson, Mathis and Chapman, in prep.), the following characters and character states of the female abdomen have been provisionally recognised as the most important in the eight genera in the outgroup utilised by these authors:

1. Sterna 7 and 8 broadly to narrowly separated by membrane (plesiomorphic); fused (apomorphic).
2. Sternum 8 a single, transverse plate (plesiomorphic); a pair of hemispherical lobes (apomorphic).
3. Hypoproct a single, transverse, setose lobe-like plate (plesiomorphic); separated medially by membrane into two lateral lobes (apomorphic state 1); a single lobe, setose posteriorly, with anterior portion a bare concave plate with tricuspid anterior margin (apomorphic state 2).
4. Spermathecae without an apical appendage (plesiomorphic); with an apical appendage (apomorphic).

Other fine details also have been distinguished in the female abdomen. Following is a description of features common to both *T. punctifrons* and *T. latifibula* (specimens examined: *T. punctifrons*, 3♀, Ireland; *T. latifibula*, 2♀, Sweden). We note that it is important to view the sterna not only in ventral view (in which view sterna 7 and 8 may appear fused), but also with the abdomen tipped upward posteriorly (in which view any membrane separating sterna 7 and 8 can be seen more clearly).

Spiracles 6 and 7 in the extreme anterolateral corner of terga 6 and 7 – as figured for *T. plebeja* Loew by Knutson (1987). Fisher and Orth (1983) figured these spiracles in the terga for seven of the species they studied but in the membrane for *T. latifibula*. Abdomen without mid-dorsal dark stripe. Sterna 6 and 7 broadly separated by membrane. Epiproct a minute, lightly sclerotised plate, with about four setulae. Two spermathecae (viewed at 70x) hemispherical, surface smooth, base flattened, stem not sclerotised.

The following diagnoses reveal very significant differences between females of the two species, not previously described.

T. latifibula (Fig 3a, from Fisher and Orth 1983): Terga 2, 3, and 4 without a trace of mid-dorsal dark stripe. Setae near posterior margin of terga 3, 4, and 5 strongest, especially laterally (note: the posterior-most row of so-called “posterior marginal tergal setae” are not on the ultimate posterior margin of the terga; there is a rather broad, bare, somewhat more lightly sclerotised posterior marginal extension to terga 3-7, which is especially strong on tergum 4 [well illustrated for *T. plebeja* in Knutson 1987]). Sterna 7 and 8 broadly separated by membrane). Hypoproct a densely setose, semi-circular plate. Cerci slightly broadened apically in lateral view. Spermathecae without apical process. In Figs 3a and b, St 7 and 8 = Sterna 7 and 8.

T. punctifrons (Fig. 3b, photograph by J. Carey): Terga 2, 3, and 4 with faint to strong mid-dorsal dark stripe. Setae near posterior margin of terga 4, 5, and 6 strongest, much stronger than in *T. latifibula*. Sterna 7 and 8 appearing fused in ventral view but in posterior view barely but distinctly separated by membrane. Hypoproct a transversely rectangular plate, in some specimens very narrowly separated by median membrane on posterior margin, posterior margin only slightly

curved. Cerci not broadened apically in lateral view. Spermathecae with minute but distinct apical process (note: this apical process also is figured for *T. punctifrons* by Rivosecchi 1992).

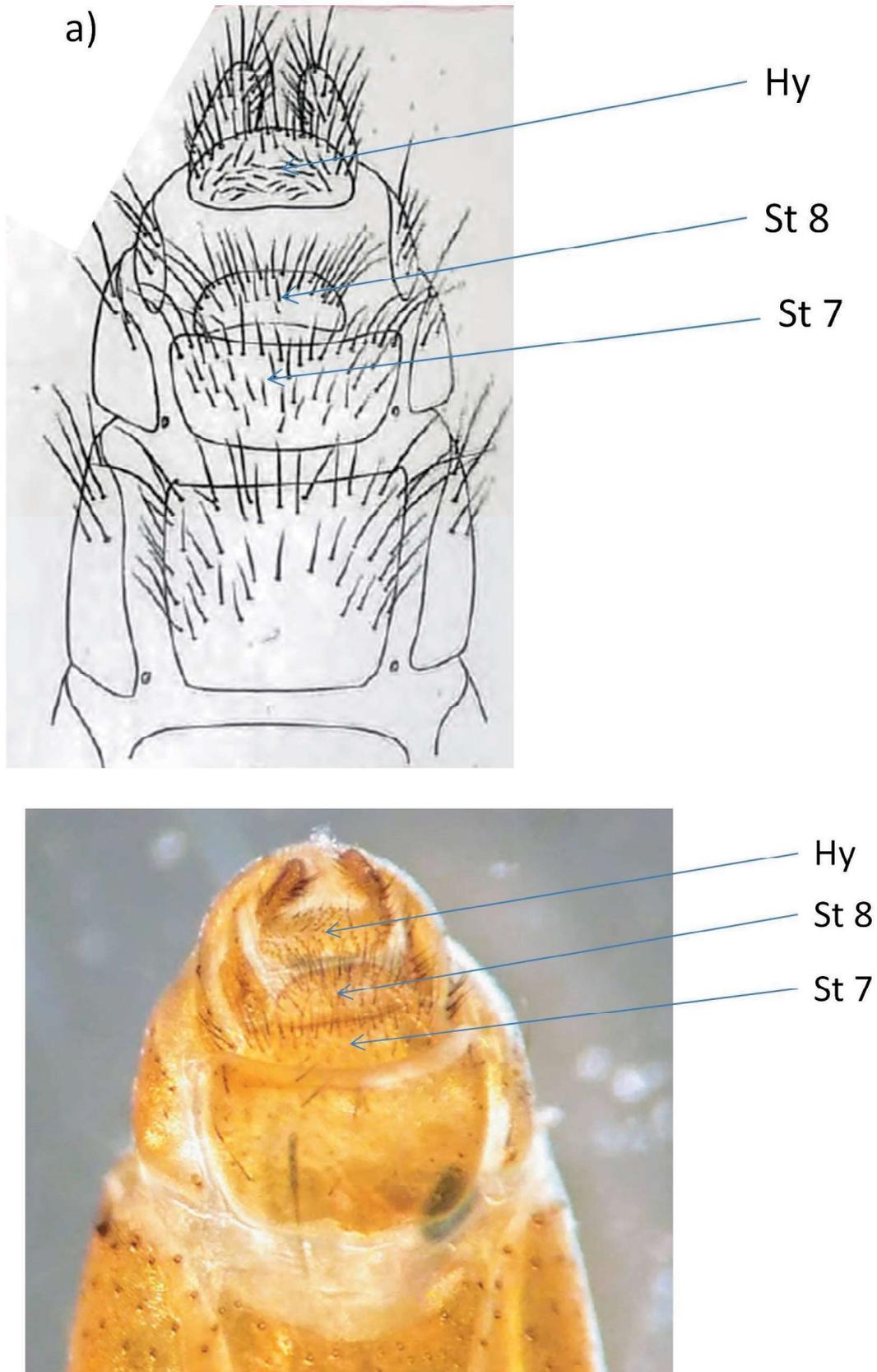


Fig. 3. Female genitalia: a, *Tetanocera latifibula* (after Fisher and Orth 1983); b, *Tetanocera punctifrons* (photograph by J. Carey).

Other characters: Other characters used by various authors in separating other species of *Tetanocera* were not found to be useful in separating our specimens of *T. punctifrons* and *T. latifibula*, but they may be worth checking further. These characters included positions of fronto-orbital setae relative to anterior margin of frons and anterior ocellus; colour of face, parafacies, and genae; width of gena relative to eye height; extent of hairs on parafacies; length of hairs on anterior margin of frons; basal flagellomere concave or straight above (but more often more deeply concave in *T. punctifrons* than in *T. latifibula*); colour of occipital spot; colour of thoracic dorsum; scutellum flat or convex; scutellum with or without an anterior ridge; colour of fore tarsus; curvature of posterior cross-vein; cross-veins infumated or not; and colour of stigma.

Key: The following key is in a format that may be of broader use than is the traditional format. That is, first we present characters that we have found to be the most reliable. Second, we include, in parentheses, characters that have been used by other students of the two species but for which there is disagreement or doubt as to their reliability. Thus we first guide the user to the so-called reliable distinctions and then provide other characters that may prove important.

1. Arista hairs moderately dense, black, longer than width of pedicel; in lateral view pedicel at most as long as broad. Hind femur with two anterodorsal setae beyond mid length and rarely with a third, short, anterior-most seta. Surstylus long, in lateral view posterior ventral margin straight, anterior ventral margin gently and evenly excavated in apical half. (Second arista segment at most as long as wide. Ventral margin of epandrium straight. In female, ventral setae of hind femur strong and numerous) *T. punctifrons*
- Arista hairs less dense, brownish black, shorter than width of pedicel; in lateral view pedicel slightly longer than broad. Hind femur with three or four anterodorsal setae. Surstylus shorter, in lateral view posterior ventral margin slightly excavated in basal half, anterior ventral margin more deeply and abruptly excavated in apical half. (Second arista segment slightly longer than broad. Ventral margin of epandrium slightly excavated. In female, ventral setae of hind femur weaker and sparser) *T. latifibula*

The only other *Tetanocera* species in Ireland that might be confused with *T. punctifrons* or *T. latifibula* is *T. robusta* Loew, which ranges from Ireland to Kamchatka and which is widespread in the Nearctic. Males of *T. robusta* are readily recognised by the conical projection (even in dry specimens) on the left side of the epandrium. Notably, *T. robusta* is the only species of *Tetanocera* (both males and females) with a setose prosternum (posterior portion). Furthermore, whereas *T. punctifrons* and *T. latifibula* have one strong seta before the apex on the posterior surface of the mid femur, *T. robusta* usually has one strong seta and two to three weaker setae in this area. If, as a result of collection or preparation procedure, female specimens of *T. robusta* have lost the prosternal setae and the setae on the posterior surface of the mid femur (but sockets should still be visible) or if they show unusual variation (we have seen one female *T. robusta* from Ireland with setulae on only one side of the prosternum), it might be useful to note that *T. robusta* and *T. latifibula* lack a mid-dorsal dark stripe on the abdomen (present in *T. punctifrons*). In *T. robusta*, the postpedicel is longer than wide, with the dorsal and ventral margins almost parallel, as in *T. latifibula* (not almost square as in *T. punctifrons*), and the arista setulae are sparse but long as in *T. punctifrons* (not shorter and more dense as in *T. latifibula*).

Habitat

Many recent and on-going ecological studies of Sciomyzidae in Ireland have focused on the use of sciomyzids as ecosystem service providers and bioindicators. In a study of 10 turloughs

(temporary lakes practically unique to the west of Ireland), Williams *et al.* (2009a) showed a negative relationship between the abundance of the dominant species [*Ilione albiseta* (Scopoli)] and its prey when factors such as hydrology and vegetation structure were controlled. *Tetanocera arrogans*, *T. ferruginea*, and *T. robusta* were significant indicators of particular turloughs, but *T. punctifrons* was not collected in this study. One of the specimens of *T. punctifrons* noted in the present paper came from Skealaghan Turlough (Co. Mayo) during a separate study. Despite an intensive study of a transect at this turlough, Williams *et al.* (2009b) failed to collect *T. punctifrons*.

Other recent work in Ireland has included a detailed study of the Sciomyzidae of the Shannon Callows, the largest unregulated river flood plain in Europe. Maher *et al.* (2014) delineated hydrological niches for 22 species of Sciomyzidae in Ireland, including six species of *Tetanocera*. Whereas Williams *et al.* (2009a) demonstrated a quadratic relationship between Sciomyzidae species richness and soil moisture, Maher *et al.* (2014) showed a linear relationship between species richness and hydroperiod. More recent work on Sciomyzidae in Ireland has focused on wet grasslands. In a detailed study of temporal and spatial partitioning of Sciomyzidae and Syrphidae on often ecologically overlooked wet grasslands, Carey *et al.* (2017a) found that, “Spatiotemporal analysis showed that species turnover between habitats at different times made the most significant contribution to overall Diptera diversity.” Carey *et al.* (2017b) showed significant correlations between parataxonomic unit abundance and co-structure of nine families of Diptera and Sciomyzidae abundance and co-structure, making them useful bioindicators of Diptera in general. Whereas Williams *et al.* (2009a) could find no support for co-structure between Sciomyzidae communities and Mollusca, Carey (*pers. obs.*) did find a relationship between his Malaise trap collections and soil-sieved Mollusca.

Mulkeen collected four *T. punctifrons* from Malaise traps as part of an on-going study to investigate the biodiversity-supporting functions of constructed wetlands as compared to those of natural wetlands. This study has involved the use of both Malaise and emergence traps at selected sites.

Habitat of T. punctifrons

Beaver (1972) collected a few adults of “*T. punctifrons*” from marshy dune slacks and a lake margin in north-western Wales. These specimens have been destroyed, but as noted above, the distribution data would seem to support the identification. Rozkošný (1984) described the habitat of this species throughout its range as “mesic woods, alongside running water, and also in the mountains.” Vala (1989) stated that adults are found at higher altitudes as well as in plains, along canals, and in dry woods. Rivosecchi (1992) recorded adults from various types of heavily vegetated habitats near water in Italy. A male collected on 14 July 1994 in France (Thoranc, Alpes Maritimes, J.P. Haenni, and C. Dufour, Mus. Neuchâtel, Switzerland) is labelled “joncs, laïches, massettes, ruisseau, partie marécageuse.” In a summary of the macrohabitats of the 81 species of Sciomyzidae known from the Atlantic zone of Europe, Speight and Knutson (2012) noted, for *T. punctifrons*, “wetland / open ground; tall-herb open areas in *Alnus incana* alluvial forest; montane fen and stream-sides in seasonally-flooded, lightly grazed, humid, unimproved grassland.”

Most of the extensive collecting of Sciomyzidae in Ireland has been conducted in turloughs and other seasonal or permanent, aquatic to semi-aquatic habitats. However, Speight (2001, 2004) carried out a detailed analysis of sectors (primarily infrastructure, disused, productive, plus set-aside) of a 41-ha. case-study farm in Riverstick, County Mayo. A 27-Malaise-trap survey of Syrphidae and Sciomyzidae was conducted from April through September. Of the 182 specimens of 17 species of Sciomyzidae collected by Malaise traps (23 species were collected from the farm by use of sweep-net, Malaise, and emergence traps; six other species were collected by use of

sweep-net and emergence trap), one male and one female *T. punctifrons* were collected in an acidic fen-like habitat in one of the 10 disused sectors, the male “from an acid fen/seasonally flooded, oligotrophic *Molinia* grassland” and the female “from a grassy field margin beside a permanently-flowing streamlet backed by a hedge.” Speight (2004) tested the predicted occurrence of Sciomyzidae in the total of 21 different kinds of habitats in the three main sectors by intensive emergence surveys from April to September 2000-2003 inclusive (total of 1,316 trapping units where 1 unit equalled 1 sq. m trapped for 1 month). *Tetanocera punctifrons* was not recovered among the 18 species of Sciomyzidae recovered from three productive land habitats, four infrastructure habitats, and five disused habitats.

One of our female specimens was collected at Skealaghan Turlough, County Mayo, in the west of Ireland, by C. Maher. Turloughs are temporary wetlands that develop on karstified limestone; they are found primarily in the west of Ireland. The specimen was caught by sweep-net within an 8 x 8 m enclosure (Moran 2005) where no grazing had taken place for four years, in a vegetation zone dominated by the sedge *Carex nigra*. This vegetation zone is situated in one of the wetter areas of the turlough where flooding takes place for an average of six months each year (Moran *et al.* 2008). Other species of Sciomyzidae caught with this specimen of *T. punctifrons* included *Pherbina coryleti* (Scopoli, 1763), *Ilione albiseta* (Scopoli, 1763), and *Sepedon sphegea* (Fabricius, 1775).

A female specimen of *T. punctifrons* was collected by J. Carey in a Malaise trap positioned in a dense but relatively small stand of the rush species *Juncus effusus* in close proximity to a small, permanent pond in semi-improved wet grassland at Annagh East, County Galway (53°24'28.95"N – 09°02'44.90"W) approximately 350 m from the nearest large water body (Lough Corrib). The vegetation was subject to very light grazing by cattle but was generally undisturbed. Both the *Juncus* stand and the pond were located in wet grassland. This Malaise trap was part of a larger invertebrate biodiversity study being carried out in wet grassland habitats. It was operated continuously from 1 May 2014 to 4 September 2014. Other Sciomyzidae species captured with *T. punctifrons* from this location included *Colobaea bifasciella* (Fallén, 1820), *Elgiva cucularia* (Linnaeus, 1767), *Hydromya dorsalis* (Fabricius, 1775), *Ilione albiseta*, *Ilione lineata* (Fallén, 1820), *Limnia unguicornis* (Scopoli, 1763), *Pherbellia argyra* (Verbeke, 1967), *Pherbellia s. schoenherri* (Fallén, 1826), *Pherbellia ventralis* (Fallén, 1820), *Pherbina coryleti*, *Pteromicra angustipennis* (Staeger, 1845), *Pteromicra pectorosa* (Hendel, 1902), *Renocera pallida* (Fallén, 1820), *Tetanocera arrogans*, *T. elata*, *T. ferruginea*, *T. freyi*, *T. hyalipennis* and *T. robusta*.

Additional invertebrate surveys were taking place concurrently at natural and constructed wetlands in the west of Ireland between May and October 2014. During this study, two female specimens of *T. punctifrons* were captured in a south-westerly facing Malaise trap on the edge of a reed and large sedge swamp (Fossitt 2000) on the shores of Corgar Lough. The habitat was dominated by tall stands of *Phragmites australis* with occasional *Typha latifolia* and *Equisetum fluviatile*. Other habitats in the area include improved agricultural grassland and scrub (Fossitt 2000). Additional Sciomyzidae species captured at this site included *Hydromya dorsalis*, *Pherbellia ventralis*, *Renocera pallida*, *Sciomyza dryomyzina* (Zetterstedt, 1846), *T. arrogans*, *T. hyalipennis*, and *T. robusta*.

One of the male specimens of *T. punctifrons* was captured during the same study in a south-westerly facing Malaise trap on the edge of a reed and large sedge swamp (Fossitt 2000) on the shores of Lough Down. The habitat was also dominated by tall stands of *Phragmites australis* with a mixture of broadleaved herbs such as *E. fluviatile*, *Mentha aquatica*, *Filipendula ulmaria*, and *Menyanthes trifoliata*. Neighbouring habitats include wet grassland, improved agricultural grassland, and rich fen and flush (Fossitt 2000). Some other sciomyzid species captured at Lough Down included *Renocera pallida*, *T. arrogans*, and *T. hyalipennis*. The second male specimen

of *T. punctifrons* was captured in a Malaise trap on the edge of a reed and large sedge swamp at Lough Meelagh. Other habitats immediately surrounding the collection point include tall-herb swamps, hedgerows and wet grassland (Fossitt 2000).

Habitat of *T. latifibula*

Fisher and Orth (1983) collected an unusually large number of specimens (110 females, 226 males) (1949-1974) in north-eastern California in “open, unshaded or sparsely shaded grassy meadows and marshes,” at 1334-1783 m, 7 June–21 September, primarily with a suction machine (this huge, unique resource of specimens would have been useful for further study of variation in identification features, but it was discarded by the Department of Entomology, University of California–Riverside, after Fisher had died and Orth retired). Foote (1999) collected adults, “...most commonly in Idaho and Washington by sweeping emergent and shoreline vegetation bordering open, permanent ponds and lakes” e.g. “a dense stand of *Scirpus* sp. growing in about seven centimetres of water at a small, permanent lake,” but he also collected a few specimens from “unshaded vernal marshes that became dry by midsummer.” Foote *et al.* (1999), in Alaska, collected adults in “open sedge and rush marshes, road-side drainage-ditches, and marshy borders of shallow lakes and ponds. Particularly common in those fresh-water situations in which standing water disappears as summer progresses.” Knutson (unpublished) collected adults from a marshy area on the shore of Umeå R. in northern Sweden, on 16, 18, and 23 July 1967, where 21 other species of Sciomyzidae were found.

Biology and Immature stages

The life cycles of *T. punctifrons* and *T. latifibula* are in general similar to those of the other species of *Tetanocera* in Ireland that are typical predators of freshwater, non-operculate snails in truly aquatic situations, i.e. *T. ferruginea*, *T. hyalipennis*, *T. montana*, and *T. robusta* (Knutson and Vala 2011).

T. punctifrons: our life cycle data on *T. punctifrons* is based on a single laboratory rearing from adults collected in Belgium by J. Verbeke, reared at Cornell University by LVK, and reported in his thesis (Knutson 1963; summarised by Vala 1989). Eggs were laid end to end on leaves of substrate vegetation during August and hatched about four weeks later. During the 20-25 days of larval life the larvae killed and ate the fresh tissues of *Gyraulus parvus* (Say), *Lymnaea humilis* Say, and *Helisoma trivolvis* (Say) (none being natural prey) and *Physa* sp. About half of the tissues of each snail (12-18 snails, 2.0-8.0 mm. in length or diameter, attacked per larva) were consumed within a few hours, and then the larvae left the snail; only one larva pupariated, and the puparium did not produce an adult.

The rather extensive biological information on “*T. punctifrons*” in the papers by Beaver (1972, 1973, 1974) on studies in north Wales probably can be accepted as pertaining to that species, but the specimens upon which her studies were based, and the other Sciomyzidae she studied in Wales, were destroyed by an infestation of museum pests (O. Beaver, *pers. comm.* to C. Maher, 2008).

We summarise the main aspects of Beaver’s data on life cycles as follows. A female (1 of 4 adults collected between June and August near Newborough, Anglesey, Wales) laid 69 eggs over a period of 7 days, with 41% hatching. The incubation period was 14-20 days. The total duration of larval life was 26-35 days, with the first stadium being 7-21 days (mean 13.0) and the third 11-18 days (mean 15.7). The duration of the puparial stage was 36-50 days (mean 43.3).

T. latifibula: Foote (1999) presented fragmentary results from a laboratory rearing based on a female collected on 17 August in the state of Washington, U.S.A. A few first-instar larvae dissected from eggs (37 laid on the cheese-cloth cover of the breeding jar during late August) fed on *Physella* snails 1.4-10.0 mm in length. Only one larva pupariated, having killed and consumed

38 snails during the 35 days of larval life. The puparium, formed on 20 March on the lid of the rearing dish, produced a male on 29 March. The author concluded that *T. latifibula* has only one generation per year, with overwintering as eggs or young larvae.

Knutson (unpublished) had similar difficulties rearing *T. latifibula*. A female collected on 18 July 1967 near Umeå in northern Sweden (by LVK) laid 46 eggs between 24 July and 24 August. Several eggs hatched (some having been held in a refrigerator at 7°C for 3 months), but most larvae emerged only partially from the egg membranes, as Foote (1999) also noted during his rearings. Several larvae killed and ate *Lymnaea peregra* (Müller) and *Planorbis* (Linnaeus) but refused *Bathymphalus contortus* (Linnaeus). Only one larva pupariated (23 November) after about 70 days passing through the three larval stadia; it produced a female on 11 December. Knutson concluded (as did Foote 1999) that *T. latifibula* has only one generation per year, with overwintering as first-instar larvae within the egg membrane.

The morphology of the immature stages of *T. latifibula* and *T. punctifrons* is similar to those of other aquatic, predaceous species of *Tetanocera*. The integument of first-instar larvae is unpigmented, whereas that of older larvae is rather darkly pigmented, with a dark mid-dorsal stripe; integumentary papillae are lacking in both species; the body segments are tuberculate, especially laterally; the posterior end is uplifted dorsally, the posterior spiracular disc bears short, subequal dorsal and lateral lobes and much longer ventrolateral and ventral lobes, and the ventrolateral lobes have a short, broad basal portion and a narrower, longer apical portion. The ventrolateral lobes of first-instar *T. latifibula* are exceptionally long and not bipartite, similar only to the Nearctic *T. soror* Melander. Both species have well-developed float hairs between the spiracular openings on spiracular plates of the spiracular tubes, and the projecting anal proleg bears long, recurved spines. The anterior spiracles have 13-16 papillae in *T. punctifrons* and 16 in *T. latifibula*.

The puparia of both species are very similar, with the posterior end uplifted dorsally and an evident anal proleg, except that *T. latifibula* differs from *T. punctifrons* in having weaker posterior spiracular disc lobe vestiges, and a weaker mid-dorsal stripe, without lighter-coloured borders. Finally, the integument of *T. latifibula* has a bronze cast, not present in *T. punctifrons*.

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***Angioneura acerba* (Meigen) (Diptera, Calliphoridae) found in**

Scotland – On 3 September 2015 I swept a single male *Angioneura acerba* (Meigen, 1838) from herbaceous vegetation at Longniddry Bents (NT4376, V.C. 82). Longniddry Bents is part of the coastal sand dunes, sea buckthorn (*Hippophae rhamnoides*) scrub, beaches and rocky shore developed along much of the East Lothian coast. The swept vegetation included dune meadow with grasses and tall herbs and a marsh (NT437767) with sea club-rush (*Bolboschoenus maritimus*), tall *Juncus* and great willow herb (*Epilobium hirsutum*) near to a stream that runs through the dunes.

Angioneura species are small, dark, grey-dusted calliphorids belonging to the subfamily Melanomyinae and resemble muscids or anthomyiids. The species was identified using the keys, descriptions and genitalia drawings in K. Rognes (1991. *Blowflies (Diptera, Calliphoridae) of Fennoscandia and Denmark* **24**, 272 pp. E.J. Brill and Scandinavian Science Press Ltd., Leiden and Copenhagen).

Angioneura acerba was first found in Britain by D.M. Ackland (1967. *Angioneura acerba* (Meigen, 1838) (Diptera, Calliphoridae) new to Britain. *Entomologist* **100**, 122-123) in 1966 at Oxford, near the River Thames, by sweeping over marshy ground. The species was subsequently found by Peter Chandler in herb-rich marsh on the West Floodplain adjacent to a tributary of the River Kennet (Chandler, P. and Denton, J. 2004. Recent records of some rare snail-killing flies (Diptera, Calliphoridae) from Berkshire. *Dipterists Digest (Second Series)* **11**, 110). J.D. Coldwell (2011. Some scarce Diptera from the Barnsley area in 2011 including nine species new to Yorkshire. *Sorby Record* **47**, 16-18) and A. Grayson (2014. Additions and corrections to the Yorkshire Diptera list (part 5). *The Naturalist* **139**, 14-22) gave details of finds of five specimens of *A. acerba* from three localities near Barnsley (SE30, SE40) and Coldwell (*op. cit.*) notes a Lancashire record by A. Godfrey (*pers. comm.*). S. Falk (2016. *British blowflies (Calliphoridae) and woodlouse flies (Rhinophoridae)*, draft key available at www.stevenfalk.co.uk), gives additional records for Godmanchester in Cambridgeshire (2007) and Stoney Moors in the New Forest (2008).

All the published records from England of *A. acerba* are from inland sites while the Scottish record was from the coast. However, all Dutch sites for *A. acerba* are from coastal areas (Huijbregts, H. 2002. Nederlandse bromvliegen (Diptera: Calliphoridae). *Entomologische Berichten* **62**(3-4), 82-89).

The immature stages and life-cycle of *A. acerba* are unknown according to K. Rognes (*op. cit.*), who, however, cited a number of sources as evidence that members of the subfamily Melanomyinae are parasitoids of snails, including *Angioneura cyrtoneurina* (Zetterstedt), which is a parasitoid of a succineid snail. Snails of the family Succineidae mainly occur in wet, marshy habitats such as fens, reed and sedge beds (Cameron, R.A.D. and Redfern, M. 1976. British land snails. Mollusca: Gastropoda. *Synopses of the British Fauna (New Series)* No. 6). This together with finds of the species in marshland in England suggests that the small marsh near the stream at Longniddry may have been the actual location of my capture.

No published records of *A. acerba* in Scotland were found in the Scottish Insects Records Index, and no Scottish specimens of *A. acerba* were located in the Diptera collection, both maintained at the National Museums of Scotland at West Granton – **DAVID HORSFIELD**, National Museums Collection Centre, 242 West Granton Road, Edinburgh EH5 1JA

Pipiza accola Violovitsh (Diptera, Syrphidae) in France and its recognition

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Summary

Pipiza accola Violovitsh, 1985 (Diptera, Syrphidae) is recorded for the first time from France. Its distinctions from the extremely similar *Pipiza luteitarsis* Zetterstedt, 1843 and other European *Pipiza* species are considered. Its male terminalia are figured, together with the terminalia of the other European *Pipiza luteitarsis* group species. It is concluded that the range of *P. accola* probably extends further into western Europe than is yet recognised.

Introduction

A male of *Pipiza accola* Violovitsh, 1985 was collected by hand net during course of a survey carried out on an alluvial site at the western edge of the French Alps. It then languished as unidentifiable, until identified some eight years later, using the figures of the terminalia provided by Vujić *et al.* (2008, 2013). The data of this specimen are as follows:

Haute-Savoie (France): Delta de la Dranse, Publier, 32T 030910 514170, 22 May 2009; on foliage of *Populus nigra* in the sun, small open area in secondary alluvial hardwood forest; coll. and det. MCDS.

Speight and Castella (2011) provided further information on the character of the site and its syrphid fauna. *Pipiza festiva* Meigen, 1822 and *P. luteitarsis* Zetterstedt, 1843 were also collected from this site.

The European *Pipiza* species fall into two groups. In the larger group of species, the ventral surface of the hind femur has a pair of short ridges, apically. In the other group the ventral surface of the hind femur is flat apically. Following the revision of Vujić *et al.* (2008) this latter group has been referred to as the *P. luteitarsis* group and now comprises four species in Europe: *Pipiza accola* Violovitsh, 1985; *P. luteibarba* Vujić, Radenković & Polić, 2008; *P. luteitarsis* Zetterstedt, 1843; *P. quadrimaculata* (Panzer, 1802). *Pipiza quadrimaculata* is a species of humid coniferous forest. The other three species occur in humid deciduous forest of various types. *Pipiza luteibarba* has so far been found only on the Balkan peninsula, in Austria and on the Aegean island of Lesvos. By contrast, *Pipiza luteitarsis* has been recorded widely in Europe, from Scandinavia to the Mediterranean and from Ireland to European Russia. *Pipiza accola* was first described from Asiatic Siberia and its presence in Europe has only been recognised for some 20 years (Wolff 1998). Since then it has been found repeatedly in Scandinavia (particularly in Sweden: Bartsch *et al.* 2009), in addition to those parts of Germany from which it was recorded by Wolff (1998). Both *Pipiza luteitarsis* and *P. quadrimaculata* have been previously recorded from France, but not *P. accola* (Speight *et al.* 2016), so the record of *Pipiza accola* reported here is the first from France. The possibility is therefore considered that this species might have been overlooked elsewhere.

Identification

In the male, *Pipiza quadrimaculata* can be distinguished from the other three species of the *P. luteitarsis* group by its broad abdomen – tergite 4 is more than twice as wide as long, in the others less than twice as wide as long. In the female, *P. quadrimaculata* lacks the frontal dust spots

present in the other species. Without examination of the terminalia, males of *Pipiza accola*, *P. luteibarba* and *P. luteitarsis* cannot reliably be distinguished. In its terminalia, the male of *Pipiza accola* may be distinguished from both *P. luteitarsis* and *P. luteibarba* by the presence of a comb-like series of inwardly-directed, golden-yellow bristles on the inner margin of the surstylus (Fig. 1B). The surstylus is almost devoid of hairs in this position in *P. luteitarsis*. The same is true for *P. luteibarba* (A. Vujić pers. comm.). In addition, the male of *P. luteitarsis* can be distinguished from both *P. accola* and *P. luteibarba* by the total lack of a protrusion at the base of the surstylus, which is present in males of the other two species (Figs 1, 2: *sl*). This protrusion, referred to by Vujić *et al.* (2008) as the semicircular lobe of the surstylus, can also be used to separate males of *P. accola* from males of *P. luteibarba*. In *Pipiza accola* it protrudes in line with the longitudinal axis of the surstylus (Fig. 1A: *sl*), progressively narrowing as it does so, whereas in *P. luteibarba* it protrudes at a pronounced angle to the longitudinal axis of the surstylus (Fig. 2E: *sl*) and broadens abruptly shortly before its tip. The semicircular lobe of *Pipiza quadrimaculata* is shown in Fig. 2G.

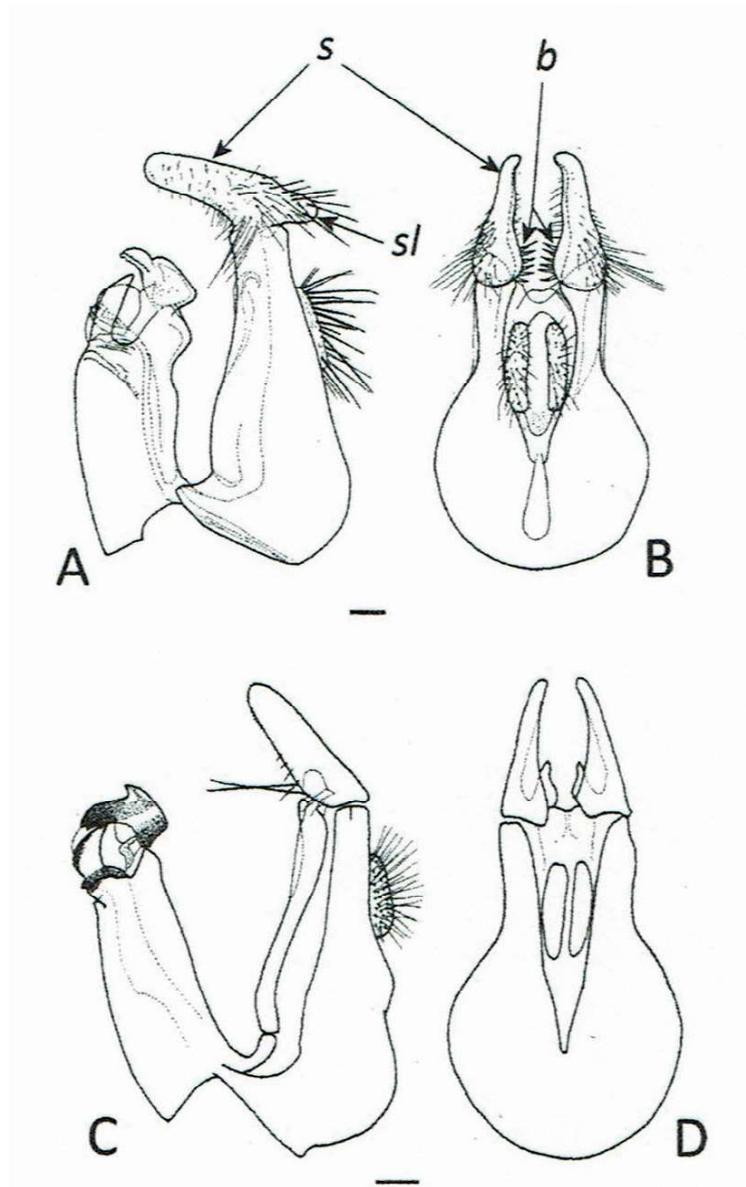


Fig. 1. Male terminalia of *Pipiza* species; A, C = lateral view; B, D = epandrium, dorsal view; A, B = *Pipiza accola*; C, D = *P. luteitarsis*; *b* = bristles on inner margin of surstylus; *s* = surstylus; *sl* = semicircular lobe; scale lines = 0.1mm; in D all hairs have been omitted; figures after Vujić *et al.* (2008).

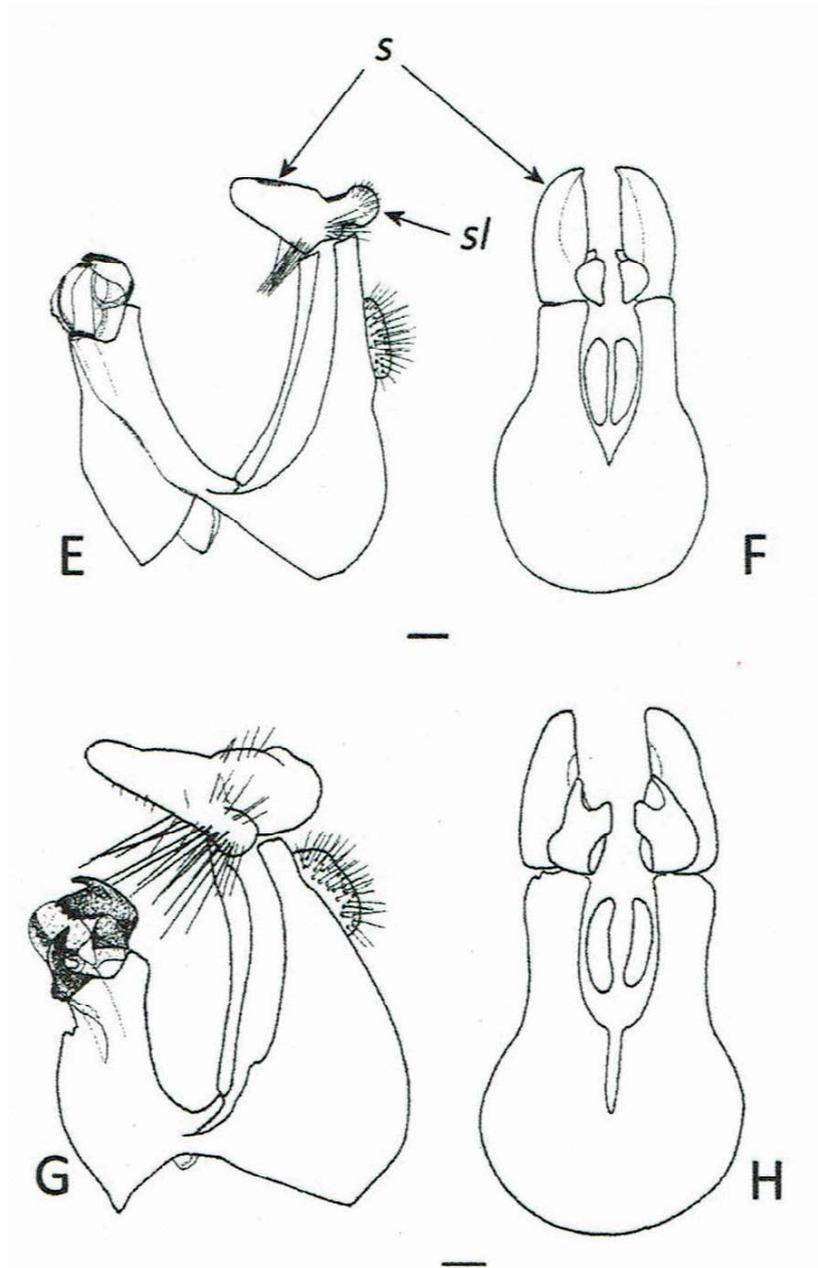


Fig. 2. Male terminalia of *Pipiza* species; E, G = lateral view; F, H = epandrium, dorsal view; E, F = *Pipiza luteibarba*; G, H = *P. quadrimaculata*; *b* = bristles on inner margin of surstylus; *s* = surstylus; *sl* = semicircular lobe; scale lines = 0.1mm; in F and H all hairs have been omitted; figures after Vujić *et al.* (2008)

In the female, *Pipiza luteitarsis* is distinguished from both *P. accola* and *P. luteibarba* by the proportions of tergite 5, which is longer than wide in *P. luteitarsis* and wider than long in the other two species. Females of *P. accola* and *P. luteibarba* can be separated by the shape of the third antennal segment, which is almost circular in *P. accola*, but distinctly elongate in *P. luteibarba* (Figs 3I, 3J).

Ventro-apically, the hind femur of the male from Delta de la Dranse is quite flat, entirely without ridges and its terminalia correspond very well with the figures provided by Vujić *et al.* (2008), which are reproduced here. In particular, the comb of golden-yellow bristles on the inner side of the surstylus is very evident, and provides a marked contrast with the almost bare inner margin of the surstylus, observed in specimens of *P. luteitarsis* from southern England, eastern

France and Ireland. But the facial hairs, stated to be mostly charcoal grey in *P. accola*, as depicted by Bartsch *et al.* (2009), are entirely yellowish white in the Delta de la Dranse specimen.

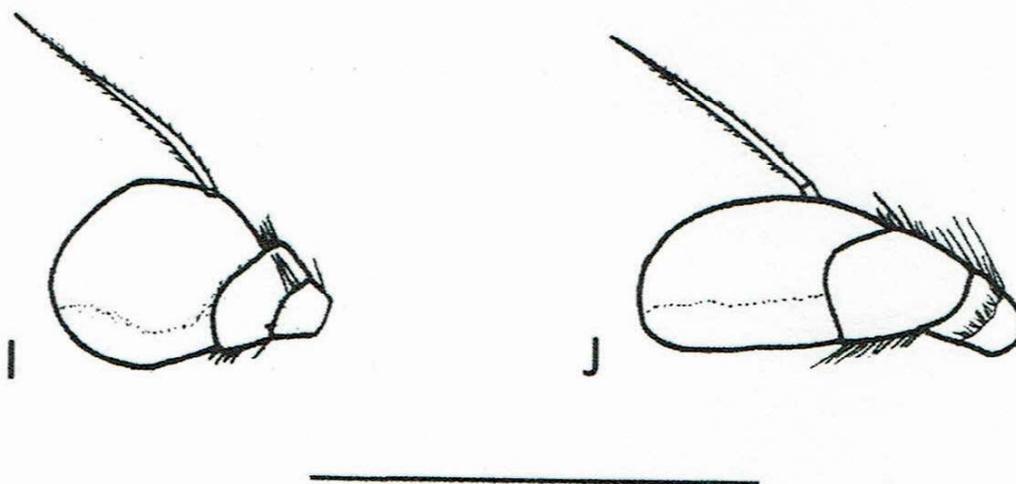


Fig. 3. Lateral view of antenna, *Pipiza* species; I = *P. accola*, female; J = *P. luteibarba*, female; scale line = 1 mm; figures after Vujić *et al.* (2008).

Discussion and conclusions

Members of the *Pipiza luteitarsis* group are distinguished by their lack of apico-ventral ridges on the hind femora. But this feature has not as yet been used in regional monographs on European syrphids, which thus do not separate *luteitarsis* group species, en bloc, from the more numerous *Pipiza* species in which these ridges are present. This is unfortunate, since most European *Pipiza* species with apico-ventral ridges on the hind femora remain extremely difficult to separate, morphologically, even if progress has been made in defining them genetically (Vujić *et al.* 2013). This discouraging situation can result in *Pipiza* species either not being collected or, if collected, being put on one side, unidentified. *Pipiza accola*, and the other members of the *luteitarsis* group, are unnecessarily consigned to this fate since they can be identified – as detailed above.

While it is true that members of the *luteitarsis* group can be identified, *P. accola*, *P. luteibarba* and *P. luteitarsis* are nonetheless very similar to each other in appearance. *Pipiza luteitarsis* is also very widespread in Europe and thus the best known of these three species. Until now, *Pipiza accola* had only been found north of the Alps and in Scandinavia, while *P. luteibarba* has been found no further west than Austria – of the three of them, only *Pipiza luteitarsis* had been found in western Europe. The record of *Pipiza accola* reported here is from the eastern edge of central France, opening to question of whether the species might occur further west, especially in the circumstances that its presence in Europe was only established 20 years ago, there have been taxonomic difficulties in recognising it and it closely resembles a different, widespread species (*P. luteitarsis*) with which it may occur in the field.

At the moment, *Pipiza accola* is not recorded from any part of the Atlantic zone. Is that due to some ecological limitation, or has it simply been overlooked? *Pipiza accola* does not seem to be an insect of humid *Fagus* forest and acidophilous *Quercus* forest, where *P. luteitarsis* can be found. But both species can occur in alluvial hardwood forest and *P. accola* occurs in addition in various forms of *Alnus/Salix/Populus* forest with a fluctuating water table that results in winter-flooding, including riparian and lake-edge *Populus nigra* forest. According to Bartsch (2009), *Pipiza accola* is associated with *Prunus padus*, a tree frequent in many types of woodland, including in the Atlantic zone. It would seem quite possible that re-examination of western European material, standing under the name *Pipiza luteitarsis* in collections, could lead to an expansion in the known range of *P. accola*.

Acknowledgements

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Crepuscular flower visiting in adult Lauxaniidae (Diptera) – Adult lauxaniids (Diptera, Lauxaniidae) feed by tearing and rasping fungal hyphae growing on leaves (Broadhead, E.C. 1984. Adaptations for fungal grazing in lauxaniid flies. *Journal of Natural History* **18**, 639-649). I have, for instance, often seen adults of the genus *Meiosimyza* Hendel (Lauxaniidae) with their mouthparts pressed against the foliage of ground layer plants, shrubs and trees. Various authors, however, refer to lauxaniids as also being anthophilous, for example, G. Shewell (1987. Lauxaniidae. **In** McAlpine, J.F. (Ed.). *Manual of Nearctic Diptera* **2**, 951-964), M. Proctor, P. Yeo and A. Lack (1996. *The Natural History of Pollination*. Harper Collins, New Naturalist) and M.C.D. Speight (2010. Flower-visiting Flies. **In** Chandler, P.J. (Ed.) *A Dipterist's Handbook, 2nd Edition. The Amateur Entomologist* **15**, 469-479).

During the evening of 28 July 2017, while walking past Anworth Old Kirk near Gatehouse of Fleet, Dumfriesshire (NX5856), adult *Meiosimyza* were conspicuous by their number on capitula of road verge hogweed *Heracleum sphondylium* (Apiaceae). To investigate this on 29 July, every 2 hours from 9a.m. to 9p.m., and subsequently between 7.30 and 10p.m. on 30 July and 2 and 5 August, I monitored about 30 road verge hogweed capitula in a standard walk past the Kirk. Monitoring consisted of a few minutes visual inspection of each capitulum and counting the number of yellow/orange lauxaniids present and arriving. On the return walk I attempted to tube capture each lauxaniid seen on a capitulum. On the evening of 29 July, I used Pentax Papillo 8.5x21 binoculars that enable close focus to follow the behaviour of individual lauxaniids, n = 8.

Sixty adults were counted in total and 46 were captured as follows: *Meiosimyza rorida* (Fallén) 15 males, 19 females; *Meiosimyza decempunctata* (Fallén) 2 males and 4 females; *Meiosimyza decipiens* (Loew) 1 male and 2 females and, *Tricholauxania praeusta* (Fallén) 3 females. Adults were identified using the keys by J.E. Collin (1948. A short synopsis of the British Sapromyzidae (Diptera). *Transactions of the Royal Entomological Society of London* **99**, 225-242). On 29 July, when monitoring took place throughout the day, adults were not observed on capitula before 7p.m. and they were present at 10p.m. when observations ceased. If they spent the night on capitula this was not determined, but suggesting that this might occur occasional adults were seen stationary and facing towards the ground on the supporting petioles immediately under the flowers. Up to four adults per capitulum were recorded and in the few cases observed, adults landed at the edge of a capitulum. On the capitulum adults followed an apparent random walking path and dipped their heads and extended mouthparts on to the nectaries at the flower base. They did not circle round the nectaries of each flower, but tended to move along one side before walking to an adjacent flower and repeating head-dipping movements. They were slow moving and apart from head-dipping, interrupted walking with grooming and being stationary, individual visits lasted 40+ minutes. If another flower visitor of a similar or larger size, e.g. a muscid or anthomyiid, walked too close, they flew away rarely and more frequently flipped underneath the capitulum and in a few seconds, reappeared at the surface in a different position.

Microscopic examination of captured adults revealed that no pollen grains adhered to their bodies, suggesting that pollination is unlikely. Nearly all the capitula examined were in relatively shaded positions, either sunk into taller ground layer vegetation or overhung by trees and shrubs. Exposed capitula, for example on the other side of the road, were not visited. This conforms to the known habit of many lauxaniids for shaded conditions (Papp, L. and Shatalkin, A.I. 1998. Family Lauxaniidae. In Papp, L. and Darvas, B. (Eds) *Contributions to a Manual of Palaearctic Diptera* **3**, 383-400). Head-dipping and extending mouthparts on to hogweed flower nectaries suggests that a major function of visiting capitula is to feed, but explaining the apparent preference for crepuscular visits is not straightforward. At earlier times on 29 July capitula were crowded with insects in the typical way and it is possible that high light levels and interference from these insects explains the lack of daytime visits by the lauxaniids recorded here. Suggesting a preference for hogweed a range of typical hedgerow flowers were present at Anworth, but no lauxaniids were seen visiting them. In a study of insects visiting hogweed capitula near the River Teviot in southern Scotland J. Grace and M. Nelson (1981. Insects and their pollen loads at a hybrid *Heracleum* site. *The New Phytologist* **87**, 413-423) did not, however, record lauxaniids. The results here suggest a possible explanation, that recording did not include evenings. Although the extent to which lauxaniids in general make crepuscular visits to hogweed capitula and how much other apicate capitula are utilised is unclear, at least for the species recorded here crepuscular examination of hogweed capitula in shaded conditions appears to be a productive assessment method – **GRAHAM E. ROTHERAY**, 16 Bracken Wood, Gatehouse of Fleet, Dumfriesshire, DG7 2FA; grahamrotheray@googlemail.com

***Lonchaea carpathica* Kovalev (Diptera, Lonchaeidae) new to Britain and other Diptera from Cherkley Wood, Leatherhead, Surrey**

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Summary

Lonchaea carpathica Kovalev, 1974 is reported as new to Britain from Surrey and Devon. Details are given of other Diptera species recorded at Cherkley Wood, Surrey.

Introduction

In 2013 I undertook a Diptera survey of Cherkley Wood near Leatherhead, Surrey. Cherkley Wood is a Site of Nature Conservation Importance and lies within an area of high nature conservation interest (the Mole Gap to Reigate SSSI & SAC which includes Box Hill adjoins the site to the south, whilst Juniper Hill Field Station is located off the southern edge of the woodland block and has undertaken ecological studies for several decades). Cherkley Wood itself is ancient woodland, with a large number of impressive, mature beeches *Fagus sylvatica* present. The woodland is private but is criss-crossed by a series of public footpaths and bridleways.

A series of visits have been made to Cherkley Wood and the surrounding area since 2012. In 2013, a single male lonchaeid was taken from a bait trap hung from a tree and laced with amyl acetate at TQ18895442 on 10 August. Females may also have been present but because these are more difficult to reliably identify, I ignored them. A Malaise trap was placed in the same location but did not catch the species. A large fallen beech was nearby, whilst decaying wood on trees and on the ground was frequent and stands of dog's mercury *Mercurialis perennis* were also present.

In 2017, Keith Alexander was surveying Diptera from a site on the River Exe in Devon using flight interception traps. Material was sent to Peter Chandler for identification and included a single male of *Lonchaea carpathica* Kovalev, 1974 as well as 10 females considered likely to be conspecific. These were from a trap operated at the Countess Wear Waste Water Treatment Works (SX9588) from 24 April to 4 July. All specimens came from just one trap of the four being operated across the study site. The trap in question was hung from a low lateral branch of a mature open-grown oak tree standing at the edge of a large area of secondary oak woodland overlooking a large deep-water pool. Although secondary in nature, the woodland lies within the wider Exe Estuary which contains large numbers of veteran open-grown oak trees derived from hedgerows as well as in-field trees. This veteran-tree-rich landscape is known to support a relatively species-rich saproxylic Coleoptera fauna. The whole complex, including the secondary woodland, has been designated as the Exe Estuary SSSI and SAC.

Methods

A range of passive sampling methods were employed at Cherkley Wood to effectively sample the Diptera associated with the veteran trees as well as the usual sweep netting. These passive methods included the use of two Malaise traps, small water traps lodged in veteran trees and bait traps. The latter comprised commercial bait traps laced with either commercially available bait

or amyl acetate ('pear drops'). The latter was used mainly because the author has a small supply and it is sometimes recommended as suitable bait for bait traps.

Identification

I dissected the male genitalia of the single lonchaeid specimen and failed to identify the species using MacGowan and Rotheray (2008). Consequently, I examined the Palaearctic literature available to me. The epandrium is elongate-triangular, whilst the bi-segmented phallus has an elongate distiphallus with the basiphallus bearing a characteristic notch. The genitalia clearly matched the detailed figures of *L. carpathica* in Kovalev (1974). The male genitalia are also figured on the Lonchaeidae online website at: <http://lonchaeidae.myspecies.info/category/lonchaeidae-classification-and-species-info/lonchaeidae/lonchaeinae/lonchaea/lonchaea-carpa>

Biology

Kovalev (1974) found larvae and puparia in rotting beech and adults emerged in June and August. I have not been able to locate any more information on the species. The subsequent records appear to relate to swept adults with no habitat data.

Distribution and status of *Lonchaea carpathica*

At present, *Lonchaea carpathica* is only known in Britain from single sites in Surrey and Devon. Although British dipterists are equipped with an excellent and up-to-date identification guide to the family (MacGowan and Rotheray 2008), the family is not popular and is clearly under-recorded. It is therefore likely that this is an overlooked native species rather than a recent introduction. Whether this is a species restricted to southern England is unclear and more records will be required to establish its distribution and status in Britain.

The species is known from Bulgaria, the Czech Republic, Denmark, Finland, Greece, Montenegro, Slovakia, Sweden, Switzerland and the Ukraine according to the above website.

Other Diptera from Cherkley Wood

Cherkley Wood proved to be of outstanding interest for its Diptera. Perhaps the most surprising record at the time was *Rhamphomyia marginata* (Fabricius, 1787) (Empididae), a singleton of which was swept in the western part of the wood on 27 May 2013 and two others were caught in the Malaise trap at TQ1857554097 on 26 May 2013 and 22 June 2013. This species is primarily known from Kent, although it appears to be spreading out into neighbouring counties (Plant 2017). These records presumably represent the first for Surrey.

Two specimens of *Neurigona erichsoni* (Zetterstedt, 1843) (Dolichopodidae) were recorded from the same Malaise trap on 10 August 2017. This species was not on the British list at the time, but has been subsequently been added (Drake 2014).

Also recorded in 2013 were: *Ctenophora flaveolata* (Fabricius, 1794) and *C. pectinicornis* (Linnaeus, 1758) (Tipulidae); *Limonia nigropunctata* (Schummel, 1829), *Rhipidia ctenophora* Loew, 1871 and *R. uniseriata* Schiner, 1864 (Limoniidae); *Ditomyia fasciata* (Meigen, 1818) (Ditomyiidae); *Keroplatus testaceus* Dalman, 1818 (Keroplataidae), *Holoplugia richardsi* (Edwards, 1934) (Scatopsidae), *Chrysopilus laetus* Zetterstedt, 1842 and *Ptiolina obscura* (Fallén, 1814) (Rhagionidae); *Atelestus dissonans* Collin, 1961 (Atelestidae); *Euthyneura inermis* (Becker, 1910) (Hybotidae); *Brachypalpus laphriformis* (Fallén, 1816), *Criorhina asilica* (Fallén, 1816) and *Rhingia rostrata* (Linnaeus, 1758) (Syrphidae); *Nephrocerus flavicornis* Zetterstedt, 1844 and *N. scutellatus* (Macquart, 1834) (Pipunculidae); *Sapromyza albiceps* Fallén, 1820 and *S. basalis* Zetterstedt, 1847 (Lauxaniidae); *Clusiodes caledonicus* (Collin, 1912) (Clusiidae); *Lasiambia brevibucca* (Duda, 1932) (Chloropidae); *Eccoptomera obscura* (Meigen, 1830) (Heleomyzidae) and *Phaonia exoleta* (Meigen, 1826) (Muscidae). Few of these were located by

sweep-netting, which shows the importance of using passive trapping methods for sampling saproxylic Diptera.

Acknowledgements

I would like to thank Richard Wilson Ecology who commissioned the Cherkley survey, Keith Alexander for information on the Devon record and Iain MacGowan for comments.

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A second record in Ireland of *Metriocnemus ephemerus* Langton (Diptera, Chironomidae) –

While collecting Chironomidae on 28 August 2017 in the north-east of Achill Island, County Mayo, on the Atlantic west coast of Ireland, several adult males and females, some pharates and pupal exuviae were captured by skim net from a shallow pool on the landward side of sand dunes at Ballynagappul Beach, Dugort (Grid Reference F694088). The adult males had distinctive antennae, with a reduced prone plume, and short wings and were identified as *Metriocnemus ephemerus* Langton, 2015 from the revised key to the known British and Irish species of *Metriocnemus* by P.H. Langton (Langton, P.H. 2015. *Metriocnemus ephemerus* sp. nov. (Diptera, Chironomidae) from Northern Ireland. *Dipterists Digest (Second Series)* **22**, 35-42). A specimen was sent to Peter Langton, who kindly confirmed the identification. The species was first described from adult males, collected on two occasions three days apart on 28 February and on 3 March 2014, from a small tidal bay at the River Bann inflow to the sea at Coleraine, County Derry, Northern Ireland, approximately 250 km north east of Achill Island. Langton (2015, *loc. cit.*) drew attention to a presumed restricted eclosion period in early springtime for *M. ephemerus* since, in his extensive weekly collections over a period of 15 years at the type location on the River Bann, the new species he described had not been collected prior to February / March 2014 or since then. The presence of adults on Achill Island in late August 2017 indicates a different phenology. Voucher material will be 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

The banded mosquito *Culiseta annulata* (Schrank) on Fair Isle, first record and first breeding in the Northern Isles of Scotland – “Sugaring”,

the painting on fence posts of a sugar-rich mixture laced with alcohol, is an effective way of attracting moths after dark to Schoolton garden, Fair Isle but the results are generally disappointing as autumn wears on. On the evening of 13 October 2014, I chose to ignore the only imbiber, which I took to be a small crane fly. I was again disappointed on 14 October; no moths, just the fly of the night before. However, this time I recognised it as a mosquito and intercepted it. The species keyed comfortably to *Culiseta annulata* (Schrank, 1766), a female. Its banded abdomen and annulated legs make it one of the easier mosquitoes to recognise and I was familiar with the species from the Mediterranean. Nevertheless, I sought expert opinions and received verification, based on photographs, from Martin Ebejer and Jolyon Medlock.

Fair Isle is establishing something of a reputation for vagrant insects (e.g. Parnaby, S., Parnaby, D. and Riddiford, N.J. 2014. *Sitochroa palealis*: New to Scotland. *Atropos* No. **52**, 68-69; Riddiford, N.J. and Young, M.R. 2016. *Phyllonorcyter apparella* (Herrich-Schaffer, 1855) (Lep.: Gracillariidae) new to the British Isles from Fair Isle. *Entomologist's Record & Journal of Variation* **128**, 19-22; Shaw, D. and Riddiford, N.J. 2016. A Migratory Locust *Locusta migratoria* (L. 1758) on Fair Isle. *Atropos* No. **56**, 16-19) as well as birds, so I assumed it to be a rare stray. However, on 20 August 2016 I noticed a couple of mosquito pupae close to the surface of a water-filled concrete dish outside Upper Stoneybrek, Fair Isle. I tubed one and brought it home. The following day I remembered the tube, retrieved it from my bag and discovered the pupal case and a dead, drowned, adult male *Culiseta annulata* inside. It had not had time to inflate its wings fully, otherwise it was classic *C. annulata*. The pupa was also distinct, sharing the banding characteristics of the adult.

On a visit to the breeding site two days later, I found several pupal cases but no active pupae. I subsequently made a systematic check of the various livestock drinking troughs across the isle without success except at Quoy where I found numerous exuviae, but no remaining pupae or larvae, in an old bath. The bath is within 100m of the first record at Schoolton, 500m from Upper Stoneybrek.

There are no records of any mosquito species in the Shetland Biological Records Centre database (P.V. Harvey, SBRC, *pers. comm.*) and just one for Orkney Wildlife Information and Records Centre (S. Gauld, Orkney Wildlife Information and Records Centre, *pers. comm.*): *Anopheles claviger* (Meigen, 1804), Scapa Cottages, St Ola, circa 26 September 1999, *leg.* Denise Kirkness & Colin Bullen, *det.* Keith Bland (National Museums of Scotland). *Culiseta annulata* is recorded widely in Britain north to the north Scottish coast in Caithness (NBN. 2017. *Culiseta annulata* (Schrank, 1776). National Biodiversity Network. <https://data.nbn.org.uk/Taxa/NBNSY50000011591>, accessed 2 January 2016.).

My confidence level that the species is newly arrived on Fair Isle rather than previously overlooked is high. I have been monitoring and trapping Diptera across the isle for over 15 years and regularly check drinking troughs and other standing water for aquatic Coleoptera and Heteroptera. Thus, the Fair Isle records, comprising the first of this species and first breeding record for the Northern Isles, appear to represent a true extension in range.

I am grateful to Sydney Gauld (OWIRC) and Paul Harvey (SBRC) for advising on the status of mosquitoes in Orkney and Shetland and Martin Ebejer and Jolyon Medlock for verifying the species. The National Biodiversity Network is acknowledged as my source for UK status and distribution – **NICK J. RIDDIFORD**, Schoolton, Fair Isle, Shetland ZE2 9JU; taibnick@gmail.com

Phytomyza scotina Hendel (Diptera, Agromyzidae) new to Britain

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Summary

Phytomyza scotina Hendel, 1920 (Diptera, Agromyzidae), a monophagous leaf miner of *Salvia*, is reported as a species new to Great Britain. A description of the circumstances of the discovery, the larval mine, puparium and adult is given.

Introduction

During an Agromyzidae survey of the Yorkshire Museum Gardens (SE598521), North Yorkshire, on 26 May 2017, the author collected mines on a *Salvia* species, which looked unusual. Many of the mines were tenanted with feeding larvae.

Within a few days, the larvae had vacated the mines to pupate. On 14 June 2017, a single adult male emerged. More adults emerged over the next five days, with females emerging much later on 24 July and 4 September, along with males on 25/28 July and 5/6/24 August. In total, 17 adults were successfully reared from a total of 28 puparia (12 ♂ and 5 ♀). Thirteen of these are retained as voucher specimens in the author's private collection, with two (♂ + ♀) donated to the NHM London.

Due to the host plant, the features of the larval mines and that the larvae vacated the mines to pupate, two possible causers were considered, *Phytomyza salviae* Hering, 1924 and *Phytomyza scotina* Hendel, 1920. A closer examination of the mines suggested that the latter was more likely.

Upon my dissection of the males, reference to the illustrations in Spencer (1990) confirmed the identification as *Phytomyza scotina* Hendel, 1920, a species which has not previously been reported from Britain.

A single male and female were sent to Miloš Černý in the Czech Republic, who confirmed my determination.

Biology

The larvae form mines on *Salvia* species, which are typical of most *Phytomyza* species, in that a winding corridor is formed, which often crosses itself. This can be either upper or lower surface; however, all of the mines examined in York were upper surface.

The position of the mine seems quite inconsistent, with many of the mines examined forming at the edges of the leaf (Fig. 1) whilst others were formed in the centre (Fig. 2 and Hering, 1957, vol. iii, fig. 602b). Where a leaf has several feeding larvae present, the mines often coalesce, resulting in a blotch-like appearance (Fig. 3).

Frass is deposited in closely spaced grains, which can be so close that it gives the appearance of 'pearl chains'. There are no secondary feeding lines present, unlike *P. salviae*, which has clear primary and secondary feeding lines.

The puparium is dark brown (Fig. 4), with the rear spiraculum having 15 papillae. De Meijere (1926) figured those in his larval description.

Hering (1957) stated that larvae can be found in May and June. No return visit has been made to the location to ascertain if the species is indeed univoltine or whether additional

generations occur. The author plans to visit the site in due course to determine the phenology of this species.



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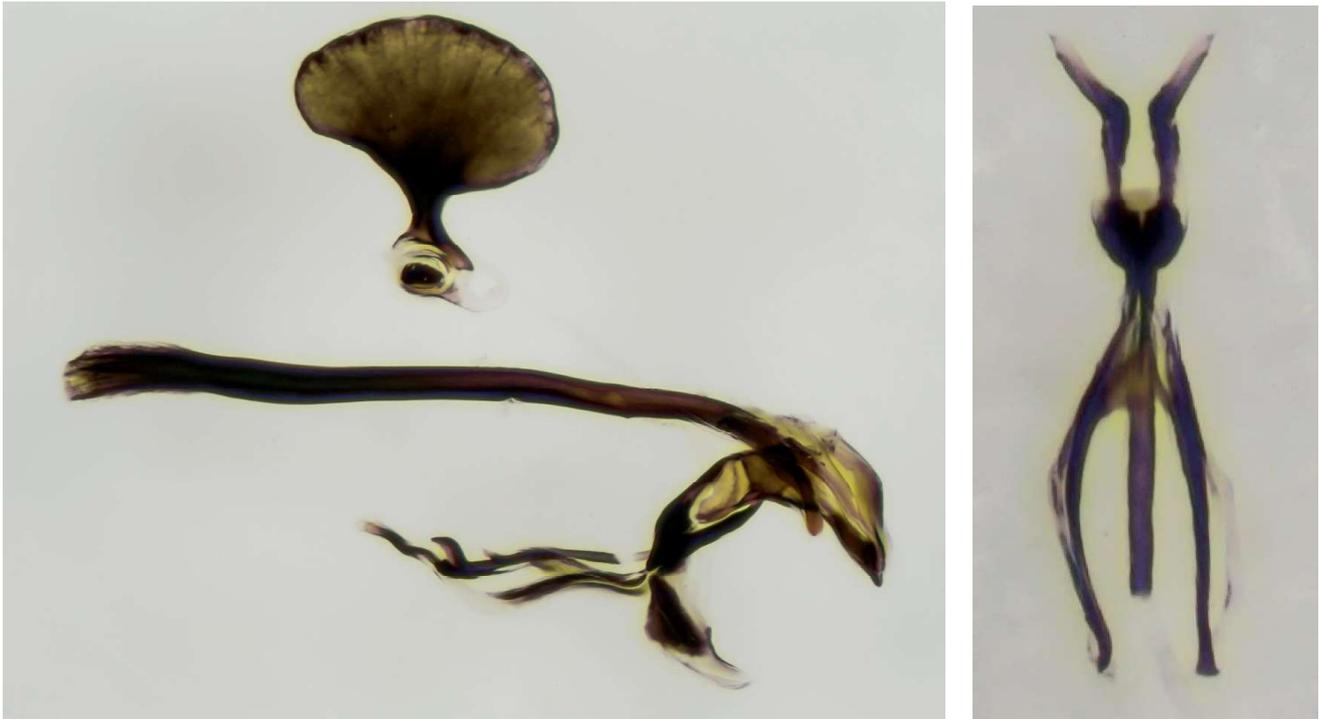
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Figs 1-4; 1-3, *Phytomyza scotina* Hendel leaf mines: 1, mine formed at edge of leaf; 2, mine in central position; 3, mines coalesced due to presence of several feeding larvae, resulting in a blotch-like appearance. 4, *Phytomyza scotina* puparium.

Identification

The adult fly closely resembles *P. salviae*, on both external characters and in the male genitalia; however, *P. scotina* lacks the outer cross-vein which is present in *P. salviae*. All of the adults which emerged lacked this cross-vein, however, it is understood that this feature can be variable (Michael von Tschirnhaus *pers. comm.*).

Phytomyza scotina is a dark species, with a wing length of approximately 2mm. Legs and knees are all black, with the wing base black-brown. There are usually two reclinate *ors* of equal length. The frons projects strongly above the eye in profile. The third antennal segment is of medium size, longer than deep, rounded, slightly rectangular. The second costal section is approximately 1½ times that of the fourth. Wings are greyish and transparent.



5

6

Figs 5-6. *Phytomyza scotina* Hendel, male genitalia: 5, lateral view (below) and ejaculatory apodeme (above); 6, distiphallus, ventral view.

Phytomyza scotina belongs to the *Phytomyza petoei* group, which consists of five species in Europe. The genitalia and the exceptionally large ejaculatory apodeme immediately distinguishes this group from members of the *P. nepetae* Hendel, 1922 group – five small black *Phytomyza* species feeding on Lamiaceae (Nowakowski 1959).

When viewed laterally, the aedeagus of *P. scotina* (Fig. 5) is very similar to that of *P. salviae*, with the hypophallus seemingly more sclerotised in the former. The main difference is that of the distiphallus when viewed ventrally. In *P. scotina*, the distiphallus shows a distinct curvature (Fig. 6), whereas in *P. salviae* this is almost parallel.

Distribution

Phytomyza scotina is known in Europe from Albania, Germany, Lithuania, Poland, Romania and the Spanish mainland (Martinez 2011). In the Agromyzidae database of Michael von Tschirnhaus, among 101 references to this species, records from nine further countries are included: Austria, Czech Republic, France, Hungary, Italy, Russia, Slovenia, Sweden and The

Netherlands. Godfray (1986) first reported *Opius filicornis* Thomson, 1875 (Braconidae) from Great Britain, the only known host of which is *P. scotina*.

Additional information

The area in which the mines were present was created as a butterfly border in 1995. Interestingly, there are two varieties of *Salvia* present in the border, *Salvia nemorosa* 'Amethyst', which was planted in the autumn of 2009 and *S. nemorosa* 'May Night' (no known date of planting). Despite these two varieties being adjacent to each other, only *S. nemorosa* 'May Night' was mined.

Acknowledgements

I would like to thank Miloš Černý (Halenkovice, Czech Republic) for taking the time to confirm the determination, Stuart Ogilvy and Alison Pringle at York Museum Gardens for gathering site information and Michael von Tschirnhaus (University of Bielefeld, Germany) for checking his Agromyzidae database and confirming that my photographs of the genitalia exactly agree with his material from Germany.

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The first record of *Tipula (Mediotipula) stigmatella* Schummel (Diptera, Tipulidae) in France

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Summary

The first French record for the rare crane-fly *Tipula stigmatella* Schummel, 1833 is reported here.

Introduction

The type locality for *Tipula stigmatella* Schummel, 1833 lies near Wrocław in Poland and, according to de Jong (1995) the distribution area of *T. stigmatella* extends over most of central Europe, the Caucasus and western Turkey. Theowald (1980) listed the countries where it has been found and saw many examples from Greece. Recently it has been more frequently recorded in eastern Europe, Turkey and Russia, as well as western Europe where the species is known from Italy, Austria, Switzerland, Czech Republic, Germany, Luxembourg and Belgium (Oosterbroek 2017). Dufour (1986) recorded *T. stigmatella* from only two sites in Switzerland; both are steep woodland on thin soil. One site is a clearing in an oak wood, while the other is in a clearing surrounded by hop-hornbeam trees (*Ostrya carpinifolia*). The habitats of larvae and pupae are thought to be in moss cushions. Savchenko (1966, as *T. bidens* Bergroth, 1888 in de Jong 1995) recorded the larval habitat of *T. stigmatella* as under dry moss, especially *Brachythecium velutinum* (Hedwig, 1801).

The location of the French record

The specimen, a male, was captured in alcohol by a Malaise trap set up by Dominique Langlois, the Conservation Officer in the Ravin de Valbois National Nature Reserve [47° 05' 2.84"N 6° 05' 39.51"E, Département Doubs, Commune Cléron] (Réserves Naturelles de France 2014). The fortnightly Malaise trap sample that included this specimen was taken on 2 June 2009, and so the catch represents the period 19 May - 2 June 2009. This was the same large sample from which *Tipula (Pterelachisus) trifascingulata* Theowald, 1980 was recorded (Kramer 2014), but because the sub-samples were separated this specimen was identified at a later date.

The Ravin de Valbois National Nature Reserve is situated quite near to the River Loue, east of Cléron, between Cléron and Chassagne-Saint-Denis, near Ornans, about 25 km south of Besançon (the D101 is the nearest road). The wooded gorge starts at the Château Saint Denis, is 3km long, and lies between 300 and 550m altitude. It forms part of the Loue/Lison Natura 2000 site. There is a waterfall at the eastern end and the stream flows westward into the river Loue. The cliffs are calcareous while the floor of the ravine, where the stream flows, is clay. The reserve is 335ha in extent, with two forested areas - La Forêt de Valbois - left uncut since 1910. Old trees are frequent and there is much dead wood. The ecological details of the site are as follows:

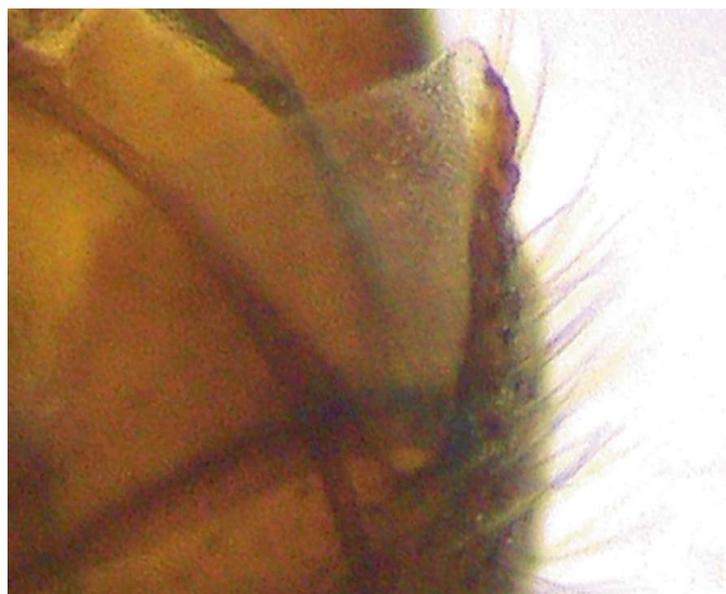
Macro-habitat: Dominant trees, beech (*Fagus sylvatica*) with large-leaved lime (*Tilia platyphyllos*). Corine [land use classification] 41.13. Pedunculate oak (*Quercus robur*) is found by the river at the bottom of the ravine.

Supplementary Habitats: Malaise trap 4 was one of 8 placed in the ravine and was located among beeches, nearer the eastern end in a clearing with *Molinia* and *Carex davalliana*. The steep slope of the ravine causes the trees to fall before reaching their full age. Some of these fall across the stream. Rocks fall from the limestone cliffs into the gorge and both these and the trees are covered in mosses.

Tufaceous Springs: Corine [land use classification] 54.12. **Altitude:** 400 m.

Aspect: On the slope of the ravine, orientated to the north-east.

Geology: Jurassic limestone cliffs, with Oxford and Argovian Marls in the ravine.



Figs 1-4. *Tipula stigmatella*: 1, lateral view of outer and inner claspers (© NHMUK); 2, tergite 9 and dorsal view of inner claspers; 3, ventral view of posterior part of abdomen; 4, sternite 8 to show membrane (photos: author).

Description of the species

The most striking feature is the shape of the inner clasper (style) which is diagnostic. It is strap-shaped, being thin when viewed laterally (Fig. 1) and broader when viewed ventrally (Fig. 3). Distally it is shaped like a bird's head. There is a long projecting beak-like process with a cluster of spines on the top of the 'head' (Figs 1 and 2). Another distinctive feature is a leaf-like extension from the base of the clasper, clearly visible in Fig. 1. Tergite 9 has a short dark central projection with pointed lateral corners (Fig. 2). There is a V-shaped cleft on sternite 8 filled by a translucent membrane (Figs 3 and 4).

Acknowledgements

Thanks to Pjotr Oosterbroek and Herman de Jong for identification and confirmation. I am again grateful to Conservateur Dominique Langlois for erecting the series of traps, for his excellent and detailed recording of the habitat factors, for the sorting of trap material, and his willingness to donate specimens for investigation. Many thanks are due to Phil Withers for organising the investigation of the tipuloid fauna of the Reserve and sending me the Malaise trap crane fly samples.

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***Calliphora uralensis* Villeneuve (Diptera, Calliphoridae) in East Lothian** – A blowfly netted from hogweed *Heracleum sphondylium* on 6 July 2017 in rough ground close to the shore at North Berwick (V.C. 82, NT5685) turned out to be a female of *Calliphora uralensis* Villeneuve (Calliphoridae). I have recently described the distribution of this fly in the north and west of Scotland, where it is not uncommon (Macdonald, M. 2014. Observations of *Calliphora uralensis* Villeneuve (Diptera, Calliphoridae) in Scotland. *Dipterists Digest (Second Series)* **21**, 197-200; Macdonald, M. 2016. Further observations of *Calliphora uralensis* Villeneuve (Diptera, Calliphoridae) in Scotland. *Dipterists Digest (Second Series)* **23**, 215-218). I had been aware of only two localities in southern Scotland. Records from the Isle of May (Firth of Forth, in 1958) and Ailsa Craig (Firth of Clyde, in 1969) are given by L. Davies (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). An earlier (undated) record from Ailsa Craig is cited by J. MacLeod and J. Donnelly (1956. The geographical distribution of blowflies in Great Britain. *Bulletin of Entomological Research* **47**(3), 597-619). Both islands hold seabird colonies. The location at North Berwick is only a few kilometres from the large gannet colony on the Bass Rock and the smaller islands of Fidra and Craigeleith where other seabirds nest. This raises the possibility that there is a distinct population associated with the Forth seabird islands. Vigilance by dipterists in seabird colonies outside the core range of *C. uralensis* in the north and west might determine if there are unexpected outposts for the fly elsewhere – **MURDO MACDONALD**, ‘Tigh nam Beithe’, Strathpeffer, Ross & Cromarty IV14 9ET

Two species of acalypterate Diptera new to France – Among the Diptera collected in an arboretum on the Col de Gratteloup, Var on 23.vii.1995 was a series of male *Periscelis* (Periscelididae), which I placed to one side. They superficially resembled *P. winnertzii* Egger, 1862 but had a yellow scutellum and the second antennal segment was ventrally yellow also. Another specimen from Charnay, Rhône was subsequently captured on 28.vii.1997.

These exact criteria are among those used by J. Roháček and R. Andrade (2017. *Periscelis fugax* sp. nov., an overlooked European species of Periscelididae (Diptera), with notes on the morphology and terminology of terminalia. *Acta Entomologica Musei Nationalis Pragae* **57**(1), 229-251) to separate their new species *P. fugax*. A genitalia preparation of one of the males has confirmed this determination. Whether the true *P. winnertzii* occurs in France now requires confirmation.

I can also record the first French specimens of *Podocera soniae* (Merz & Roháček, 2005) (Stenomicridae), as follows: 1 male, 1 female, marais de Lavours, Ain, Malaise trap, 29.vi.2013. These were identified using B. Merz and J. Roháček (2005. The Western Palaearctic species of *Stenomicra* Coquillett (Diptera, Periscelididae, Stenomicrinae), with description of a new species of the subgenus *Podocera* Czerny. *Revue Suisse de Zoologie* **112**, 519-539). The subgenus *Podocera* was raised to generic rank by J. Roháček (2009. New biological and biogeographical data about two European species of Stenomicridae (Diptera). *Časopis Slezského Zemského Muzea, Opava (A)* **58**, 1-8) and this position was confirmed from a study of the genitalia by J. Roháček (2011. Taxonomy of *Stenomicra cogani*, with description of *S. gracilior* sp. nov. from Turkey and comparative morphology of terminalia in Stenomicridae (Diptera). *Acta Entomologica Musei Nationalis Pragae* **51**(2), 697-722) – **PHIL WITHERS**, 40 Montée du Cimetièrre, Sainte Euphémie, 01600, France

Remarkable records of the carnid genus *Meoneura* Rondani (Diptera, Carnidae) from the collection of the Tel Aviv University (SMNHTAU) with the introduction of one new synonym

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Summary

The previously unidentified Carnidae of the genus *Meoneura* Rondani in the collection of the Tel Aviv University have been investigated. This paper lists all non-Israeli records, with Israeli records provided in a separate publication (Stuke and Freidberg 2017). One new synonym is introduced: *Meoneura hennigi* Gregor, 1971 = *Meoneura inversa* Papp, 1976 (**syn. nov.**). Thirteen species are reported with new species records for Cyprus, Egypt, Ethiopia, Italy, Nevada, Syria, Tanzania, and Turkey.

Introduction

Carnidae is a small family of acalyptrate flies with 115 described species worldwide. These flies are only up to 2mm long and mainly black. Due to the similarity to several other more common Acalyptratae, Carnidae are easily overlooked in samples. Therefore, it is not surprising that the knowledge of this group is poor, and that we are only just beginning to understand the species richness and the distribution of species. Usually only a few specimens are held in entomological collections and therefore it is a rare situation that due to the immense activity of the junior author and his collaborators a large collection of Carnidae was built up in the Tel Aviv University collection. A revision of the genus *Hemeromyia* Coquillett, 1902 is in progress by Freidberg and co-authors, and the records from Israel of the two remaining Palaearctic genera *Meoneura* Rondani, 1856 and *Carnus* Nitzsch, 1818 have recently been published (Stuke and Freidberg 2017). The remaining specimens in the collection belong to the genus *Meoneura* and these records are presented here.

Materials and methods

All specimens are dried and pinned. In a very few specimens the diagnostic structures of the postabdomen could be identified without any preparation. Otherwise the abdomen was dissected, macerated for about four hours in NaOH(aq) solution at room temperature and stored in a microvial in glycerine together with the specimen on the insect pin. Because the specimens are very dry they have been softened before cutting the abdomen by putting them for two to three hours in an air-tight closing box with damp paper. The material is stored in the collection of the Tel Aviv University (SMNHTAU) with duplicates kept in the private collection of Stuke (PJHS). The data are adopted from the labels with as few changes as necessary. Coordinates are only added if these are printed on the labels. The basis for the identification were the keys of Collin (1930), Papp (1978), and Sabrosky (1959). Species not treated by these authors were identified by comparing them with original descriptions. The nomenclature of the species is adopted from Brake (2011).

Results

Meoneura flavifrons Papp, 1981

Material: SWITZERLAND: 1♂, 21.vii.2004, Valais, Visperterminen, GIW-Gebidempass [46°16'N 7°55'E], 1900-2200 m, A. Freidberg, SMNHTAU.

Meoneura freta Collin, 1937

Material: ITALY: 1♂, 26.vii.2005, Fiastra, 400 km E Assisi [43°02'N 13°10'E], 650 m, A. Freidberg, SMNHTAU.

First record for Italy.

Meoneura glaberrima Becker, 1907

Material: TURKEY: 1♂, 12.v.2000, Büyükeceli 50 km sw Silifke, Rt. 400, A. Freidberg, H. Ackerman & L. Friedman, SMNHTAU.

First record for Turkey.

Meoneura helvetica Papp, 1997

Material: SPAIN: 3♂, 4.x.1985, Sierra Nevada, Veleta, 2100 m, A. Freidberg, SMNHTAU, PJHS.

Meoneura hennigi Gregor, 1971

= *inversa* Papp, 1976 (**syn. nov.**)

Material: EGYPT: 2♂, 15.iii.1982, Sinai, Ein Qsaib, I. Yarom, PJHS, SMNHTAU.

First record for Egypt. The two specimens reported here fit completely the original description of *M. hennigi* and the original description of *M. inversa*. There are no differences in the genitalia drawings of Gregor (1971: plate 2, figs 2-3) and Papp (1976: 372, figs 5-6) that cannot be easily explained by different viewing angles. Papp (1976) mentioned the similarity of *M. inversa* with *M. hennigi* but did not point out any character to distinguish these species. *Meoneura inversa* Papp, 1976 is therefore treated as a junior synonym of *Meoneura hennigi* Gregor, 1971 (**syn. nov.**).

Meoneura lacteipennis (Fallén, 1823)

Material: CYPRUS: 3♂, 7.iv.2008, Lefkara, Rt. E105 [34°51.6'N 33°18.6'E], A. Freidberg, SMNHTAU, PJHS; GERMANY: 1♂, 20.v.1998, Brandenburg, Potsdam, Schenkenhorst, on *Anthriscus*, I. Brake, SMNHTAU; EGYPT: 1♂, 12.iii.1982, Sinai, 20 km N Dahab, A. Freidberg, SMNHTAU; TURKEY: 1♂, 7.v.2000, Rt. 300, 60 km NE Konya, 1000 m, A. Freidberg, H. Ackerman & L. Friedman, SMNHTAU.

First records for Cyprus, Egypt, and Turkey.

Meoneura lamellata Collin, 1930

Material: GERMANY: 1♂, 20.v.1995, Niedersachsen, Mellum [MTB 2214.4], dunes with *Larus* colony, I. Brake, SMNHTAU.

Meoneura palaestinensis Hennig, 1937

Material: EGYPT: 1♂, 23.v.1981, Sinai, Dahab, A. Freidberg, SMNHTAU; TANZANIA: 1♂, 8.-16.ix.1992, Same, Rt. B1, A. Freidberg, SMNHTAU.

First records for Egypt and Tanzania.

***Meoneura pappi* Stuke, 2015**

Material: SWITZERLAND: 1♂, 21.vii.2004, Valais, Visperterminen, GIW-Gebidempass [46°16'N 7°55'E], 1900-2200 m, A. Freidberg, SMNHTAU.

***Meoneura pohlae* Stuke, 2016**

Material: SYRIA: 2♂, 1.xii.1973, Qnaitra, A. Freidberg, SMNHTAU, PJHS.

The specimens fit perfectly the holotype that is at hand, although the surstylus of the Syrian specimens is slightly more elongated and anteriorly less rounded. *Meoneura pohlae* has been previously recorded only from the type locality in the Italian alps.

***Meoneura polita* Sabrosky, 1959**

Material: USA: 1♂, 23.ix.1980, Nevada, Mesquite, A. Freidberg, SMNHTAU.

First record for Nevada.

***Meoneura prima* (Becker, 1903)**

Material: ETHIOPIA: 1♂, 21.iv.2013, Chancho, 40 km N Addis Ababa [9°21'N 38°47'E], 2550 m, A. Freidberg, SMNHTAU; TURKEY: 1♂, 6.v.2000, 45 km S Eğirdir, 800 m, A. Freidberg & H. Ackerman, SMNHTAU.

First records for Ethiopia and Turkey.

***Meoneura triangularis* Collin, 1930**

Material: SYRIA: 3♂, 25.x.1973, Beit Djan, A. Freidberg, PJHS, SMNHTAU.

First record for Syria.

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Rearing of *Tephrochlamys flavipes* (Zetterstedt) (Diptera, Heleomyzidae) from fungi in Britain

– As part of a wider investigation of terrestrial invertebrates in the medieval ancient pasture oak woodland, Hamilton High Parks SSSI (NGR: NS7353), a fallen beefsteak fungus, *Fistulina hepatica* was bagged and brought off site on 1 December 2016. As it was both wet from rain and senescent the fruiting body quickly liquefied and a mass of brachyceran larvae became evident. From 16 February 2017, adult flies began to emerge which proved to be *Tephrochlamys flavipes* (Zetterstedt, 1838). In addition to this event one of us (KNA) has unpublished records of this fly reared from *Fistulina* including Melbury Park, Dorset (ST5705), 20 November 2008 and 11 August 2009; Donington Park, Leicestershire (SK4126), 11 November 2009; Shorne Woods, Kent (TQ6870), 27 September 2011; Piper's Hill Common, Worcestershire (SO9565), 10 October 2007 and also from Hamilton High Parks on 15 August 2010. A record of *T. flavipes* reared from a different bracket fungus, *Polyporus squamosus* was obtained also at Melbury Park in 2008. DH reared *T. flavipes* from a single puparium from a large bracket fungus that had fallen from an ash tree at Hermitage of Braid, Edinburgh (NT2570), 7 May 1995 (adult emerged 13 May 1995) but this record is less convincing as larvae were not seen.

Records for *T. flavipes* associated with fungi exist in the literature but not from Britain. It was reared by W. Hackman and M. Meinander (1979. Diptera feeding as larvae on macrofungi in Finland. *Annales Zoologica Fennici* **16**, 50-83) and E. Séguy (1934. Diptères (Brachycères) (Muscidae Acalypterae et Scathophagidae). *Faune de France* **28**, 1-832). In a wide-ranging study of flies in fungi in Britain, P.A. Buxton (1960. British Diptera associated with fungi. III. Flies of all families reared from about 150 species of fungi. *Entomologist's monthly Magazine* **96**, 61-94) obtained only *Tephrochlamys tarsalis* (Zetterstedt) and *T. rufiventris* (Meigen). *Tephrochlamys tarsalis* was also reared by I. Eisfelder (1956. Die häufigsten Pilzbewohner. *Zeitschrift für Pilzkunde* **22**(4), 108-117) from macrofungi in Germany and by J. Roháček and J. Ševčík (2013. Diptera associated with sporocarps of *Meripilus giganteus* in an urban habitat. *Central European Journal of Biology* **8**(2), 143-167) from *Meripilus giganteus* in the Czech Republic. *Tephrochlamys rufiventris* was reared from fungi by A. Dely-Draskovits and M. Babos (1993. Flies (Diptera) in macrofungi species in Hungary. *Folia Entomologica Hungarica* **27**, 29-41).

Other substrates from which *T. flavipes* has been reared show it to be commonly found in birds' nests. The E.B. Basden Collection in the National Museums of Scotland contains many specimens from a range of birds' nests. Basden published little of his own data but J.E. Collin (1943. The British species of Helomyzidae (Diptera). *Entomologist's monthly Magazine* **79**, 234-251) refers to *T. flavipes* reared from old birds' nests, which is based on Basden's work. All Basden's data are given in G.E. Rotheray (1991. E.B. Basden's collection of Diptera from bird and mammal runs, burrows and droppings. *National Museums of Scotland Information Series No 3*, 1-46). E. Hicks (1959. *Check-list and bibliography on the occurrence of insects in birds' nests*. The Iowa State College Press. 681pp) cited other references to rearing of *T. flavipes* from birds' nests. P. Skidmore (2010. Dung. In Chandler, P.J. (Ed.) *A Dipterist's Handbook* 2nd Edition. *The Amateur Entomologist* **15**, 157-165) has it from rodent dung, probably based on W. Hackman (1963. Studies on the dipterous fauna in burrows of voles (*Microtus*, *Clethrionomys*) in Finland. *Acta Zoologica Fennica* **102**, 1-64), who reared *T. flavipes* from mouse droppings. There are references in the literature to *T. flavipes* attracted to carrion but we have yet to track down a definite rearing record from carrion – **E. GEOFFREY HANCOCK**, Hunterian Museum, University of Glasgow, Glasgow, G12 8QQ, **DAVID HORSFIELD**, National Museums Collection Centre, 242 West Granton Road, Edinburgh, EH5 1JA and **KEITH N.A. ALEXANDER**, 59 Sweetbrier Lane, Heavitree, Exeter, EX1 3AQ

Colour dimorphism in the hoverfly *Microdon myrmicae* Schönrogge *et al.* (Diptera, Syrphidae)

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Summary

Colour dimorphism in *Microdon myrmicae* Schönrogge *et al.*, 2002 is described, based on individuals emerging from puparia collected from sites in Devon, south-west England. Individuals can either be predominantly gold (orange or reddish-brown) haired or silver (white or pale grey) haired. This holds true for both males and females. However, while more males are silver than gold, the reverse is true for females, suggesting complex genetic factors. Mating was observed in the field of all four possible colour and sex combinations. Proportions may differ between populations. Similar hair colour dimorphism has been recorded in Nearctic *Microdon* species and is likely to occur in other European species, in particular *M. mutabilis* (Linnaeus, 1758). The colour morphs of *M. myrmicae* reflect colour variations in solitary bee species of the genus *Andrena* found in the same habitat and which the flies appear to mimic. In both *Andrena* species and *M. myrmicae* ‘gold’ hairs fade as individuals age, especially males.

Introduction

Colour dimorphism or polymorphism is well known in the adults of a number of British hoverflies. Examples include *Criorhina berberina* (Fabricius, 1805), *C. ranunculi* (Panzer, 1804), *Merodon equestris* (Fabricius, 1794) and *Volucella bombylans* (Linnaeus, 1758), all of which are bumblebee (*Bombus* spp.) mimics. It has not, however, apparently been described previously in any British *Microdon* species including *M. myrmicae* Schönrogge *et al.*, 2002, the subject of this paper. The description of adult *M. myrmicae* as a new species (Schönrogge *et al.* 2002) focussed on morphometric rather than colour differences from its cryptic sibling species *Microdon mutabilis* (Linnaeus, 1758). These two *Microdon* species are also apparently bee mimics as adults, most closely resembling solitary bees such as *Andrena* species.

Table 1. Details of sites from which puparia collected.

Site	National Grid Reference	Number of puparia collected	Host ant species
Lower Prewley Moor, Sourton, Dartmoor	SX540910	25	<i>Myrmica scabrinodis</i> Nylander, 1846 and <i>Myrmica ruginodis</i> Nylander, 1846
Coombe Farm, Highampton, West Devon	SS496025	18	<i>Myrmica scabrinodis</i>
Waterpark Plantation, Halsdon Wood, Torridge	SS552130	2	<i>Myrmica scabrinodis</i>
Langaford Farm, Chagford, Dartmoor	SX701847	3	<i>Myrmica scabrinodis</i>
Whiddon Deer Park, Drewsteignton, Dartmoor	SX724891	2	<i>Myrmica scabrinodis</i>

Methods

Puparia were collected from *Myrmica* ant nests in Devon, south-west England, in April and May 2017. Ants from a sample of nests at each site with *Microdon* present were also collected, to check the identity of the host species. See Table 1 for details. Puparia were placed in pots at room temperature, and the colour forms of adults emerging in May and June 2017 recorded.



Fig. 1. Silver male and gold female *M. myrmicae* mating. Locks Park Farm, Hatherleigh, Devon, June 2009.

Results

A total of 50 puparia were collected. 43 adults emerged from these. In line with observations of individuals seen in the field in Devon in previous years (Wolton 2011, 2012), these exhibited two clear colour morphs (Fig. 1). One has all hairs gold, orange or reddish-brown (depending on the light source and angle of view). This is called here the gold morph. The other, the silver morph, has all hairs white or pale grey except for the top of the thorax (scutum and scutellum), the posterior two thirds of the frons (the colour change occurring at a distinct parting in hair direction) and the ventral surface of the tarsi. In these places the hairs are gold, orange or reddish-brown as in the gold morph. In the silver morph the face hairs are frequently tinged yellow as are those on sternites 4 and 5 and on the dorsal surface of the tarsi. Integument (ground) colour is independent of hair colour and rather constant. Only the integument of the scutellum varies - normally it is a clear orange but in some individuals it verges on black regardless of colour morph or sex. Observations of individuals kept in captivity and wild ones marked as part of a previous study (Wolton 2012) show that the hairs fade as the fly ages. This is particularly evident for silver males where the hairs on the top of the male thorax can lose their gold colour and become almost white.

Table 2 gives the numbers of each colour morph by sex and site. Across the whole sample, the sex ratio was 19 males to 24 females, and the colour ratio was 21 gold to 22 silver. However, this apparent parity in colour frequency between the sexes hides significant differences. Nearly

three times as many silver males emerged as gold males. This would be expected according to Mendelian genetic principles if a single gene locus is involved and the silver allele dominant (Chi square test $p=0.89$). In contrast though, twice as many gold females emerged as silver females, a figure not significantly different from the classic Mendelian 1:3 ratio (Chi square test $p=0.34$), but with gold as the dominant allele.

Table 2. Numbers of each colour morph emerging from puparia.

Site	Numbers of adults emerging from puparia				
	Gold males	Silver males	Gold females	Silver females	Total
Lower Prewley Moor	1	9	8	3	21
Coombe Farm	4	3	6	3	16
Other sites combined	0	2	2	2	6
All sites	5	14	16	8	43

Comparing the results from the two main collecting sites Lower Prewley Moor and Coombe Farm, significantly fewer gold males were found at Lower Prewley Moor than expected (Fisher's exact test $p>0.05$).

All possible combinations of mating pairs have been observed in the field: gold male with gold female (Figure 2); gold male with silver female; silver male with silver female and silver male with gold female (Fig. 1).

Puparia collected from Lower Prewley Moor were consistent with regard to the shape of the anterior spiracular projections and surface reticulations despite two host ant species being present.



Fig. 2. Gold male and gold female *M. myrmicae* mating. Locks Park Farm, Hatherleigh, Devon, June 2009.

Discussion

The results confirm that two readily distinguished colour morphs occur in both male and female adult *M. myrmicae* on emergence from puparia. Similar dimorphism has been found in several North American *Microdon* species. Akre (1973) noted that *M. cothurnatus* Bigot, 1883 has both orange and yellow forms: 96 out of 375 emergent adults were orange, 55 of these being female. Akre reports that Wheeler (1908) mentioned a variety of *M. tristis* Loew, 1864 having a rich orange-red pile instead of characteristic yellow or silver, suggesting that this is another species that has more than one colour morph. Thompson (1981) described six colour morphs in *M. lanceolatus* Adams, 1903, hair colour ranging from entirely yellow through yellow and black to entirely black. Distinct colour polymorphism, affecting both integument and hair colour, occurs in a few oriental and neotropical Microdontinae (Menno Reemer *pers. comm.*, unpublished).

Colour dimorphism may also occur in *M. mutabilis*, *M. myrmicae*'s sibling species. Of the four *M. mutabilis* specimens held by The Natural History Museum (London) positively identified (by K. Schönrogge) as belonging to this species, three are females with silvery white abdominal hairs dorsally, becoming pale yellowish-white laterally and one a male with the hairs being pale yellow dorsally, becoming richer golden-yellow laterally. Six further specimens in this collection are probably *M. mutabilis* since they were reared from the nests of *Formica* ant species. Five of these were reared by H. Donisthorpe from Porlock in Somerset: two are females with the dorsal abdominal hairs yellowish-white, and three are males with the abdominal hairs yellow, ranging from pale yellow in the palest specimen to a richer and more golden-yellow, especially laterally, in the most intensely coloured one. The other specimen is a male from Grassington in Yorkshire, which is silver-white haired on the abdomen (Nigel Wyatt *pers. comm.*). A series of freshly-emerged specimens needs to be examined to clarify whether or not colour dimorphism exists in *M. mutabilis*.

This study indicates that in *M. myrmicae* colour is sex-linked. However the underlying genetic mechanism must be complex since both colours are found in each sex, with silver predominating in males and gold in females. It may be surmised that gold is the dominant allele, coding for a pigment, while silver is the default recessive state. The fact that gold hairs, whether on males or females, fade with time supports this contention. In males, the Y chromosome may perhaps have an independent modifier locus that can dominantly cause the silver phenotype by suppressing gold production. Further research is required. Captive breeding experiments crossing different phenotypes and using laboratory ant nests, if feasible, would be instructive.

Environmental influences as opposed to genetic factors typically result in a gradation in phenotypes, not in distinct forms, so is unlikely to be a major factor in the dimorphism observed in *M. myrmicae*. In *Episyrphus balteatus* (De Geer, 1776) longer pupal development caused by low temperature results in phenotypically darker adults (Marriott and Holloway 1998). On the other hand, in *Merodon equestris* and *Volucella bombylans*, both species with discrete colour patterns, genetic factors alone are sufficient to explain satisfactorily the polymorphism observed (Conn 1972, Keeler 1926). In *Eristalis tenax* (Linnaeus, 1758) both genetic and environmental factors influence the varied colour patterns of the abdominal integument that show many intermediate forms (Heal 1979). It is possible that in *Microdon* there is a similar interplay of environmental and genetic factors but the lack of obvious intermediates argues against this. The possible influence on adult hair colour of temperature during the pupal stage could readily be investigated.

The low number of gold males at Prewley Moor in comparison to Coombe Farm, these being the two sites from which most of the puparia were collected, suggests that there may be differences in the frequencies of colour morphs between populations. Further samples are required to confirm this.

The consistency of puparium morphology at Lower Prewley Moor where two host ant species were present suggests that only one *Microdon* species is involved, *M. myrmicae*, and that the presence of more than one ant host did not account for the differences in morph ratios between this site and Coombe Farm.

Microdon myrmicae appears to mimic solitary bees, resembling most closely the genus *Andrena*, members of which are frequent within the habitats used by the hoverfly. While most British *Andrena* species have predominantly brown or orange hair when fresh, particularly on the thorax, some have grey or silver hair. Perhaps *M. myrmicae* has evolved to mimic *Andrena* bees in general rather than specific species? Male *Andrena* are often paler than the females, but since they are harmless it seems improbable that the silver morph predominates in male *M. myrmicae* on this account. Hair colour in *Andrena* species fades with age, especially in males, just as with *M. myrmicae*.

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Discovery of another *Parasyrphus nigratarsis* (Zetterstedt) (Diptera, Syrphidae) colony in North Yorkshire – *Parasyrphus nigratarsis* (Zetterstedt, 1843) is a Nationally Scarce hoverfly (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). It is mainly a northern and western species that is widely distributed across Scotland, Cumbria and Wales, but is also reported from East Anglia, South Hampshire and Cornwall (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).

Records exist for *P. nigratarsis* from the Farndale area of North Yorkshire, which lies 5 km north of Kirkbymoorside in the North York Moors National Park: V.C. **62**: Harland Beck or Gillamoor, SE6891, 23.v.1992, S.J. Falk; 14 larvae collected by David Robertson and Graham Rotheray on 18.vi.1992 from foliage of *Alnus glutinosa* on bank of River Dove at Farndale Nature Reserve, near Gillamoor, 4 males and 4 females emerged 25.5-5.vi.1993 (Rotheray, G.E. 1997. Larval stages of the predatory hoverflies *Trichopsomyia flavitarsis* (Meigen), *Platycheirus melanopsis* (Loew) and *Parasyrphus nigratarsis* (Zetterstedt) (Diptera, Syrphidae). *Entomologist's Gazette* **48**, 127-134).

The larvae of *Parasyrphus nigratarsis* feed on the eggs and larvae of chrysomelid beetles *Chrysomela aenea* (Linnaeus, 1758) on alder *Alnus glutinosa* and *Lochmaea capraea* (Linnaeus, 1758) on willows (*Salix* spp). It was also discovered to feed on the eggs and larvae of *Gastrophysa viridula* (De Geer, 1775) on dock *Rumex* spp (Rotheray, G.E. and Hewitt, S.M. 1999. Northern records of *Parasyrphus nigratarsis* (Zetterstedt) (Syrphidae). *Dipterists Digest (Second Series)* **6**, 107-111).

It was noted, while exploring the River Rye near Helmsley, North Yorkshire, that this habitat looked very similar to that along the River Dove in Farndale, which lies just 10 km north-east. On 18 May 2017, a search was made for *P. nigratarsis* along a meander of the River Rye 2km south-east of Helmsley, SE627825. The search initially concentrated on alder, because of the Farndale records, but no chrysomelid beetles were located. Attention was diverted to dock *Rumex obtusifolius* (Fig. 1), and single and *in copula* pairs of *G. viridula* (Fig. 2) were located, along with their orange egg clusters, on the underside of the dock leaves.



Figs 1-2. 1, Swathes of *Rumex* by the River Rye, Helmsley; 2, *Gastrophysa viridula* in copula, 18 May.

While searching under one dock leaf after another, it became apparent that a hoverfly was also undertaking the same search pattern – hovering around the clumps of dock and disappearing under a leaf for a few seconds before moving on to the next. This behaviour, coupled with the broad, dark-orange stripes on the abdomen, suggested that this was *P. nigratarsis*. Three individuals were located and one, a female (Fig. 3), taken. The identity of the specimen was further determined using the key in British Hoverflies (Stubbs, A.E. and Falk, S.J. 2002. *British Hoverflies, an illustrated identification guide*. British Entomological and Natural History Society) and by Roger Morris (*pers. comm.*).



Fig. 3. *Parasyrphus nigratarsis* female, 18 May.

Further searching on 18 May revealed a few pale yellow eggs overlaid on a cluster of orange beetle eggs (Fig. 4), likely to be the eggs of *P. nigratarsis*. On 22 May, a further two beetle egg clusters with pale eggs overlaid were located. No further adults were seen.



Fig. 4. *G. viridula* eggs (orange) overlaid by pale yellow eggs, likely to be eggs of *Parasyrphus nigratarsis*, 18 May.

On 1 June, the site was revisited and additional beetle egg clusters overlaid with pale eggs were located. Three small hoverfly larvae were also found – one in association with a beetle egg cluster and two in association with newly hatched beetle larvae (Figs 5-6). No adults were seen. The larvae were confirmed as *P. nigritarsis* by Geoff Wilkinson (*pers. comm.*).



5.



6.

Figs 5-6. 5, *Parasyrphus nigritarsis* larva in association with *Gastrophysa viridula* eggs, 1 June; 6, two *P. nigritarsis* larvae in association with *G. viridula* larvae, 1 June.

A number of *Rumex* plants in a wide variety of other locations in Yorkshire were examined. Although large numbers of beetle eggs and larvae were found in many of these sites, no *P. nigratarsis* larvae or adults were located, suggesting that this species is genuinely scarce, rather than just overlooked.

On 7 June, the River Rye flooded and broke its banks, flooding the access path to the *P. nigratarsis* colony, making it too treacherous to visit. By 9 June, the floodwaters had subsided (Fig. 7) and the site was accessible again. The water had spilled over the riverbank, leaving mud coating the lower leaves of the dock. Any eggs or larvae on lower leaves would have likely perished; however, searching of the upper dock leaves revealed plenty of beetles *in copula* and fresh clusters of beetle eggs, several of which had overlaid paler eggs, and one larva was located feeding on beetle eggs (Fig. 8). The larva was considerably larger than those found on 1 June. It was noted that the beetle larvae were apparently now dispersed, making it harder for an observer to locate them; presumably once the hoverfly eggs have hatched, the *P. nigratarsis* larvae also have to disperse with them.



Fig. 7. Receding floodwaters on the River Rye, leaving mud on the lower leaves of the *Rumex*.



Fig. 8. Growing *Parasyrphus nigratarsis* larva in association with *Gastrophysa viridula* eggs, 9 June.

On 19 June, a visit to the colony produced no sightings of *P. nigritarsis* larvae or adults and only one remaining cluster of beetle eggs. The dock had grown to cover a large area, so it would be likely that the beetle and hoverfly larvae were more thinly dispersed, and that the larvae had begun to go into diapause in leaf litter on the ground or concealed in tightly rolled leaf edges (Geoff Wilkinson *pers. comm.*). Subsequent visits also failed to produce further signs of *P. nigritarsis* larvae.

Only a very small amount of *G. viridula* larval feeding damage was observed to the *Rumex* leaves, compared, for example, at Wheldrake Ings on 27 May 2017 (Fig. 9) where *P. nigritarsis* was searched for but not located. It is interesting to speculate how *P. nigritarsis* might affect beetle populations in a local situation, bearing in mind the difference in feeding damage to the leaves in sites with and without predatory hoverfly larvae.



Fig. 9. Intense *Gastrophysa viridula* larva feeding damage to *Rumex* leaves at Wheldrake Ings, where *Parasyrphus nigritarsis* was not located.

As a point of conservation for *P. nigritarsis*, as well as having to contend with flood events, it was noted that neighbouring landowners were spraying out clumps of *Rumex* in their fields.

Thanks to Bedfordshire Hoverfly Recorder John O’Sullivan, and Ian Andrews, for their comments on a draft of this article – **JOAN CHILDS**, Ridgewood, 39 Deepdale Avenue, Scarborough, North Yorkshire YO11 2UF; waterpipit@live.co.uk

Strongylophthalmyiidae, a family new to the fauna of the Netherlands (Diptera, Acalyptrata)

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Summary

Strongylophthalmyia ustulata (Zetterstedt, 1847) is recorded as new to the Netherlands. Its biology and behaviour are discussed.

Introduction

For several years I have been studying the smaller families of acalyptrate Diptera in the Netherlands, those being families with fewer than fifty species known to occur in North-Western Europe. I have been especially on the lookout for species and families found in surrounding countries, but hitherto unknown from the Netherlands. Here I can report the finding of the family Strongylophthalmyiidae with the species *Strongylophthalmyia ustulata* (Zetterstedt, 1847) (Fig. 1) as new for the fauna of the Netherlands. The first time the species came to my attention was when looking through photographs on the website *waarneming.nl* of unidentified flies. Sandra Lamberts had photographed a specimen in the Dutch dunes, an atypical habitat according to the literature.



Fig. 1. *Strongylophthalmyia ustulata* female, collected on 10 August 2017 in Noord-Hollands Duinreservaat, Terrein Bakkum, leg. E. de Bree, coll. G. Pennards (Photo: S. Bot).

Identification

On first sight, in the field, the species resembles a member of the family Micropezidae. Standing high on its legs and the way it moves are reminiscent of this family. Also, the ovipositor of the female *S. ustulata* is bulbous when alive, reminiscent of the ovipositor of Micropezidae. However, on closer examination of collected specimens one might mistake it for a member of the family Psilidae. The species is included in the only Dutch key to Psilidae (Van der Goot and Van Veen 1996b).

Diagnostic characteristics of the European species of the family are: postocellar bristles converging; two pairs of fronto-orbital bristles; interfrontal and vibrissal bristles absent; wing with subcostal break and vein Sc incomplete, crossvein BM-Cu present and cell cup closed; tibiae without dorsal pre-apical bristles.

Larvae are described by Mamaev *et al.* (1977) and the puparium is described by Rotheray and Robertson (1998). Unfortunately the larva is not included in the key of Smith (1989) despite it had been found in Britain in 1981 (Cole 1981) and its larva had already been described by Mamaev *et al.* (1977).

The photograph of the pinned specimen in Fig. 1 is in one regard somewhat misleading. The ovipositor's sixth abdominal segment is constricted anteriorly and bulging posteriorly when alive. For a photograph see Roháček (2016, fig. 4). When reading Cole (1981) it is clear that he never saw living flies. His comment "The female abdomen tapers to an unspecialised and relatively unchitinised ovipositor" clearly refers to pinned specimens.

Records of *Strongylophthalmyia ustulata* (Zetterstedt, 1847) in the Netherlands

Noord-Holland:

22-7-2017: 1♀, Noord Hollands-Duinreservaat, Terrein Bakkum, S. Lamberts (photo)

28-7-2017: 3♀, Noord Hollands-Duinreservaat, Terrein Bakkum, S. Lamberts & A. Wijker (photo)

2-8-2017: 1♀, Noord Hollands-Duinreservaat, Terrein Bakkum, A. Wijker (photo)

9-8-2017: 1♀, Noord-Hollands Duinreservaat, Vogelwater, A. Wijker; 12♀, Noord Hollands-Duinreservaat, Terrein Bakkum, S. Lamberts & A. Wijker (observed); 1♀, Noord Hollands-Duinreservaat, Terrein Bakkum, S. Lamberts (collected)

10-8-2017: 2♀, Noord-Hollands Duinreservaat, Terrein Bakkum, E. de Bree (in alcohol) col. E. de Bree; 1♀, Noord-Hollands Duinreservaat, Terrein Bakkum (pinned) col. G. Pennards; 11♀, Noord-Hollands Duinreservaat, Terrein Bakkum, E. de Bree (observed)

13-8-2017: 7♀, Noord Hollands-Duinreservaat, Terrein Bakkum, A. Wijker (observed)

16-8-2017: 7♀, Noord-Hollands Duinreservaat, Terrein Bergen Zuid, A. Wijker (photo)

4-9-2017: 1♀, Noord-Hollands Duinreservaat, Terrein Egmond, A. Wijker (observed)

Zuid-Holland:

16-8-2017: 1♀, Goeree-Overflakkee, Voornes duin (in alcohol) col. E. de Bree; 2♀, Goeree-Overflakkee, Voornes duin, E. de Bree (observed)

Habitat

Remarkably, in the Netherlands the species has only been found in dunes, not elsewhere despite searches in apparently suitable habitat. For an impression of the Dutch habitat see Fig. 2. In both 2015 and 2016, the author undertook excursions into the elevated and southern parts of the province of Limburg. Searches, for example on fallen (both older and recently fallen) logs of Canadian poplar (*Populus x canadensis*) and American poplar (*Populus deltoides*) in streams of the Geul and small rivulets in the forests of Bunde and Vijlen, turned out to be fruitless. The habitats searched match the descriptions given by Palaczyk *et al.* (2013). However, aspen

(*Populus tremula*) is very rarely found as a large tree in the Netherlands. In all searched habitats aspen logs were absent.



Fig. 2. Site in Noord-Hollands Duinreservaat, Terrein Bakkum where *Strongylophthalmyia ustulata* was recorded (Photo: E. de Bree).

Often the species is reported as occurring at higher elevations, e.g. Merz (1997) and Roháček (2011). It is then interesting to note the two dots on the distribution map in Palaczyk *et al.* (2013) at the Polish coast. The authors, however, make no mention of these apparently aberrant sightings. Dutch specimens have been caught in the dunes and also Roháček (2016) reported it from lowland situations. This indicates that the species is not restricted to the more elevated parts of Europe and could be more widespread.

Biology

Most Dutch specimens of *Strongylophthalmyia ustulata* have been found on trunks of abele (= white poplar, *Populus alba*) and grey poplar (*Populus x canescens*), not aspen (*Populus tremula*) as reported by most authors e.g. Palaczyk *et al.* (2013) and Roháček (2011). There are reports from oak (*Quercus*) and hazel (*Corylus*) in Sweden (Cole 1981); however, most records seem to be from poplars (*Populus* spp). Merz (1997) mentioned that the species has been reared from 'Eschen' sensu Krivosheina 1981. This translates to ash (*Fraxinus* sp.). As both Palaczyk *et al.* (2013) and Roháček (2016) cite the same source but mention aspen (*Populus* sp.) as the host; this must be a translation error on Merz's part.

Rotheray and Robertson (1998) found puparia under the bark of aspen (*Populus tremula*). This seems to be the only definitive host tree species. Most likely in the Netherlands, *S. ustulata* develops in abele (*Populus alba*) and grey poplar (*Populus x canescens*). Successful oviposition has been observed on trunks of grey poplar (*Populus x canescens*). Also aspen is very rare in the Dutch dunes and not found in the vicinity of the observed individuals of *Strongylophthalmyia*. It seems that other poplar (*Populus* sp.) tree species are not suitable. Searches of the author on Canadian poplar (*Populus x canadensis*) in both the dunes where *S. ustulata* was found and in the Limburg in apparently suitable habitat yielded no *S. ustulata* specimens. The paper reporting *Homalocephala biumbrata* (Wahlberg, 1838) new for the fauna of the Netherlands describes an apparently suitable habitat for *S. ustulata* in Ballastbos, Lauwersmeer (Smit *et al.* 2015). Since *H. biumbrata* is an accompanying species, one might expect it to be found there as well. The logs there were of Ontario poplar (*Populus balsamifera*). All logs where *Strongylophthalmyia* was observed in the Netherlands had recently fallen, at least not more than five years ago.

The common feature between aspen (*Populus tremula*), abele (*Populus alba*) and grey poplar (*Populus x canescens*) is the structure of the bark, being a smooth bark with occasional crevices. All other poplar (*Populus*) species in the Netherlands have rough bark without any smooth surfaces. Actually, grey poplar is a hybrid of abele and aspen.

Only females of *S. ustulata* were observed in the Netherlands. The flight period as given by Palaczyk *et al.* (2013) is from mid-June to the end of August. However, a specimen in Switzerland was found as late as October (Merz 1997). As the first Dutch observation is from late July, males may be gone by that time.

Curiously, both Palaczyk *et al.* (2013) and Roháček (2016) mentioned that they found most specimens of *S. ustulata* on leaves instead of trunks. In the Netherlands most were observed on trunks rather than walking on leaves. This may be due to different behaviour throughout the season or a bias by only females having been observed.

Behaviour

Strongylophthalmyia ustulata was observed walking on leaves of broad-leaved trees and on trunks of abele and grey poplar. On leaves they walked nervously back and forth.

In the Noord Hollands Duinreservaat Bakkum, the author spent several hours observing the behaviour of *S. ustulata*. Here follows a description of those observations. On trunks, the flies walked carefully, performing occasional wing-waving. The way of walking and wing-waving is akin to Clusiidae, which share similar life habits. When other individuals of *Strongylophthalmyia* came closer they were chased by one of them running quickly to the other. Also, individuals of other species like *Palloptera muliebris* (Harris, 1780) (Pallopteridae) and *Clusiodes albimanus* (Meigen, 1830) (Clusiidae) were chased away by *S. ustulata* females. After landing on a trunk, a *Strongylophthalmyia* would at first walk nervously and fast across the trunk. Within thirty seconds, they would move more calmly. The flies would walk for five centimetres in one direction, occasionally halting. Then, moving further at an oblique angle, after thirty to forty centimetres a much sharper angle was chosen, often reversing the direction of travel. Single

individuals would stay at one side of the trunk in an area of roughly forty by thirty centimetres and patrol it in the way described.

Females would abruptly stop during walking and at the same time move their head downwards and use their proboscis to touch apparently suitable places for oviposition. Only a small number of the places examined were used for oviposition. After examining the spot for several seconds the ovipositor was bent downwards and then extended, then carefully moved into a crevice in the bark. Successful oviposition was observed once and lasted less than a minute.

Accompanying species

On trunks of abele (*Populus alba*) where *Strongylophthalmyia ustulata* was found, there were a number of other xylophagous species of Diptera present. The following species were observed: *Megamerina dolium* (Fabricius, 1805) (Megamerinidae), *Clusiodes albimanus* (Meigen, 1830) (Clusiidae), *Lonchaea fugax* (Becker, 1895) (Lonchaeidae), *Peplomyza litura* (Meigen, 1826) (Lauxaniidae), *Palloptera muliebris* (Harris, 1780) (Pallopteridae), *Homalocephala biumbrata* (Wahlberg, 1838) (Ulidiidae) and *Neopachygaster meromelas* (Dufour, 1841) (Stratiomyidae). Of all the above-mentioned species, at least one female was seen ovipositing on the bark of trunks where *S. ustulata* was present at the same time.

Interestingly, Roháček (2011) described a nearly similar fauna occurring on an aspen log (*Populus tremula*) in the Czech Republic. Also, Barber (2006) reported the similar families of Diptera occurring on aspen (*Populus tremuloides*) logs in Canada and the United States, e.g. Clusiidae, Lonchaeidae and Otitidae (= Ulidiidae).

Both Barber (2006) and Evenhuis (2016) noted a possible association of Strongylophthalmyiidae with wood-boring beetles. As I was not aware of this in the field, no beetles were collected; those observed were species of Scolytidae (or Scolytinae as subfamily of Curculionidae) and Anobiidae, as well as *Bitoma crenata* (Fabricius, 1775) (Colydiidae or Zopheridae depending on the author).

Distribution and discussion

Strongylophthalmyia ustulata is known to occur in most of the countries surrounding the Netherlands. Records in Europe are known from Andorra, Austria, Estonia, Finland, Germany, Great Britain, Hungary, Latvia, Norway, Poland, Romania, Russia, Slovakia, Sweden, Switzerland and Ukraine. Outside Europe it is also known from Japan and North Korea (Palaczyk *et al.* 2013).

Although *S. ustulata* is reported in the literature as much overlooked, it seems likely that it is a recent arrival to the fauna of the Netherlands. Van der Goot and van Veen (1996a) reported on the occurrence of *Megamerina dolium* in the Netherlands. There are specimens caught by Van der Goot himself in the national collection of Naturalis from the dunes in Castricum. Also Van der Goot and van Veen (1996b) included the genus *Strongylophthalmyia* in their key to Dutch Psilidae. Moreover, when examining the Micropezidae material in the national collection at Leiden, it was noted that many specimens of this family were collected in the Dutch dunes. Micropezidae behave much like Strongylophthalmyiidae, as both walk on leaves and both families look alike as mentioned earlier. During the eighties and nineties of the last century, there were Dutch dipterists collecting in the dunes in the suitable habitat for *Strongylophthalmyia*, and with the ability to recognise it, yet unable to do so. This leads me to assume that *S. ustulata* is a recent arrival in the dunes of the Netherlands. Moreover, looking at the accompanying Diptera fauna, many of those species and families have been studied in the Netherlands without once finding a specimen of *Strongylophthalmyia*. Some accompanying species are even recent arrivals such as *Homalocephala biumbrata* (Smit *et al.* 2015)

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First record of *Empis (Euempis) tessellata* (Fabricius) as a pollinator of *Dactylorhiza maculata* (Asparagales, Orchidaceae) in Britain

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Summary

During a survey of *Dactylorhiza maculata* at Cors Y Llyn National Nature Reserve in Radnorshire, mid-Wales a male empid fly *Empis (Euempis) tessellata* (Fabricius, 1794) was recorded as a pollinator of *D. maculata*. This is the first record of *Empis (Euempis) tessellata* as a pollinator of *D. maculata* in Britain

Introduction

Cors Y Llyn ('the bog of the lake') National Nature Reserve (NNR) is situated in Radnorshire, mid-Wales and is c. 61.7 acres in size. It comprises a nationally important example of an acidic basin mire and its floating raft of vegetation (schwingmoor) is one of the best examples of this habitat in the British Isles (Stevens *et al.* 1999). The marginal lagg zone around the basins comprises woodland. At the northern end of the reserve is a small meadow of unimproved wet pasture with a mosaic of damp hollows.

A variety of plants have been recorded in the meadow including Asteraceae: *Cirsium dissectum*, *C. palustre*, *Hypochaeris radicata*; Brassicaceae: *Cardamine pratensis*; Cyperaceae: *Carex echinata*; *C. leporina*, *C. panicea*; Fabaceae: *Genista anglica*, *G. tinctoria*, *Lathyrus linifolius*, *Lotus corniculatus*, *Trifolium pratense*, *T. repens*; Fagaceae: *Quercus* sp.; Lamiaceae: *Ajuga reptans*, *Betonica officinalis*; Orobanchaceae: *Euphrasia* sp., *Pedicularis sylvatica*; *Rhinanthus minor*; Plantaginaceae: *Digitalis purpurea*, *Plantago lanceolata*; Polygonaceae: *Rumex acetosa*; Poaceae: *Holcus lanatus*; Ranunculaceae: *Ranunculus acris*, *R. flammula*, Rosaceae: *Potentilla erecta* and a large population of the heath spotted orchid *Dactylorhiza maculata* (Orchidaceae).

Orchidaceae

The Orchidaceae is one of the largest families of flowering plants in the world with approximately 25,000 species. Orchids are found on every continent except Antarctica (Dressler 1981, Nilsson 1992 in Niiniahho 2011). The family is divided into five subfamilies with Apostasioideae being basal. This is followed by Vanilloideae, Cyripedioideae and then the two most species-rich subfamilies, Orchidoideae and Epidendroideae (Chase *et al.* 2015).

Dactylorhiza maculata (synonym: *Orchis maculata*) is a tuberous perennial in the Orchidoideae. It is found in a variety of habitats including grassland, heathland, marshland and more rarely in open woodland (Parker 2006, Harrap and Harrap 2009, Online Atlas of the British and Irish Flora 2017).

The flowering period is usually from mid-May to July (Harrap and Harrap 2009). Inflorescence size ranges from twenty to fifty flowers in a single conical spike. Flowers consist of an upper sepal, two lateral sepals, two petals, a landing platform for insects known as the labellum and a spur. The labellum has a central lobe and two side lobes (Fig. 1). In *D. maculata* subspecies (ssp.) *ericetorum* the average length of the spur is 5.0-6.0mm (Neiland 1994).



Fig. 1. *Dactylorhiza maculata* at Cors Y Llyn National Nature Reserve in Radnorshire, mid-Wales.



Fig. 2. *D. maculata* var. *leucantha* with small flies in the mouth of the spur.

Flower colour is usually polymorphic with individuals exhibiting variable-sized purple dots, dashes and loops on various shades of purple or white (Fig. 1); variety (var.) *leucantha* has pure white flowers (Fig. 2) and has been recorded twice at Cors Y Llyn (Harris, unpublished observations). The species is widespread but rare in Britain (Harrap and Harrap 2009).

A faint scent is reported (Bowmer 2008). Plants are hermaphrodite (Niiniaho 2011) and hybridise with several other orchid species (Harrap and Harrap 2009). The number of seeds per capsule were estimated by Darwin (1877) to be c. 6200.

Pollination

The anther of *D. maculata* (Claessens and Kleynen 2013) contains two greenish (Fig. 3) or yellowish (var. *leucantha*, Harris, unpublished observations) pollinia (singular pollinium). The pollinia are shaped like a blunt pyramid or cone, up to 360 μ in length (Warnstorff in Knuth 1909) and are sectile (Schill and Pfeifer 1977 in Johnson and Edwards 2000).

In orchid species with sectile pollinia the stigmatic surfaces are often flat or slightly convex and have a fairly shallow adhesive covering. This facilitates the gradual erosion of pollen and enhances pollen carryover (Nilsson 1983 in Johnson and Edwards 2000) from one plant to several plants in succession (Westerbergh and Saura 1994).

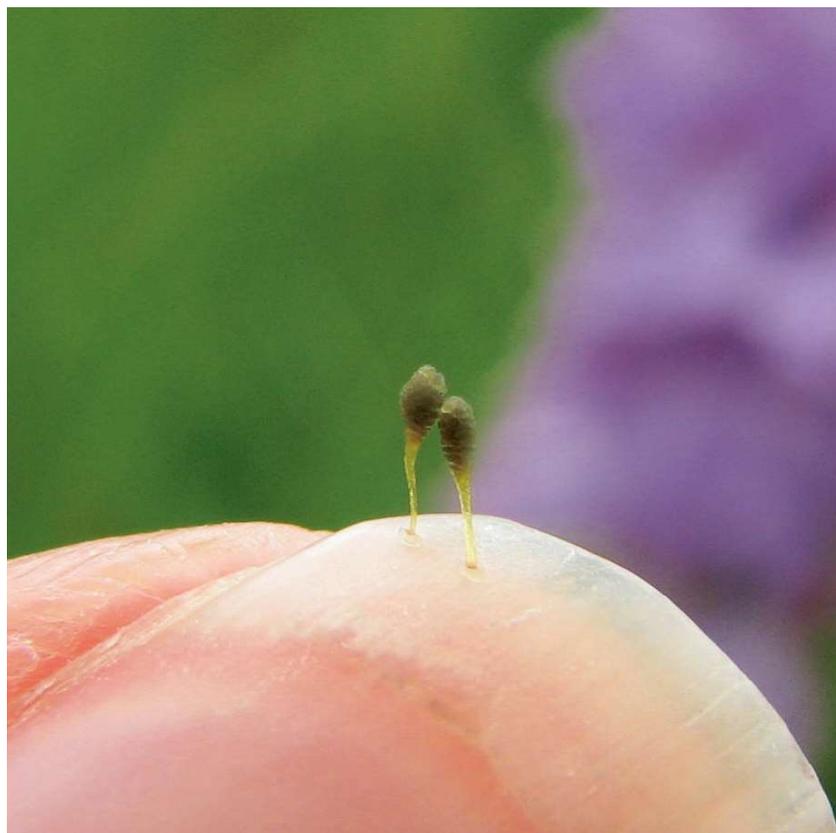


Fig. 3. Two pollinaria of *D. maculata*, each pollinarium with a large, greenish pollinium.

In *D. maculata* each pollinium is joined to a viscid disc (viscidium) by a caudicle to form a structure known as a pollinarium (plural pollinaria). The pollinarium (or pollinaria if the two viscid discs are adhered together) is removed from the flower by a potential pollinator or pollinator. For a species to be a pollinator it must have removed three or more pollinaria. This indicates that the insect has visited at least two flowers and that visitation to the flowers was not a chance event.

After removal from the anther Darwin (1877) showed that bending of pollinaria in *D. maculata* is at the base of the caudicle. The bending movement ensures that the pollinia become correctly orientated to strike the stigma with pollen (Johnson and Edwards 2000). Pollinaria ensure efficient pollen removal from the anther, minimal pollen wastage during transportation between flowers and a high probability of deposition on stigmas within the same species (Johnson and Edwards 2000).

Orchid pollinators are most often insects, but in rare instances birds (Roberts and Dixon 2008). The first definitive fossil record of an insect with orchid pollinaria has been found embedded in 40-55 million year old Baltic amber (Poinar and Rasmussen 2017). The insect was a species of *Bradysia* (Diptera, Sciaridae) with the pollinaria attached to the base of the hind leg (Poinar and Rasmussen 2017).

Pollinators visit the flowers for potential rewards. Floral nectar is the most common reward (Roberts and Dixon 2008). Other rewards include pollen, oils, floral fragrances, resins (Pemberton and Liu 2008 in Niiniahho 2011) and/or a site for shelter (Roberts and Dixon 2008). However, approximately one-third of orchid species have evolved mechanisms of deceit (Boyden 1982 in Koivisto *et al.* 2002). Most of the deceptively pollinated orchids are nectarless food frauds (Johnson and Nilsson 1999 in Koivisto *et al.* 2002).

Deception of pollinators is achieved through olfactory and/or visual stimulation (Dafni 1987 in Neiland 1994). Floral traits typical of nectar-rewarding species, for example, colour, shape, size, markings exploit the instinctive foraging of pollinators (Internicola and Harder 2012), in particular naive insects. These insects may be recently emerged from hibernation (Nilsson 1984 in Kindlmann and Jersáková 2006), or exploratory pollinators whose food sources are becoming depleted.

The probability of pollinators learning to avoid the non-rewarding flowers seems to be decreased by flower colour variation within populations (Koivisto *et al.* 2002). For example, in the bee-pollinated, nectarless orchid *Thelymitra epipactoides* the high colour variability of the orchid flowers appeared to reduce the probability of the bee learning of the deception (Cropper and Calder 1990).

One of the evolutionary consequences of the deceptive pollination strategy is that it usually decreases the amount of geitonogamous self-pollination (Johnson and Nilsson 1999 in Koivisto *et al.* 2002). This may result from both a lower number of visits per flower and/or less time spent per flower compared with plants with nectar rewarding flowers.

A lower number of visits and shorter stays on the inflorescence generally reduce capsule production in nectarless species of orchid and often fewer than 50% of flowers produce a capsule (Neiland and Wilcock 1998 in Koivisto *et al.* 2002).

The capsule set of *D. maculata* ssp. *ericetorum* at Dinnet Nature Reserve, Deeside, Scotland was 37.4% in 1990, 46.3% in 1991 and 41.7% in 1992 and at Coulnacraig Reserve, Deeside, Scotland, 23.8% in 1993 (Neiland 1994). In England the capsule set for *D. maculata* ssp. *ericetorum* was 38.4% (Neiland 1994 in Neiland and Wilcock 1998). In Europe the overall fruit set values for nectarless and nectariferous orchids were 27.7% and 63.1% respectively (Neiland and Wilcock 1998).

Empis* pollinators and potential pollinators of *Dactylorhiza maculata

During a survey at Cors Y Llyn NNR on 14 June 2014, five pollinaria from *D. maculata* were found attached to the face of a male empid fly *Empis* (*Euempis*) *tessellata* feeding from the lilac coloured flowers of *Cardamine pratensis* (Fig. 4). The presence of five pollinaria indicates that *E. tessellata* has visited at least three different orchid flowers.

Empis tessellata is found in woodland (Parmenter 1957, Hobby and Smith 1961 in Laurence 1992), woodland margins (Parmenter 1957, Gibbons 1999) and hedgerow margins (Laurence 1992) in May and June (Laurence 1958). Adults visit flowers for nectar (Parmenter 1957, Gibbons 1999) and are also predatory on other flies (Parmenter 1957). Along the hedgerow, the prey has consisted of *Tipula vernalis* (Meigen, 1804) (Tipulidae), *Bibio marci* (Linnaeus, 1758) (Bibionidae) and *Syrirta pipiens* (Linnaeus, 1758) (Syrphidae) (Parmenter 1957). A more detailed list of prey was given in Parmenter (1968).

In courtship and copulation males present a 'gift' to the female in the form of a dead insect. Females will not mate with males that do not present a gift (Preston-Mafham 1999).

There are two forms of *E. tessellata*, a pale-legged form and a dark-legged form (Laurence 1992). The male recorded at Cors Y Llyn NNR was the dark-legged form with entirely dark posterior femora (Fig. 4).

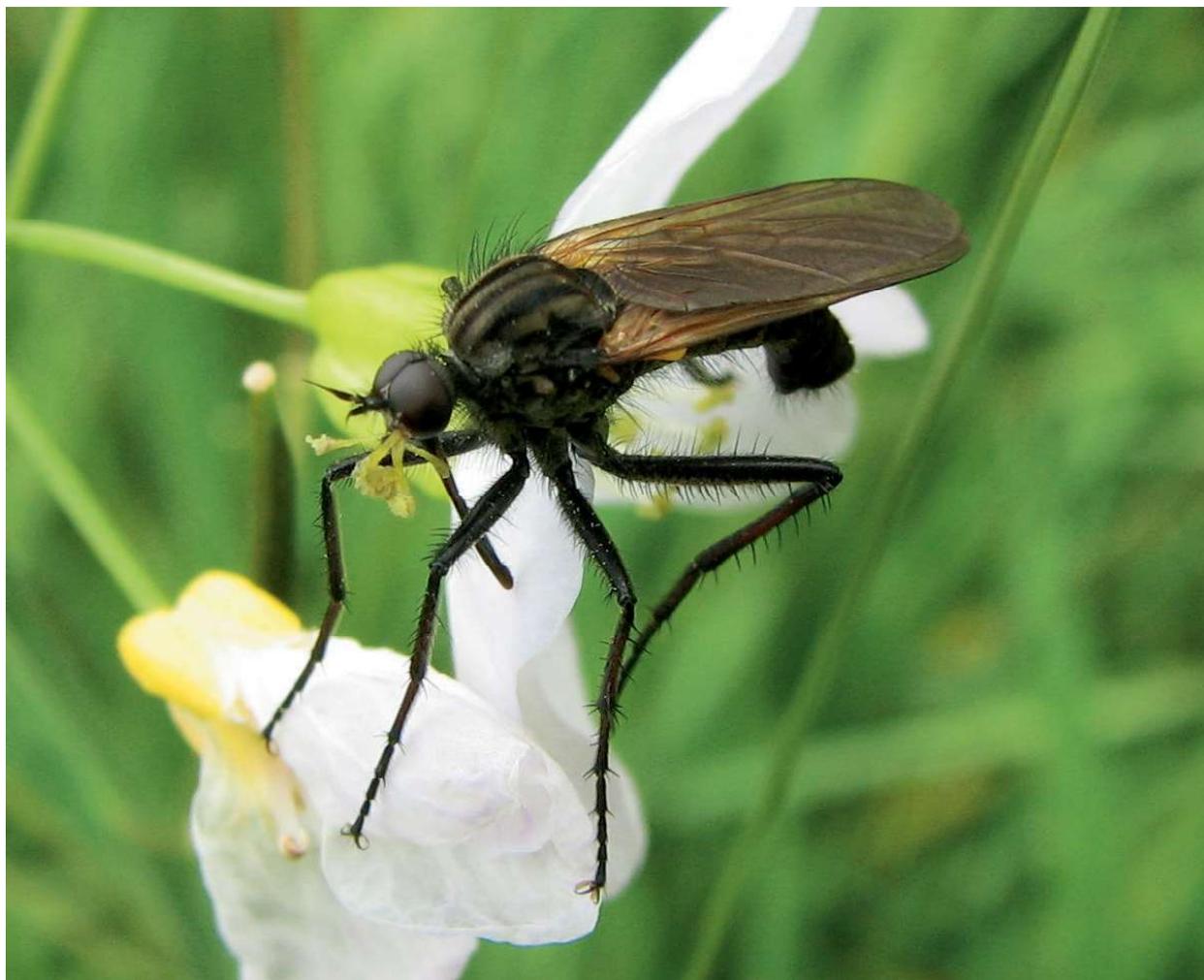


Fig. 4. *Empis tessellata* male on *Cardamine pratensis* with 5 pollinaria of *Dactylorhiza maculata* attached to the face.

In England Darwin (1877) recorded two other *Empis* species, *Empis* (*Kritempis*) *livida* (Linnaeus, 1758, as *Empis livadi*) and *E. (E.) pennipes* (Linnaeus, 1758) as pollinators of *D. maculata*.

Many *E. livida* were seen by Darwin and his son George inserting their proboscides into the spur (nectary in Darwin 1877). Specimens of *E. livida* brought home by George had pollinaria (six pollinaria on one specimen and three on another) attached to their spherical eyes on a level with the bases of the antennae (Darwin 1877). George also saw *E. pennipes* inserting its proboscis into the spur. One specimen of this latter *Empis* had three pollinaria attached to the dorsal surface of its convex thorax (Darwin 1877). Silén (1906) also observed numerous *E. livida* visiting flowers of *D. maculata*. Two females had a pollinarium attached to the eyes and a third female had a pollinarium on the pronotum.

Other pollinators of *Dactylorhiza maculata*

Coleoptera: Cerambycidae: *Paracorymbia maculicornis* (De Geer, 1775), a single individual was taken on *Spiraea salicifolia* with eleven pollinaria attached to the frons (Silén 1906, as *Leptura*

melanura Linnaeus), one, 12mm long, beetle had six pollinaria attached to the lower side of the head (due to an upside down inflorescence) (Vetlesen 2011); Diptera: Scathophagidae: *Scathophaga stercoraria* (Linnaeus, 1758), twenty-four males and nineteen females had three or more viscidia on their heads. One male was recorded with eight viscidia on its head (Rotheray and Britton 2015).

Other potential pollinators of *Dactylorhiza maculata*

Coleoptera: Cerambycidae: *Stictuleptura maculicornis* (De Geer, 1775), several specimens with pollinaria on the frons were seen flying from flower to flower (Silén 1906, as *Leptura maculicornis* De Geer), a male with a pollinarium attached to the head (Vetlesen 2011); Diptera: Calliphoridae: *Pollenia rudis* (Fabricius, 1794), one specimen with pollinaria (Rotheray and Britton 2015); Muscidae: *Drymeia hamata* (Fallén, 1823), two specimens with pollinaria; *Neomyia cornicina* (Fabricius, 1781), one specimen with pollinaria (Rotheray and Britton 2015); Scathophagidae: *Scathophaga litorea* (Fallén, 1819), one specimen with pollinaria (Rotheray and Britton 2015); Syrphidae: *Eristalis horticola* (De Geer, 1776), the pollinaria were attached to the front of the head (Müller in Knuth 1909), *E. intricaria* (Linnaeus, 1758), the two pollinaria were attached to the face (between the antennae and the mouthparts) (Hagerup 1951, fig. 57), *Melanogaster hirtella* (Loew, 1843), one specimen with pollinaria, the viscidia were attached to the head (Rotheray and Britton 2015), *Volucella bombylans* (Linnaeus, 1758), a female with pollinaria (Silén 1906), the pollinaria were attached to the front of the head (Müller in Knuth 1909); Hymenoptera: Apidae: *Bombus* sp., on average 24.3% of all visits by bumblebees to the inflorescences resulted in removal of one or more pollinia (Koivisto *et al.* 2002); Tenthredinidae: *Tenthredo (T.) arcuata* (Förster, 1771), four specimens with pollinaria (Rotheray and Britton 2015).

In central Norway *E. tessellata* is also a potential pollinator of the nectar rewarding orchid *Gymnadenia conopsea* sensu lato. It was the most frequent diurnal visitor with more than 50% of recorded visits to flowers (Sletvold *et al.* 2012). In one male *E. tessellata* two pollinaria were attached to the proboscis (Sletvold *et al.* 2012, fig. 1C).

Other flower visitors of *Dactylorhiza maculata*

Coleoptera: Cerambycinae: *Leptura aethiops* (Poda, 1761) (Müller in Knuth 1909, as *Strangalia atra* Laich); Nitidulidae: *Cychramus luteus* (Fabricius, 1787), hiding in a flower (Silén 1906); Diptera: Anthomyiidae: *Botanophila brunneilinea* (Zetterstedt, 1845), *Hylemya variata* (Fallén, 1823), *Pegoplata aestiva* (Meigen, 1826), *P. infirma* (Meigen, 1826) (Rotheray and Britton 2015); Calliphoridae: *Calliphora vicina* (Robineau-Desvoidy, 1830) (Rotheray and Britton 2015), *Lucilia* sp. (MacLeod in Knuth 1909 under Muscidae); Chironomidae: chironomid sp. (Rotheray and Britton 2015); Dolichopodidae: *Dolichopus atratus* (Meigen, 1824), *D. medicornis* (Verrall, 1875), *D. phaeopus* (Haliday in Walker, 1851), *D. plumipes* (Scopoli, 1763), *D. trivialis* (Haliday, 1832), *D. vitripennis* (Meigen, 1824), *Hercostomus nigripennis* (Fallén, 1823) (Rotheray and Britton 2015); Empididae: *Empis (Xanthempis) aemula* (Loew, 1873) (Rotheray and Britton 2015); *E. (Pterempis) decora* (Meigen, 1822), sucking (skg) (MacLeod in Knuth 1909); *E. (Leptempis) grisea* (Fallén, 1816), *E. livida*, *Hilara* sp. (Rotheray and Britton 2015); Hybotidae: *Hybos femoratus* (Müller, 1776) (Rotheray and Britton 2015); Muscidae: *Coenosia pedella* (Fallén, 1825), *C. intermedia* (Fallén, 1825), *C. tigrina* (Fabricius, 1775), *Helina evecta* (Harris, 1780), *Hydrotaea irritans* (Fallén, 1823), *Phaonia incana* (Wiedemann, 1817), *Thricops semicinereus* (Wiedemann, 1817) (Rotheray and Britton 2015); Psilidae: *Loxocera aristata* (Panzer, 1801) (Rotheray and Britton 2015); Rhagionidae: *Chrysopilus cristatus* (Fabricius, 1775) (Rotheray and Britton 2015); Sciaridae: sciarid spp. (Rotheray and Britton 2015); Sciomyzidae: *Tetanocera robusta* (Loew, 1847), *Limnia* sp.

(Rotheray and Britton 2015); Syrphidae: *Eristalis tenax* (Linnaeus, 1758) (Dafni 1987 in Neiland 1994), *Helophilus affinis* (Wahlberg, 1844), a few females without pollinia (Silén 1906), *Cheilosia illustrata* (Harris, 1780), *Eristalinus sepulchralis* (Linnaeus, 1758), *Helophilus pendulus* (Linnaeus, 1758), *Platycheirus clypeatus* (Meigen, 1822), *P. manicatus* (Meigen, 1822) (Rotheray and Britton 2015), *Volucella zonaria* (Poda, 1761) (Wright 1992 in Neiland 1994); Tabanidae: *Haematopota bigoti* (Gobert, 1880) (Rotheray and Britton 2015); Hymenoptera: Apidae: *Apis mellifera* (Linnaeus, 1758) (Dafni 1987 in Neiland 1994), *Bombus lapidarius* (Linnaeus, 1758) (Dafni 1987 in Neiland 1994), female *B. pascuorum* (Scopoli, 1763) (Alfken in Knuth 1909, as *B. agrorum* (Fabricius)), female *B. pratorum* (Linnaeus), once (Müller 1873); Formicidae: small ants (MacLeod in Knuth 1909).

Other flower species visited by *E. tessellata*

Adoxaceae: *Viburnum lantana* (Parmenter 1957), *V. opulus*, skg (Buddeberg in Müller in Knuth 1908); Apiaceae: *Myrrhis odorata* (Borgstette in Knuth 1908); both the pale-legged and dark-legged forms of *E. tessellata* were found on flowers of *Anthriscus sylvestris* in woods and alongside hedgerows (Laurence 1992); Asteraceae: *Achillea millefolium*, skg (Müller in Knuth 1908), *Arnica montana*, numerous, skg (Müller 1873), *Carduus defloratus* sensu stricto (Loew in Knuth 1908), *Leucanthemum vulgare* (Müller in Knuth 1908, as *Chrysanthemum leucanthemum*), *Senecio nemoralis* (Loew in Knuth 1908); Campanulaceae: *Jasione montana*, very common, skg (Müller in Knuth 1909); Caprifoliaceae: *Linnaea borealis*, intermediate pollen loads (20-100 pollen grains) were carried on the legs, head, thorax and abdomen of the fly (Scobie and Wilcock 2009); Caryophyllaceae: *Stellaria holostea*, one male and one female (Silén 1906), skg (Müller 1873); Convolvulaceae: *Convolvulus sepium*, skg (Müller in Knuth 1909); Dipsacaceae: *Knautia arvensis*, pollen devouring (po-dvg) and skg (Knuth 1908), 3-4, skg (Müller 1873, as *Scabiosa arvensis*); Ericaceae: *Calluna vulgaris* (Alfken and Höppner in Knuth 1909), *Orthilia secunda*, one male, skg (Silén 1906, as *Pyrola secunda*); Euphorbiaceae: *Euphorbia amygdaloides*, po-dvg (Parmenter 1957, Parmenter 1961, Hobby and Smith 1961 in Woodcock *et al.* 2014); Lamiaceae: *Mentha aquatica*, skg (Müller 1873), *M. sylvestris* (Heinsius in Müller in Knuth 1909), *Thymus serpyllum* (Müller in Knuth 1909); Malvaceae: *Tilia ulmifolia* (Alfken in Knuth 1908); Orchidaceae: *Epipactis palustris*, one male and one female (Nilsson 1978), *Neottia ovata*, a female (Silén 1906), *Orchis militaris* (Hawke 1989 in Harding, 1996 and Burger 2004 in Henneresse and Tyteca 2016); Plantaginaceae: *Veronica chamaedrys* (Alfken in Knuth 1909); Polygonaceae: *Persicaria vivipara* (Loew in Knuth 1909, as *Polygonum viviparum*); Ranunculaceae: *Ranunculus acris*, *R. bulbosus*, *R. repens* (Knuth 1908, Parmenter 1957); Rosaceae: *Crataegus monogyna* (Parmenter 1957), *C. "oxyacantha"* (Alfken in Knuth 1908), *Rubus fruticosus* agg., skg (Müller 1873), *R. idaeus*, very common (Alfken in Knuth 1908), *Sorbus aria* (Parmenter 1957), *S. aucuparia* (Loew in Knuth 1908); Rubiaceae: *Galium odoratum*, one, skg (Müller in Knuth 1908, as *Asperula odorata*); Saxifragaceae: *Saxifraga granulata*, skg (Müller in Knuth 1908).

Smith (1952) found that the pale-legged form was 16% of the *E. tessellata* population on *Viburnum* blossom along a roadside and 66% on *Heracleum* along a shrubby path at King's Somborne, Hampshire, England (in Laurence 1992).

Long-proboscid flies are also important in the pollination of orchids in South Africa (Johnson 2006). Flies caught on the nectar-rewarding *Disa scullyi* carried pollinaria of *D. scullyi* on the basal underside of their proboscides (Johnson 2006).

It has been estimated, based on 456 orchid species, that 67% have a single pollinator species, 14% have two pollinators and 17% have more than two pollinators (Tremblay 1992). *Dactylorhiza maculata* has at least five pollinator species although the presence of these pollinators may vary at different sites depending on factors such as geographical location, climate,

habitat, pollinator life history and flight period. Vetlesen (2011) noted that *D. maculata* was exclusively pollinated by flies on the Faroe Islands where no woods exist. In contrast observations from woody areas in Austria and Poland revealed that 90% of the pollination of *D. maculata* was done by longhorn beetles.

Dactylorhiza maculata may also benefit from growing in the vicinity of numerous nectariferous co-flowering species, as these increase abundance of pollinators in the local habitat. At Cors Y Llyn NNR the nectar-producing flowers were *Cirsium dissectum* (de Vere 2007), *C. palustre* (Mogford 1974), *Hypochaeris radicata* (Drabble and Drabble 1927), *Cardamine pratensis* (Hutchinson 1955), *Lathyrus linifolius* (Westerkamp 1993), *Lotus corniculatus* (Raine and Chittka 2007), *Trifolium pratense* (Hutchinson 1955), *T. repens* (Raine and Chittka 2007), *Ajuga reptans* (Knuth 1909), *Betonica officinalis* (Knuth 1909), *Euphrasia* sp. (Knuth 1909), *Pedicularis sylvatica* (Knuth 1909), *Rhinanthus minor* (Westbury 2004), *Digitalis purpurea* (Knuth 1909), *Ranunculus acris* (Hutchinson 1955), *R. flammula* (Hutchinson 1955) and *Potentilla erecta* (Hutchinson 1955).

In var. *leucantha* small flies were found in the mouth of the spur (Fig. 2). Interestingly in the study of insects visiting *D. maculata* on the Hebridean Islands of Canna and Sanday, Sciaridae were often found trapped in the spur at the back of flower and large empids such as *Empis livida* were seen to land on spikes and probe flowers one after another. The authors suggest that the trapped sciarids are potential food rewards (Rotheray and Britton 2015).

As a result of this new discovery in Wales three *Empis* species have now been recorded in Britain as pollinators of *D. maculata*.

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Fungal hosts of *Ula* Haliday (Diptera, Pediciidae) in Britain, with reference to the collection of P.A. Buxton in the Natural History Museum, London

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Summary

Rearing records for *Ula* species are compared and support the associations of the two common British species, *U. mollissima* and *U. sylvatica* with saproxylic and terrestrial fungi respectively; however, care must be exercised in the interpretation of the results.

Introduction

Until the 1960s, it was thought by most dipterists that only one species of the genus *Ula* Haliday, 1833, *U. sylvatica* (Meigen, 1818) occurred in Britain. During 1963, following the work of Tjeder (1959) it was realised by R.I. Vane-Wright (*pers. comm.*) that a second species, then known as *U. crassicauda* Agrell, was present. Hutson and Vane-Wright (1969) checked the type specimens and the nomenclature, and discovered that the name *U. mollissima* Haliday, 1833 took precedence over *U. crassicauda* Agrell, 1945.

Hence all identifications and literature records pre-1970 need to be checked against voucher specimens. This has relevance to reference material in museum collections, and to the Cranefly Recording Scheme. There are some 80 pre-1969 records of *U. sylvatica* currently included in the BRC database, which remain to be checked before they can be accepted. These records are currently included in the map for *U. sylvatica* shown in Fig. 7.

Later studies in Czechoslovakia (Starý 1983) discovered that two species separable only by details of the genitalia had been confused under *U. mollissima*; the new species *U. mixta* Starý, 1983 was first captured in Britain in 2002 (Merrifield 2003). The spotted-winged *Ula bolitophila* Loew 1869, has not as yet been confirmed in Britain, although it occurs in Scandinavia.

Biology

All larvae of the genus *Ula* are mycophagous, feeding on and inside the fruiting bodies of fungi such as mushrooms, toadstools and bracket fungi. No remains of other invertebrates have been found in their guts. They migrate into the soil and leaf litter and pupate in silken cocoons (Krivosheina 2008).

A number of studies of fungal fauna have been carried out both in Britain and elsewhere in Europe. Alan Stubbs (Stubbs 1974) reared *U. mollissima* from pulp in a wet rot hole in a large fallen beech trunk, whilst *U. sylvatica* was reared by him from the terrestrial fungus *Collybia* sp. (Agaricales), also in beech woodland at Shepleas, Surrey. This suggested to him a possible ecological separation between the two species.

Prior to 1969, when all British *Ula* were attributed to *U. sylvatica*, P.A. Buxton published extensive data on rearing these craneflies, as well as other Diptera (Buxton 1960). Fortunately these rearing records are supported by well curated specimens in the Natural History Museum, London (NHM). In the 1970s, Alan Stubbs began a study of these Buxton specimens, allocating some seven of them to either *U. sylvatica* or *U. mollissima*. Since this was before the discovery of *U. mixta* no genitalia preparations were made. Some of these fragile specimens had lost their abdomens, but genitalia preparations by the author enabled re-identification of 36 specimens from

Buxton's collection (Appendix 1). Two specimens from other collectors, included in the Buxton collection, were also re-identified (Table 4). No specimens of *U. mixta* were found; this species seems rare in Britain and therefore probably has little influence on conclusions drawn from post-1970 work.

Other pre-1969 studies had been made. Bryce (1957) studied the life histories of some flies which included '*Ula sylvatica*' but his specimens have not been located for re-identification.

Subsequently, some rearing was done by Peter Chandler (Chandler 1977) and Judy Webb (*pers. comm.*), the results of which are summarised below and included with Buxton's in the totals analysed. This review of available evidence is an attempt to discover the habitat preferences of *U. mollissima* and *U. sylvatica* and relate this to the feeding method of their host fungi.

Terminology

A number of different terms are used in the literature to describe the differing modes of nutrition of fungi. Those feeding on wood are described as wood-decaying, saproxylic or lignicolous. Those feeding on humus are described as ground or terrestrial fungi, or saprophytic. Humus is a complex material and the classification of fungi into wood-decaying and non-wood-decaying (terrestrial) is not a sharp one. As wood decays, it turns to humus in the soil and as a consequence there will be different types of humus, some more woody, some less so, depending on its origin. Stubbs' original observation was from wet wood pulp, which is different in many ways from saproxylic bracket fungi. I will use the terms saproxylic and terrestrial here.



P. A. Buxton

Fig. 1. Patrick Alfred Buxton (1892-1955) (from Wigglesworth 1956).

The work of P.A. Buxton (Buxton 1960)

Patrick Alfred Buxton (1892-1955) (Fig. 1) was a Professor of Medical Entomology at the London School of Hygiene and Tropical Medicine and, 'feeling a need to refresh' himself, from the autumn of 1950 until 1955 he very methodically investigated the Diptera associated with fungi. His very thorough paper (Buxton 1960) made a significant contribution to our understanding of this topic. He did not describe the precise location of his sites but worked in a

small area around Gerrard's Cross, Hertfordshire (SU9987). Bulstrode Park and Burnham Beeches are nearby. Buxton was a qualified medical doctor who travelled widely in his youth and his biographical obituary makes interesting reading (Wigglesworth 1956).

Fungi were collected in October and some also in January during the period 1950-1953 and numerous larvae were found. In all, 447 samples were taken which covered 154 species of fungi. Buxton kept the host fungi and their associated larvae in jars with moist sawdust at the base, retaining them from the autumn until the adults emerged or until the following mid-summer at the latest. The larvae of *Ula* moved to congregate beneath the rotting fungus, and there formed rough firm galleries in the sawdust where pupation occurred.

Identification

Recognition of the genus *Ula* in Britain is unproblematic, since it is the only group of craneflies here with fine hair-like structures between the ommatidia of their compound eyes (ommatrichia), and long hair-like structures (macrotrichia) covering the wings. The macrotrichia are attached to sockets surrounded by characteristic circular bases or alveoli, which apart from size distinguish them from the smaller microtrichia (Fig. 2).

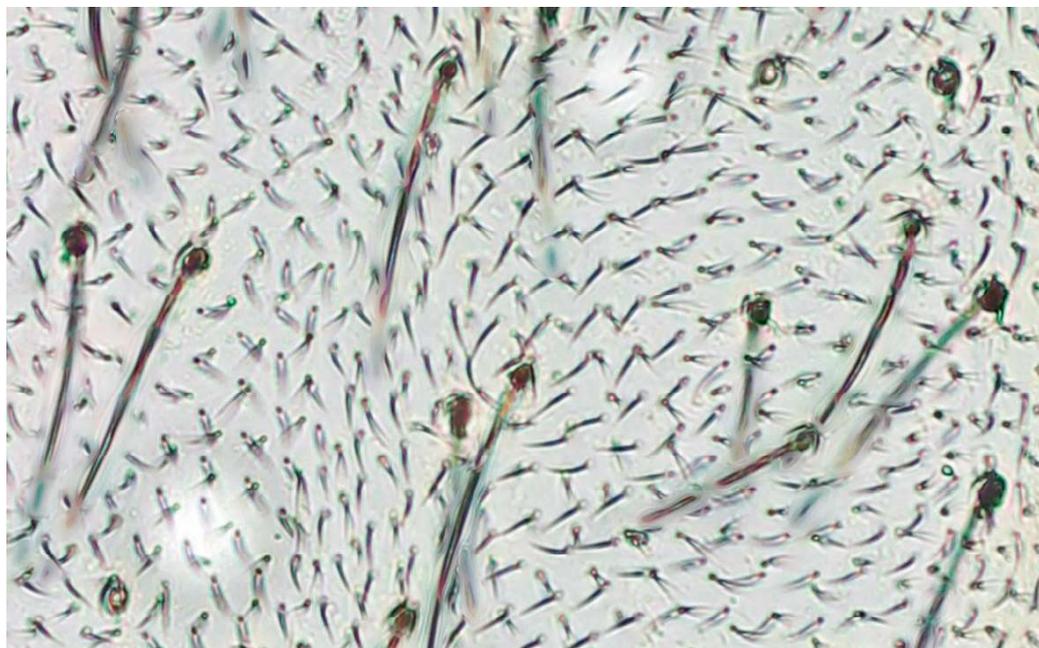


Fig. 2. Part of the wing membrane of *Ula mollissima* to show the microtrichia and much larger macrotrichia. Photo. JK ©NHM London.

Males of *U. sylvatica* are readily identified by the structure of the style, with fewer large spines than in the other species (Fig. 3a). Females of *U. sylvatica* have a conspicuous heart-shaped genital plate, visible at the base of the cerci (Fig. 4). Males of *U. mollissima* and *U. mixta* share styles with a similar number and structure of spines (Fig. 3b) but the male aedeagal complex of *U. mixta* differs from that of *U. mollissima* in being considerably larger and having a stouter penis which possesses a membranous flange (Starý 1983, fig. 6). This flange, together with the large anterior median fan-shaped vesicular (ejaculatory) apodeme (both arrowed) are diagnostic.

Males of *U. mixta* also differ from *U. mollissima* in the shape of sternite 9 and the size of the posterior central notch (Starý 1997). Although some microscopic features differ, females of *U. mixta* lack any conspicuous species-specific features and therefore cannot easily be separated from females of *U. mollissima* (cf. Starý 1983). No attempt was made in this study to separate females of these two species.



Fig. 3. Male styles: a, *Ula sylvatica*; b, *Ula mollissima*. Photo. JK ©NHM London.



Fig. 4. Female genital plate of *Ula sylvatica*, displaced anteriorly by dissection. Photo. JK ©NHM London.

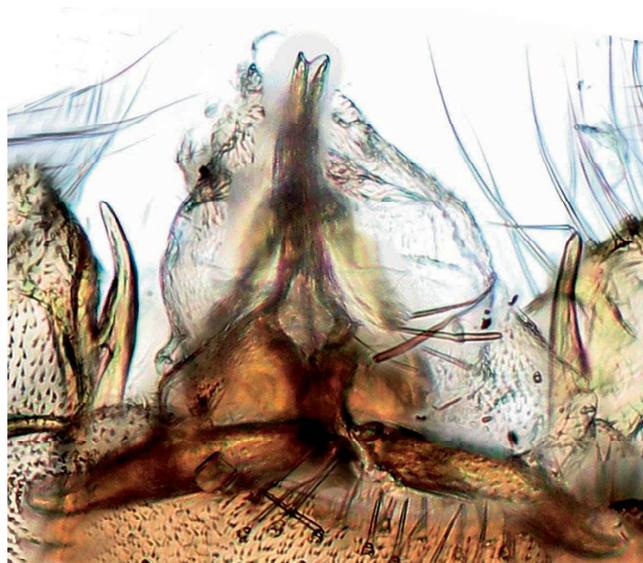


Fig. 5. Male genitalia of *U. mollissima*. Photo. JK ©NHM London.

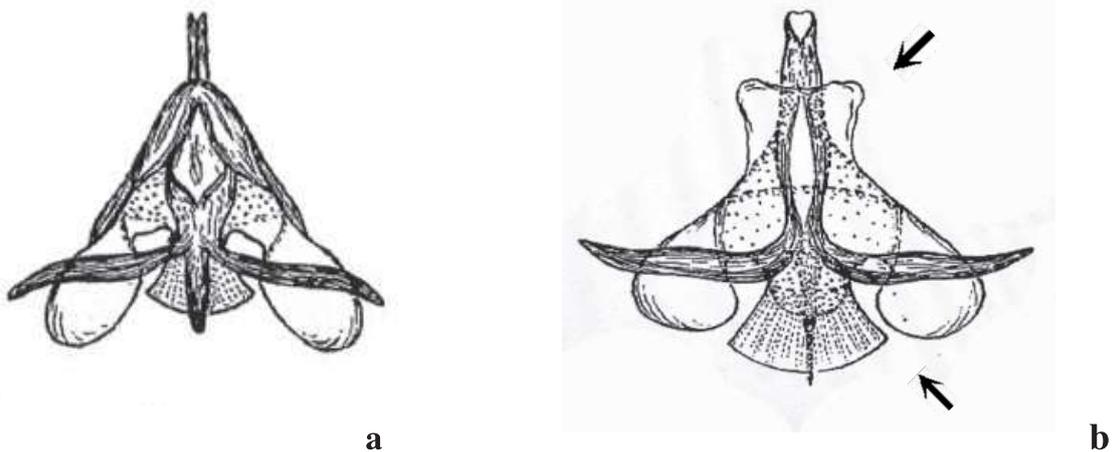


Fig 6. Aedeagal structures of *Ula* species: a, *U. mollissima*; b, *U. mixta*, showing the diagnostic membranous flap of *U. mixta* (arrowed) (from Starý 1983).

The results of the genitalia preparations by the author were photographed in the Sackler Imaging Laboratory in the NHM.

Results

See Appendix I for details of Buxton's specimens. All results are summarised in the following tables.

Table 1. Buxton's results.

	Saproxylic fungi		Terrestrial fungi		Fungal hosts
	No.	%	No.	%	No.
<i>U. mollissima</i>	7	78	2	22	9
<i>U. sylvatica</i>	3	43	4	57	7
					14

Out of a total of 14 fungal species studied by Buxton which hosted the *Ula* larvae, 78% of *U. mollissima* specimens emerged from wood-decaying fungi. 43% of specimens of *U. sylvatica* were found from saproxylic fungi, 57% emerging from terrestrial fungi. Thus, in this sample, *U. mollissima* was recorded far more from saproxylic species of fungi while *U. sylvatica* showed no significant preference.

The work of Chandler (1977)

In this study *Ula* species were reared from 28 batches of fungi and representative males were retained, comprising 31 specimens of *U. sylvatica* and 22 of *U. mollissima*. Both species were reared from a wide range of soft fungi, both terrestrial and wood-decaying species.

Table 2. Results from Chandler (1977).

	Saproxylic fungi		Terrestrial fungi		Fungal hosts
	No.	%	No.	%	No.
<i>U. mollissima</i>	10	71	4	29	14
<i>U. sylvatica</i>	2	13	13	87	15
					24

Ula mollissima was reared from 14 species of fungi, nine growing on wood with five of these being polypores. The remaining four fungi which hosted *U. mollissima* were terrestrial fungi of the genera *Russula*, *Paxillus*, *Boletus* and *Scleroderma*. Thus more specimens of *U. mollissima* were recorded from saproxylic fungi.

Ula sylvatica was obtained from 15 species of fungi, mostly terrestrial (e.g. *Paxillus*, *Cantharellus* and two *Boletus*) but including two growing on wood. Here, in contrast to *U. mollissima*, significantly more specimens of *U. sylvatica* were recorded from terrestrial fungi.

Table 3. The work of Judy Webb (pers. comm).

	Saproxylic fungi		Terrestrial fungi		Fungal hosts
	No.	%	No.	%	No.
<i>U. mollissima</i>	4	80	1	20	4
<i>U. sylvatica</i>	0	0	2	100	1
					4

Craneflies were reared from fungi as follows: *Ula mollissima* from *Hygrophorus dichrous*, *Polyporus durus*, *Meripilus giganteus*, *Grifola frondosa*; *Ula sylvatica* from *Hygrophorus dichrous*.

Table 4. Two specimens curated and re-identified within the NHM Buxton Collection (details in Appendix I).

	Saproxylic fungi		Terrestrial fungi		Fungal hosts
	No.	%	No.	%	No.
<i>U. mollissima</i>	1	100	0	0	1
<i>U. sylvatica</i>	0	0	1	100	1
					2

Craneflies were reared from fungi as follows: *Ula mollissima* from *Gymnopilus spectabilis*; *Ula sylvatica* from *Phallus impudicus*.

When all the British records listed above are added, the results are shown below:

Table 5. Total Results from Buxton, NHM, Chandler and Webb.

	Saproxylic fungi		Terrestrial fungi		Fungal hosts
	No.	%	No.	%	No.
<i>U. mollissima</i>	7+10+4+1=22	76	4+2+1+0=7	24	21
<i>U. sylvatica</i>	2+3+0+0=5	20	13+4+2+1=20	80	24
					38

Analysis

Hypothesis: *Ula mollissima* and *U. sylvatica* chose significantly different groups of fungi, either saproxylic (wood-digesting or lignicolous) or terrestrial (ground or saprophytic), in which to lay their eggs. The null hypothesis, that there is no significant preference shown, was tested using the Chi-squared test.

From Table 1. Buxton's Results:

$n = 17$, $\chi^2 = 2.490$, $df = 1$.

There was not a significant difference, at the 5% level, between *U. mollissima* and *U. sylvatica* in their association with either saproxylic or terrestrial host fungi and there is the possibility, because of the small sample size, that these results could have occurred through chance alone.

From Table 5. Total Results:

$n = 54, \chi^2 = 16.758, df = 1.$

There is a less than 1% chance that these results are due to chance. The results therefore support the working hypothesis that *Ula mollissima* and *U. sylvatica* chose different groups of fungi for oviposition. *Ula mollissima* has an association with saproxylic fungi, and *U. sylvatica* has a significant association with terrestrial fungi.

Discussion

Ideally, to discover host preferences, we would like to follow a large number of named ovipositing *Ula* females as they laid their eggs, and to record the fungal species they chose. We could imagine them flying along laying their eggs randomly in whatever fungi they happen upon. We would then find, other things being equal, that adults emerged from whatever fungi were most common at the time of oviposition. Since it is not possible to observe egg-laying in this way, we must do the best we can and care must be taken in interpreting results. An association does not necessarily mean that a choice has been exercised.

How might the differences between *U. mollissima* and *U. sylvatica* be explained? There are a number of factors that might be considered:

Number of visits and eggs deposited per species: when more than one adult of a single species emerges from a fungus this may be due to one visit, or a number of visits by different females. When a single adult emerges, this does not preclude the possibility that eggs may have been laid in that fungus by other *Ula* females but failed to reach maturity. In order to interpret the above results it has been assumed that each species recorded emerging from a fungus is the result of a single visit by a female fly, and that there is a similar mortality rate in each host fungus.

Seasonality of flies and fungi: an assumption is made also that the ecological niche of each species does not differ significantly, apart from its host fungi. If insect emergence dates differ, that might result in a different suite of fungi being available by random choice oviposition. Terrestrial fungi are generally more seasonal and less permanent than some of the saproxylic bracket fungi and it may be these latter that are used by both species if they emerge when soft fungi are absent. From the available phenological data, both *Ula* species have two peaks of emergence in May and September, and although there are slight differences in spread, their emergence times do not seem to differ significantly.

Distributional factors: when the pattern of geographical distribution nationally is examined, *U. sylvatica* shows a slightly more northerly and westerly range, sites being sparser in the south and east of Britain (Fig. 7). Records of *U. mollissima* are rarer in northern Britain with more sites in the south and east. The distribution of fungi may also be different and could affect the relative abundance of terrestrial and saproxylic species.

Abiotic, biotic and behavioural differences: *Ula sylvatica* and *U. mollissima* may be affected by different environmental factors at the same location. For example, a shared humidity range might determine the fungal host in which the eggs are laid relative to location. The presence of predators might affect the success in other ways. If adult females seeking suitable oviposition sites do so at different heights in relation to ground vegetation, then certain species of fungi would not be selected.

Sampling bias: there is also the possibility of bias during collecting such a much smaller proportion of the available resource of (say) less conspicuous ground fungi being gathered than aerial bracket fungi.

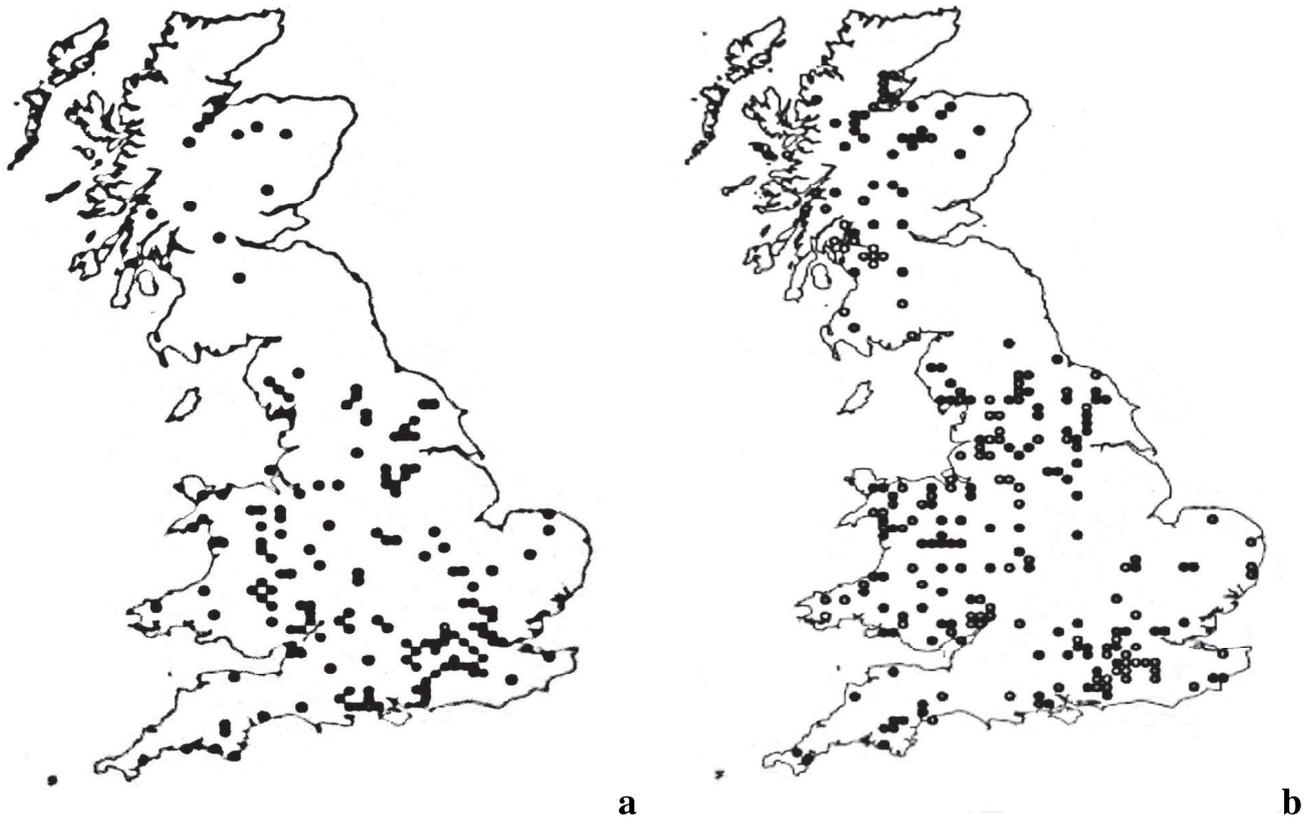


Fig. 7. Distribution maps of *Ula* species: a, *U. mollissima*; b, *U. sylvatica*.

Work in other parts of Europe.

This has followed a similar pattern to that in Britain. For the work carried out by Eberhard Lindner (1958) to be evaluated, re-identification of voucher specimens will be necessary. More recently Ševčík (2006) has carried out extensive work on rearing Diptera from fungi in the Czech Republic and Slovakia and some results are shown below for comparison with the British ones.

Table 6. Results of Ševčík (2006).

	Saproxylic fungi		Terrestrial fungi		Fungal hosts
	No.	%	No.	%	
<i>U. mollissima</i>	8	73	3	27	11
<i>U. sylvatica</i>	7	39	11	61	18
					25

Czech and Slovak records thus support this seeming preference of *U. mollissima* for saproxylic fungi, and to a lesser extent *U. sylvatica* for terrestrial fungi.

Conclusions

Although the larvae of both species of *Ula* use both terrestrial toadstools and saproxylic toadstools and bracket fungi as a source of food, if we accept the assumptions made, the evidence presented here would seem to support the idea that *U. mollissima* has a preference for saproxylic fungi, whilst *U. sylvatica* prefers saprophytic ground toadstools as a larval habitat.

However, many questions still remain for investigation. For example, are adult females attracted to fungi by their “smell” and so exercise a choice using this chemoreceptor sense? Do the proportions of terrestrial and saproxylic fungal hosts vary in different locations throughout

Britain and Europe? Some results from Ševčík (2006) indicate that the pattern of associations may vary from place to place. Krivosheina (2011) has provided a key to *Ula* larvae and so we can ask what happens inside the fungal tissue regarding the competition and mortality of the larvae?

Thanks to the careful curation at the NHM, Buxton's very thorough research has not been lost but forms a useful base on which future work can be built.

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Appendix I. Emergence results of *Ula* species recorded by P.A. Buxton (re-identified by the author).

No.	Species	m/f	Coll.	Buxton No.	Site	Fungal host	Saproxylic/ Terrestrial
1	<i>Ula mollissima</i>	f	P.A. Buxton	61A	Gerrard's Cross	<i>Aurantioporus fissilis</i>	S
2	<i>Ula mollissima</i>	f	P.A. Buxton	61A	Tonbridge	<i>Aurantioporus fissilis</i>	S
3	<i>Ula mollissima</i>	f	P.A. Buxton	46D	Gerrard's Cross	<i>Pleurotus cornucopiae</i>	S
4	<i>Ula mollissima</i>	m	P.A. Buxton	46D	Gerrard's Cross	<i>Pleurotus cornucopiae</i>	S
5	<i>Ula mollissima</i>	f	P.A. Buxton	46D	Gerrard's Cross	<i>Pleurotus cornucopiae</i>	S
6	<i>Ula mollissima</i>	f	P.A. Buxton	46D	Gerrard's Cross	<i>Pleurotus cornucopiae</i>	S
7	<i>Ula mollissima</i>	m	P.A. Buxton	74	Gerrard's Cross	<i>Meripilus giganteus</i>	S
8	<i>Ula mollissima</i>	f	P.A. Buxton	140	Gerrard's Cross	<i>Trametes gibbosa</i>	S
9	<i>Ula mollissima</i>	m	P.A. Buxton	19329	Gerrard's Cross	<i>Polyporus squamosus</i>	S
10	<i>Ula mollissima</i>	m	P.A. Buxton	22/52	Gerrard's Cross	<i>Polyporus squamosus</i>	S
11	<i>Ula mollissima</i>	m	P.A. Buxton	22/52	Gerrard's Cross	<i>Polyporus squamosus</i>	S
12	<i>Ula mollissima</i>	m	P.A. Buxton	22/52	Gerrard's Cross	<i>Polyporus squamosus</i>	S
13	<i>Ula mollissima</i>	m	P.A. Buxton	27/52	Gerrard's Cross	<i>Polyporus squamosus</i>	S
14	<i>Ula mollissima</i>	m	P.A. Buxton	27/52	Gerrard's Cross	<i>Polyporus squamosus</i>	S
15	<i>Ula mollissima</i>	m	P.A. Buxton	49-53	Gerrard's Cross	<i>Abortiporus biennis</i>	S
16	<i>Ula mollissima</i>	m	P.A. Buxton	49/53A	Gerrard's Cross	<i>Abortiporus biennis</i>	S
17	<i>Ula mollissima</i>	m	P.A. Buxton	19/53	Gerrard's Cross	<i>Abortiporus biennis</i>	S
18	<i>Ula mollissima</i>	m	P.A. Buxton	34-54	Gerrard's Cross	<i>Bjerkandera adusta</i>	S
19	<i>Ula mollissima</i>	m	P.A. Buxton	34-54	Gerrard's Cross	<i>Bjerkandera adusta</i>	S
20	<i>Ula mollissima</i>	f	P.A. Buxton	60-53	Gerrard's Cross	<i>Russula ochroleuca</i>	T
21	<i>Ula mollissima</i>	f	P.A. Buxton	60-53	Gerrard's Cross	<i>Russula ochroleuca</i>	T
22	<i>Ula mollissima</i>	m	P.A. Buxton	83	Gerrard's Cross	<i>Russula nigricans</i>	T
23	<i>Ula mollissima</i>	m	P.A. Buxton	83	Gerrard's Cross	<i>Russula nigricans</i>	T
24	<i>Ula mollissima</i>	f	P.A. Buxton	83	Gerrard's Cross	<i>Russula nigricans</i>	T

Appendix I. (Cont.) Emergence results of *Ula* species recorded by P.A. Buxton (re-identified by the author).

No.	Species	m/f	Coll.	Buxton No.	Site	Fungal host	Saproxylic/ Terrestrial
25	<i>Ula sylvatica</i>	m	P.A. Buxton	46D	Gerrard's Cross	<i>Pleurotus cornucopiae</i>	S
26	<i>Ula sylvatica</i>	m	P.A. Buxton	74	Gerrard's Cross	<i>Meripilus giganteus</i>	S
27	<i>Ula sylvatica</i>	f	P.A. Buxton	74	Gerrard's Cross	<i>Meripilus giganteus</i>	S
28	<i>Ula sylvatica</i>	m	P.A. Buxton	32-55	Gerrard's Cross	<i>Kretzschmaria deusta</i>	S
29	<i>Ula sylvatica</i>	m	P.A. Buxton	63-53	Gerrard's Cross	<i>Tricholomopsis rutilans</i>	T
30	<i>Ula sylvatica</i>	m	P.A. Buxton	63-53	Gerrard's Cross	<i>Tricholomopsis rutilans</i>	T
31	<i>Ula sylvatica</i>	f	P.A. Buxton	46D	Gerrard's Cross	<i>Tricholomopsis rutilans</i>	T
32	<i>Ula sylvatica</i>	f	P.A. Buxton	72	Gerrard's Cross	<i>Amanita muscaria</i>	T
33	<i>Ula sylvatica</i>	m	P.A. Buxton	72-53	Gerrard's Cross	<i>Amanita muscaria</i>	T
34	<i>Ula sylvatica</i>	m	P.A. Buxton	23-54	Stoke Common	<i>Suillelus luridus</i>	T
35	<i>Ula sylvatica</i>	m	P.A. Buxton	24-54	Gerrard's Cross	<i>Suillelus bovinus</i>	T
36	<i>Ula sylvatica</i>	m	P.A. Buxton	24-54	Stoke Common	<i>Suillelus bovinus</i>	T

Appendix I. (Cont.) Emergence results of two *Ula* species specimens curated and re-identified within the NHM Buxton Collection.

No.	Species	m/f	Coll.	Buxton No.	Site	Fungal host	Saproxylic/ Terrestrial
37	<i>Ula mollissima</i>	f	J. Ramsbottom	5813	New Forest	<i>Gymnopilus spectabilis</i>	S
38	<i>Ula sylvatica</i>	f	K.G.V. Smith		Wolverhampton	<i>Phallus impudicus</i>	T

Fannia pruinosa (Meigen) (Diptera, Fanniidae) new to Britain

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Summary

Fannia pruinosa (Meigen, 1826) is added to the British list on the basis of a single male collected in Essex in 2017.

A single male *Fannia pruinosa* (Meigen, 1826) was captured by GE as by-catch in his light trap operating from a rural garden in Boreham (TL754098), Essex, between 22 and 24 September 2017. DS has identified this Dipteran by-catch for 2016 and 2017.

The same catch included several known Lepidopteran migrants, namely: *Helicoverpa armigera* (Hübner, 1808) (Scarce Bordered Straw), *Autographa gamma* (Linnaeus, 1758) (Silver Y), and *Spodoptera exigua* (Hübner, 1808) (Small Mottled Willow). The weather over the period was ideal for migrant insect arrivals from the continent, with a high pressure system over western Russia and another over western Europe producing a south-easterly airflow over southern Britain.

Fannia pruinosa is distinctive among the mainly dark-legged British Fanniidae in having mainly yellow legs and a reduced, linear lower calypter. In the key by d'Assis-Fonseca (1968) it will run to *F. pallitibia*. In Rozkošný *et al.* (1997), the male keys readily to couplet 62 where it is not difficult to separate it from the common *Fannia pallitibia* (Rondani, 1866). In *F. pallitibia* the thorax and abdomen are mainly black and the abdomen has a median row of subtriangular spots, whereas *F. pruinosa* has the thorax and abdomen densely grey dusted and the abdomen with a narrow median vitta. The male terminalia (illustrated by Rozkošný *et al.* 1997), provide confirmation as there are small but distinct differences in the shape of the cercal plate between these two species. The female is keyed by Rozkošný *et al.* (*op. cit.*) as differing from *F. pallitibia* by the presutural acrostichals being biserial (usually triserial in *pallitibia*) and the front corners of the abdomen translucent yellow (entirely dark and greyish dusted in *pallitibia*).

This species is widespread but rare in Europe, and in western Europe it is known from France, Belgium, Denmark, Germany and Sweden (Pont 2004). The specimen has been donated to the Natural History Museum in London.

Acknowledgements

We are extremely grateful to Adrian Pont who confirmed the identification and commented on an early draft.

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***Glabellula arctica* (Zetterstedt), a species and family added to the French fauna (Diptera, Mythicomyiidae)**

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Summary

Glabellula arctica (Zetterstedt, 1838) is recorded as new to France. Its synonymy with *Glabellula unicolor* Strobl, 1910 is indicated, **syn. nov.** The family Mythicomyiidae in which the species is now included, is also a first record for France. The specimens were captured within the framework of an ecological diagnosis of peat bogs on the basis of the Syrph the Net method, as part of the LIFE+ programme for functional rehabilitation of the peatlands of the Jura mountains.

The microbombyliids of the family Mythicomyiidae are rarely encountered; most species are tropical in distribution. In the genus *Glabellula* only 8 extant and two fossil species have been recorded in Europe, and the majority of these are eastern/Mediterranean. Taxonomically the group has suffered an historic incoherence: at various times, some species have been included in the Empididae, others considered to be Stratiomyidae or Rhagionidae. Only recently (Greathead and Evenhuis 2001) has it been formally established that Mythicomyiidae are close to, but clearly separate from, Bombyliidae.

Two females of *Glabellula arctica* (Zetterstedt, 1838) (Fig. 1) were captured (collector Hadrien Gens) in June 2017 with Malaise traps (n° 67 and 65) between the villages of Chapelle-des-Bois (Doubs) and Bellefontaine (Jura).



Fig. 1. Female of *Glabellula arctica* (Zetterstedt, 1838).

The trapping programme concerned was oriented to capturing Syrphidae. This study was carried out within the framework of an ecological diagnosis of peat bogs using the Syrph the Net method (Speight 2017), as part of the LIFE+ programme for the functional rehabilitation of peatlands of the Jura mountains (<http://www.life-tourbieres-jura.fr>).

Data are as follows:

JURA 39400 Bellefontaine, Tourbière des Ceigne, Malaise trap 65, UTM 32 coordinates: 277013/5162015. Altitude, 1100m. 1♀, 2.vi.17* (collection Amis de la réserve naturelle du lac de Remoray)

DOUBS 25240 Chapelle-des Bois, Tourbière des Pestiférés, Malaise trap 67, UTM 32 coordinates: 278810/5163871. Altitude 1081m. 1♀, 28.vi.17* (collection P. Withers)
(*these dates represent the end of a two-week collection period)

Glabellula arctica is rarely represented in collections, probably because of its minute size and particular habits (see below). It is known from the Czech Republic, Denmark, Finland, Norway, Russia, Slovenia, Sweden, Switzerland and (somewhat surprisingly) the Netherlands. *Glabellula unicolor* Strobl, 1910 is now considered a synonym of this species (**syn. nov.**, Neal Evenhuis *pers. comm.*) and to this list can thus be added Austria and Italy. Its predominantly black coloration will separate *G. arctica* from other European species.

The study by Andersson (1974) established that larvae of *G. arctica* occur in the nests of certain *Formica* ants. He cited *F. exsecta* Nylander, 1846, *F. polycytena* Förster, 1850, *F. nigricans* Bondroit, 1912 (now *F. pratensis* Retzius, 1783) and *F. aquilonia* Yarrow, 1955. The on-line French ant resource AntArea does not record either *F. exsecta* or *F. aquilonia* as occurring in France. The other two species occur in the Doubs, and *F. pratensis* is also present in Jura. It is unclear whether the larvae, sometimes numerous, are predatory or inquiline. Adults have been swept around such nests.

The ant species represented in the Malaise traps for the above collection periods showed the presence of four *Formica* species, viz: *F. lemani* Bondroit, 1917, *F. picea* Nylander, 1846, *F. fusca* Linnaeus, 1758 and *F. truncorum* Fabricius, 1804. Of these, *F. truncorum* is the only ant species to have a similar nest type, so it may be that this is another potential host for *G. arctica*. (Other ant species determined from trapped material were: *Lasius platythorax* Seifert, 1991, *L. brunneus* (Latreille, 1798), *Leptothorax acervorum* (Fabricius, 1793), *Myrmica ruginodis* Nylander, 1846 and *M. scabrinodis* Nylander, 1846).

There may be several reasons why *G. arctica* is rare in collections. The adults are very small and do not have any obvious affinities; it is not immediately clear even to what family they might belong, and there may be unrecognised material in collections. Equally, it is possible that they are crepuscular or nocturnal, which may assist in egg-laying on or near the nests. Their strong association with such a discrete microhabitat will not likely increase the probability of capture in a random manner (even given the specimens on which this note is based); rather a concerted collecting effort close to ant-hills of the appropriate species, at the right time of the day, may be the optimal (or only) way of capturing this elusive species alive.

Acknowledgements

We are extremely grateful to Neal Evenhuis for providing us with information on Mythicomyiidae, and confirming the synonymy herein cited. He also confirmed from photographs that the specimens we had to hand were indeed *Glabellula arctica*. Bernard Kauffman directed the senior author to AntArea and answered questions on *Formica* distribution

in France. Quentin Leduc is thanked for identifications of the ant species present in the trapped material.

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Corrections and changes to the Diptera Checklist (38) – 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 10 species, resulting in a new total of **7158** species (of which 41 are recorded only from Ireland), plus addition of two Imported species.

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 species was added by J. KRAMER (2009. Some interesting records. *Crane-fly Recording Scheme Newsletter* **18**, 5. In *Bulletin of the Dipterists Forum* **67**):
Phylidorea (Phylidorea) bicolor (Meigen, 1804 – *Limonia*)

Sciaridae. The following change results from W. MOHRIG, E. KAUSCHKE and K. HELLER (2017. *Austrosciara* Schmitz & Mjöberg, 1924, a senior synonym of *Ctenosciara* Tuomikoski, 1960 (Diptera: Sciaridae) and the description of a new brachypterous species in the genus. *Zootaxa* **4344**(2), 357-366):

AUSTROSCIARA Schmitz & Mjöberg, 1924 = CTENOSCIARA Tuomikoski, 1960
Austrosciara hyalipennis (Meigen, 1804 – *Sciara*)

Culicidae. The additional mosquitoes listed here have all been published in *Aedes*, recognising the broad concept of this name, which includes *Ochlerotatus* of the checklist. The first two of these additions should be included in the **Imported species** category in the checklist.

The following tropical species, which was listed as an excluded species in the 1998 checklist as a casual introduction, has been newly recorded by T. DALLIMORE, T. HUNTER, J.M. MEDLOCK, A.G.C. VAUX, R.E. HARBACH and C. STRODE (2017. Discovery of a single male *Aedes aegypti* (L.) in Merseyside, England. *Parasites & Vectors* **10**(309), 1-8):
Aedes aegypti (Linnaeus in Hasselquist, 1762 – *Culex*)

The following species of Asian origin has been reported by J.M. MEDLOCK, A.J.C. VAUX, B. CULL, F. SCHAFFNER, E. GILLINGHAM, V. PFLUGER and S. LEACH (2017.

Detection of the invasive mosquito species *Aedes albopictus* in southern England. *The Lancet* **17**, 140) but is not considered to have become established (Jolyon Medlock *pers. comm.*):
Aedes albopictus (Skuse, 1894 – *Culex*)

The following species was added by R.E. HARBACH, A.G. BRISCOE and J.M. MEDLOCK. 2017. *Aedes nigrinus* (Eckstein, 1918) (Diptera, Culicidae), a new country record for England, contrasted with *Aedes sticticus* (Meigen, 1838). *ZooKeys* **27**(671), 119-130.

Aedes nigrinus (Eckstein, 1918 – *Culicada*)

Dolichopodidae. The following addition and nomenclatural change are noted in this issue:

Lamprochromus kowarzi Negrobov & Chalaja, 1988

Lamprochromus semiflavus (Strobl, 1880 – *Diaphorus*) = *L. strobli* Parent, 1925 (established as the valid name by I.Ya. GRICHANOV, and A. AHMADI. 2017. Palaearctic species of the genus *Lamprochromus* Mik, 1878 (Diptera: Dolichopodidae). *Far Eastern Entomologist* **336**, 1-12).

Lonchaeidae. The following species is added in the present issue:

Lonchaea carpathica Kovalev, 1974

Agromyzidae. The following species are added in the present issue:

Metopomyza nigrohumeralis (Hendel, 1931 – *Liriomyza*)

Phytomyza scotina Hendel, 1920

A correction is necessary regarding *Liriomyza trifolii*, which should, like *L. huidobrensis*, be designated as “quarantine species – eradicated” as the reference cited confirmed its eradication from commercial nurseries (Joe Ostojca-Starzewski *pers. comm.*).

Periscelididae. The following species is added in the present issue. It is unconfirmed whether all British records of *P. winnertzii* Egger, 1862 refer to this species, so that species is presently retained on the British list:

Periscelis fugax Roháček & Andrade, 2017

Chloropidae. The following species was added by M.T. JENNINGS (2017. *Lipara pullitarsis* Dorskocil & Chvála (Diptera: Chloropidae) new to Britain. *British Journal of Entomology and Natural History* **30**, 169-170):

Lipara pullitarsis Dorskocil & Chvála, 1971

Ephydriidae. The following synonymy was proposed by T. ZATWARNICKI and A.G. IRWIN (2017. Taxonomic notes on the genera *Scatella* and *Scatophila* (Diptera: Ephydriidae) with a remark on *Trixoscelis chilensis* (Trixoscelididae). *Zootaxa* **4377**(1), 91-109):

Scatella lacustris (Meigen, 1830 – *Ephydra*) = *S. tenuicosta* Collin, 1930

Anthomyiidae. The following species is raised from synonymy with *Hydrophoria lancifer* (D.M. Ackland *pers. comm.*), having first been recorded in Britain by J.E. COLLIN (1953. *Journal of the Society for British Entomology* **4**, 176):

Hydrophoria diabata (Pandellé, 1899 – *Anthomyia*)

Fanniidae. The following species is added in the present issue:

*Fannia pruinos*a (Meigen, 1826 – *Anthomyia*)

***Prionocera pubescens* Loew (Diptera, Tipulidae) in Highland**

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Summary

Following the discovery of a strong colony of *Prionocera pubescens* Loew, 1844 in north Scotland in 2013, visits to other sites with suitable habitat have confirmed it as widespread over much of the eastern part of Highland. It flies mainly in May by boggy pools, and is associated with the later stages of succession. It shares habitat with its much commoner congener *P. turcica* (Fabricius, 1787) and several other crane-flies.

Introduction

The crane-fly *Prionocera pubescens* Loew, 1844 is regarded as scarce throughout Great Britain. It is classed as ‘Vulnerable’, and is included in the Scottish Biodiversity List of species of principal importance for biodiversity conservation under the Nature Conservation (Scotland) Act 2004. Stubbs (1992) mapped six hectads in Britain, only three of them (one each in Scotland, England and Wales) with records since 1960. The National Biodiversity Network (NBN) Atlas accessed on 29 August 2017 shows records in only eight hectads in England and two in Wales since 1990 (four and two respectively since 2000). For its congener *P. turcica* (Fabricius, 1787), to put these in context, the post-2000 hectads are 49 for England and 12 for Wales, suggesting that *P. pubescens* is indeed relatively rare and not just overlooked. Until recently it was known in Scotland from a single site at Dalfaber Bog (NH903134) near Aviemore in Strathspey in 1981, but that site is now lost to development (A. Stubbs *pers. comm.*). This scarcity means that the biology and ecology is poorly known, and the larva has never been described. According to Boyce (2004), it is a stenotopic inhabitant of lowland bogs which appears to have an association with *Sphagnum* lawns.

In May 2013, I netted several crane-flies at a boggy site near Strathpeffer, and identified them as *P. pubescens*. That was confirmed by Geoff Hancock, and specimens of males and females were deposited at the National Museums of Scotland in Edinburgh, and the Hunterian Museum in Glasgow. Subsequently, targeted searches in suitable habitats by me and Stewart Taylor revealed three further sites for the fly in Strathspey. Until 2017, recording was casual and opportunistic. In 2017, I made a special effort to establish the status of the fly, to add to the knowledge of its habitat and phenology, and to compare its ecology with that of *P. turcica* which also occurs widely in Highland in similar habitat. Work was confined to the east part of Highland (the local authority area covering V.Cs 96, 97, 104-109 and parts of V.Cs 95 and 98).

Methods

Possible sites of suitable habitat were identified from local knowledge, and from examination of Ordnance Survey Landranger maps and images on Google Earth. These were visited during May 2017, and any Tipulidae or Pediciidae (‘larger crane-flies’) encountered were netted and identified. The two *Prionocera* species were normally identified in the field with a x15 lens. The rostrum is black in *pubescens*, yellow in *turcica*; the nasus very short in *pubescens*, longer and easily visible from the side in *turcica* (Alan Stubbs, *in litt.* 2013). *P. subserricornis* (Zetterstedt, 1851) is excluded by the same features. *Tipula oleracea* Linnaeus, 1758, *T. paludosa* Meigen, 1830, *T. fulvipennis* De Geer, 1776 and *Pedicia rivosa* (Linnaeus, 1758) were usually recognised in the

field. Other species were collected and keyed out later using Stubbs (1996) supplemented with images on the *Catalogue of the Craneflies of the World* website (Oosterbroek 2018), though after initial determination some males were identified in the field with a lens from genital characters. Records from other observers were confirmed by me from specimens. Short-palped craneflies were generally ignored.

An attempt to determine extreme dates was made by making visits to the most easily accessible site from mid-April to late September as follows:

April – 21, 23, 26, 29	May – 1, 10, 18, 21, 23
June – 3, 17	July – 3, 11, 17, 25
August – 6, 7, 10, 17, 27	September – 3, 6, 12, 18, 25

Visits were made in clement weather, avoiding wind, rain and low temperatures, and involved a slow walk around the edge of the site for at least 30 minutes. An effort was made to net at least five tipulids on each visit, though that was not always achieved. Sample sizes were usually far too small and variable to allow any finer analysis than presence/absence.

To reduce the possibility of ‘confirmation bias’ in relation to habitat and phenology, all tipulids encountered in Highland from April to September 2017 were identified.

The main study area – the Jubilee Pond

Prionocera pubescens was first encountered on the edge of the Jubilee Pond in Strathpeffer (NH4757, V.C. 106). This is an artificial lined pond, originally a little less than 1ha in area, created to mark the jubilee of Queen Victoria in 1887 and used for skating and curling. It was maintained as open water until around the 1960s by cutting back encroaching vegetation. When I first saw the site in 1981, open water remained dominant, and it was used by mallard *Anas platyrhynchos* Linnaeus, 1758, teal *A. crecca* Linnaeus, 1758 and little grebe *Tachybaptus ruficollis* (Pallas, 1764) for nesting. Since then, and in the absence of any intervention, succession has proceeded steadily. *Sphagnum* and other mosses have encroached especially from the western margin, followed by increasing establishment of a range of herbaceous plants and self-seeded saplings of several species. It is bounded by conifer plantation, though there is frequent wild native hardwood, notably *Betula*, *Alnus glutinosa*, and *Salix*, near to the edges. The current maximum extent of standing water is around 0.4ha. The edge is floating bog characterised by scattered short water horsetail *Equisetum fluviatile*, bottle sedge *Carex rostrata*, pondweed *Potamogeton* and bogbean *Menyanthes trifoliata*, in a fine substrate of decayed plant material with up to 2cm depth of water left dominant between the plants.

The pond is filled by surface drainage only, and drained by two small ditches. This renders it susceptible to significant changes in depth and extent of open water. Unusual weather in May 2017, with low rainfall and high temperatures, may have affected validity of the results on phenology. Following a winter with below average precipitation (348.6mm, 45%, compared with a mean of 766.3mm 1989-2016), the rainfall in April and May 2017 close to the most easily accessible site was only 67.2mm (56% of the 1989-2016 mean of 119.4mm). Temperatures were also unusually high, with extended periods of sunshine raising air temperature to 20-26°C. By mid-May, this unusual weather had caused the ‘wet edge’ of the bog to retreat to a point where it was inaccessible. This may have prevented contact with *P. pubescens* in late May and June even if present.

Results

Range in Highland

P. pubescens is now known from 5 hectads in Scotland, all in the east of Highland, as shown in Fig. 1. Its known sites in Scotland are listed in Table 1. *P. turcica* is much more widespread

Location	Grid reference	Date(s)	Numbers	Comment
Jubilee Pond	NH479572	2013-2017	Hundreds at peak times.	See detailed description above.
Tulloch Moor	NH9673716558	7 May 2014	1 male, 1 female.	<i>Sphagnum</i> bog with stunted <i>Betula</i> , and old peat-workings nearby. Some areas of <i>Sphagnum</i> cover quite deep peaty pools. Found by Stewart Taylor.
Street of Kincardine	NH94341735	12 May 2016	1 male.	Wet peatland with slightly raised <i>Sphagnum</i> tussocks and large areas of <i>Sphagnum</i> bog with some stunted <i>Betula</i> . Natural peaty pools, some perhaps man-made. Found by Stewart Taylor.
An Camas Mór	NH90551222	10 June 2015	3 males	Kettle-hole in forest, c 0.1ha, at an advanced stage of succession.
Loch nan Craoiseag	NH4909556344	1 May 2017	4 males caught, possibly a few others present.	Open water extending to c 80x40m in 19 th C, still with some open water in the early 1980s, now almost entirely covered in <i>Sphagnum</i> and encroaching vegetation. 20x10m of habitat left.
Monadh Mór SSSI	NH5918453277, NH5932554056, NH5945054148, NH5956254208	4 May 2017	Males at four sites, possibly up to 20 at the first pool.	Four boggy pools in a large area of bog woodland. Likely to be more widespread on the site.
Kinellan	NH4613557767	9 May 2017	2 males.	Small boggy pool on edge of forest and moorland.
Unnamed lochan	NH4767059456, NH4771359357	9 May 2017	3 males caught, possibly up to 20 others.	An old lochan 150x75m, succession having advanced to create a quaking <i>Sphagnum</i> bog.
Unnamed lochan, locally 'Seagull Loch'	NH4709959455	9 May 2017	1 male, possibly 2 others.	An open lochan, 200x100m, but with shallow water and bog at least at the west end.
Elsick flood	NH47685730	11 May 2017	1 male.	Small lochan formed in the late 1990s after disruption to previous field drainage, subject to succession by mosses and <i>Salix</i> . <i>P. turcica</i> also present.
Daviot Wood	NH70273862	12 May 2017	1 male.	Edge of lochan with very soft edges of encroaching <i>Sphagnum</i> bog, surrounded by conifer plantation (some recently removed). Found by Stephen Moran.
L na Cuilce	NH5215434752	17 May 2017	2 males.	Open lochan in forest, but around half of its area subject to succession.
Loch Laide	NH5477835158, NH5463635097	17 May 2017	2 males.	Large open loch, 400x400m, with shallow water and bog at the west end. 5m, 2f <i>turcica</i> (one ovipositing) also present.
Loch Battan	NH5376038960	17 May 2017	2 males, 1 female.	Extensive area of quaking moss at SW end of loch in forest.

Table 1. Sites where *Prionocera pubescens* was found in Highland, 2013-2017.

Species	April				May				June				July				August				September			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<i>P. pubescens</i>																								
<i>P. turcica</i>																								

Table 2. Phenology of *Prionocera pubescens* and *P. turcica* in Highland, based on all records in the HBRG database. Dark grey shows the more numerous species in any quarter-month. Extreme dates were *pubescens* 16 April – 10 June; *turcica* 16 April – 17 August.

Date	April				May				June				July				August				September							
	21	23	26	29	01	10	18	21	23	03	17	03	17	03	11	17	25	06	07	10	17	27	03	06	12	18	25	
<i>Prionocera pubescens</i>																												
<i>Prionocera turcica</i>																												
<i>Tipula montium</i>																												
<i>Tipula oleracea</i>																												
<i>Pedicia rivosa</i>																												
<i>Tipula lateralis</i>																												
<i>Tipula couckeii</i>																												
<i>Tipula paludosa</i>																												
<i>Tipula fulvipennis</i>																												
<i>Tipula luteipennis</i>																												

Table 3. Craneflies (Tipulidae and Pediciidae) recorded at the Jubilee Pond during 2017. Grey – present; white – none seen.

(Fig. 2), recorded in all areas of the country including Shetland and the Western Isles. Major gaps are likely to be a consequence of poor recording effort.

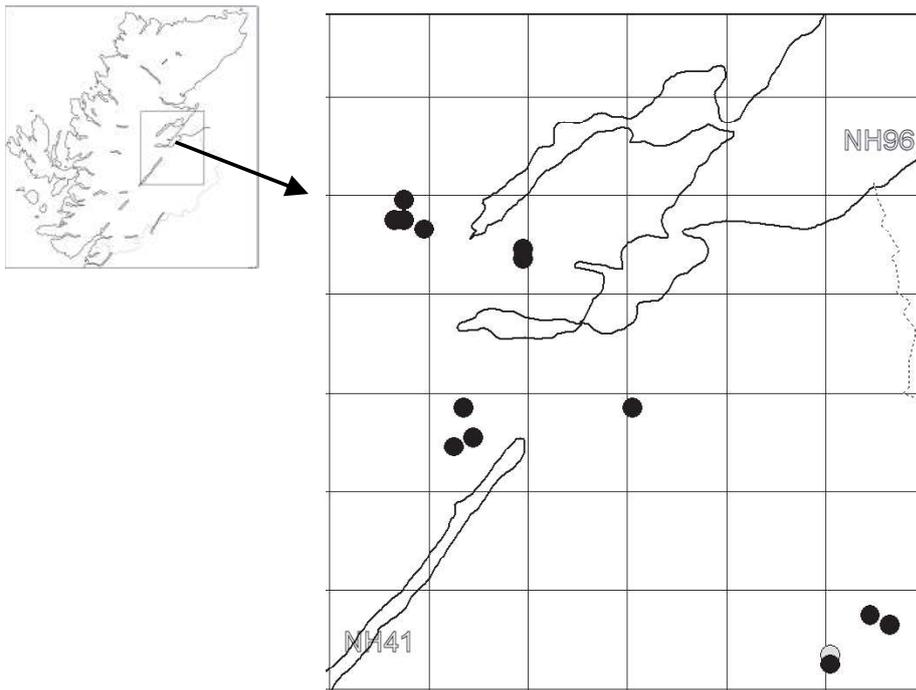


Fig. 1. Known distribution of *Prionocera pubescens* in Scotland. Symbols are 2km diameter, and plotted at 1km precision. The grey symbol marks the original 1981 site. The 10km OS grid lines are shown.

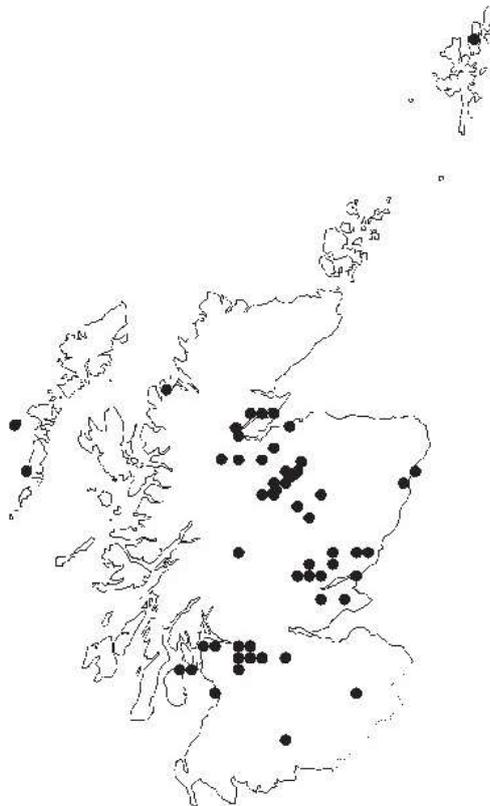


Fig. 2. Distribution of *Prionocera turcica* in Scotland, mapped on hectads. Data from the HBRG database, and from other datasets on the NBN Atlas, 29 August 2017.

Habitat

Prionocera pubescens was found almost exclusively on bare damp substrate at the extreme edge of standing water, or where up to 2cm of water stood. Sometimes that was at the edge of larger open water-bodies; elsewhere, in small patches of shallow water only a few metres across in floating bogs. Similar features were present at all the sites where *pubescens* was found, whether in bogs or on the edge of larger areas of open water. The fly was not found where there was an absence of very shallow open water, whether through the water being significantly deeper than 2cm or where the vegetation was tall or dense. Shelter from surrounding trees was a common factor, and may be significant. Although both species of *Prionocera* were frequently found together, *turcica* appeared to be much more catholic in its habitat choice, often being taken over deeper water, in tall dense stands of *Carex rostrata*, and occasionally over dry ground some tens of metres from water.

Phenology and behaviour

Extreme dates and range of records for the two *Prionocera* are shown in Table 2. It appears that *pubescens* in Highland has a short flying season, principally from mid-April to early June. It is fully active in cool conditions, once recorded in an air temperature of 8°C on a cloudy day. *P. turcica* appears at about the same time, but flies until late August, though its numbers appear to fluctuate irregularly during that long season. During September, many hundreds of *Tipula luteipennis* Meigen, 1830 were flying – the only tipulid recorded there in that month – so it is possible that other species were present in small numbers, but not detected.

Males of both *P. pubescens* and *P. turcica* are obvious when flying a few cm above the substrate, occasionally landing on emergent vegetation. At the Jubilee Pond in late April and early May, large numbers of male *pubescens* would be flying thus, creating a remarkable sight. As with other small tipulids, female *pubescens* were remarkably difficult to find unless mating or ovipositing.

Seven other tipulid species and *Pedicia rivosa* were recorded on the Jubilee Pond in 2017, as shown in Table 3. *Phylidorea ferruginea* (Meigen, 1818) was also present and common, as were other short-palped species but they were not routinely identified.

Discussion

Prionocera pubescens is obviously much commoner in the eastern part of Highland than previously thought. Indeed, given its apparent rarity in the rest of Britain, Highland may hold its main British populations. Although we know of 14 current sites in 5 hectads, it must be far more widespread across the area. An early and restricted flight season, the remoteness of many of the sites, the difficulty of mobility on the soft bogs, and the scarcity of resident dipterists, all combine to make recording difficult. However, the habitat is not unusual in Highland and more commonly seen in the north and west of Scotland where the recording effort of craneflies is even less intense. The fact that nine of the ten sites selected purely on gross habitat character contained *P. pubescens* suggests that it is a common spring tipulid in suitable habitat there.

My observations place *P. pubescens* as one of the earliest tipulids to emerge in spring in Highland. The HBRG database has records earlier than 16 April only for *T. rufina* Meigen, 1818 and *T. maxima* Poda, 1761 (1 record of each), and only *T. rufina* and *T. subnodicornis* peak in activity as early as *P. pubescens*. The NBN Atlas holds 31 records of *pubescens* from England and Wales, 19 (61%) in April and May. However, 8 records (26%) were in July and August, well beyond the last dates seen in Highland, suggesting a much longer season in the southern part of the range.

A recurring feature of the sites is advanced succession from open water to moss lawn, scrub and woodland. These sites will inevitably become unsuitable, some, because succession is

so advanced, probably within a few years. One would expect that a species which seems to favour temporary seral stages would have good powers of dispersal, which, in the case of *Prionocera* would in some cases require long flights over unsuitable habitat including forest, farmland and built-up areas. Only monitoring of potential habitat over many years will establish if the fly is capable of that dispersal and the maintenance of the wider population. It is difficult to assess dispersal ability from current distribution, as land use in the area has changed markedly in the past several decades, especially through commercial forestry operations, so currently isolated sites may not have been so isolated in the past.

Stubbs (2003) stated, in relation to *P. pubescens*, ‘very few other crane flies occur in similar habitat’. This did not seem to apply at the Jubilee Pond, where *P. turcica*, *Pedicia rivosa*, and seven species of *Tipula* were present. Although there was no proof of breeding, there was every indication that all except *P. rivosa* (seen only once) and *T. couckeii* Tonnoir, 1921 (seen twice) were breeding in the general area of the pond most often frequented by *P. pubescens*. At least three sites had both *Prionocera* species flying together – once a male of each taken in the same sweep. Subjective observations suggested that *turcica* is much less restricted in habitat preferences. It is frequent around an area of open water with dense stands of *Typha* and *Carex* in quite deep water only 320m from the Jubilee Pond where *pubescens* was found only once.

It is difficult to see how practical conservation measures could help to safeguard many of the existing sites in favourable condition for the fly. In those most at risk from the advance of succession any intervention would be impractical. Where succession is less advanced, there is probably little need to intervene. The most extensive site, the bog woodland at Monadh Mór, is probably safe from natural deterioration in the medium term at least, and is protected from any development under SSSI status. Perhaps the greatest risk would come from drainage of bogs associated with forestry activities. Forestry Commission Scotland, who own several of the known sites and probably many still to be found, has been alerted to the importance of such habitats.

Acknowledgements

I am grateful to Stewart Taylor and Stephen Moran for help in checking potential sites, and for comments on the draft. Alan Stubbs provided early advice and encouragement. Maps were produced with DMAP. Records from the NBN Atlas provided by the Biological Records Centre, Natural Resources Wales, Countryside Council for Wales, Shropshire Ecological Data Network, and Natural England were consulted. These groups and the NBN Trust bear no responsibility for any further analysis or interpretation of that material, data and/or information.

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A third English site and rearing record for *Reliquantha variipes* Roháček (Diptera, Anthomyzidae)

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Summary

The rearing of *Reliquantha variipes* Roháček, 2013 from rotten wood of sycamore *Acer pseudoplatanus* is reported. This is the third known record of this species.

On 24 March 1982, I reared two small, female acalypterates from dead wood in Dagnam Park Essex. The material was collected within a small area of ancient woodland within the Dagnam Park local Nature Reserve at TQ546927. The sample was from within the rotting bole of a sycamore *Acer pseudoplatanus*, and it is possible that some soil and or leaf litter contaminated the sample though unlikely, as the samples were quite small. This was a regular collecting site and I had collected samples in the two preceding years. The material was confined in plastic jars and stored indoors in a cool room. The two acalypterates emerged on 17 and 20 May 1982.

I failed to recognise these specimens and set them to one side looking at them every five or six years, until January 2018 when I finally admitted defeat and sent one to Peter Chandler who identified it as *Reliquantha variipes* Roháček, 2013.

Reliquantha variipes was described by Roháček (2013) from a female found on a bracket fungus on elm at Oxford by George Varley on 15 July 1975 and a male collected by Peter Chandler in Oxwich Wood on the Gower Peninsula on 5 July 2009. The Roháček paper was summarised by Chandler (2014). It has not yet been recorded outside the British Isles. Its nearest relative and the only other known species of this genus, *R. eocena* Roháček, 2014 was described from a male specimen in Baltic amber (Roháček 2014).

It was assumed from the Varley record to be fungus associated, and unsuccessful searches by Peter Chandler at Oxwich Wood in 2014 had this assumption in mind. It is possible that these flies had developed in a fungus before pupariating in the rotten wood. However, the table below includes all the other species reared from the rot hole over the three years from 1980 to 1982. None have known associations with fungi.

Family	Species	Year
Clusiidae	<i>Clusiodes albimanus</i> (Meigen, 1830)	1981
Dolichopodidae	<i>Medetera impigra</i> Collin, 1941	1980
Dolichopodidae	<i>Systemus bipartitus</i> (Loew, 1850)	1980
Empididae	<i>Hilara lurida</i> (Fallén, 1816)	1982
Fanniidae	<i>Fannia polychaeta</i> (Stein, 1895)	1981
Fanniidae	<i>Fannia umbrosa</i> (Stein, 1895)	1981
Hybotidae	<i>Oedalea apicalis</i> Loew, 1859	1980
Hybotidae	<i>Platypalpus exilis</i> (Meigen, 1822)	1981

Hybotidae	<i>Platypalpus parvicauda</i> (Collin, 1926)	1981
Hybotidae	<i>Tachypeza fuscipennis</i> (Fallén, 1815)	1982
Hybotidae	<i>Tachypeza nubila</i> (Meigen, 1804)	1982
Milichiidae	<i>Madiza britannica</i> Hennig, 1937	1982
Syrphidae	<i>Criorhina floccosa</i> (Meigen, 1822)	1981
Tachinidae	<i>Eloceria delecta</i> (Meigen, 1824)	1980

One of the female specimens of *Reliquantha variipes* will be deposited in the collection of the British Entomological and Natural History Society at Dinton Pastures Country Park, Reading and the other in the collection of the Natural History Museum, London.

Acknowledgements

I would like to thank Peter Chandler for the identification and his invaluable help in the preparation of this note, and Jindřich Roháček for his helpful comments.

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***Periscelis fugax* Roháček & Andrade (Diptera, Periscelididae) in Britain and another French record**

– In a note above (p. 164) Phil Withers has recorded the occurrence at two localities in France of *Periscelis fugax* Roháček & Andrade, 2017, which had been described from Portugal and the Czech Republic.

J. Roháček and R. Andrade (2017. *Periscelis fugax* sp. nov., an overlooked European species of Periscelididae (Diptera), with notes on the morphology and terminology of terminalia. *Acta Entomologica Musei Nationalis Pragae* **57**(1), 229-251) recognised that two species had previously been identified as *Periscelis winnertzii* Egger, 1862, and they provided characters for separating these species, illustrated by colour photographs of the insects and figures of the male and female genitalia of both species. Specimens they confirmed as *P. winnertzii* were recorded

from Portugal, Slovakia and Hungary, but less material was available to them than of *P. fugax*. Both species were recorded in Portugal from around oak trees (*Quercus* species) bearing sap runs. The Czech material of *P. fugax* was obtained at beer traps and in Malaise trap catches. The flight period was from June to October, but records for the autumn months predominated.

Apart from the differences in structure of both male and female genitalia, these species can be recognised from several external characters. Both have a blackish spot on the outer side of the antennal pedicel, which extends to its ventral margin in *P. winnertzii* but distinctly stops short of this edge in *P. fugax*. The mesonotum has a grey ground colour in both species, on which a pair of brown stripes may be present between the rows of dorsocentral bristles; these stripes are relatively faint or absent in *P. winnertzii*, but always quite distinct in *P. fugax*. The scutellum in *P. winnertzii* is also entirely grey or narrowly yellow apically, but in *P. fugax* it is largely or entirely yellow on the disc.

Like some other species of Diptera associated with sap runs on decaying trees, *Periscelis winnertzii* has rarely been recorded in Britain. The recent review of acalyptrate statuses (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**) provided a provisional status of Vulnerable for this species. It was there stated to be known from only five English localities: Lyndhurst, New Forest, Hampshire (1960); Ickworth Park, Suffolk (2004); Moccas Park NNR, Herefordshire (1905, 1934); Bushy Park, Middlesex (2010); Wyre Forest, Worcestershire (1987).

It has so far been possible to re-examine specimens from Moccas Park, two males collected by J.E. Collin in August 1934 (Natural History Museum, London collection) and a female from Wyre Forest, collected in a Malaise trap operated by Colin Plant on 25 August 1987 (in the author's collection). All have two distinct brown stripes on the mesonotum. One of the Moccas specimens has the scutellum destroyed, but it is yellowish in the other as described for *P. fugax*. The Wyre female also has an entirely yellow scutellum, and on dissection the structure of its postabdomen was found to agree with the figures of *P. fugax* provided by Roháček and Andrade (*op. cit.*).

The Ickworth Park (TL815615) record was based on five specimens caught at a sap run on oak by Ivan Perry (1♀ 31.viii, 1♂ and 1♀ 1.ix, 1♀ 3.ix, 1♀ 6.ix); these also have distinct thoracic stripes and a yellow scutellum (Ivan Perry *pers. comm.*); this tree died in the following year.

The record from Bushy Park was of three females (9 and 31.viii, 13.ix.2010), identified by Martin Drake, from vane traps secured to two oak trees at separate locations in the Park; these were not isolated from the trapped material returned to the Royal Parks, but it was noted at the time of examination that they had a striped thorax, so it seems most likely that they are also *P. fugax* (Martin Drake *pers. comm.*).

There are five specimens in the Cambridge University Museum collection, collected at Moccas Park by C.G. Lamb on the same date as those caught by J.E. Collin mentioned above (Ivan Perry *pers. comm.*). The identities of these and the New Forest record are yet to be determined.

It is possible that both species occur in Britain, as is the case in central Europe and in Portugal, but this awaits confirmation, as Phil Withers (*op. cit.*) has indicated for France. I can report a third French record of *P. fugax* as I caught a female at Les Hauteurs de la Solle in the ancient Forêt de Fontainebleau, Seine-et-Marne, 20-21 September 1997.

Periscelis species are widespread in Britain and should be sought at sap runs, especially where these are active in the autumn.

I am grateful to Jindřich Roháček, Martin Drake and John Ismay for comments on drafts of this note – **PETER J. CHANDLER**, 606B Berryfield Lane, Melksham, Wiltshire SN12 6EL

The leaf-mining fly *Metopomyza nigrohumeralis* (Hendel) (Diptera, Agromyzidae) new to Britain from Sutton Fen RSPB reserve in the Norfolk Broads

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Summary

Metopomyza nigrohumeralis (Hendel, 1931) (Diptera, Agromyzidae) has been discovered new to Britain at Sutton Fen RSPB reserve in the Norfolk Broads. The potential for further discoveries amongst the Diptera of the Broads is discussed with a comparison to Coleoptera data.

MGT carried out an invertebrate survey at Sutton Fen RSPB reserve over the course of 12 days between April and August 2016 (Telfer 2017). Aerial-netting (sweep-netting with a lightweight dipterists' net) was a minor component of the fieldwork but 16 aerial-netting samples were taken, following the sampling method described by Drake *et al.* (2007: pages 36-37) though sampling for a 20-minute duration rather than the 10-minute duration recommended therein. Diptera specimens were separated out of the sample, frozen and passed to DJG for identification. The Diptera samples included a species of leaf-mining fly (Agromyzidae) with no previous British record: *Metopomyza nigrohumeralis* (Hendel, 1931).

Metopomyza nigrohumeralis is a small, black leaf-mining fly with bright yellow antennae, notopleuron, scutellum and knees. It is readily identifiable on external characters using Spencer (1976), who also illustrated the lateral and ventral aspects of the distinctive aedeagus. A male of *M. nigrohumeralis* was netted in the Grimes Fen area of the Sutton Fen reserve at TG 37190 23770 (sampling point 5F) (Fig. 1) on 27 May 2016. This is an area of open fen managed by light seasonal grazing using the reserve's herd of Highland cattle. The vegetation is dominated by sedge *Carex* and marsh fern *Thelypteris palustris* with diverse other species including marsh lousewort *Pedicularis palustris*, alder *Alnus glutinosa* saplings and common reed *Phragmites australis* with a substantial cover of mossy ground and small patches of standing water.

This species has otherwise been recorded from Austria, Denmark, France, Germany, Italy, Slovakia, Sweden and Russia (Sakha (Yakutia)) (<http://www.fauna-eu.org>; Miloš Černý, *in litt.*, Feb. 2018; Zlobin 1995).

There are no published host plant data for *M. nigrohumeralis* but related species of *Metopomyza* have been found mining monocotyledons, including sedges *Carex*, flowering-rush *Butomus umbellatus*, rushes *Juncus* and grasses (*Alopecurus*, *Deschampsia*) (Spencer 1976; Spencer 1990; Pakalniškis 1998). Michael von Tschirnhaus (*pers. comm.* to Miloš Černý) has a specimen of *M. nigrohumeralis* in his collection which was reared from *Carex acuta*.

Discussion

This invertebrate survey at Sutton Fen focused on beetles (355 species recorded, 43% of the total species list for the survey of 832) with a relatively small amount of effort on flies (218 species, 26%). There is an unexpected contrast when comparing Coleoptera and Diptera results; while

the survey yielded two agromyzids new to Britain (a paper on the second species is in prep.), there was not even a single beetle new to Norfolk! There are two main explanations for this: either Sutton Fen is richer and more exceptional for Diptera than it is for Coleoptera, or Sutton Fen is relatively more under-recorded for Diptera than it is for Coleoptera. Sutton Fen is a well-recorded site for Diptera (e.g. Drake 2007) but it is certainly under-recorded relative to Coleoptera. To date, 648 species of Diptera have been recorded, forming 9.1% of the British and Irish Diptera list of 7,148 species (Chandler 2017) compared to 676 species of Coleoptera (16.4% of 4,130 species (Duff 2018)). In our view, Sutton Fen is probably an exceptional site which would repay further survey of Agromyzidae and other Diptera.



Fig. 1. Sutton Fen RSPB Reserve, sampling area.

Acknowledgements

We would like to thank those who arranged and assisted with the survey: Mark Gurney, Richard Mason, Martin Drake and Mick A'Court, and would like to thank Richard Mason also for provision of data on the reserve's Diptera and Coleoptera lists. The text has been improved thanks to comments from Martin Drake, Tony Irwin, Miloš Černý and Michael von Tschirnhaus.

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Changes to the Irish Diptera List (25) – 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 net gain of one species cited here brings the total Irish list to 3409.

Pjotr Oosterbroek (*pers. comm.*) has drawn attention to some discrepancies in citation of craneflies from Ireland in the checklist:

The following species listed as ? occurring in Ireland are removed from the Irish list:

Tipula (Lunatipula) vernalis Meigen, 1804 (removed by Ashe *et al.* 2007)

Tipula (Pterelachisus) pabulina Meigen, 1818 (removed by Ashe *et al.* 2007)

Dicranomyia stigmatica (Meigen, 1830) (removed by Ashe *et al.* 1998)

Limnophila (Limnophila) schranki Oosterbroek, 1992 (removed by Ashe *et al.* 2005)

The following species listed as ? was confirmed as Irish by Ashe *et al.* (2007):

Tipula (Vestiplex) montana Curtis, 1834

The following species were stated in error to have been confirmed by Ashe *et al.* (1998):

Limonia maculipennis (Meigen, 1818) (removed by Ashe *et al.* 1998)

Limonia stigma (Meigen, 1818) (removed by Ashe *et al.* 1998)

The following species were added by Ashe *et al.* (1998), although not formally recognised as distinct British species until the revision by Starý and Stubbs (2015):

Dicranomyia (Dicranomyia) affinis (Schummel, 1829)

Dicranomyia (Dicranomyia) lutea (Meigen, 1804) (also recorded from Ireland by Ashe *et al.* 2008)

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Biogeographical Society **31**, 296-357.

Ashe, P., O'Connor, J.P., Alexander, K.N.A., Chandler, P.J. and Oosterbroek, P. 2008. Additions, with some corrections, to the records of the crane flies of Ireland (Diptera: Cylindrotomidae, Limoniidae, Pediciidae and Tipulidae). *Bulletin of the Irish Biogeographical Society* **32**, 6-20.

Starý, J. and Stubbs, A.E. 2015. Five species under *Dicranomyia* (*Dicranomyia*) *mitis* (Meigen, 1830) (Diptera, Limoniidae). *Zootaxa* **3964**, 321-334.

***Chorisops nagatomii* Rozkošný (Diptera, Stratiomyidae) new to Scotland**

– On 19 August 2017 in Dalgety Bay (NT1582), Fife, a female *Chorisops nagatomii* Rozkošný, 1979 was taken amongst a collection of flies obtained by means of both sweeping and targeted netting along the woodland/shore edge. Photographs of the specimen can be seen on the iRecord website at https://www.brc.ac.uk/irecord/record-details?occurrence_id=5627615. This represents a significant jump north in its known British distribution.

Chorisops nagatomii is a soldierfly with a southerly distribution in the British Isles which has only been recognised as a separate species from its congener *Chorisops tibialis* (Meigen, 1820) since 1979. The females of *C. nagatomii* and *C. tibialis* are very similar and are separated by the former's yellow humeri and posterior calli and by its more extensively yellow tergites. After initial determination, the voucher was compared against others in the National Museums of Scotland (NMS), where it is now deposited, before being sent to Martin Harvey who, along with Alan Stubbs, was able to confirm the determination. Characters for distinguishing the two species were also provided by Martin Speight (1981. *Chorisops nagatomii*, an insect new to Ireland and its segregation from *C. tibialis* (Diptera: Stratiomyiidae). *The Irish Naturalists' Journal* **20**(8), 327-329).

Previous records of *C. nagatomii* mostly form a sparse but continuous block across the south of Great Britain. The reference by A. Stubbs and M. Drake (2014. *British Soldier Flies and Their Allies*. Second edition. 528 pp. British Entomological and Natural History Society, Reading) to a record from Cumbria apparently refers to one from Leighton Moss (SD4775) by E.G. Hancock on 22 August 1973 (Crossley, R. 1989. Some old records of *Chorisops nagatomii* Rozkošný (Stratiomyidae). *Dipterists Digest (First Series)* **2**, 39). *Chorisops tibialis* is also a southern species in Britain, though slightly less so, with a body of records extending north into the south of Scotland; *C. tibialis* is the commoner of the two species. While records for *C. tibialis* extend past the August date of this record, *C. nagatomii* has a peak in August – slightly later than *C. tibialis*.

Both species are said to favour woodland and mature scrub, though specific habitat requirements of *C. nagatomii* are not well known (Stubbs and Drake *op. cit.*). The woodland is a narrow coastal strip of principally sycamore (*Acer pseudoplatanus*), and the edge from which the specimen was taken is bordered with oraches (*Atriplex* spp), behind which are other wild flowers including herb robert (*Geranium robertianum*), nettle (*Urtica dioica*), sea mayweed (*Tripleurospermum maritimum*) and hedge woundwort (*Stachys sylvatica*). The shore itself is a narrow, stony beach on the edge of the Firth of Forth, this mostly covered at high tide. Also between wood and shore are some large prostrate tree trunks.

My thanks are due to Ashleigh Whiffin of NMS, Martin Harvey and Alan Stubbs, who all contributed to confirmation of determination and status – **ALISTAIR SHUTTLEWORTH**, 25 Donibristle Gdns, Dalgety Bay, Fife KY11 9NQ

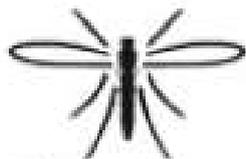
<i>Calliphora uralensis</i> Villeneuve (Diptera, Calliphoridae) in East Lothian MURDO MACDONALD	164
Two species of acalypterate Diptera new to France PHIL WITHERS	164
Remarkable records of the carnid genus <i>Meoneura</i> Rondani (Diptera, Carnidae) from the collection of the Tel Aviv University (SMNHTAU) with the introduction of one new synonym JENS-HERMANN STUKE and AMNON FREIDBERG	165-167
Rearing of <i>Tephrochlamys flavipes</i> (Zetterstedt) (Diptera, Heleomyzidae) from fungi in Britain E.G. HANCOCK, D. HORSFIELD and K.N.A. ALEXANDER	168
Colour dimorphism in the hoverfly <i>Microdon myrmicae</i> Schönrogge <i>et al.</i> (Diptera, Syrphidae) ROBERT J. WOLTON.....	169-173
Discovery of another <i>Parasyrphus nigratarsis</i> (Zetterstedt) (Diptera, Syrphidae) colony in North Yorkshire JOAN CHILDS	174-178
Strongylophthalmyiidae, a family new to the fauna of the Netherlands (Diptera, Acalyptrata) ELIAS DE BREE	179-184
First record of <i>Empis (Euempis) tessellata</i> (Fabricius) as a pollinator of <i>Dactylorhiza maculata</i> (Asparagales, Orchidaceae) in Britain ELISABETH A. HARRIS	185-194
Fungal hosts of <i>Ula</i> Haliday (Diptera, Pediciidae) in Britain, with reference to the collection of P.A. Buxton in the Natural History Museum, London JOHN KRAMER	195-205
<i>Fannia pruinosa</i> (Meigen) (Diptera, Fanniidae) new to Britain DEL SMITH and GRAHAM EKINS	206
<i>Glbellula arctica</i> (Zetterstedt), a species and family added to the French fauna (Diptera, Mythicomyiidae) PHIL WITHERS, JOCELYN CLAUDE AND HADRIEN GENS	207-209
Corrections and changes to the Diptera Checklist (38) – EDITOR	209-210
<i>Prionocera pubescens</i> Loew (Diptera, Tipulidae) in Highland MURDO MACDONALD	211-217
A third English site and rearing record for <i>Reliquantha variipes</i> Roháček (Diptera, Anthomyzidae) DEL SMITH	218-219
<i>Periscelis fugax</i> Roháček & Andrade (Diptera, Periscelididae) in Britain and another French record PETER J. CHANDLER	219-220
The leaf-mining fly <i>Metopomyza nigrohumeralis</i> (Hendel) (Diptera, Agromyzidae) new to Britain from Sutton Fen RSPB reserve in the Norfolk Broads MARK G. TELFER and DAVID J. GIBBS	221-223
Changes to the Irish Diptera List (25) – EDITOR	223-224
<i>Chorisops nagatomii</i> Rozkošný (Diptera, Stratiomyidae) new to Scotland ALISTAIR SHUTTLEWORTH	224

Dipterists Digest Volume 24, No. 2 2017

- The British species of *Lamprochromus* Mik (Diptera, Dolichopodidae) including *L. kowarzi* Negrobov & Chalaja new to Britain C.M. DRAKE 115-128
- Sarcophaga sinuata* Meigen (Diptera, Sarcophagidae) found in Scotland
DAVID HORSFIELD 128
- Diagnostic definitions and figures of male and female *Tetanocera punctifrons* and *T. latifibula*, new records of *T. punctifrons* in Ireland, and notes on biology (Diptera, Sciomyzidae) C.A. MAHER *et al.* 129-145
- Angioneura acerba* (Meigen) (Diptera, Calliphoridae) found in Scotland
DAVID HORSFIELD 146
- Pipiza accola* Virolvitsh (Diptera, Syrphidae) in France and its recognition
MARTIN C.D. SPEIGHT 147-151
- Crepuscular flower visiting in adult Lauxaniidae (Diptera)
GRAHAM E. ROTHERAY 151-152
- Lonchaea carpathica* Kovalev (Diptera, Lonchaeidae) new to Britain and other Diptera from Cherkley Wood, Leatherhead, Surrey ANDREW GODFREY..... 153-155
- A second record in Ireland of *Metriocnemus ephemerus* Langton (Diptera, Chironomidae)
DECLAN A. MURRAY 155
- The banded mosquito *Culiseta annulata* (Schrank) on Fair Isle, first record and first breeding in the Northern Isles of Scotland NICK J. RIDDIFORD..... 156
- Phytomyza scotina* Hendel (Diptera, Agromyzidae) new to Britain
BARRY P. WARRINGTON 157-160
- The first record of *Tipula (Mediotipula) stigmatella* Schummel (Diptera, Tipulidae) in France JOHN KRAMER 161-163

continued inside back cover

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