Dipterists Digest

2015 Vol. 22 No. 1

Above: Bushy Park, Middlesex: north shore of Heron Pond and acid grassland in compartment 23c, 4 August 2015.

Cover illustration: Bushy Park, Middlesex: acid grassland invaded by bracken in compartment 24l, on south side of Leg of Mutton Pond, 4 August 2015. The trees behind are near the eastern (Hampton Wick) boundary of the Park (see pages 69-110).

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Editor

Peter J. Chandler, 606B Berryfield Lane, Melksham, Wilts SN12 6EL
(E-mail: chandgnats@aol.com)

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- notes on identification and deletions or amendments to standard key works and checklists.

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Style and format should follow articles published in the most recent issue. A short Summary (in the form of an Abstract) should be included at the beginning of each article. References to journals should give the title of the journal in full. Scientific names should be italicised. Authors of scientific names should be given in full and nomenclature should follow the most recent checklist, unless reflecting subsequent changes. Descriptions of new species should include a statement of the museum or institution in which type material is being deposited.

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Dipterists Digest 2015 **22,** 1-3

Okeniella caudata (Zetterstedt) (Diptera, Scathophagidae) a new genus and species for the British Isles

IAIN MACGOWAN
Scottish Natural Heritage, Battleby, Redgorton, Perth PH1 3EW, Scotland
E-mail: iain.macgowan@snh.gov.uk

Summary
The scathophagid *Okeniella caudata* (Zetterstedt, 1838) is recorded as a genus and species new to the British Isles from the Scottish Highlands. This distinctive species is an addition to a very small group of brachyceran Diptera that are considered to be restricted to the highest British mountains.

Introduction

Whilst sorting through an otherwise relatively routine sample of montane Diptera, I noticed some rather striking scathophagids, with which I was not familiar. With a fringe of long golden setulae on male genitalia they most resembled *Pogonota barbata* (Zetterstedt, 1838), a species of bogs and wet woodlands at lower altitudes. The most striking feature was, however, the entirely lemon-yellow face, antennae and anterior part of the frons, a feature not found in *Pogonota*. After consulting the key by Gorodkov (1988), checking against specimens in the National Museums of Scotland and a useful e-mail exchange with Stuart Ball, it was established that the specimens were of *Okeniella caudata* (Zetterstedt, 1838), a species and genus not previously recorded from the British Isles.

1

2

Plates 1-2. ***Okeniella caudata*****: 1, lateral view of male; 2, detail of male genitalia.**

Identification

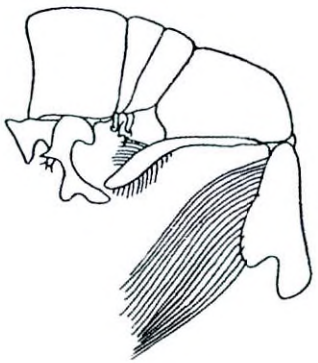
In the key to genera of Scathophagidae (Gorodkov 1988), *Okeniella* keys out close to the similar *Pogonota* but it is distinguished by the lack of a "beard" of long setulae on the genae below the eye. In *Pogonota* males, these extend ventrally below the genae, almost equalling in length the height of the head. They are also present, although shorter in length, in the females.

There are two species of *Okeniella* which occur in Scandinavia, *O. caudata* and *O. dasyprocta* (Loew, 1864). The separation of these is relatively easy as *O. caudata* has a group of very elongated setulae on the wing at the ventral surface of the costa, between the insertion of Sc and R_1 which is not found in *O. dasyprocta*; the male genitalia are also distinct (Gorodkov 1988).

In the British fauna, the only species which *O. caudata* may be confused with is *Pogonota barbata*, with which it shares the feature in males of a long fringe of apical setulae on the cerci. In addition to the facial "beard" mentioned above, the following characters also serve to distinguish the species:

P. barbata. Males: antennae entirely dark; anterior genal setae dark; wings with additional cross veins; genitalia (Fig. 1) with cerci not paddle-shaped, with a broad apical notch, bearing an apical fringe of fewer, long, yellowish setulae; ventral process smaller, not L-shaped. Females: a short facial beard present; thoracic dorsum, scutellar disc and tergites heavily grey-pollinose.

O. caudata. Males: antennae entirely yellow; anterior genal setae almost all pale; wing venation simple; genitalia (Fig. 2) with cerci paddle-shaped, bearing an apical fringe of rather numerous, long, golden-brown setulae; an obvious large L-shaped ventral process present lying just anterior to the cerci. Females: no facial beard; antennae dark as in *Pogonota* but thoracic dorsum, scutellar disc and tergites sub-shining black.



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Figs 1-2. Slightly expanded lateral view of male terminalia: 1, *Pogonota barbata*; 2, *Okeniella caudata* (after Gorodkov 1988).

Records, distribution and ecology

British Isles

Scotland: Angus, Meikle Kilrannoch, NO2277, 2.vii.2015, sweeping flushes and freshwater margins, 860m, I. MacGowan, 3♂, 3♀; Perth & Kinross, Glas Maol, NO1676, 4.vii.2015, sweeping around peaty pools, 900m, I. MacGowan, 1♂.

Despite collecting in the Scottish mountains for the past 25 years, including on several occasions on Glas Maol, this is the first time I have knowingly come across this species. The distinctive males may have a relatively short flight period or they may prove to be restricted to the more geologically rich parts of the south-eastern Cairngorms

Europe

Šifner (2008) gave the European distribution of *O. caudata* as Finland; Norway; Russia – European Russia, West Siberia, East Siberia, and Sweden. He provided some more detailed habitat information on the Swedish syntypes, which were taken in Torne Lappmark in northern Sweden where they were "found among grasses and leaves of *Salix glauca* L." and "in grasses" at Stensele, Umeå and Vilhelmina, all in Västerbotten province. Dahl (1968) recorded *O. caudata* in good numbers in coastal areas of Norway north of the Arctic Circle in "grass meadow" and "bog meadow" habitats. Gorodkov (1986) stated "forest tundra" and "northern tundra" as a habitat for this species.

There are five specimens in the National Museums of Scotland, which were donated as part of the Mike Nelson collection. These include two males from Norway which have altitudinal information attached; one from Grønbakkenn, Dovrefjell was captured at 940m, whilst the other from Heinstjorna, Buskerud was captured at 1118m.

The larval biology is unknown, but it is most likely that *O. caudata* belongs to the group of species, within the Scathophagidae, which have predatory aquatic larvae.

This is clearly a boreal species of tundra-type habitats and as such *O. caudata* joins the select group of montane Brachycera in the British Isles as identified by Horsfield and MacGowan (1998). On the basis of its current known distribution it would fall within what they identified as the most restricted "Grampian group" which contains six species apparently confined to the high mountains of the Central Highlands, extending from Ben Nevis in the west to the elevated plateaux of the eastern Cairngorms.

Acknowledgements

I thank Richard Lyszkowski for photographing the specimen and Stuart Ball for his comments.

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Gorodkov, K.B. 1988. Family Scatophagidae (Cordyluridae, Scatomyzidae, Scopeumatidae). **In** Bei-Bienko, G.Y. and Steyskal, G. (Eds) *Keys to the Insects of the European Part of the USSR. Volume V, Diptera and Siphonaptera, Part II.* 1505 pp. Amerind Publishing, New Delhi.

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***Scaptomyza vittata* Coquillett (Diptera, Drosophilidae) in Britain –** The Anglo Aquatic glasshouses in Enfield, Middlesex (TL315001) are well-known as the haunt of accidentally introduced exotic insects (Agassiz, D.J.L. 1978. Five introduced species, including one new to science, of China Mark moths (Lepidoptera: Pyralidae) new to Britain. *Entomologist's Gazette* **29,** 117–127; Disney, R.H.L. 1980. An exotic scuttle fly, *Chonocephalus heymonsi* Stobbe (Diptera, Phoridae), from Middlesex. *Entomologist's monthly Magazine* **116,** 207–212; Agassiz, D. 1981 Further introduced china mark moths (Lepidoptera: Pyralidae) new to Britain. *Entomologist's Gazette* **32,** 21–26; Brooks, S.J. 1988. *Exotic dragonflies in north London. Journal of the British Dragonfly Society* **4**(1), 9–12).

This note records a further species of alien from the site. Two males and one female of *Scaptomyza* (*Mesoscaptomyza*) *vittata* Coquillett, 1898 were taken on 10 June 1978. The specimens, which are in the Natural History Museum, London, were determined by Walter Hackman in 1979. It was on the basis of this record, communicated by Paul Beuk, that *S. vittata* was included under imported species in the British Diptera checklist (Chandler, P.J. 1998. (Ed.) Checklists of insects of the British Isles (New Series). Part 1: Diptera. (Incorporating a List of Irish Diptera). *Handbooks for the Identification of British Insects* **12**(1), i-xix, 1-234. Royal Entomological Society, London).

This species will run to the couplet including *Scaptomyza clavigera* Frey and *S. pallida* (Zetterstedt) in the key to European species (Bächli, G., Vilela, C.R., Escher, S.A. and Saura, A. 2004. The Drosophilidae (Diptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica*, Volume 39. Brill, Leiden & Boston).

Scaptomyza vittata is separated from other European species of *Scaptomyza* by the combination of two rows of acrostichal bristles and all dark palpi. In addition, *S. vittata* has a pair of bristles subequal to and just below the vibrissae. In other European *Scaptomyza*, the peristomal bristles are significantly smaller. W. Hackman (1959. On the genus *Scaptomyza* Hardy (Dipt., Drosophilidae). *Acta Zoologica Fennica* **97,** 1-73) gave a figure of the male genitalia, which will enable confirmation of the species.

Outside of the Americas, *S. vittata* has been collected in the Canary Islands and in Israel, but it has the potential to turn up anywhere with imported materials. Whether it is able to survive out-of-doors in Britain is debatable, but it is easy to check any pale yellow *Scaptomyza* for the presence of dark palpi.

Scaptomyza vittata is native to the southern United States and Central America. Although its biology appears to be unknown, other species in the subgenus *Mesoscaptomyza* are leaf miners or saprophages. At the time of collection, there were several bins of rotting aquatic plants in the glasshouses in Enfield, and it seems likely that this was where the species was breeding.

I thank Gerhard Bächli for information on the Palaearctic distribution of *S. vittata*, and the late Walter Hackman for identifying the specimens. Paul Beuk kindly helped me to access some literature, and Ian McLean tactfully encouraged me to publish this record – **TONY IRWIN,** 47 The Avenues, Norwich, Norfolk NR2 3PH

Dipterists Digest 2015 **22**, 5-10

Metriocnemus albipunctatus sp. nov. (Diptera, Chironomidae) from England

PETER H. LANGTON and PATRICK D. ARMITAGE*
University Museum of Zoology Cambridge, Downing Street, Cambridge, UK
(address for correspondence: 16, Irish Society Court, Coleraine, Co. Derry, Northern Ireland BT52 1GX)
*The River Laboratory, Freshwater Biological Association, Church Lane, East Stoke, Dorset BH20 6BB

Summary
A new species of *Metriocnemus* van der Wulp is described from adult males collected in the south of England.

Introduction
On 10 September 2012, PDA collected some chironomids from a swarm that were conspicuous by their pale spots at the postero-lateral corners of the abdominal segments (Fig. 1). All specimens from the swarm had similar abdominal markings. Except for the pale spots [borders], these specimens run in Sæther (1995) to *Metriocnemus eurynotus* (Holmgren), a common winter midge throughout Britain and Ireland. As a bicoloured *Metriocnemus* is a novelty and all specimens from the swarm had similar abdominal markings, it is described as a new species here, but, if on further investigation (e.g. molecular analysis) it turns out to belong to a previously established species after all, then the name proposed here might be applicable on the subspecies level.

***Metriocnemus albipunctatus* sp. nov.**
Etymology. The species epithet refers to the whitish abdominal spots of the adult.

Holotype male: ENGLAND, Dorset, swarm over reeds in an intermittently wet floodplain pond about 80m from the River Frome 1 km east of the FBA River Laboratory, East Stoke, SY 87774 86406; slide mounted. To be deposited in University Museum of Zoology, Cambridge. **Paratypes:** Data as for holotype: 6 males in PHL's collection, 4 in PDA's.

Description (follows Sæther's (1989, 1995) revisions of the genus *Metriocnemus* van der Wulp; morphological terminology as in Sæther 1980). Total length 3.0-3.4mm (n=5). Wing length 1.90-2.00mm (n=5); width 0.48-0.50 mm; width at anal lobe 0.30-0.36mm (n=5). Total length/wing length 1.5-1.68 (n=4). Wing length/length of profemur 2.06-2.31 (n=5). Coloration black, abdominal segments III-VIII with postero-lateral pale marks; haltere clear yellow.

Head. Antenna of 13 flagellomeres (Fig. 2c). AR 1.7-2.0 (n=5). Terminal flagellomere 600-649µm long. Eyes bare. Temporal setae 25; including 17 inner verticals, 8 outer verticals and 0 postorbitals (n=1). Clypeus with 22-25 setae (n=4). Palpomeres: 32-48, 44-60, 220-240, 140-176, 168-192µm long (n=6).

Thorax (Fig. 2b). Antepronotum with 11-17 lateral setae (n=3). Acrostichals 19, 34 (n=2); dorsocentrals 51, 53, including 13, 14 on humeral area (n=2); prealars 14-28 (n=3); supraalars 6-10 (n=4). Scutellum setae 31, 37 (n=2).

Wing. (Fig. 2a). Narrowed to base, anal lobe prominent, but small. VR 1.18-1.28 (n=6). C extension 132-224µm. Cu_1 gently curved. Brachiolum with 12, 14 setae (n=2), R with 43-71;

R_1 with 30-58; R_{4+5} with 68-101; RM with 1-7; M with 20-38; M_{1+2} with 95-130; M_{3+4} with 17-58; Cu with 61-67; Cu_1 with 19-48; Pcu with 107-123 and An with 27-72 setae (n=6). Wing membrane covered with macrotrichia, with about 21-54 in cell m basally of RM, macrotrichia length 30-42μm. Squama with18, 20 setae (n=2).

Legs. Spur of front tibia 80-96μm long; spurs of middle tibia 32-46 and 36-40μm long; of hind tibia 80-84 and 28-44μm (n=6). Comb of 11-15 spinules, longest 52-72μm long. Mid leg and hind leg with 2 pseudospurs on tarsomere 1, and with 1 (rarely 2) on tarsomere 2, length 28μm. Pulvilli absent. Lengths (in μm) and proportions of legs (n=6, except $p_1$fe =5):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
p_1	840-940	1000-1080	620-720	380-420	280-300	180-200	120-140
p_2	880-1000	960-1060	420-520	240-300	180-200	140-160	100-120
p_3	960-1040	1200-1380	640-700	340-400	260-300	160-200	120-140

	LR	**BV**	**SV**	**BR**
p_1	0.62-0.71	2.47-2.65	2.64-3.10	2.5-3.4
p_2	0.42-0.51	3.18-3.63	3.77-4.68	2.7-3.6
p_3	0.49-0.53	2.94-3.13	3.37-3.61	3.3-4.9

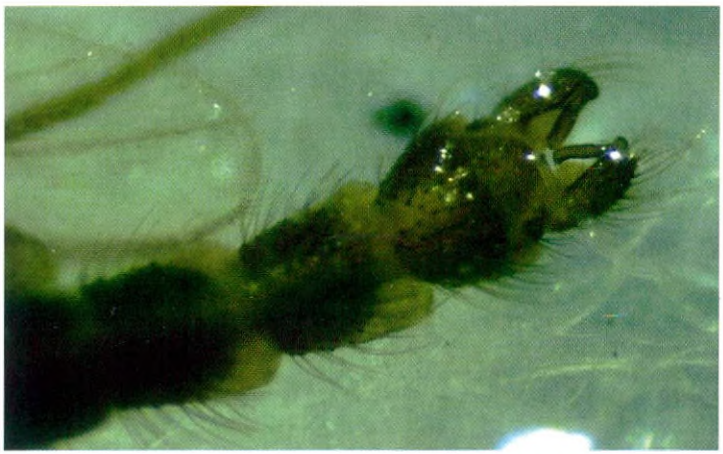

Fig. 1. ***Metriocnemus albipunctatus*** **sp. nov., adult male abdomen.**

Abdomen. Tergites densely clothed with setae, about 0.66 the length of the respective tergite.

Hypopygium (Fig. 2d). Anal point short (24-40μm long) narrowed from base to sharp tip. Tergite IX with 27-46 setae (n=6). Laterosternite IX with 3-6 long setae (n=6). Phallapodeme 66-74μm long; transverse sternapodeme 110-140μm long, oral projections bluntly triangular. Virga of 1-3 spines 28-40μm long (n=6). Gonocoxite 220-260μm long; inferior volsella extending for about two thirds the length of the gonocoxite, strongly projecting, broadly rounded, the apical third depressed, so that, in some aspects, the volsella appears to terminate rectangularly; volsella covered with strong setulae dorsally. Longest setae on gonocoxite about 0.75 the length of the gonocoxite. Gonostylus 104-120μm long, nearly parallel-sided with a strong subapical tooth. Megaseta 10-16μm long. HR 1.93-2.32 (n=6). HV 2.58-3.27 (n=6).

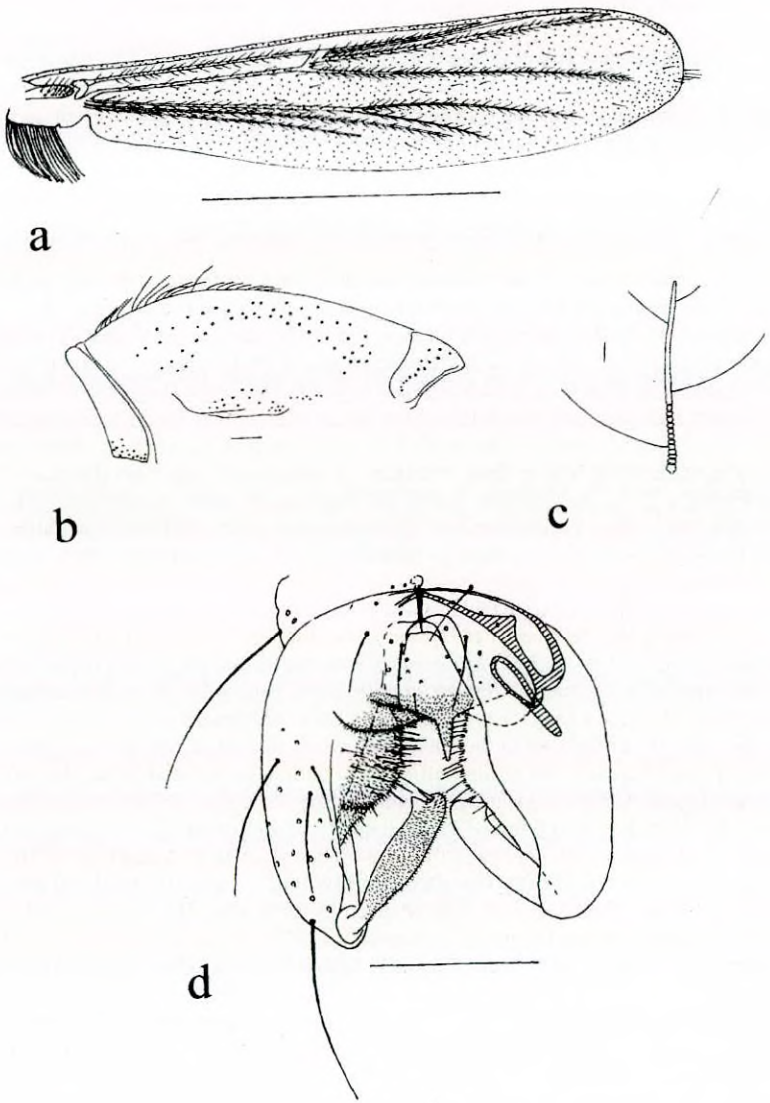

Fig. 2. ***Metriocnemus albipunctatus*** **sp. n., adult male: a, wing; b, thorax, lateral; c, antenna; d, hypopygium, left: dorsal, right: ventral/internal. Scale lines a = 0.5mm; b-d 0.1mm.**

Female and immature stages. Unknown.

Distribution. Known only from the type locality in southern England.

Metriocnemus species are generally all black or dark brown in colour; *M. albipunctatus* is very unusual for the genus in having pale postero-lateral corners to the posterior abdominal segments, where the dark pigment is missing. This gives the impression that the segments are cut off triangularly or have pale spots. In the *Metriocnemus* species that I have inspected, the colour of the cuticle is tan varying from yellow to golden brown. The black colour is imparted by melanin granules in the hypodermal cells. These melanin containing cells in *M. eurynotus* extend into the postero-lateral corners of the abdominal segments, whereas in *M. albipunctatus* the hypodermal cells in the postero-lateral corners of the posterior abdominal segments contain no melanin granules, but those medially do. The apparent posterior transverse band in Fig.1 is due to shine on the cuticle medially. The demarcation of colour is not so obvious in slide mounted material, whether macerated or not, because the tan colour of the unpigmented cuticle does not contrast with the pigmented areas as obviously under higher magnification.

In the key to British and Irish chironomid males by Langton and Pinder (2007), *M. albipunctatus* runs to '*M.* sp.' on account of the clear yellow halteres. Sæther's (1989, 1995) revisions treated this form as a misidentification of *M. hirticollis* (Staeger, 1839) by Edwards (1929). Sæther had assigned that form to the species for which the current valid name is *M. eurynotus* (Holmgren, 1884), but Langton and Pinder kept it separate as '*Metriocnemus* sp.', following P.S. Cranston's conviction, working on larvae, that the two species were distinct (Langton 1980).

The morphological, parametric and numerical data of *M. albipunctatus* either overlap, or lie within, those given for *M. eurynotus* by Sæther (1989, as *M. obscuripes*) after studying a great many specimens from the Holarctic region. In his diagnosis for *M. obscuripes* Sæther stated: '"The male imago is easily recognizable by the usually completely parallel-sided anal point with broad, rounded apex; and the sharply triangular crista dorsalis". His figure 7E-M shows variation in the shape of the anal point, but conforms reasonably to the diagnosis quoted above. In the detailed description of the species Sæther qualified that part of his diagnosis as follows: "Anal point proper 34-56, 42µm long, usually parallel-sided with broad rounded apex, occasionally slightly tapering". In all but one of the specimens of *M. albipunctatus*, the anal point narrows to the apex (n=6) quite evenly; the single outlier has a parallel-sided anal point. It is interesting to note that two figures for *M. hygropetricus* Kieffer, which Sæther (1989) synonymised with *M. obscuripes* show tapering anal points (Goetghebuer 1940, Lehmann 1971). Sæther concluded his description of *M. obscuripes* with the comment "There is a large variation within the species which might indicate that more than one species is involved". Few numerical and parametric data for *M. albipunctatus* fall entirely within those given by Sæther for *M. obscuripes*, which indicates that it is not a variety of the latter. It is possible that *M. albipunctatus* is conspecific with, or closely related to '*M. hirticollis*' sensu Edwards, which remains to be specifically evaluated and fully described.

In Chironomidae monospecific swarms are the rule rather than the exception (personal observation and see Lindeberg 1967). Both *M. eurynotus* and '*M.* sp.' are very common widespread species in England. If *M. albipunctatus* belongs to either of these species one would expect there to be fully black specimens in the swarm; all specimens in the swarm collected were of similar coloration; therefore they are not isolated aberrant specimens and have a taxonomic identity.

Since Sæther's revisions (1989, 1995) of the genus there have been a number of new species described: one from the Himalayas (Som *et al.* 2013), one from France (Langton 2012), one from Northern Ireland (Langton 2013), six from north-east Russia (Makarchenko and Makarchenko 2009, 2013, 2014), one from China (Li and Wang 2014) and two from the neotropics (Donato

and Paggi 2005, Donato and Siri 2010). None of these new species key to *M. eurynotus* in Sæther's key, nor is any bicoloured.

Acknowledgements
I am indebted to M. Spies and P. Ashe for helpful comments on the original manuscript.

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Metriocnemus (*Inermipupa*) *carmencitabertarum* Langton and Cobo (Diptera, Chironomidae) now in Northern Ireland

– *Metriocnemus* (*I.*) *carmencitabertarum* was first described from temporary pools in Galicia and a river in Portugal (Langton, P.H. and Cobo, F. 1997. *Metriocnemus* (*Inermipupa*) *carmencitabertarum* subgen.n., sp. n. from Spain and Portugal. *Entomologist's Gazette* **48,** 263-271). Since then it has been reported from the Azores (2004), England (2012), the Netherlands (2012) and Ireland (2012, 2013) (summarised in Sæther, O.A. and Spies, M. 2013. Fauna Europaea: Chironomidae. **In** Beuk, P. and Pape, T. (Eds), Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6. http://www.faunaeur.org/ (P. Ashe and D.A. Murray tell me that the records for Estonia and Poland (2013) are uncorroborated); see also Moller Pillot, H. 2013. Chironomidae larvae of the Netherlands and adjacent lowlands. III. Biology and ecology of the aquatic Orthocladiinae – Prodiamesinae – Diamesinae – Buchonomyiinae – Podonominae – Telmatogetoninae. KNNV Publishing, Zeist (The Netherlands), and Murray, D.A. 2013. Supplementary records of *Metriocnemus (Inermipupa) carmencitabertarum* Langton and Cobo, 1997 (Diptera: Chironomidae) in Ireland with some observations on larval behaviour. *Bulletin of the Irish Biogeographical Society* No. **37,** 204-207).

I can now report it from Northern Ireland: on 29 December 2013, I collected a pupal exuviae from the Lodge Burn, Anderson Park, Coleraine, Co. Derry, C850325. The species is known to develop in small bodies of stagnant water, frequently temporary. The Lodge Burn was in spate at the time of collection, so the pupal exuviae could have originated from a marginal pool that had been flooded releasing the exuviae into the stream (the presence of the exuviae in the river in Portugal could have been equally fortuitous, for these are the only two records of the species from flowing water). The pupal exuviae is so distinctive that it is unlikely to have been overlooked in studies other than those reviewed above; thus the recent records may indicate a spread northwards into countries with Atlantic coastlines over the past five years or so. I thank M. Spies, D.A. Murray and P. Ashe for advice in the preparation of this note – **PETER H. LANGTON,** University Museum of Zoology, Downing Street, Cambridge (address for correspondence: 16 Irish Society Court, Coleraine, Co. Derry, Northern Ireland BT52 1GX)

Chrysopilus laetus Zetterstedt (Diptera, Rhagionidae) in West Cornwall (V.C. 1)

– On 19 September 2014, I collected a rhagionid species inside the lavatory at Cornish Garden Nurseries (SW772373) near Penryn and subsequently keyed it out as a female *Chrysopilus laetus* Zetterstedt, using *British Soldierflies* by Stubbs and Drake (2014). This species was first recorded in Britain from Windsor Great Park in 1938 and was known only from Windsor until being found in East Norfolk and Cambridgeshire in the 1980s. More recently there have been records from further counties around London.

The Soldierfly Recording Scheme database holds a record of *C. laetus* in Devon by Keith Alexander on 6 July 1990 at Knightshayes Park (SS960152), which ironically is only a couple of kilometres from my home in Tiverton. The most recent westerly record was in Gloucestershire by David Gibbs in 2008.

The present record from west Cornwall represents its most south-westerly location in Britain. The discovery site was adjacent to two mature woods, Cosawes Wood and Devichoys Wood. This species was recorded by several others during 2014 in London, Bedfordshire and Buckinghamshire. All of the 2014 records were females, perhaps suggesting that males stay high in the canopy whilst females come low to lay eggs, hence are recorded more often (Martin Harvey *pers. comm.*).

All previous records of *C. laetus* within the Recording Scheme database have occurred between 31 May and 20 July, so this discovery represents an unusually late record that is difficult to explain.

I would like to thank Martin Drake for advice on this specimen and Martin Harvey for checking my specimen and assisting with this note – **ANDREW CUNNINGHAM,** 9 The Close, Tiverton, Devon EX16 6HR

***Campiglossa loewiana* (Hendel) (Diptera, Tephritidae) new to Cornwall** – A single female *Campiglossa loewiana* (Hendel) was taken by sweep-netting an area of bracken alongside an old Cornish hedge in the sheltered valley below Carn Galva, Zennor, in the West Penwith Moors area of West Cornwall (V.C. 1; SW4236) in July 2014. The species does not feature in the local ERICA biological recording database and so appears to be new to the county list. The total number of hectads with records has now reached 39, of which 21 are from 1990 to date (information from the Tephritidae Recording Scheme, courtesy of Laurence Clemons). It may therefore be expected to be given conservation status (Nationally Scarce) at the next species status review. Ian White (1988. Tephritid Flies. Diptera: Tephritidae. *Handbooks for the Identification of British Insects* **10 (5a)**) stated that the species develops in the flower-heads of the native golden rod *Solidago virgaurea*. The host-plant is very widespread across Britain on acid mineral soils, in lowland woods, on hedge banks, heaths and coastal cliff tops, as well as in the uplands (Preston, C.D., Pearman, D.A. and Dines, T.D. 2002 *New Atlas of the British & Irish Flora*. Oxford University Press) and so the rarity of records is intriguing. The Cornish hedge along which the specimen was swept contained much golden rod.

The survey work was commissioned by Natural England and Diptera samples were identified by Peter Chandler, and Laurence Clemons kindly provided data from the Tephritidae Recording Scheme; the landowner, The National Trust, should also be thanked for permission to sample invertebrates – **KEITH N.A. ALEXANDER**, 59 Sweetbrier Lane, Heavitree, Exeter EX1 3AQ

The second British records of two *Sciara* species (Diptera, Sciaridae), rediscovered after more than a century – The genus *Sciara* includes some of the more distinctive species of the family Sciaridae, the most familiar being *S. hemerobioides* (Scopoli, 1763) (formerly known as *S. thomae* (Linnaeus, 1767)) of which the females, with bright yellow membranes at the sides of the abdomen, are conspicuous when feeding at umbelliferous

flower heads (Apiaceae). Seven species of this genus have been recorded in Britain and most are easily recognised by the very distinctive structure of their male genitalia. The most recent of these to be added to the British list was *S. militaris* Nowicki, 1868, of which the larvae have unusual migratory behaviour (Craik, J.C.A., Wormell, P., Smith, J.E. and Menzel, F. 2005. Long columns of "army worms" in west Scotland - the first record of *Sciara militaris* Nowicki (Diptera, Sciaridae) in the British Isles? *Dipterists Digest* (*Second Series*) **12,** 21-27). The latter is apparently widespread in conifer plantations in Scotland and possibly northern England (Crossley, R. 2009. *Sciara militaris* Nowicki (Diptera, Sciaridae), a probable occurrence in northern England. *Dipterists Digest* (*Second Series*) **16,** 100-101). Two other species, *S. humeralis* Zetterstedt, 1851 and *S. hebes* (Loew, 1869) (= *S. nursei* Freeman, 1983), are widespread in wetlands and carr woodland. The remaining three British species are poorly known – *S. lackschewitzi* (Lengersdorf, 1934) from two records at fen and bog sites in North Wales and Cumbria, and the other two species from single records from 1904 and 1910 respectively. Surprisingly, second British records have recently been obtained of the two latter.

Sciara flavimana Zetterstedt, 1851 was known as British from a female collected at Nairn on 10 August 1904 by J.J.F.X. King, while a male of *S. ruficauda* Meigen, 1818 was obtained by the same collector at Brockenhurst, Hampshire on 31 July 1910. In neither case were any details recorded concerning the precise habitat. Both specimens are in the collection of the Natural History Museum, London and were the basis for these species being included in the handbook by Paul Freeman (1983. Sciarid Flies. Diptera, Sciaridae. *Handbooks for the Identification of British insects* **9**(6), 1-68). Their identity was confirmed by F. Menzel, J.E. Smith and P.J. Chandler (2006. The sciarid fauna of the British Isles (Diptera: Sciaridae), including descriptions of six new species. *Zoological Journal of the Linnean Society* **146,** 1-147).

One male of *S. flavimana* was caught at Aston Rowant National Nature Reserve, Oxfordshire, in a Malaise trap sample for the period 2 to 25 June 2014; the trap was operated from 7 May to 20 October 2014 in the Beacon Hill West area near Cuckoo Pen (SU7297). Judy Webb sorted the catches on behalf of Natural England. The trap was situated in a small clearing of longish grassland, within scrub composed of purging buckthorn *Rhamnus cathartica*, blackthorn *Prunus spinosa*, hawthorn *Crataegus monogyna* and wayfaring tree *Viburnum lantana*. This species is widespread in Europe and the Aston Rowant specimen has been compared with a male found in a flowery meadow by a stream at Rocamadour, Lot, France on 24 June 1980 (leg. P.J. Chandler), and one from Balaton Füred, Hungary, in the week from 28 May to 3 June 1972 (leg. W.J. Parker) (both in PJC collection); the latter is apparently a new national record for Hungary.

A male of *S. ruficauda* was caught by IP on 9 July 2012 at Denny Bog (SU337055) in the New Forest, Hampshire. The habitat is a valley mire dominated by *Sphagnum*, *Myrica* and *Molinia*, though close to Denny Wood with its ancient oaks and beeches. This provided valuable confirmation that this species is still extant in the New Forest, and may have been overlooked in the intervening century due to insufficient recorder effort on this family. It also gave some indication of likely habitats in which it might be sought elsewhere. This species is also widespread in Europe but with fewer national records than *S. flavimana*, so apparently less common, although there are unpublished records from several countries (Frank Menzel *pers. comm.*).

We are grateful to Judy Webb, and to Mick Venters of Natural England, for the opportunity to examine material from Aston Rowant NNR, to the Forestry Commission for permitting IP to record in the New Forest, and to Frank Menzel for information – **PETER J. CHANDLER,** 606B Berryfield Lane, Melksham, Wilts SN12 6EL and **IVAN PERRY,** 27 Mill Road, Lode, Cambridge CB25 9EN

Dipterists Digest 2015 **22,** 13-15

Chaetocladius purbeckensis sp. nov.: "*Chaetocladius* sp. Dorset" Langton and Armitage, 2010 (Diptera, Chironomidae) named

PETER H. LANGTON and PATRICK D. ARMITAGE*
University Museum of Zoology, Cambridge, Downing Street, Cambridge
(address for correspondence: 16 Irish Society Court, Coleraine, Co. Derry, Northern Ireland BT52 1GX)
*The River Laboratory, Freshwater Biological Association, Church Lane, East Stoke, Dorset BH20 6BB

Summary
Based on morphology and distinct DNA barcodes "*Chaetocladius* sp. Dorset", described and keyed by Langton and Armitage (2010) is defined as a new species and here named *Chaetocladius purbeckensis*.

Introduction

In 2010 Langton and Armitage described and keyed a species of *Chaetocladius* new to Britain, but refrained from naming it because according to Elisabeth Stur and Torbjørn Ekrem (Trondheim) (*pers. comm.*) they had detected a sibling swarm of very similar species, the resolution of which would require DNA comparisons. All of the three original specimens had been mounted on slides and so were unsuitable for DNA analysis. On 30 November 2013 PDA discovered that the seepage where the original specimens were found and that had later been obliterated by a cliff fall, had reinstated itself. Sweeping over the seepage produced three further adults, two of which were sent in alcohol to Elisabeth Stur for DNA barcoding and comparison with partial cytochrome c oxidase subunit 1 (CO1) gene sequences from related *Chaetocladius* species. The original description of *Chaetocladius* sp. Dorset was incorporated in a discussion of its systematic status and was restricted to those characters appropriate to the discussion. We here fully describe the holotype male.

Chaetocladius purbeckensis sp. nov.

Etymology. The species epithet refers to the locality where the specimens were collected: the Isle of Purbeck in Dorset, England.

Holotype male: ENGLAND: Dorset, Worbarrow Bay, SY865803; under a stone by chalk cliff seepage. Holotype to be deposited in The University Museum of Zoology, Cambridge.
Paratypes. Two males collected with the holotype in the collections of the authors; two males 30 November 2013 from the type locality, ES356 and ES357 in NTNU-VM: Department of Natural History, Norwegian University of Science and Technology, Trondheim.

Description of holotype. Total length 3.2mm. Wing length 2.0mm; width 0.5mm; width at anal lobe 0.4mm. Total length/wing length 1.6. Wing length/length of profemur 2.1. Coloration brown; head, thorax and coxae dark brown; appendages, halteres, scutellum and main wing veins pale brown.

Head. Antenna of 13 flagellomeres. AR 1.07. Ultimate flagellomere 456µm long. Eyes bare. Temporal setae 12 on one side. Clypeus with 7 setae. Palpomeres: 32, 48, 112, 88, 160µm long.

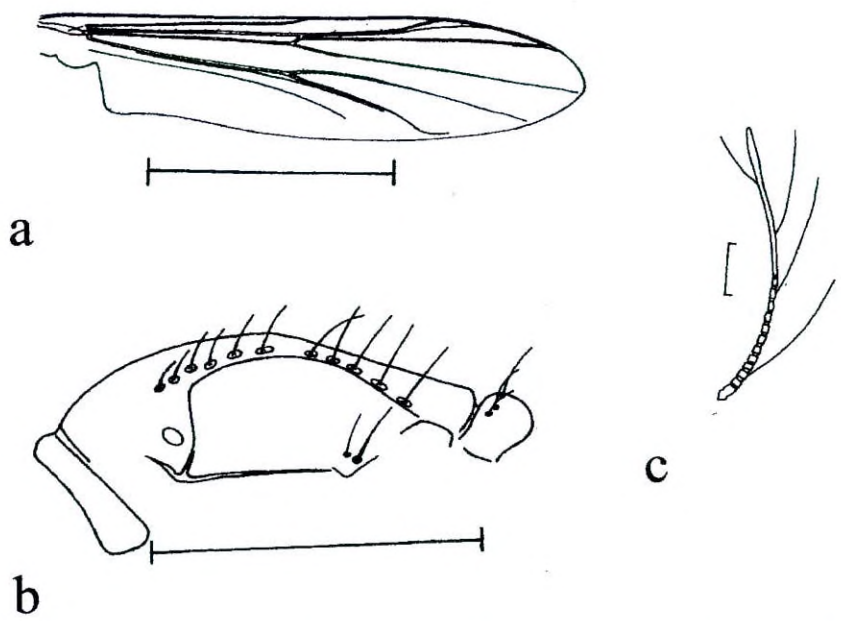

Fig. 1. ***Chaetocladius purbeckensis*** **sp. nov.: a, wing; b, chaetotaxy of thorax; c, antenna (scale lines a, b 1mm, c. 0.1mm).**

Thorax (Fig. 1b). Antepronotum with a few very short, fine lateral setae. Dorsocentrals 11, with only one encroaching on the humeral area; acrostichals apparently absent; prealars 2; supraalars 0. Scutellum setae 5.

Wing (Fig. 1a). Wing with well developed right angled anal lobe. VR 1.05. C extension 52μm. Cu_1 gradually curved. Brachiolum with 1 seta, R with 14; R_1 with 2; R_{4+5} with 2; RM with 0; remaining wing veins and membrane without setae. Squama with 8 setae.

Legs. Spur of front tibia 68μm long; spurs of middle tibia 28 and 32μm long; of hind tibia 68 and 28μm. Comb of hind tibia of 15 spines longest about 44μm long. Tarsomeres without pseudospurs. Pulvilli absent. Lengths (in μm) and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BR
p_1	970	940	620	360	280	160	130	0.66	1.7
p_2	900	880	380	260	200	140	100	0.43	2.0
p_3	1000	1040	620	340	280	160	120	0.60	2.3

Abdomen. Tergites densely clothed with setae.

Hypopygium (Langton and Armitage 2010, Fig. 2, drawn from the paratype in coll. PHL; that of the holotype has the anal point kinked to one side). Anal point transparent, bare, narrow, tapered to apex (20μm long), pointed at tip, projecting from the posterior margin of tergite IX. Tergite IX with 16 setae; laterosternite IX with 10 setae. Gonocoxite 200μm long; inferior volsella broad, triangularly produced at its distal end, pubescent except at tip of distal expansion, reaching to 0.7 gonocoxite length. The virga is composed of two separate short spines.

Gonostylus 80μm long, triangularly expanded with a broadly rounded outer corner, 52μm at widest. Megaseta 12μm long.

HR 2.5. HV 4.0.

DNA barcodes

The DNA barcodes (partial CO1 sequences) were generated using standard procedures for DNA extraction, PCR and bi-directional Sanger sequencing at the Canadian Centre for DNA Barcoding at the Biodiversity Institute of Ontario, University of Guelph, Canada. Metadata and sequence data are available through the Barcode of Life Data Systems (www.boldsystems.org) under the dataset name DS-CHAETPUR. Sequences are also deposited in NCBI GenBank with the accessions KR736246 and KR736247.

The two generated barcodes of *Chaetocladius purbeckensis* are identical and 7.7% different (uncorrected pairwise genetic distance) from the nearest neighbour, a Norwegian specimen of *Chaetocladius laminatus* Brundin. Thus, they are considerably more divergent from their nearest neighbour than what has previously been recorded as intraspecific variation in Chironomidae (e.g. Ekrem *et al.* 2007, 2010).

Concluding note

For differential diagnosis of the male *Chaetocladius purbeckensis* sp. n., and for discussion of its morphological relationships to similar males in the genus, see Langton and Armitage (2010).

Acknowledgements

The authors are indebted to Dr Elisabeth Stur and Dr Torbjørn Ekrem for help with the generation and evaluation of DNA barcodes from two of the paratypes. DNA barcode data in this publication was generated in collaboration with the Norwegian Barcode of Life Network (NorBOL), funded by the Research Council of Norway and the Norwegian Biodiversity Information Centre.

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***Telmatogeton murrayi* Sæther (Diptera, Chironomidae) new to Ireland** – Mr Charlie McConaghy goes beach combing for invertebrates at White Rocks Bay (Co. Antrim), on Sundays while walking his dog. Ever curious to know what he has found, he passes on his catch to me for identification. On 6 April 1914, he found a dozen small flies in a spider's web at the entrance to one of the caves (C886407). These turn out to be *Telmatogeton murrayi*, using the character described in Langton, P.H. and Hancock, G. (2013. *Telmatogeton murrayi* Saether and *T. japonicus* Tokunaga (Diptera, Chironomidae) new to Britain. *Dipterists Digest* (*Second Series*) **20,** 157-160). *Telmatogeton murrayi* was first described from Iceland as a possible endemic (Sæther, O.A. 2009. *Telmatogeton murrayi* sp. n. from Iceland and *T. japonicus* Tokunaga from Madeira (Diptera: Chironomidae). *Aquatic Insects* **31,** 31-44), but Langton and Hancock recorded it from the Shetlands: it may be widespread along the north east Atlantic coast – **PETER H. LANGTON,** University Museum of Zoology, Downing Street, Cambridge (address for correspondence: 16 Irish Society Court, Coleraine, Co. Derry, Northern Ireland BT52 1GX)

***Glyptotendipes* (*Heynotendipes*) *signatus* (Kieffer) and *Harnischia fuscimanus* Kieffer (Diptera, Chironomidae) new to Ireland** – Whilst examining chironomid pupal exuviae collected by field research staff of the Environmental Protection Agency on 27.vii.2007 and 12.ix.2007 from Lough Illauntrasna, Glentrasna, Garomna, County Galway (L888254 – Hydrometric Area 31), several exuviae were determined from P.H. Langton and H. Visser (2003. Chironomidae exuviae. A key to pupal exuviae of the West Palaearctic Region, Interactive System for the European Limnofauna. Biodiversity Centre of ETI. UNESCO Publishing, Paris) as *Glyptotendipes* (*Trichotendipes*) *signatus* Kieffer, 1909. However, in a review of the subgeneric nomenclature of *Glyptotendipes,* M. Spies and O.A. Sæther (2004. Notes and recommendations on taxonomy and nomenclature of Chironomidae (Diptera). *Zootaxa* **752,** 1-90) proposed *Glyptotendipes* (*Heynotendipes*) as nom. nov. for the type species *G. signatus* Kieffer, since the subgeneric epithet *Trichotendipes* was preoccupied from D.K. Guha, S.K. Das, P.K. Choudhuri and D.K. Choudhuri (1985. Chironomid midges from the Andaman Islands (Diptera: Chironomidae). *Proceedings of the Indian National Science Academy* **B 55,** 22-38). The *Glyptotendipes* record for Ireland from L. Illauntrasna is thus reported here as *Glyptotendipes* (*Heynotendipes*) *signatus* (Kieffer, 1909).

A second addition to the Irish chironomid checklist derives from a collection of pupal exuviae taken by drift net suspended from the pedestrian bridge over the River Boyne at the visitor centre of the Newgrange, Brú na Bóinne, Neolithic passage grave, a UNESCO World Heritage Site at Donore, County Meath, (O023727 - Hydrometric Area 7). The drift net was in place for approximately 30 minutes around midday on 28 June 2015 during a field outing of the recently established Boyne Valley Natural History Field Club. Amongst the exuviae recovered was a single specimen of *Harnischia fuscimanus* Kieffer, 1921. One of the aims of the Field Club was to promote recording of biodiversity in County Meath (<www.meath.ie>) and it is gratifying that the outing on 28 June resulted in an addition to the Irish chironomid faunal checklist. Voucher slide mounted specimens of both species reported here are 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, e-mail: declan.murray@ucd.ie

Dipterists Digest 2015 **22,** 17-20

Protearomyia withersi MacGowan (Diptera, Lonchaeidae) new to the British Isles

IAIN MACGOWAN
Scottish Natural Heritage, Battleby, Redgorton, Perth PH1 3EW, Scotland.
E-mail: iain.macgowan@snh.gov.uk

Summary
Protearomyia withersi MacGowan, 2014 is recorded as new to the British Isles, based on specimens collected at sites in southern England. A key is provided to males of the British species.

Introduction

The genus *Protearomyia* belongs within the tribe Earomyiini of the subfamily Lonchaeinae. It is distinguished within the family Lonchaeidae by the absence of poststigmatal setae, bare lunule, non-metallic body colour and scutellum entirely bare apart from four marginal setae. It is a relatively small genus with a world fauna consisting of eleven species, five of which occur in Neotropical and Nearctic regions (McAlpine 1983) with six species occurring in the Palaearctic Region (MacGowan 2014).

MacGowan and Rotheray (2008) listed only one species, *P. nigra*, as occurring in the British Isles and indeed previously all European *Protearomyia* specimens from areas other than the Mediterranean were then considered to belong to this widely distributed species. However, the description of three further cryptic species by MacGowan (2014) has led to a further examination of British material and as a result one further species is added to the British fauna.

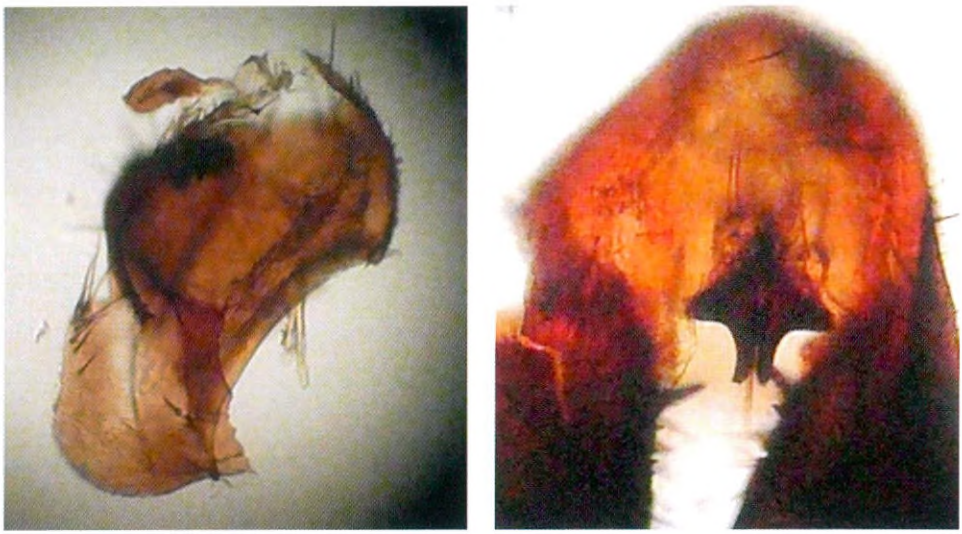
Recognition

All species of *Protearomyia* are externally very similar and, although *P. withersi* has an abdomen with a slightly shorter apical segment and is slightly less pollinose than *P. nigra*, these features can be difficult to interpret depending on how the specimen has been captured, stored or the manner in which pinned specimens may have dried. As a result examination of the male genitalia is almost always required to confirm identification.

One of the main features separating *P. withersi* from *P. nigra* is the shape of the ventral lobe of the epandrium. In *P. withersi* this is almost square (Fig. 1), whilst in *P. nigra* it is obviously higher than it is wide (Fig. 3). A further distinguishing feature is the shape of the apex of the hypoproct which lies anteriorly below and is fused to, the cerci. In *P. withersi* (Fig. 2) this takes the form of two ventrally projecting, diverging curved spines whilst in *P. nigra* (Fig. 4) they form two blunt-ended apical projections and obvious lateral processes. The fused parameres which enclose the phallus also provide important distinguishing features (Figs 5-6).

British records of *P. nigra* now need to be reviewed in light of this addition to the fauna. However, from the limited sample I have examined it appears to be still the case that *P. nigra* is the commonest and most widespread *Protearomyia* in the British Isles, with confirmed records from **England:** Berkshire, Dorset, Isle of Wight, Oxfordshire, Somerset; **Ireland:** Clare, Offaly; **Scotland:** Perthshire, Ross and Cromarty. Unfortunately at present it is only possible to determine the males to species level.

Figs 1-2. ***Protearomyia withersi*****. 1, epandrium and associated structures, lateral view showing square ventral lobe; 2, posterior view showing apex of hypoproct.**



Figs 3-4. ***Protearomyia nigra*****. 3, epandrium and associated structures, lateral view showing rectangular ventral lobe; 4, posterior view showing apex of hypoproct.**

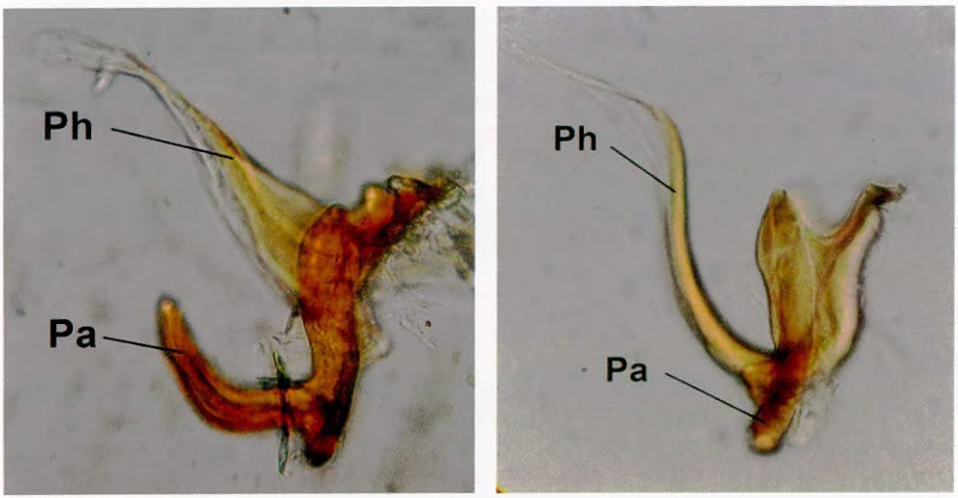
A third species *P. rameli* MacGowan also occurs in Europe and may yet be found in the British Isles. It belongs to the *P. withersi* group of species, in that it has a square-shaped ventral process to the epandrium, but can be distinguished by having the apex of the hypoproct in the form of two narrow parallel processes. It is included here in the key to males; a full description was provided by MacGowan (2014).

Records, distribution and ecology.

Protearomyia withersi

ENGLAND: Berkshire, Windsor Forest, Highstanding Hill (SU9273), ancient beech and oak woodland on slopes near Badger's Brook, 21.v.1979, 1 male; 31.v.1987, 1 male; SU929739, 30 April 2014, 1 male, P.J. Chandler. **Hampshire,** Alice Holt Forest, Abbots Wood (SU8140), 25.v.1991, 2 males, oak woodland, P.J. Chandler. **Shropshire,** Haughmond Hill (*SJ5413),* 21.v.2012, 1 male, predominately coniferised woodland with remnant mature oak, beech and birch, N.P. Jones; Haughmond Hill (*SJ545146),* 29.v.2013, 1 male, habitat as previous specimen, N.P. Jones; Hollies, Haughmond Hill (SJ537141), 30.iv.2014, 3 males, mature broad-leaved woodland with many old trees and dead wood, oak, beech, ash and birch, N.P. Jones.

In mainland Europe *P. withersi* has been recorded from Andorra, France, Germany, Greece, Poland, Spain and Sweden.



Figs 5-6. Phallus (Ph) and parameres (Pa). 5, *P. withersi*; 6, *P. nigra.*

Little is known about the larval ecology of *Protearomyia* species. Perris (1848) described *P. nigra* larvae as occurring in a range of herbaceous plants including *Verbascum* species, *Angelica sylvestris* and *Cirsium vulgare*, and it is probable that this is where all *Protearomyia* species develop. The adults show a strong association with grassland, heathland, meadow and wood pasture habitats. European and British capture data indicate that *P. withersi* seems to be a spring and early summer species with most records of adults being collected in May and June. *Protearomyia nigra* is also found as early as May but its flight period extends later in the season with records into August.

Key to males of *Protearomyia* McAlpine, 1962

1. Ventral lobe of epandrium higher than wide; hypoproct with two blunt-ended apical projections and obvious lateral processes (Figs 3-4); parameres without anterior projections (Fig. 6) ..... ***nigra***
- Ventral lobe of epandrium square or wider than high; apex of hypoproct not as above (Figs. 1-2); parameres with anterior projections (Fig. 5) (*withersi* group) 2

2. Hypoproct apically with two obviously diverging claw-like processes (Fig. 2); phallus small, with apical portion emerging directly from and extending at right angles to the basal plate (Fig. 5) ..... ***withersi***

- Hypoproct apically with two narrow, parallel processes; phallus U-shaped with an elongated apex at right angles to the basal plate (MacGowan, 2014, Figs 7-12) ..... ***rameli*** (European species)

Acknowledgements

I thank Peter Chandler and Nigel Jones for providing access to their collections of *Protearomyia* specimens.

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Dipterists Day Exhibits 2014
– compiled by Editor from exhibitors' notes

Details are given here only of exhibits that did not also appear at the 2014 Exhibition of the British Entomological and Natural History Society.

CROSSLEY, R. 'Distribution and habitat associations of Yorkshire Dolichopodidae', supported by a copy of a recent issue of '*The Naturalist*' containing the exhibitor's short paper; Notes on the distribution and habitat associations of dolichopodid flies in Yorkshire. *Naturalist*, 2014. **139** – no. 1086, pp 108-111. Species used in the display to illustrate various distribution patterns and habitat associations were: *Dolichopus plumipes* (Scopoli), *D. trivialis* Haliday, *Poecilobothrus nobilitatus* (Linnaeus), *Aphrosylus celtiber* Haliday, *Liancalus virens* (Scopoli), *Campsicnemus curvipes* (Fallén), *Sympycnus desoutteri* Parent. Also exhibited were two species not yet recorded from Yorkshire, but which occur on saltmarshes on the south bank of the Humber, opposite Spurn: *Dolichopus notatus* Staeger and *Muscidideicus praetextatus* (Haliday).

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

(2) *Bombylius fimbriatus* Meigen, France, Vallée de Combau, Drôme, 1690 m altitude. On the Continent, flies are not always what they seem – what appeared at first to be *Bombylius major* Linnaeus was named from a French key as *B. fimbriatus*. For recognition it should be noted that it has black femora (not reddish) and black bristles on the thorax around the base of the wings (*B. major* from Jansac and Col de Penne, Drôme, 5 June 2014 was shown for comparison).

Dipterists Digest 2015 **22,** 21-22

Ophiomyia skanensis (Spencer) (Diptera, Agromyzidae), new to Britain

IVAN WRIGHT[1] and DAVID GIBBS[2]

[1] 15 Blenheim Way, Horspath, Oxford OX33 1SB irwright@shotover-wildlife.org.uk

[2] 6 Stephen Street, Redfield, Bristol BS5 9DY david.usia@blueyonder.co.uk

Summary

A single male specimen of the agromyzid fly *Ophiomyia skanensis* (Spencer, 1976), discovered in Oxfordshire, is reported and discussed.

Introduction

Shotover Hill is 5km east of Oxford City and has extensive early records of Diptera, dating back to the late 19th century (Salzman 1939). A more contemporary inventory of Diptera is now being compiled, and since 2011 a funded study has added a great many new species records for the site, as well as accumulating data for an informative comparison with the earlier records. Within the various habitats sampled, a Malaise trap was placed in a small (0.3 hectare) mildly acidic marsh, and amongst the species collected in 2013 was an agromyzid fly, which proved to be a male *Ophiomyia skanensis* (Spencer, 1976), described from a single male from Sweden.

Identification

The male of *Ophiomyia skanensis* is keyed to species by Spencer (1976) using external characters, but Spencer also noted that the species "belongs to the difficult *maura* group in which a positive identification may only be possible from the male genitalia". The intermediate vibrissal angle of *O. skanensis* (60°-70°) causes couplet 9 to run both ways, reaching the species by either of two possible routes. However, the narrow jowl and raised narrow facial ridge are quite distinctive features, and useful characters throughout the key. The male genitalia were illustrated by Spencer (1976, Figs 108-109).

In the earlier Royal Entomological Society key to British species (Spencer 1972) the vibrissal angle of 60°-70° causes the same uncertainty, as above, at couplet 10. In the case where a specimen were to have a vibrissal angle of 70° the key would run, using external characters only, to reach *O. melandricaulis* or *O. labiatarum/collini*, emphasising the importance of using the genitalia figures of Spencer (1976) to confirm identification.

Biology

The host plant is unknown, although the closely allied species *O. maura* makes a gallery mine in the leaves of goldenrod *Solidago virgaurea* and other related species also utilise Asteraceae so mines should be looked for in these plants.

Distribution and Status in Britain

So far, this is the only specimen to have been identified in Britain. Shotover Hill (SP5606), V.C 23, Oxfordshire, 6 August 2013, 1♂, genitalia preparation in DMHF on cover slip on same mount. Voucher retained at the Oxford University Museum of Natural History.

Acknowledgements
The authors would like to thank the Heritage Lottery Fund for a grant to support this work, also Oxford City Council for permission to sample invertebrates.

References

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Spencer, K.A. 1976. The Agromyzidae (Diptera) of Fennoscandia and Denmark. *Fauna entomologica Scandinavica* **5** part, 1-304.

Phytomyza centaurii (Spencer) (Diptera, Agromyzidae) reared from *Gentiana tibetica* in Oxfordshire

– There is a group of internally pupating agromyzids feeding on Gentianaceae that have been placed in the genus *Chromatomyia* though recent molecular evidence (Scheffer, S.J., Winkler, I.S and Wiegmann, B.M., 2007. *Molecular Phylogenetics and Evolution* **42,** 756-775) shows that *Chromatomyia* is polyphyletic and should not be separated from *Phytomyza*. In K.A. Spencer's British key (1972. Diptera, Agromyzidae. *Handbooks for the Identification of British Insects* 10(5g), Royal Entomological Society, London), *Phytomyza gentianae* Hendel, 1920 was included from specimens reared from *Blackstonia perfoliata* and *Centaurium umbellatum*. Subsequently, K.A. Spencer (1990. *Host Specialization in the World Agromyzidae* (Diptera). Kluwer Academic Publishers, Dordrecht) described the leaf miners from each of these host genera as different species, *P. blackstoniae* (Spencer, 1990) and *P. centaurii* (Spencer, 1990) respectively, and *P. gentianae* was removed from the British list. Further related species are known from Continental Europe and Asia.

In autumn 2010, I planted in my garden near Goring Heath, south Oxfordshire (SU6779) a plant of *Gentiana tibetica* King ex Hooker, purchased from a nursery in southern Scotland. *Gentiana tibetica* is a late-flowering herbaceous perennial to 75cm with quite fleshy leaves. In early June 2011, I noticed relatively inconspicuous upper-surface mines of an agromyzid that pupated internally, and suspected that they might be made by the true *P. gentianae*.

Mines were collected on 5 and 19 June and eight adult flies (and no parasitoids) emerged from 24 June to 2 July 2011. Dissection of the genitalia of two of the three males that were reared showed, surprisingly, that the mines were made by *P. centaurii*. Though the genitalia of *P. centaurii* and *P. gentianae* are similar, the more sclerotised and longer distal processes of the former are distinctive. Spencer (1990 *op. cit.*) in his description of *P. centaurii* notes that it "remains to be confirmed with further collecting that [*P.*] *blackstoniae* and [*P.*] *centaurii* are exclusively associated with *Blackstonia* and *Centaurium* respectively, as suggested on present evidence." The data reported here show that *P. centaurii* has, at least in gardens, a broader host range within the Gentianaceae.

The origin of the flies is not clear. No mines were noticed on the gentian when it was planted, though it is possible that they were overlooked. The nursery kindly examined their *G. tibetica* stock and reported that they could find no mines. *Phytomyza centaurii* is recorded locally in the south of England with no records in the north, or in Scotland. I have not observed *Centaurium* spp growing in the near vicinity of the house, though again, it may have been missed, and the plant certainly grows a few kilometres away. The one other species of Gentianaceae I grow, *Gentiana asclepiadea*, was not mined. Mines were observed again on *G. tibetica* in 2012 but the plant did not survive the 2012/2013 winter – **H. CHARLES J. GODFRAY,** Department of Zoology, University of Oxford, South Parks Road, Oxford OX1 3PS

Achalcus britannicus Pollet (Diptera, Dolichopodidae) in Devon –

During the first few months of 2015, I had the good fortune to discover two males of *Achalcus britannicus* Pollet, 1997 in Devon. The first was caught on 11 January 2015 by the Grand Western Canal (SS997128) near Halberton, V.C. 4. The second was found on 10 March 2015 at a small brackish marsh (SY075830) by the River Otter at Budleigh Salterton, V.C. 3.

Extensive stretches of the Grand Western Canal support *Typha latifolia* along both sides, as well as clumps of *Phalaris arundinacea*. The latter, as well as tussocks of Poaceae, were focussed on, hence were most probably the source of the specimen from the canal.

The brackish marsh at Budleigh Salterton extensively supports *Phragmites australis* as well as *Juncus* and *Carex* species, which had died back during the winter. There is also a limited amount of *Phalaris arundinacea* on the margins.

The stronghold for *A. britannicus* is its type locality at Marazion Marsh in Cornwall which is the largest reedbed in that county. Marazion Marsh is also adjacent to the sole Grade 1 agricultural land in the said county. Cornwall's geology is predominantly acidic so the presence of base rich soil at Marazion Marsh might hint at its preferred habitat requirements, thereby influencing the fly's distribution. The nearest known locations are base rich fenny seepage sites in Dorset. Other counties it is known from, as far as I am aware, include Somerset, Wiltshire, Hampshire, Suffolk, Norfolk, Cambridgeshire and Yorkshire. To the best of my knowledge, these two specimens constitute the first and second records for Devon.

The method of collection for both specimens involved beating dense tussocks close to water over a white tray and retention by a small pooter. This is a method I have used to good effect during the winter to accumulate Diptera records. A second unsuccessful attempt to find it at Halberton was made on 5 March after identification had been achieved.

Out of a set of ninety records kindly supplied by Martin Drake, the capture methods break down as, sweep netting (7), suction sampler (22), water trap (53), pond netting (1) and three unknowns. The data is skewed by a large portion coming from studies at Marazion. These capture methods, as well as that used to acquire the two Devon specimens, might imply that this species is a secretive one that keeps to the base of dense vegetation. Therefore, the use of a suction sampler amongst short dense vegetation close to water could prove successful in winter and possibly the warmer months.

The same data supplied by Martin shows records for *A. britannicus* in June (2), July (17), August (22), September (29), October (14) and November (1). The November record, as well as the discovery of the two Devon specimens in January and early March, demonstrates that it flies well into late winter and is probably worth sampling for in reed beds and bankside vegetation during the winter months.

I would like to thank Martin Drake for discussing this record as well as sharing his distribution data – **ANDREW CUNNINGHAM,** 9 The Close, Tiverton, Devon EX16 6HR

Life history of *Botanophila fugax* Meigen (Diptera, Anthomyiidae) –

Centaurea macrocephala is a tall yellow-flowered knapweed with large leaves that is grown occasionally in gardens in Britain. On 16 October 2010 I collected mines of an agromyzid (probably *Phytomyza autumnalis* Hering, though I failed to rear adults) from basal leaves of plants in my garden near Goring Heath in south Oxfordshire (SU6779). To rear the mines I placed leaves in a plastic container and excised the agromyzid pupae when they formed at the end of the mine. The leaves of the plant quickly rotted and when I came to clean the container three weeks

later, I was surprised to find six cyclorrhaphan puparia. These hatched into anthomyiid flies between 11 and 15 November and dissection of a male and comparison with the figures and description in Michael Ackland's MS draft of *British Anthomyiidae* showed them to be *Botanophila fugax* Meigen, a common British species.

This finding prompted me to dissect two anthomyiids reared by the late Claire Towner from decaying leaves of *Rumex obtusifolius* at Silwood Park, Berks (SU9468) in 1989, as part of her PhD research. The leaves had been collected because they contained mines of *Pegomya solennis* (Anthomyiidae). These flies too were *B. fugax.*

Mary Miles (1952. Studies of British Anthomyiid flies. *Bulletin of Entomological Research* **43,** 83-90; 1953. Studies of British Anthomyiid flies. *Bulletin of Entomological Research* **43,** 591-596) described this species as feeding on and within the fresh and decaying leaves of brassicas, including cauliflower and Brussels sprouts, lettuce and spinach, and quotes earlier reports of feeding on carnations (*Dianthus*, as a miner), decomposing oat seedlings, beet and sunflowers. She reported oviposition to occur on fresh leaves but also on dead leaves and tissues affected by rot, damaged by insects, or cut during harvesting. The larvae "seemed unable to feed on healthy tissue" of brassicas but fed on rotted material. On his *Leafminers of Europe* website (http://www.bladmineerders.nl/index.htm) [accessed 10.8.2015], Willem Ellis also quotes records from *Dianthus* but suggests it may have a more restricted host plant range: "Amaranthaceae, monophagous (?)" [the family in which *Spinacia* is now placed]. W. Hennig (1970. 63a. Die Fliegen der Palaearktischen Region, Stuttgart: Schweizerbart) recorded it from decaying parts of plants already attacked by other insects, and also on mouse droppings (the life history quoted by Peter Skidmore in the *Dipterists' Handbook* 2nd edition, 2010, p. 163).

The new and published records for this species suggest the following provisional hypothesis for the life history of *B. fugax.* Eggs are laid on a variety of herbaceous plants, especially on damaged tissue or pre-senescent leaves. Larvae may feed initially on living plant tissue (though the extent of this, and whether as a leafminer, needs confirmation), but predominantly on decaying plant material. Pupation occurs in the soil, which may account for rearing records from animal faeces, which are probably incorrect – **H. CHARLES J. GODFRAY,** Department of Zoology, University of Oxford, South Parks Road, Oxford OX1 3PS

A Cumbrian record for *Pseudoseps signata* (Fallén) (Diptera, Piophilidae) – During the Dipterists Forum acalyptrate workshop at Preston Montford FSC Field Centre in February 2015, PJC recognised a female of *Pseudoseps signata* (Fallén, 1820) among the Piophilidae in the collection of the World Museum, Liverpool, which had been brought to the workshop for reference purposes by RU. This specimen had been collected by RU on 19 June 1999 at Ulpha, Wallowbarrow Coppice (SD221964), Cumbria. It was swept over mixed vegetation in coppice, on a warm overcast day.

This species has a mainly boreal distribution in Europe and in Britain was only known from five sites in the vicinity of the Spey valley in the central Scottish Highlands, until David Gibbs found it by sweeping a flowering hawthorn (*Crataegus*) at Clatworthy Reservoir, Somerset in 2011 (Gibbs, D.J. 2013. *Pseudoseps signata* (Fallén) (Diptera, Piophilidae) found in Somerset. *Dipterists Digest* (*Second Series*) **20,** 186). The Cumbria record thus bridges a gap in its distribution, and may suggest that it could occur elsewhere in the west of Britain – **RICHARD UNDERWOOD,** 3 Stone Mason Close, Ormskirk L39 2BN and **PETER J. CHANDLER,** 606B Berryfield Lane, Melksham, Wilts SN12 6EL

Dipterists Digest 2015 **22,** 25-27

Observations concerning *Gastrolepta anthracina* (Meigen) (Diptera, Tachinidae) at Lodmoor Country Park, Weymouth, Dorset

MICK PARKER
9 East Wyld Road, Weymouth Dorset DT4 0RP

Summary
The tachinid *Gastrolepta anthracina* (Meigen, 1826) is a rare and poorly known species, with few published observations. During early April 2014, whilst working in the area of Lodmoor Country Park, Weymouth, Dorset (SY6880), the author was drawn to a lengthy complex of cherry laurel *Prunus laurocerasus* hedges. These hedges were attracting insects and as time went by, more and more species were being attracted to them; in due course one species *G. anthracina* in particular gained the author's attention and thereafter, during the period from early April to mid July 2014, he compiled detailed notes on an almost daily basis; these and additional observations during this period are reported.

Introduction

My first recording of *Gastrolepta anthracina* (Meigen) at Lodmoor Country Park, Weymouth, Dorset was on 10 May 2014. Sightings then increased in numbers as the week unfolded. Some counts were made of the numbers present, with some twenty being observed basking on *Prunus laurocerasus* leaves on 13 May 2014. Those counted all occurred within a short length of hedge, a distance of scarcely 10 feet. This was followed by another count on the same stretch of hedge, of some 32 on 18 May 2014 (most of these appeared to be males). Away from this "easy to count" area, there were also large numbers of *G. anthracina* on other lengths of *P. laurocerasus* hedge. These hedges were around a car park situated to the west of Lodmoor Country Park, with urban development to the west and north, and coast to the south.

The close proximity of a large building ruled out total exposure to direct sunlight, casting shade and only allowing observations in certain directions. Therefore, at the beginning of their emergence the vast majority of these observations were on the long line of *P. laurocerasus* hedges facing west; only later were they seen on the hedges facing south, and later still a few were noted on the the north-facing hedges.

Spring brood

It was very pleasing to encounter this species in such numbers; equally, it was of interest to note their behaviour, which, was in the main, very consistent. The vast majority of the males appeared to hold territories; in nearly every case, they would remain poised on a *P. laurocerasus* leaf. The mere hint of any other *G. anthracina* or other similar sized insects passing within range would result in interception and sparring. After sparring, they would return to roughly the same area and remain alert to any passing insect.

From an early stage of my observations, it was obvious that they greatly favoured cherry laurel *Prunus laurocerasus* and in the weeks that followed it was clear that this was the main plant of choice. On the very few occasions that plants other then *P. laurocerasus* were used, it was only because of their very close proximity to *P. laurocerasus*, e.g. greater bindweed *Calystegia silvatica*, which emerges through *P. laurocerasus* as a climber, or on one occasion as a vagrant on bramble *Rubus fruticosus* agg., following late brood dispersal. My persistent checks on all the hedges of other species in the area, during this spring period, did not reveal any *G. anthracina*, in stark contrast to the numbers prevalent on *P. laurocerasus.*

My notes on 24 May record that *G. anthracina* was still much in evidence and this was despite heavy showers! And there was still no evidence that other species of bushes were being utilised. Numbers reached a peak in late May; thereafter, the population of *G. anthracina* appeared to dwindle, with an obvious reduction recorded on 2 June, which occurred throughout the area. Despite this decline an interesting observation was made on 5 June, the discovery of *G. anthracina* on an isolated *P. laurocerasus* bush, which reinforced my view that, whatever conditions it prefers, it appears to find them most favourably with *P. laurocerasus*. This isolated bush was completely detached from the main row of *P. laurocerasus*, but not from other species of bushes and large ornamental plants, none of which showed any sign of *G. anthracina*. Then on 7 June 2014, one male *G. anthracina* was noted on a small isolated bramble *Rubus fruticosus* agg. bush. This and the surrounding small area had been under observation throughout my period of work, and had never before produced any *G. anthracina* records; this record was considered to be due to dispersal. Away from this isolated bush the decline in numbers of *G. anthracina* continued; then one male recorded on 8 June, was considered to be the last representative of the Spring brood.

The Spring brood was recorded on the following dates: 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 24, 25, 27, 28, 29 and 31 May; 1, 2, 5, 6, 7 and 8 June 2014 (a total period of 29 days). Despite observations, no *G. anthracina* were seen on the 10, 11 and 12 June or any date after 12 June; there was thus a marked break before the emergence of the Summer brood.

Summer brood

Two *G. anthracina* were seen on 26 June 2014, suggesting that the emergence of a second brood was underway. At least eight *G. anthracina* were then noted on the morning of 28 June and a further twelve were seen in the afternoon. From that date onwards they appeared to be increasing in numbers and were widespread throughout the site, with numbers of basking males appearing in the species' previously favoured areas. Most of the more widespread observations were of females, which was in almost complete contrast to the Spring brood; they also accounted for nearly half of *G. anthracina* recorded on certain days (observations during the Spring emergence appeared to show the ratio to be about 10 to 1 in favour of the males).

The following observations supported female dispersal. Two females were seen temporarily on lilac *Syringa vulgaris*, which had not previously been noted despite observations on this particular bush, and one of these females was then observed nectaring on sow-thistle *Sonchus* species. This was the first occasion that flower visiting was witnessed, but return visits to the bush failed to find any further trace of *G. anthracina*. Additional females noted on the bramble *Rubus fruticosus* agg. area, were likewise not seen again. Two females were seen basking on mallow *Malva* species leaves, again apparently temporarily, as they also soon disappeared. This evidence, together with the fact that Summer brood females appeared to be far more mobile and prominent throughout the site, gave rise to the suspicion that the females soon disperse after summer brood emergence.

Males, on the other hand, mostly take up territories. On 8 July 2014, *G. anthracina* continued to be distributed more or less throughout the *P. laurocerasus* bushes, with an additional small group occurring on bramble *Rubus fruticosus* agg. Here males were displaying in the same manner as previously noted on *P. laurocerasus*. This *Rubus fruticosus* patch is the only other piece of vegetation utilised in this way. However, with the arrival of 12 July decline had set in, with numbers of *G. anthracina* well on the wane, with them missing from *Rubus fruticosus* and large sections of the *P. laurocerasus*, only four males being seen on that date. That observation was followed by two males on 13 July and one male on 14 July. Though I was not present at this site after 14 July, substantial decline had already been obvious prior to my departure.

The Summer brood was recorded on the following dates: 26, 28, 29 and 30 June and 3, 4, 5, 6, 8, 9, 10, 12, 13 and 14 July 2014 (a total period of 19 days)

Host species

The darkling beetle *Lagria hirta* (Coleoptera, Tenebrionidae), has been recorded as a host to *G. anthracina* on the Continent. One specimen of *Lagria hirta*, was recorded on 31 May 2014. From then on it was recorded fairly regularly and usually several were noted on each occasion, nearly always crawling over the *P. laurocerasus* hedges. The presence of this species strongly reinforces the view, that these *P. laurocerasus* hedges are a breeding site for *G. anthracina. Lagria hirta* was recorded on the following dates: 31 May 2014; 1, 2, 5, 7, 8, 10, 11, 12, 14, 15, 18, 19, 23, 28, 29 and 30 June; 3, 5, 6, 8, 9 and 12 July.

Additional notes on habitat

Obviously, being adjacent to and largely surrounded by a large car park, there is virtually no natural habitat in the area concerned. Nearly everything of consequence had been planted; besides the *P. laurocerasus* hedges, there were various other non-native species including hollyhock *Alcea* species, lilac *Syringa vulgaris* and cotoneaster species. A few native species had also been planted and they included broom *Cytisus scoparius* and fennel *Foeniculum vulgare.* Another native species present was greater bindweed *Calystegia silvatica* which was assumed to have arrived via self sown seed; various other native species noted were likewise also presumed to be via self sown seed, but they were in the main single plants or in very low numbers. One tiny patch of bramble *Rubus fruticosus* agg. became relevant towards the conclusion of my observations. Another characteristic of some of the *P. laurocerasus* hedges, was the lack of vegetation adjacent and beneath the *P. laurocerasus*, nothing but exposed and bare ground with leaf litter; hedges of this nature tended to have higher numbers of *G. anthracina*.

Conclusions

Clearly, this site proved to be excellent for *G. anthracina* and attraction of this species for cherry laurel *Prunus laurocerasus* cannot be overstated. It may well be worth checking *P. laurocerasus* bushes in situations similar to that described here.

Some differences were apparent between the broods. Firstly, regarding sightings, the ratio of males and females was much more even in the Summer brood, than was the case in the Spring brood.

The other notable feature was dispersal, which occurred in both broods, but most markedly in the Summer brood; there was little evidence of it occurring in the Spring brood until very late in the flight period, and it was then only confined to a few males. The situation regarding the second brood was, however, very different, with it later showing marked dispersal, including a number of females that were seen away from the *P. laurocerasus* bushes on several occasions; this was something that was not noticed in the Spring brood. It would also appear that the Summer brood was comparatively short lived, apparently no more than 19 days compared to 29 days for the Spring brood.

Acknowledgements

My deep gratitude is extended to the Management and Staff of Local Parking Security Ltd (Warwick).

Eumerus sogdianus Stackelberg (Diptera, Syrphidae) present in Kent – Adam Wright (2013. *Eumerus sogdianus* Stackelberg (Diptera, Syrphidae) new to Britain. *Dipterists Digest* (*Second Series*) **20,** 15-16) reported the first known presence in the British Isles of the hoverfly *Eumerus sogdianus* Stackelberg, 1952 on the Isle of Wight, Hampshire. This note puts on record the second known locality for the species, at Dungeness in Kent. On 6 and 22 June 2014, near to the old lighthouse on the end of Dungeness peninsula at TR087168, I caught several hoverflies of the genus *Eumerus* flying around a tree mallow *Lavatera arborea*. Several of the specimens keyed out securely as *Eumerus funeralis* Meigen using the key by A.E. Stubbs and S. Falk (2012. *British Hoverflies, an illustrated identification guide*. Reading, British Entomological and Natural History Society), but three other male specimens did not. They had ocelli that were positioned intermediate between those illustrated in couplet 2 for *Eumerus* by Stubbs and Falk (*op. cit.*). Using the key by M.P. Van Veen (2004. *Hoverflies of Northwest Europe: Identification keys to the Syrphidae*. 254 pp. KNNV Publishing, Utrecht) and the Swedish key by H. Bartsch (2009. *Tvåvingar: Blomflugor: Diptera: Syrphidae: Syrphinae. National nyckeln till Sveriges flora och fauna*. 406 pp. ArtDatabanken, SLU, Uppsala), the males keyed out to *E. sogdianus* since the hind margin of the fourth sternite has a pair of very distinctive lobular projections. This feature is well illustrated in both keys. The identification was subsequently confirmed by Alan Stubbs.

The location is on the shingle peninsula, where the soil is thin and the dominant vegetation is a lichen heathland with scattered grass. There are some residential gardens nearby which could well contain the plants the larvae are feeding on. It is perhaps worthy of note that, like the first reported location for the species in Britain, this new site is close to the sea, perhaps suggestive of a very recent colonisation event.

I suggest it is worth checking any male *Eumerus* specimens whose ocelli are intermediate between the extremes in couplet 2 of the *Eumerus* key provided by Stubbs and Falk (*op. cit.*) and examining the fourth sternite more closely for the diagnostic form of *E. sogdianus* – **GRANT HAZLEHURST,** 27 West Oak, Beckenham, Kent, BR3 5EZ, granthazlehurst@msn.com

The genus _Gymnometriocnemus_ (Diptera, Chironomidae) in Northern Ireland – A recent review of the genus *Gymnometriocnemus* Edwards (Stur, E. and Ekrem, T. 2015 A review of Norwegian *Gymnometriocnemus* (Diptera, Chironomidae) including the description of two new species and a new name for *Gymnometriocnemus volitans* (Goetghebuer) sensu Brundin. *ZooKeys* **508,** 127-142) prompted me to review the specimens in my collection. The specimen recorded by D.A. Murray, P.H. Langton, J.P. O'Connor and P. Ashe (2014. Distribution records of Irish Chironomidae (Diptera): Part 2 – Orthocladiinae. *Bulletin of the Irish Biogeographical Society* **38,** 60-244) as *G. brumalis* (Edwards) turns out to be *G. subnudus* (Edwards); however, three specimens recently collected from the surface of the River Bann in Coleraine (1 September 2013, 14 September 2014, C854304, Hydrometric Area HA3) are all *G. brumalis*. Both species are recorded for Ireland in Murray *et al.* (*loc. cit.*): this note is necessitated because *Fauna Europaea* (Sæther, O.A. and Spies, M. 2013. Fauna Europaea: Chironomidae. **In** Beuk, P. and Pape, T. (Eds.), Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6. http://www.faunaeur.org/) treats Northern Ireland as a separate geographical entity – **PETER H. LANGTON,** University Museum of Zoology, Downing Street, Cambridge (address for correspondence: 16, Irish Society Court, Coleraine, Co. Derry, Northern Ireland, BT52 1GX)

Dipterists Digest 2015 **22**, 29-32

Apparent bivoltine pattern of *Molophilus pusillus* Edwards and some other cranefly emergence patterns in Scotland, 2009 (Diptera: Tipulidae, Limoniidae)

E. GEOFFREY HANCOCK
The Hunterian (Zoology Museum), University of Glasgow, Scotland, Glasgow, G12 8QQ
email: geoff.hancock@glasgow.ac.uk

Adult records of *Molophilus pusillus* Edwards, 1921 from a Malaise trap run over twelve months on the east shore of Loch Lomond during 2009 show a double peak (Fig. 1). The trap was set in oak woodland at the Scottish Centre for Ecology and the Natural Environment, a University of Glasgow field station, located at Rowardennan, Stirlingshire. Since the Cranefly Recording Scheme started in 1973, the large number of participants has provided many records for *M. pusillus* and it is widespread in Britain and Ireland. Prior to then it was known only from the type series from Ayrshire. Females can be common and occasionally swarm in large numbers but no males have been found, indicating apparent parthenogenesis. This, combined with its current status as endemic to the British Isles, make it an interesting species. Being amongst the smallest of cranefly species, with a wing length of 3-4mm, possibly it is overlooked elsewhere in Europe although craneflies have been studied by several generations of entomologists and it has not been located there.

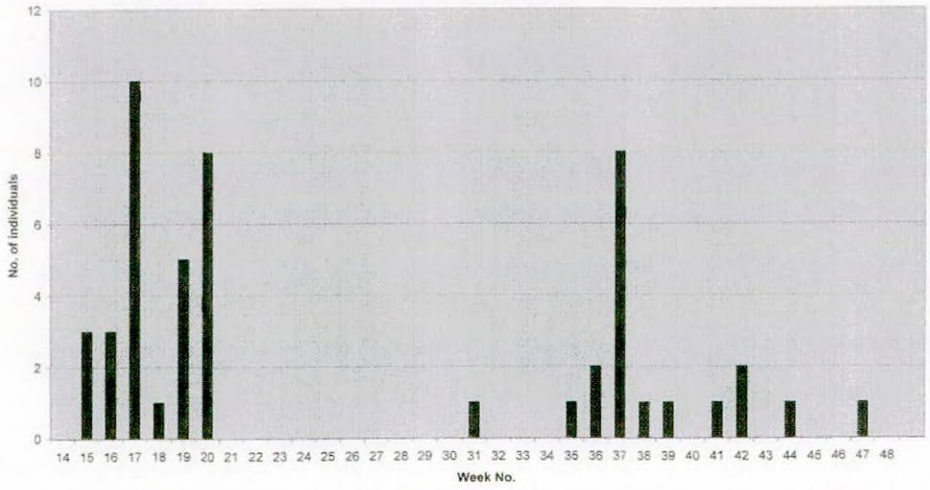

Fig. 1. Number of adults of *Molophilus pusillus* from a Malaise trap between weeks 15 and 47 (14 April – 14 November, 2009), set on the east side of Loch Lomond.

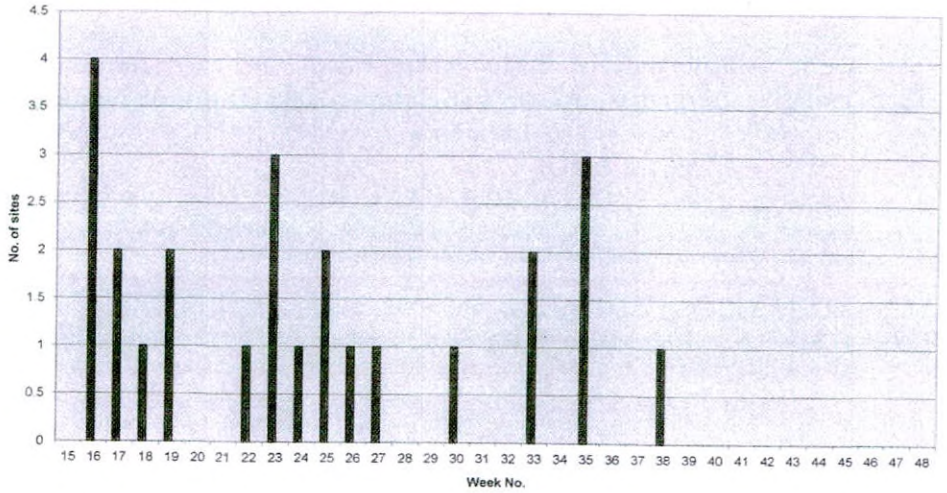

Fig. 2. Number of sites at which *M. pusillus* appeared in the Lake District, derived from Hewitt *et al.* (2005). These date from week 16 (22 April) to week 38 (9 October) during 2005.

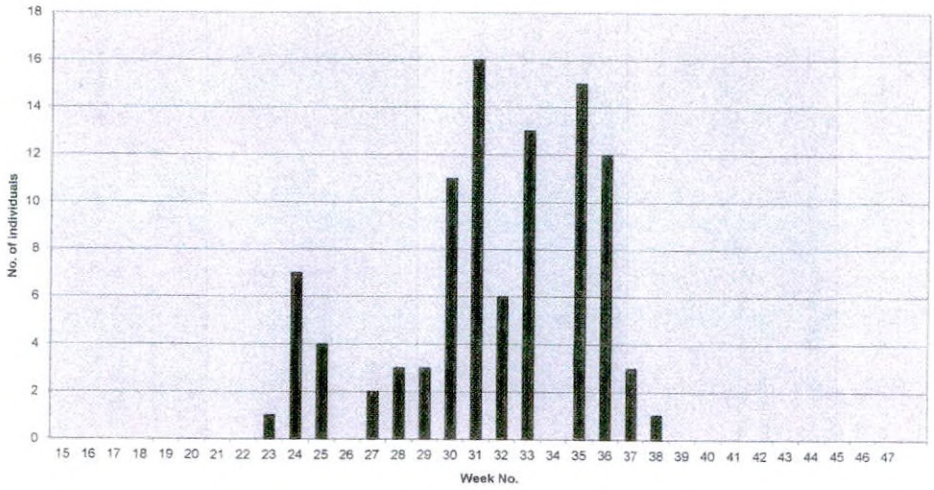

Fig. 3. Number of adults of *Molophilus appendiculatus* from a Malaise trap set on the east side of Loch Lomond. The peak periods between weeks 30 to 36 cover the period from 20 July to 31 August 2009.

There appear to be no other available trap data for *M. pusillus* that can be used to compare with the results presented here. Many records of the species are available in the NBN Gateway. When examined these span months from April to October but each record is generally unaccompanied by numbers of individual insects and are spread over several years. One data set

from a site-based survey of exposed riverine sediments in the Lake District is of some interest (Hewitt *et al.* 2005). There are sufficient numbers of records that can be charted of its presence in repeat visits to the target sites (Fig. 2). These show a less distinct pattern but there are signs of *M. pusillus* appearing at fewer sites in mid-summer.

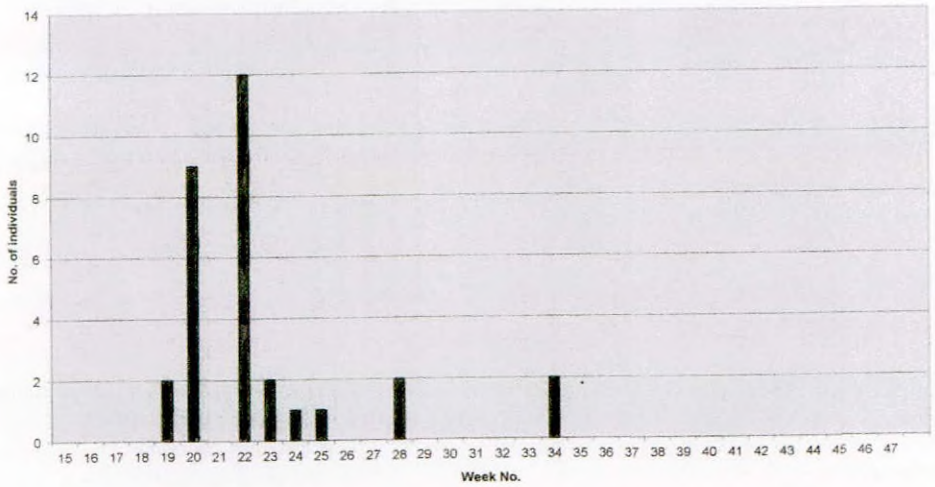

Fig. 4. Number of adults of *Gonomyia conoviensis* from a Malaise trap set on the east side of Loch Lomond. The early peak period is from 10 to 31 May 2009.

It is possible that the existence of two distinct periods of adult emergence in northern Britain is linked to climate, whereas further south perhaps *M. pusillus* can maintain a more or less continuous breeding cycle. However, it is not certain that the data from Loch Lomondside are typical for the wider area or is the product of some peculiar conditions of the site or the year in which the traps were set.

Data for some other species of cranefly recorded in the same Malaise trap during 2009 at Loch Lomondside are included here for comparison. These data demonstrate the summer peak of *M. appendiculatus* (Staeger) as shown in Fig. 3, the spring and early summer appearance of *Gonomyia conoviensis* Barnes (Limoniidae) (Fig. 4) and the late summer species *Tipula paludosa* Meigen (Tipulidae) (Fig. 5). These confirm what is known of their emergence patterns. The data for *M. appendiculatus* includes both sexes, and the only other species of *Molophilus* recorded was *M. occultus* de Meijere.

Acknowledgements

Many thanks to Cheryl McCormack and Stuart Wilson at SCENE who helped set up and change the Malaise trap collecting heads at weekly intervals during the year. Stephen Hewitt and John Parker kindly supplied the raw data from their fieldwork.

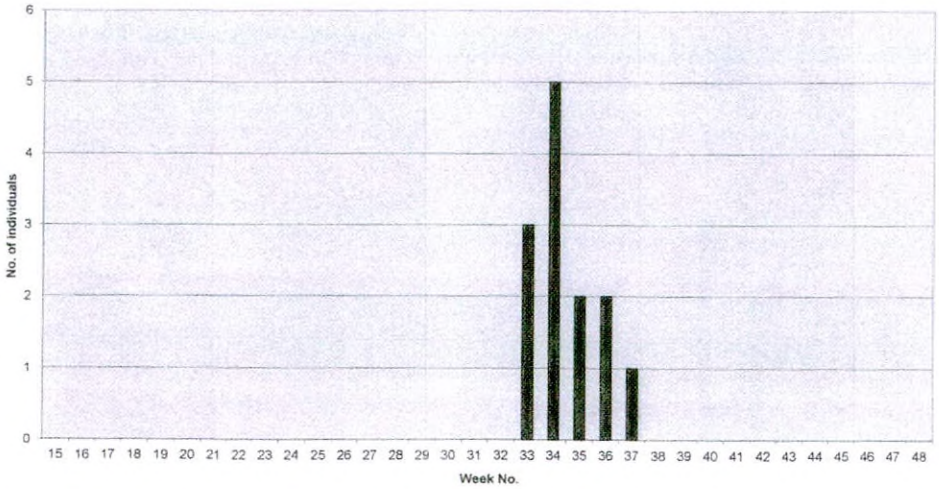

Fig. 5. Number of adults of *Tipula paludosa* from a Malaise trap set on the east side of Loch Lomond. The weeks 33-37 cover the dates from 9 August to 12 September 2009.

Reference

Hewitt, S.M., Atty, D., Parker, J., Read, J. and Sinclair, M. 2005. *Survey of the insects of exposed riverine sediments on the rivers Eden and Derwent in Cumbria in 2004*. pp 1-55. English Nature and the Environment Agency (Unpublished report).

Some Scottish records of *Hirtodrosophila confusa* (Staeger) (Diptera, Drosophilidae) – I have found only a single previous record of *Hirtodrosophila confusa* (Staeger) (as *Drosophila confusa*) in Scotland, from Golspie (Sutherland), dated 31 July 1900, by Colonel J.W. Yerbury (1913. A list of Diptera met with in Wester Ross, with notes on other species known to occur in the neighbouring areas. *Scottish Naturalist* **1913,** 173-177). This is the only record given by E.B. Basden (1954. The distribution and biology of Drosophilidae (Diptera) in Scotland, including a new species of "Drosophila". *Transactions of the Royal Society of Edinburgh* **62,** 603-654) and no other records were found in the Scottish Insects Record Index housed at the National Museums of Scotland (NMS), Edinburgh. The National Biodiversity Network website, consulted on 25 April 2015, shows records from southern England and Wales northwards into Cumbria and Yorkshire.

No specimens of *H. confusa* from Scotland were found in the Diptera collections at the NMS which contains specimens from Basden's survey of Drosophilidae in Scotland and later specimens. All 31 British specimens of *H. confusa* that I examined in the NMS collection were collected from sites in the southern half of England between 1947 and 1960, and all of them have E.B. Basden acquisition labels.

I have reared and collected adults of *H. confusa* from various sites in southern Scotland between 1993 and 2014. It was reared from fungal tissue from the fruiting bodies of two species of bracket fungi: *Meripilus giganteus*, growing on beech stumps or on a beech tree (*Fagus sylvatica*) and from *Polyporus squamosus* growing on an ash tree (*Fraxinus excelsior*) collected in or near Edinburgh. The fungal tissue was placed in rearing containers indoors for rearing, with compost for pupariation. On 4-5 July 1998 tissues from a fruiting body of *P. squamosus* were removed from the Hermitage of Braid, Edinburgh (NT2570) and taken indoors for rearing; on 7 July 1998 two males and four females and on 17 July 1998 three males and two females of *H. confusa* emerged from the fungus. Tissue from a fruiting body of *M. giganteus* was collected in Gore Glen (NT3361) to the south-east of Edinburgh on 12 September 1999 and taken indoors for rearing; from 26 to 29 September 1999 four males and five females of *H. confusa* emerged from the fungus. Further tissues from a *M. giganteus* fruiting body were taken from the Hermitage of Braid (NT2570) on 16 September 2006 and taken indoors for rearing; on 25 September 2006 six males and five females of *H. confusa* emerged in the rearing containers. On 3 September 2010 further tissue from a *M. giganteus* fruiting body was collected near Mortonhall, Edinburgh (NT2568); nine males and eight females of *H. confusa* emerged from 18 to 22 September 2010 from this fruiting body tissue held in a rearing container.

Hirtodrosophila confusa has been reared from *M. giganteus* 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) and from *P. squamosus* in Britain by B. Shorrocks and P. Charlesworth (1980. The distribution and abundance of the British fungal-breeding *Drosophila*. *Ecological Entomology* **5**, 61-78), though *H. confusa* develops in a wider range of fungi including agarics and boletes, and visits *Ganoderma* species (Chandler, P. 2010. Associations with Fungi and Mycetozoa. pp 417-441. **In** Chandler, P. (Ed.) *A Dipterist's Handbook* (2nd Edition). 525 pp. The Amateur Entomologists' Society, Orpington, Kent).

Fungal tissue for rearing was taken from sites within Edinburgh vice-county (83), while adults of *H. confusa* were taken between 1993 and 2014 from Edinburgh and a further two vice-counties: Linlithgow (84) and Lanark (77). All adult specimens of *H. confusa* were taken on or close to the bracket fungi *M. giganteus*, *P. squamosus* and *Ganoderma* species, or unidentified bracket fungi, growing on broadleaved trees, logs and stumps. Sites were in Edinburgh (NT2670, NT2570 and NT2469), at Dalmeny Park (NT1478), Gore Glen (NT3361), Roslin Glen (NT2762 and NT2863) and in woodland by Jock's Burn in the Clyde valley (NS8250). Dates ranged from 15 May to 17 September while the first capture was in the Hermitage of Braid (NT2570) on 8 August 1993 of four males taken on an unidentified bracket fungus.

I am grateful to Zoë Simmons for searching the Diptera collections at the Oxford University Museum of Natural History, although this search did not turn up any *H. confusa* belonging to Yerbury – **DAVID HORSFIELD,** National Museums Collection Centre, 242 West Granton Road, Edinburgh EH5 1JA

A Scottish record of *Paracraspedothrix montivaga* Villeneuve (Diptera, Tachinidae) – Keith Bland presented me with a small black and grey tachinid fly to identify for him, which I keyed out as *Paracraspedothrix montivaga* Villeneuve using H.P. Tschorsnig and B. Herting (1994. Die Raupenfliegen (Diptera: Tachinidae) Mitteleuropas: Bestimmungstabellen und Angaben zur Verbreitung und Ökologie der einzelnen Arten. *Stuttgarter Beiträge zur Naturkunde. Serie A (Biologie)* **506,** 1-170). The single male specimen of *P. montivaga* was taken by Keith Bland on a window inside a house at Craobh Haven, Argyll (NM7907), on the west coast of Scotland, between 22 and 27 September 2014.

Paracraspedothrix montivaga occurs in temperate Europe, north to Sweden and was recorded as new to Britain by G.A. Collins, D.J. Gibbs and C.M. Raper (2002. *Paracraspedothrix montivaga* Villeneuve and *Carcelia bombylans* Robineau-Desvoidy (Diptera, Tachinidae) new to Britain. *Dipterists Digest (Second Series)* **9,** 61-64) from Surrey, Berkshire, Oxfordshire and Warwickshire. According to the National Biodiversity Network website (accessed on 26 March 2015) the species is now known to be more widely distributed in England and Wales with records which range from the south-east of England, East Anglia, Wales, the Midlands and as far north as Lancashire. Chris Raper, who collects records for the Tachinid Recording Scheme, when consulted by me was not aware of any previous records of *P. montivaga* from Scotland.

As a further check the Diptera collections and the Scottish Insects Record Index were searched at the National Museums Collection Centre in West Granton, Edinburgh but no specimens or records from Scotland of *P. montivaga* were found. This may be the first record of this species from Scotland. I am grateful to Hans-Peter Tschorsnig for confirming the identity of the specimen of *P. montivaga*. The specimen is deposited in the National Museums collections at West Granton – **DAVID HORSFIELD,** National Museums Collection Centre, 242 West Granton Road, Edinburgh, EH5 1JA

Phaonia pullata (Czerny) (Diptera, Muscidae) in the Spey Valley –

During the Dipterists Forum autumn field meeting in Scotland in 2013, I found a male of *Phaonia pullata* (Czerny, 1900) on the south bank of the River Spey (NJ0326) at Grantown, on 13 September. The precise location was not recorded, but the habitat is the birch and aspen woodland near Spey Bridge, which is well-known to dipterists as one of the sites for the aspen hoverfly *Hammerschmidtia ferruginea* (Fallén). This was an unexpected find as *P. pullata* is a scarce species that was only previously recorded in Britain from sites in the vicinity of the River Findhorn. It was found regularly at Logie by Francis Jenkinson from 1903 to 1911, on dates from 18 August to 28 September. Details of Jenkinson's records were reported by David Horsfield (1994. A second locality for *Phaonia pullata* (Czerny) (Dipt., Muscidae) in the Scottish Highlands. *Entomologist's monthly Magazine* **130,** 20), when he recorded it from another site by the Findhorn, seven miles upstream from Logie. David's record of a female, on 10 May 1992, was by sweeping heather and bilberry in Scots pine woodland on the slopes of a ravine above the River, and he speculated that the habitat at Logie was similar. Ivan Perry (2007. Francis John Henry Jenkinson, his life and legacy. *Dipterists Digest (Second Series)* **14,** 49-72) also commented on Jenkinson's finds of this species.

Phaonia pullata is distinctive within the genus *Phaonia* as it is a rather dark coloured species, with the wings strongly infuscated. Horsfield (*op. cit.*) mentioned that it resembled *P. aeneiventris* (Zetterstedt), but that Adrian Pont had confirmed the identity of British specimens. He stated that *P. pullata* was otherwise known only from Austria, but there are now records for Germany, Switzerland, the Czech Republic, Slovakia and Norway (*www.fauneur.org*), and it has also been recorded from, Lithuania (Pakalniškis, S., Bernotienė, R., Lutovinovas, E., Petrašiūnas, A., Podėnas, S., Rimšaitė, J., Sæther, O.A. and Spungis, V. 2006. Checklist of Lithuanian Diptera. *New and Rare for Lithuania Insect Species* **18,** 16-154. Lithuanian Entomological Society, Vilnius) (Adrian Pont *pers. comm.*).

The Grantown male has been checked using the key by F. Gregor, R. Rozkošny, M. Barták and J. Vaňhara (2002. The Muscidae (Diptera) of Central Europe. *Folia Facultatis Scientiarum Naturalium Universitatis Masarykianae Brunensis, Biologia* **107,** 280 pp). Adrian Pont (*pers. comm.*) has told me that he is not aware of any other British records of this species – **PETER J. CHANDLER,** 606B Berryfield Lane, Melksham, Wilts SN12 6EL

Dipterists Digest 2015 **22,** 35-42

Metriocnemus ephemerus sp. nov. (Diptera, Chironomidae) from Northern Ireland

PETER H. LANGTON
University Museum of Zoology Cambridge, Downing Street, Cambridge, UK
(address for correspondence: 16, Irish Society Court, Coleraine, Co. Derry, Northern Ireland BT52 1GX)

Summary
A new species of *Metriocnemus* van der Wulp is described from adult males collected in the River Bann at Coleraine, Co. Derry, Northern Ireland.

Introduction

On 28 February 2014, three small black male chironomids were skimmed from the surface of the River Bann in Coleraine. They were distinctive because of their short antennae with reduced and prone plume, reduced wings and short abdominal setae. The following week two further males were collected at the same place. In 1999 I embarked on a project to research the chironomid diversity and phenology of the lower Bann that involves collecting floating pupal exuviae once a week from a small tidal bay below the weir known as The Cutts. Neither before 28 February 2014, nor since 2 March 2014, has this species been encountered in the collections. It is closest to *M. sibiricus* (Lundström, 1915), described from the New Siberian Islands, north-east Russia.

Metriocnemus ephemerus sp. nov.

Etymology. The species epithet refers to the fleeting appearance of the species in one year of an extended survey over many years.

Holotype male: NORTHERN IRELAND: Co. Derry, Coleraine, R. Bann, C854305, drift; 2.iii.2014, leg. P.H. Langton; slide mounted. To be deposited in NMI (National Museum of Ireland, Dublin). **Paratypes:** Data as for holotype: 2 males; also 3 males collected at the same place on 28.ii.2014. In the author's collection.

Description (follows Sæther's (1989, 1995) revisions of the genus *Metriocnemus* van der Wulp; morphological terminology as in Sæther 1980). Total length 2.96-3.2mm (n=5). Wing length 1.40-1.70mm (n=6); width 0.30-0.34mm (n=4); width at anal lobe 0.18-0.20mm (n=2). Total length/wing length 1.74-2.20 (n=5). Wing length/length of profemur 1.6-2.0 (n=6). Coloration dark brown/black including halteres.

Head. Antenna somewhat clavate, of 13 flagellomeres (Fig. 1c); plume short and prone. AR 0.78-1.00 (n=6). Terminal flagellomere 280-320μm long (n=6), apical quarter pubescent, without setae. Eye bare. Temporal setae 6-18; including 3-5 inner verticals, 2-8 outer verticals and 2-5 postorbitals (n=4). Clypeus with 10-15 setae (n=3). Palpomeres: 32-48, 40-48, 108-136, 88-100, 88-104μm long (n=4).

Thorax (Fig. 1b). Antepronotum with ?2 lateral setae (n=1). Acrostichals 12, 15 (n=2); dorsocentrals 17, including 3 on humeral area (n=1); prealars 9, 11 (n=2); supraalars 5, 8 (n=2). Scutellum setae 26 (n=1). Preepisternum narrowing ventrad to a rounded point.

Wing (Fig. 1a) (except in one example, brownish and not fully expanded transversely). Narrowed to base, anal lobe weak. C extension 108-168μm. Cu_1 gently curved towards tip.

Brachiolum with 3, 7 setae (n=2), R with 15-27; R_1 with 14-20; R_{4+5} with 18-29; RM with 1, 2; M with 0; M_{1+2} with 2-22; M_{3+4} with 27-36; Cu with 0-19; Cu_1 with 15-23; Pcu with 0-3; An with 19-28 setae (n=5). Wing membrane with macrotrichia confined to parts of cells near the wing tip, with 0 in cell m basally of RM, macrotrichia length 20-24μm. Squama with 6, 11 setae (n=2).

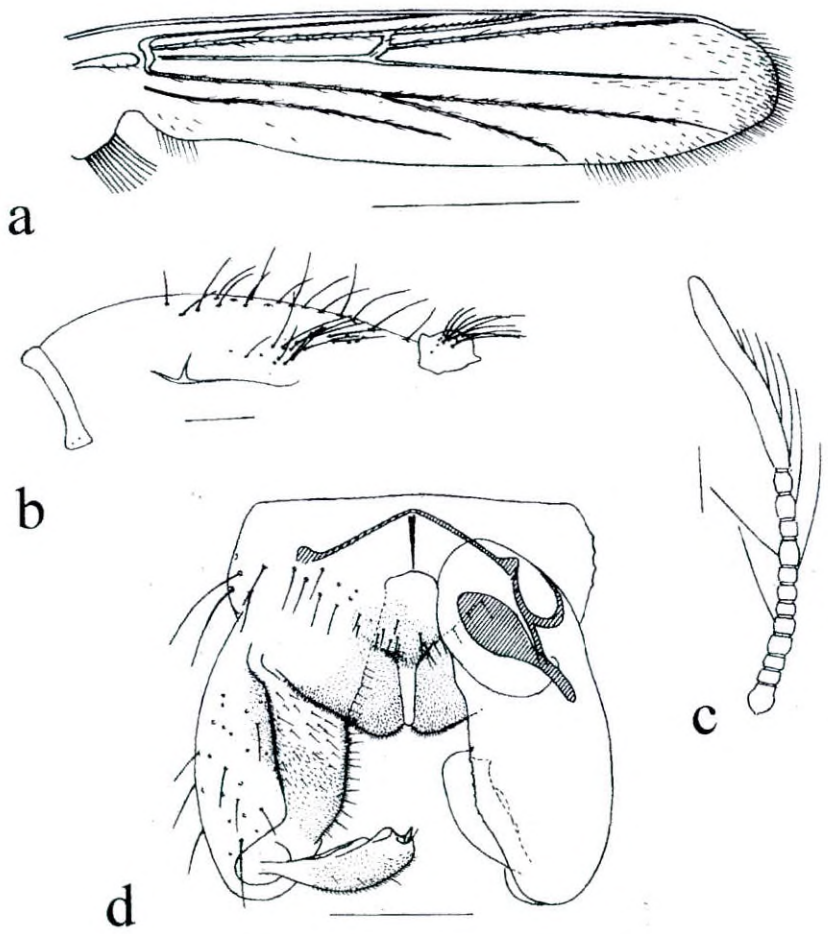

Fig. 1. ***Metriocnemus ephemerus*** **sp. n., adult male: a, wing; b, thorax, lateral; c, antenna; d, hypopygium, left: dorsal, right: ventral/internal. Scale lines a = 0.5mm; b-d 0.1mm.**

Legs. Spur of front tibia 56-68μm long; spurs of middle tibia 36-52 and 20-36μm long; of hind tibia 56-80 and 28-36μm (n=6). Comb of 8-12 spinules, longest 40-60μm long. Mid leg with 2 pseudospurs on tarsomere 1, and with 2 (rarely 1) on tarsomere 2, spur length 28μm; hind leg with 2 pseudospurs on tarsomere 1, and with 0, 1 on tarsomere 2. Pulvilli absent. Lengths (in μm) and proportions of leg segments (n=6, except p_1ta_1 =5):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
p_1	760-900	700-960	420-560	264-336	200-232	136-160	120-140
p_2	760-900	860-900	300-360	176-216	136-152	88-104	112-128
p_3	800-1000	900-1100	420-560	224-280	200-264	96-128	96-136

	LR	**BV**	**SV**	**BR**
p_1	0.58-0.60	2.11-2.81	3.15-3.48	0.62-1.4
p_2	0.35-0.40	3.58-3.83	4.94-5.73	0.86-1.42
p_3	0.44-0.51	3.40-3.62	3.70-4.23	1.0-1.54

Abdomen. Tergites densely clothed with setae, about 0.3 the length of the respective tergite.

Hypopygium (Fig. 1d). Anal point robust, long, parallel-sided (52-60μm long), tip rounded. Tergite IX with 22-49 setae (n=6). Laterosternite IX with 5-9 setae (n=6). Phallapodeme 80-110μm long; transverse sternapodeme 140-176μm long, oral projections rounded triangular. Virga 30-50μm long (n=6). Gonocoxite 264-300μm long; inferior volsella low, extending for nearly the length of the gonocoxite, weakly projecting. Longest setae on gonocoxite 0.41-0.68 the length of the gonocoxite. Gonostylus 112-132μm long, crista dorsalis expanded as a rounded tooth subapically, inner margin of gonostylus medially expanded as a rounded hump. Megaseta 10-14μm long. HR 2.2-2.4 (n=6). HV 1.29-2.86 (n=5).

Female and immature stages. Unknown.

Distribution. Known only from the type locality in Northern Ireland.

Discussion

The short antennae with low AR, 'triangular' preepisternum, reduced wings, short setae on the gonocoxites and gonostylus with apically toothed crista and median internal hump are characters that *M. ephemerus* shares with *M. sibiricus*, to which it runs in Sæther's (1995) key to the genus. However, *M. sibiricus* is known only from the New Siberian Islands to the north-east of mainland Russia, where the water is frozen for the greater part of the year; the River Bann site in contrast lies in an area warmed by the Gulf Stream, where ponds rarely freeze over in winter and then for only two or three days. The records for *M. sibiricus* given by Sæther (1995) are for May and August, while present evidence is that *M. ephemerus* has a very restricted eclosion period in the year. The result of recent chironomid surveys in north east Russia (Makarchenko and Makarchenko 2009, 2013, 2014) and China (Li and Wang 2014) do not record *M. sibiricus*: it appears to be a true arctic species, perhaps endemic to the New Siberian Islands. There are also morphological differences, though small (Table 1); in particular, *M. sibiricus* shows lower AR at larger body size, i.e. the opposite of the usual relation. These differences in habitat, phenology, location of the two populations (half a hemisphere apart at different latitudes), and morphology indicate that the River Bann specimens do not belong to *M. sibiricus*.

Table 1	AR	Total length	BR_3 *
M. sibiricus	0.47-0.51	3.49-4.25	1.60-2.00
M. ephemerus	0.78-1.00	2.96-3.20	1.00-1.54

* The beard ratios for all legs in *M. ephemerus* fall below the corresponding ranges in *M. sibiricus* – only those for the hind legs have been included in the table.

Sæther (1995) remarked on *M. sibiricus* "The wing chaetoaxy....is very variable in the species. Also the thoracic chaetotaxy is quite variable... However, this can be expected in an aberrant species with adaptions to ground mating". The specimens of *M. ephemerus* were collected in drift by skimming the surface of the River Bann. *Metriocnemus fuscipes* (Meigen) has been reared from moss on boulders regularly submerged by the tide (Langton 2013). It is possible that *M. ephemerus* develops in a similar habitat, and, unable to fly away, when the water rises gets washed off into the drift. The female of *M. sibiricus* has normal wings and presumably flies well (Sæther 1995). Colonisation of such habitats and escape from rising waters would depend on the females of *M. ephemerus* being capable of flight. A third species in *Metriocnemus* also shows reductions in the male antenna and wing; *M. longipennis* (Holmgren), also from the New Siberian Islands, has 7 or fewer flagellomeres and wings less than 1mm long (Sæther 1989).

Since Sæther's revisions (1989, 1995) of the genus, 12 new *Metriocnemus* species have been described (see Langton 2015); none of these new species resembles *M. sibiricus*.

Since Langton and Pinder's (2007) key to the adult male Chironomidae of Britain and Ireland five further species have been added to the Checklist (Chandler 1998) and *M. terrester* Pagast had been omitted. A revised key is here provided to enable identification of the known British and Irish species.

1. Preepisternum bearing many long setae (50 or more). Hypopygium Fig. 2a ..... **Metriocnemus (Inermipupa) carmencitabertarum** Langton & Cobo
- Preepisternum bare 2

2. Entire wing rather densely clothed with macrotrichia (base of cell m proximal to cross vein RM may be bare or nearly so) 3
- Basal half of wing bare or with a few scattered macrotrichia, apical half more densely covered 14

3. Gonocoxite with a pronounced lobe in the basal half 4
- Gonocoxite lobe less pronounced 7

4. Antennal ratio about 1.0. Hypopygium Fig. 2b ..... **Metriocnemus (Metriocnemus) cavicola** Kieffer
- Antennal ratio at least 1.5 5

5. Halteres blackened. Hypopygium Fig. 2c ..... **Metriocnemus (M.) eurynotus** Holmgren
- Halteres pale 6

6. Abdomen black. Hypopygium Fig. 2d ..... **Metriocnemus (M.) sp.**
- Posterior segments of abdomen with postero-lateral pale corners. Hypopygium: Langton 2015, Fig. 2d ..... **Metriocnemus (M.) albipunctatus** Langton & Armitage

7. Anal tergite without an anal point or with a very small point (<15µm long). Hypopygium Fig. 2e ..... **Metriocnemus (M.) beringensis** (Cranston & Oliver)
- Anal point well-developed, but may be transparent and difficult to see 8

8. Antennal ratio 2.5-3.0. Hypopygium Fig. 2f ..... **Metriocnemus (M.) picipes** (Meigen)
- Antennal ratio 2.0 or less 9

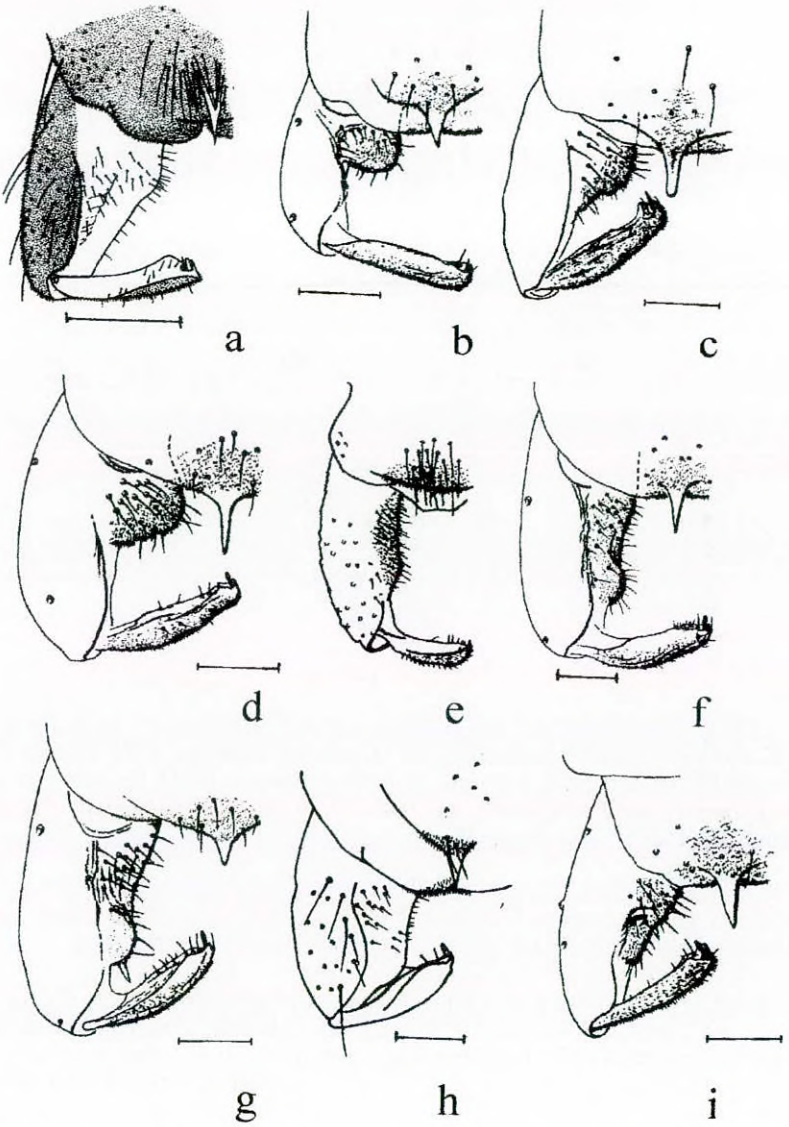

Fig. 2. *Metriocnemus* spp. hypopygia: a, *M. carmencitabertarum* Langton and Cobo (1997, fig. 1); b, *M. cavicola* Kieffer (Langton and Pinder 2007, fig. 166B); c, *M. eurynotus* Holmgren (Langton and Pinder 2007, fig. 166C); d, *M.* sp. (Langton and Pinder 2007, fig. 166D); e, *M. beringensis* (Cranston and Oliver) (Langton and Pinder 2007, fig. 167C); f, *M. picipes* (Meigen) (Langton and Pinder 2007, fig. 167A); g, *M. atriclava* Kieffer (Langton and Pinder 2007, fig. 167B); h, *M. terrester* Pagast; i, *M. albolineatus* (Meigen) (Langton and Pinder 2007, fig. 167D). Scale lines = 0.1mm.

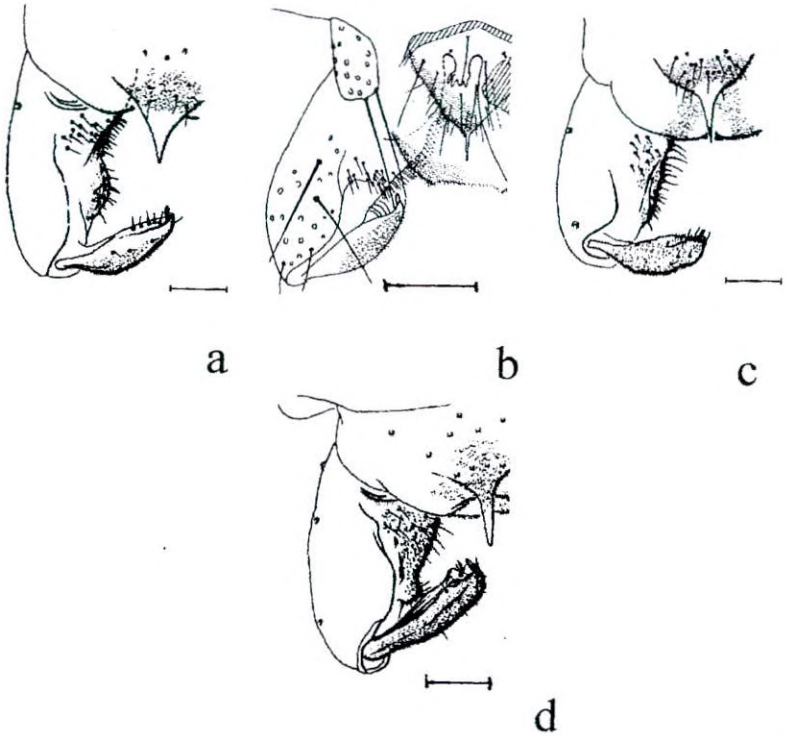

Fig. 3. *Metriocnemus* **spp. hypopygia: a,** *M. inopinatus* **Strenzke; b,** *M. fuscipes* **(Meigen) (Langton and Pinder 2007, fig. 168A); c,** *M. alisonae* **Langton (2013, fig. 1d); d,** *M. tristellus* **Edwards (Langton and Pinder 2007, fig. 168B); e,** *M. ursinus* **(Holmgren) (Langton and Pinder 2007, fig. 168C). Scale lines = 0.1mm.**

9. Antennal ratio approaching 1.5-2.0 10
- Antennal ratio only about 1.0-1.5 11

10. Gonocoxite lobe swollen hemispherically at apex. Hypopygium Fig. 2g .... **Metriocnemus (M.) atriclava** Kieffer
- Gonocoxite apically with a less projecting, longer rounded lobe. Hypopygium Fig. 2h .... **Metriocnemus (M.) terrester** Pagast

11. First tarsomere of hind leg about half as long as the tibia 12
- First tarsomere of hind leg about one third as long as the tibia 13

12 Wing macrotrichia black. Setae on gonocoxite long, those on mid coxite extending well past the tip of the coxite. Dorsal edge of gonocoxite excavated. Hypopygium Fig. 2i .... **Metriocnemus (M.) albolineatus** (Meigen)

- Wing macrotrichia pale and difficult to see. Setae on gonocoxite shorter, those on mid coxite hardly exceeding tip of coxite. Dorsal edge of gonocoxite straight from apex to base. Hypopygium Fig. 3a ..... **Metriocnemus (M.) inopinatus** Strenzke

13. Anal point triangular, broad at base and narrowed to the sharp tip. Hypopygium Fig. 3a ... . **Metriocnemus (M.) fuscipes** (Meigen)
- Anal point needle-like, narrow and more or less parallel-sided for most of its length. Hypopygium Fig. 3b ..... **Metriocnemus (M.) alisonae** Langton

14. Antennae reduced, with short and flattened plume; AR 0.78-1.0. Hypopygium Fig. 1d .... **Metriocnemus (M.) ephemerus** sp. nov.
- Antennae normal, with erect plume of long setae; AR greater than 2.0 15

15. Anal point rather slender, tapering to a point distally. Gonostylus without a preapical 'tooth'. Hypopygium Fig. 3c ..... **Metriocnemus (M.) tristellus** Edwards
- Anal point more robust, bluntly rounded distally. Gonostylus with a preapical 'tooth'. Hypopygium Fig. 3d ..... **Metriocnemus (M.) ursinus** (Holmgren)

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Villa cingulata (Meigen) (Diptera, Bombyliidae) in West Gloucestershire – On 4 July 2015, NJP caught a female of *Villa cingulata* (Meigen, 1804), which was hovering low over a dusty unsurfaced track in an extensive grassy brownfield site on the outskirts of Cinderford in the Forest of Dean, Gloucestershire (SO6415, V.C. 34). Later on the same day another female was caught by D. Scott-Langley and identified by MGM some 400 metres to the south, in the same brownfield area but in the adjacent grid square SO6414. The first individual was released close to where it was found and immediately began collecting dust or fine grit from the track into its sand chamber. After a few minutes it flew away. The second specimen was retained by MGM.

The grassland in this area has developed on calcareous soils over former industrial workings and a long-dismantled railway line. No active management has taken place in recent years but the vegetation is grazed by rabbits (formerly sheep); rank vegetation is slow to develop due to the high mineral content and low level of humus in the soil, and the area is floristically fairly diverse. Part of the brownfield area is scheduled for housing and other development, but the part where *Villa cingulata* was found is outside the development area.

Although it was in Gloucestershire where *V. cingulata* reappeared in 2000 after a long period with no British records (Stubbs, A.E. and Drake, M. 2001. *British soldierflies and their allies.* BENHS, Reading), all previous sightings in the county have been in the Cotswolds (Alexander, K.N.A. 2012. The Gloucestershire population of Downland Villa *cingulata* (Meigen) (Diptera, Bombyliidae). *Dipterists Digest* (*Second Series*) **19,** 96-97), where there have now been records from localities in six tetrads scattered over four 10km squares. Cinderford is about 25 km from the nearest of these sites. These records follow recent sightings in Wiltshire (Foster, A. 2012. A recent record for *Villa cingulata* (Meigen) (Diptera, Bombyliidae) in Wiltshire. *Dipterists Digest* (*Second Series*) **19,** 124), Middlesex (Chandler, P. 2014. *Villa cingulata* (Meigen) (Diptera, Bombyliidae) at Bushy Park, Middlesex. *Dipterists Digest* (*Second Series*) **21,** 171-172), and Dorset (Parker, M. 2014 *Villa cingulata* (Meigen) (Diptera, Bombyliidae) in Dorset. *Dipterists Digest* (*Second Series*) **21,** 171), and represent a further extension of the species' known range.

It is clearly well worth keeping a look out for *V .cingulata* in suitable grassland habitats anywhere in southern Britain – **N. JOHN PHILLIPS,** Yorkleigh Cottage, Pope's Hill, Newnham on Severn, Gloucestershire GL14 1LD, and **MARTIN G. MATTHEWS,** 56 Stanford Road, Tewkesbury, Gloucestershire, GL20 8QU

Dipterists Digest 2015 **22,** 43-57

A review of the genus *Paradelphomyia* Alexander (Diptera, Limoniidae) in Britain

JOHN KRAMER
31 Ash Tree Road, Oadby, Leicester LE2 5TE; john.kramer@btinternet.com

Summary

Available information on the species of the genus *Paradelphomyia* Alexander, 1936 (Diptera, Limoniidae, Limnophilinae) in Britain is reviewed and some problems regarding identification are discussed.

Two slightly different structures for the ejaculatory apodeme of *P. ecalcarata* (Edwards) have been observed and it is proposed that these be regarded as forms of the same structure in members of a single species, *P. ecalcarata*. An illustration is provided for the structure of the ejaculatory apodeme of *P. dalei* (Edwards). Attention is drawn to the similarity between the hypopygium of *P. nielseni* (Kuntze) and the non-British *P. nigrina* (Lackschewitz) and the characters used to separate these two species are listed.

Introduction

The genus *Paradelphomyia* Alexander, 1936 is currently placed in the family Limoniidae, subfamily Limnophilinae, having the typical wing venation with three branches to vein Rs, although some species (*P. dalei, P. ecalcarata*) lack the tibial spurs typical of this subfamily.

The British species are small, with a body-length of approximately 3-5mm and wing-length of approximately 3-6mm. They are dark brown in general coloration with a longitudinal brown pleural stripe, conspicuous against the pale pleura (Fig. 1).

Fig. 1. ***Paradelphomyia fuscula*****, lateral view of head and thorax; leg. A. Cunningham, 6.ix.2014, Yarner Wood, Devon: photo A. Cunningham.**

Vein M_{1+2} has a long stem which divides to give a small second posterior cell (Fig. 2). They have conspicuous macrotrichia on the wing membrane, the distribution patterns of which are used to aid identification. The claw-like end of the clasper (outer dististyle) is another character diagnostic for the genus (Fig. 3). Although much work has been done recently on combined morphological and molecular systematics, the genus *Paradelphomyia* seems to have been omitted from the samples used (Ribeiro 2008, Petersen *et al.* 2010). It is clear, however, that the Limnophilinae are polyphyletic and the British members of the genus *Paradelphomyia*

form a unified group. The isolating factors and resource partitioning which allow these species to remain distinct while at times occupying the same sites remain to be described.

Fig. 2. Wing of *Paradelphomyia senilis*; leg. J. Kramer, 30.vi.1998, North Poorton Combe, Dorset: photo J. Kramer.

The subgenus *Oxyrhiza* de Meijere, 1946

All of the British species are in the subgenus *Oxyrhiza* de Meijere, 1946 which was formerly called *Oxydiscus* de Meijere, 1913, a name which was preoccupied.

In describing *Oxydiscus*, Edwards (1938) wrote:

The hypopygium also shows some peculiarities. The ninth segment forms a continuous ring as in other Hexatomini, but the longitudinal suture is mid-dorsal instead of mid-ventral, which is perhaps a fundamental difference, and the ventral portion of the ring is wider than the dorsal. (This is not due to inversion of the hypopygium, as I at first thought possible). The outer style is of characteristic shape, with three terminal teeth, of which the longest is on the inner margin; this same structure is seen in the Javanese genotype of Oxydiscus.

This unusual feature of the ninth segment (Fig. 4), with the suture on the dorsal side is useful in interpretation of the orientation of terminalia under the microscope, when viewing the apodeme through the ventral surface.

Edwards also drew attention to the lack of tibial spurs in some species (*P. dalei*, *P. ecalcarata*) and the weak or absent crossvein r, which suggests classification in the Chioneinae. To summarise, in Britain, the genus *Paradelphomyia*, subgenus *Oxyrhiza* is readily identified by:

- three branches to the radial sector
- M_{1+2} long and forked to give a small second posterior cell, cell m_1 (sometimes absent)
- macrotrichia on the distal half of the wing membrane
- a dark pleural stripe contrasting with the pale pleura
- claw-like end of the clasper (outer dististyle) (Fig. 3)
- the longitudinal suture of abdominal segment 9 is mid-dorsal instead of mid-ventral (Fig. 4)

Worldwide there are about ninety named species of *Paradelphomyia*. Twenty-six species are on the Palaearctic list, chiefly in subgenus *Oxyrhiza*, with just one species in subgenus *Paradelphomyia*. The genus is present in all biogeographical regions except Australasia. Unlike other Limnophilinae (e.g. *Austrolimnophila*) none have been reported from this region (Oosterbroek 2014). Since species of *Paradelphomyia* are found in the Neotropical and Afrotropical regions, and in India, the evolutionary history of the group seems similar to that of the placental mammals, and this distribution indicates that the genus *Paradelphomyia* may have separated from its ancestral stock later than *Austrolimnophila*, at some time during the Cretaceous, as Australasia separated from the rest of Gondwanaland.

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Figs 3-4. Male genitalia of *Paradelphomyia dalei*: leg. C.M. Drake, 10.viii.2008, Frome St Quintin, Dorset: photo J. Kramer ©NHMUK.

The larvae of *Paradelphomyia*

In general, the larvae are aquatic or semiaquatic, and adults have been caught around springs, seepages and small streams. Alan Brindle (1967) provided keys for limoniid larvae and pupae to genus level. He described the larvae as: *yellow or whitish-yellow, rather slender; anal segment with 4 obvious anal lobes; marginal hairs very long, especially those on the ventral lobes; posterior surface of lobes and disc pigmented with characteristic markings.* Brindle's illustration of the anal segment of the larva of *P. senilis* is shown in Fig. 5. It is found in marshy woodland soils.

Thanks to the work of Crisp and Lloyd (1954) we know quite a lot about the structure and ecology of the larva of *P. senilis*. It grows to a length of about 6mm and is white in colour. Their description is as follows:

The four lobes of the posterior spiracular disc are rather broad, rounded at the tips, the lateral pair 0.75 the length of the ventral pair, and the inner face angled. One half of each angled face is almost completely blackened and the other is membrane except for a rigid strip running just below the bases of the hair fringe on that side.

Regarding its feeding, they wrote:

Oxydiscus senilis has the mouthparts of a gross-feeding [as distinct from a filter-feeding] *form but the stomachs do not contain recognisable plant material. Of 45 larvae examined for food, 15 contain the unbroken, or almost unbroken shells of testate Rhizopoda* [Protozoans], *including Euglypha, Difflugia, Cyphoderia and Arcella. These often lie two or three together, with no surrounding debris and have evidently been neatly picked up and swallowed whole.*

This surprisingly specialised mode of feeding suggests one way in which resource partitioning by the larvae of different species of *Paradelphomyia* occurs. Crisp and Lloyd drew attention to the unusually developed sensilla of the larval antennae, and the unusual form of the maxillae in *P. senilis* and link this with their specialised way of life, which they found in no other larvae. From the evidence from other samples they suggest that the larvae feed on animal protein. This was a seminal study, in which they described ways of collecting and rearing tipuloid larvae. A comparison of the larval head capsules of the woodland species of *Paradelphomyia* would perhaps shed light on their different niches. The larval head capsule of *P. fuscula* is shown in Fig. 6 (from Krivosheina and Krivosheina 2011). Brindle (1967) wrote that no pupae of this genus had been examined and he used an American species in his key to pupae. All other larvae

of *Paradelphomyia*, with the exception of *P. senilis* (Smith 1989), and *P. fuscula* remain to be described.

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Figs 5-6: 5, anal segment of larva of *Paradelphomyia senilis* (from Brindle 1967); 6, head capsule of the larva of *Paradelphomyia fuscula* (from Krivosheina and Krivosheina 2011).

Materials and methods

In the preparation of genitalia of specimens of *Paradelphomyia* for microscopical examination a variety of methods have been used. In the 1930s, at the Natural History Museum, F.W. Edwards mounted genitalia in Canada balsam, which has now become brown, obscuring the specimens to a greater or lesser extent.

The material photographed in the NHM [Natural History Museum, London] Sackler Lab. by the author was immersed in 10% potassium hydroxide solution for some hours, rinsed in 60% acetic acid and then in distilled water before being photographed in water. Helicon Focus software was used to produce the compound images from serial photographs. Each genitalia specimen was then preserved in a microvial of glycerol and stored on the pin, under the adult fly.

Mick Blythe has worked extensively with the preparation of *Paradelphomyia* genitalia for microscopical examination and has modified his methods over the years. He now uses 50% lactic acid as a clearing agent, in place of KOH. The preparations are examined in the lactic acid so that they can be rotated and viewed from all positions. They are eventually slide-mounted under a coverslip in Berlese Mountant. Stacked digital images are produced by him, currently using a compound microscope and Zerener stacking software. A compound microscope with a minimum of x100 magnification gives the best results for imaging the ejaculatory apodemes to identify the critical species.

For rapid examination of specimens Drake and Godfrey (2010) recommended wetting of the ventral surface of the terminal segment with alcohol, when the apodeme becomes at least partially visible through a translucent window.

Terminology

A number of alternative words have been used to identify the different parts of the reproductive system of limoniid craneflies. The terms used here are those used in Imms' General Textbook of Entomology (Richards and Davies 1977) and in the Manual of Nearctic Diptera (McAlpine at al. 1981). The relevant parts are:

- Aedeagus (penis) – male intromittent organ, for copulation. The external termination of the ejaculatory duct. It lies between a pair of parameres.

- Apodeme – internal part of the skeleton for the attachment of muscles. In the genus *Paradelphomyia* the shapes of the ejaculatory apodemes are used to identify the different species. The apodeme serves for the attachment of the muscles of the sperm pump. 'Genital apodeme' is another general term which can be used. Edwards used the term 'ventral fork' to describe the two longitudinal arms of the apodeme, which in *P. fuscula* are approximately 0.1mm in length.
- Ejaculatory duct (sperm duct) – duct from seminal vesicle to exit.
- Hypopygium – terminal abdominal segments of male which include the reproductive organs.
- Paramere – paired structures which arise near the base of, and lie one on each side of, the aedeagus.
- Seminal vesicle – stores sperm from the two testes.
- Vesica – Tjeder (1952) uses this word to describe the ejaculatory apodeme (see *P. nigrina* below). It is the sclerotised part of the sperm pump.

The British species of *Paradelphomyia*

There are six species of *Paradelphomyia* on the current British list:

- *czizekiana* Starý, 1971
- *dalei* (Edwards, 1939)
- *ecalcarata* (Edwards, 1938)
- *fuscula* (Loew, 1873)
- *nielseni* (Kuntze, 1919)
- *senilis* (Haliday, 1833)

In Europe there is another species, *P. nigrina* (Lackschewitz, 1938), which may yet be found in Britain; *P. mediterranea* (Lackschewitz, 1940) was synonymised with *P. senilis* by Starý (2007).

A number of problems have been associated with the clear definition of some of the British species in this group. The most reliable diagnostic characters – the very small ejaculatory apodemes of the males – are weakly chitinised, and seem easily distorted or dislocated to a more posterior position. In old or damaged specimens they are often difficult to see clearly with the x40 lens of a binocular microscope, even after careful preparation. Some species have apodemes of a similar shape: *P. ecalcarata* is very similar to *P. dalei*, and *P. nielseni* is similar to the non-British *P. nigrina*. So far it has not been possible to identify the females with certainty. Identification is not helped by the fact that all species except *P. czizekiana* may be found flying in similar wet woodland locations. If the wings are damaged or crumpled, other identifying features, such as the anal lobe or the distribution of macrotrichia, are readily obscured. Some of the characteristics used in the keys do not show sharp discontinuities; thus a wing, or an anal lobe, may be broad or narrow, macrotrichia may be sparse or numerous but there are variations between these extremes.

The distribution of the macrotrichia on the wings is easy to see at high power, although where the hairs have broken off it is only the bases ('sockets') which are observed.

Due to difficulties with the identification of some species of *Paradelphomyia*, information on distribution (see provisional maps based on NBN data in Appendix), habitats and phenology of these species must be regarded as tentative. Where specimens are available for close microscopical re-examination of the ejaculatory apodemes, wrong identifications have been found, including among the author's own specimens.

Species accounts

***Paradelphomyia czizekiana* Starý, 1971**

First British record: this species was first collected in Moccas Park, Herefordshire in 2002 (Drake and Godfrey 2010).

Identification: a combination of narrow wings with narrow anal lobe, macrotrichia in discal cell, and first basal cell, a dark unstriped dorsum and characteristic ejaculatory apodeme. The apodeme, parameres and aedeagus are shown in Fig. 7 (from Starý 1971).

The unshaded habitat also differs from that of other *Paradelphomyia* which are found in wet woodland and this should alert the recorder.

Habitat, Distribution and Phenology: The first specimens were taken from beside small unshaded streams and seepages in Moccas Park, Herefordshire. Recent records have also been obtained from the Norfolk Broads where the habitats include unshaded fen, reedbed and seepages, some of which were strongly calcareous or brackish (Drake and Godfrey 2010). In addition to Moccas Park, it is currently recorded from sites in Norfolk, Dorset and Derbyshire, a total of six hectads in all (C.M. Drake *pers. comm.*). Adults emerge in mid-June and early July, with one record from October.

***Paradelphomyia dalei* (Edwards, 1939)**

First British record: Glanville's Wootton, Dorset, 22.viii.1939, F.W. Edwards.

Identification: wings with a narrow anal lobe. Macrotrichia in discal cell usually absent or sparse. A pair of parallel dark stripes present on dorsum, separated by a pale central line. Sides of dorsum also dark brown, giving appearance from the front of four prescutal stripes.

Edwards wrote: *A small species resembling O. ecalcaratus Edw. in the entire absence of tibial spurs and in the presence of a pair of sharp-pointed processes extending laterally about the middle of the ventral fork of the male hypopygium* (Fig. 8).

He described the external morphology, writing that it differs from *P. ecalcarata* as follows:

- *Thorax paler,*
- *Scutum mainly pale,*
- *Praescutum with traces of four slightly darker stripes, more obvious in life ....* (see below for description of museum specimens.)
- *Wing of P. dalei with the hairs (macrotrichia) almost confined to the part beyond the discal cell, none in the discal or basal cells, or in bases of cells R2, R3, R5. (In ecalcaratus the hairs of the wing membrane extend back to the cord. They are fairly numerous in discal cell and some occur at tip of upper basal cell).*
- *Hypopygium differing from that of ecalcaratus chiefly in the length of the penis, which is almost twice as long as the ventral fork, and bent instead of straight.*

No previous illustration of the ejaculatory apodeme (Fig. 8) of *P. dalei* is known to me, and, due to the similarity of the apodemes there may have been confusion in the past in the identification of specimens of *P. dalei* and *P. ecalcarata*. If the prescutal stripes are absent but the length of the curved aedeagus is much longer than the parameres and/or if macrotrichia are absent from the basal cell, it is *P. dalei.*

NB. The lateral arms of the apodeme may point downwards out of the focal plane of the longitudinal parts, which may be displaced well forward and so care is needed when viewing.

The specimens of *Paradelphomyia dalei* in the NHM (examined by the author)

a) World collection: holotype ♂, Glanville's Wootton, Dorset, viii.1939, F.W. Edwards. The prescutal stripes are not visible. One wing is crumpled but macrotrichia are absent in the other basal cell. The terminalia are mounted on a celluloid strip below the specimen in brown Canada balsam and the lateral apodemes are not visible. The aedeagus is longer than the parameres.

b) British collection: Tray 1: six paratypes, 2♂, 4♀, Glanville's Wootton, Dorset, viii.1939, F.W. Edwards. One of the males has the genitalia preparation mounted in Canada balsam, now dark brown, on a celluloid strip below the specimen. The ejaculatory apodeme cannot be seen clearly through the brown balsam and the lateral appendages were not visible. Good preparation, illumination, magnification and resolution are needed to be sure of seeing these tiny structures. The aedeagus of this specimen is longer than the parameres.

Tray 2: six specimens, 3♂, 1♀, Chippenham Fen, Cambridgeshire, 18.viii.1947, J.E. Collin, pinned laterally through the thorax; also 1♂, Newbury, Berkshire and 1♀, Tuddenham Heath, Suffolk, A.M. Hutson (the female has macrotrichia covering the discal cell). On all of these specimens, the 'four stripes' on the dorsal thorax (prescutum) are not clear, or clearly absent (but see Edwards' comment in his species description).

Habitat, distribution and phenology: Edwards described the type habitat at Glanville's Wootton, as *a very boggy corner of a wood, heavily shaded by alder and ash, known locally as 'Mullett's Copse'*. The species is widely distributed in calcareous wet woodland (Stubbs 1992) across England and Wales and currently has been recorded from at least 74 hectads (NBN Gateway). There is a single Scottish record from just south of Edinburgh. Adults emerge June to September with the peak in July.

***Paradelphomyia ecalcarata* (Edwards, 1938)**

First British record: holotype ♂, Llangollen, 30.vi.1934, F.W. Edwards.

Identification: like *P. dalei*, the wings are narrow with a narrow anal lobe, and each of the pair of longitudinal rods of the apodeme (the 'ventral fork') has a thin lateral process (Figs 9 and 17-18). In contrasting this species with *P. dalei* Edwards (1939) wrote: *in ecalcaratus the scutum is mainly dark and the praescutum is uniformly dark without any trace of darker stripes from any angle of view.* And: *in ecalcaratus the hairs of the wing membrane extend back to the cord, they are fairly numerous in the discal cell and some occur at tip of upper basal cell.*

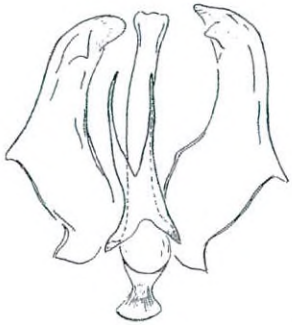
[Cord: *the series of crossveins and more-or-less transverse portions of veins at outer ends of basal and marginal cells* (Edwards 1938)]

The specimens of *Paradelphomyia ecalcarata* in the NHM collection

World collection: holotype ♂. The genitalia preparation is mounted in brown Canada balsam on a celluloid strip below the specimen. The lateral processes of the apodemes are visible and clearly curve gently backwards, towards the posterior (see Fig. 17). This is in contrast to the illustration of the aedeagus, parameres and apodeme by Edwards (1938) (Fig. 9), where these lateral processes point towards the anterior end.

British collection: 1♂ paratype, Llangollen, 30 June 193(?)4 (pin goes through number of year), F.W. Edwards. The genitalia preparation is mounted in brown Canada balsam on a celluloid strip below the specimen. The preparation is rather crumpled and the apodemes are displaced, but on the right hand side of the image the lateral apodeme can be seen curving more gently than shown in Edwards' drawing, and curving backwards, as in the holotype, posteriorly, not anteriorly as in Edwards' drawing. The parameres are as long as the aedeagus.

Habitat, Distribution and Phenology: *P. ecalcarata* is a rarely-recorded species, found at calcareous woodland streams and seepages. The preponderance of records is on the west side of Britain with a single record in East Sussex by P. Roper, a known site near Peterborough (A.E. Stubbs), and one in Scotland. It has been recorded from at least 15 hectads (NBN Gateway). The adults fly from June-August with the peak in June.



7

8

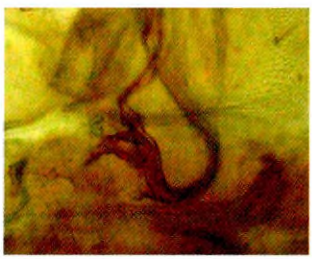
Figs 7-8: 7, parameres, aedeagus and apodeme of *Paradelphomyia czizekiana* (from Starý 1971); 8, ejaculatory apodeme of *Paradelphomyia dalei*, coll. C.M. Drake, 30.vii.2014, Park Wood, Chaffcombe, Somerset: photo J. Kramer, © NHMUK.

9

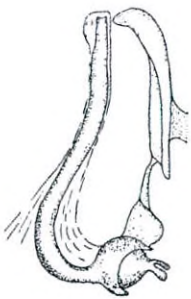
10

Figs 9-10, parameres, aedeagus and apodemes of *Paradelphomyia* species. 9, *P. ecalcarata*; 10, *P. fuscula* (from Edwards 1938).

11

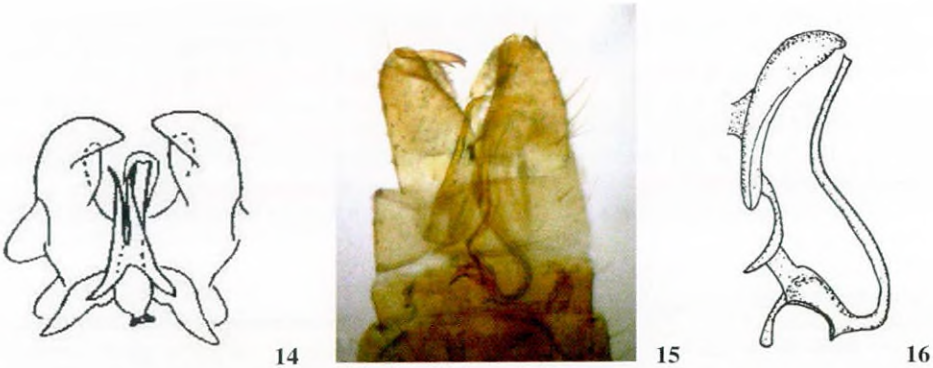


12

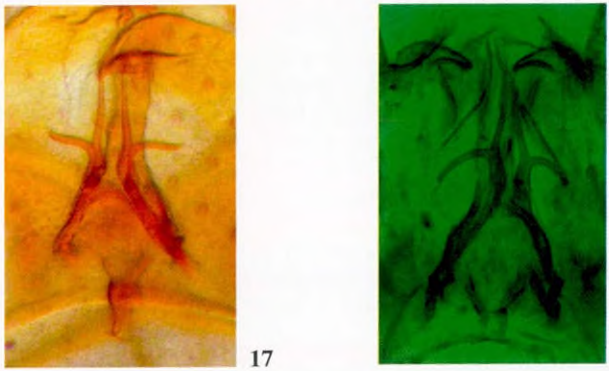


13

Figs 11-13: 11-12, *Paradelphomyia nielseni*: 11, parameres, aedeagus and apodemes (from Edwards 1938); 12, apodeme, lateral view, coll. J. Kramer, 23.ix.1998, Scam Hazel Wood, Leicestershire: photo J. Kramer, © NHMUK. 13, *P. nigrina*, apodeme, lateral view (from Tjeder 1952).



Figs 14-16: 14, *Paradelphomyia senilis*, parameres, aedeagus and apodeme (from Edwards 1938). 15-16, apodeme of *Paradelphomyia nielseni*, lateral view: 15, as Fig. 12; 16 (from Tjeder 1952).



Figs 17-18, apodeme of *Paradelphomyia ecalcarata*: 17, coll. P. Roper, 6.viii.2004, Fore Wood, Crowhurst, East Sussex: photo. P. Roper; 18, coll. M. Blythe, Lords' Yard Coppice, Wyre Forest, Worcestershire: photo. M. Blythe.

Paradelphomyia fuscula **(Loew, 1873)**

First British record: This species was first recognised as British by Edwards (1926), when he recorded museum specimens from Crowborough, Sussex and from Logie and Catacol in Scotland. It is in this paper that Edwards first illustrated the ejaculatory apodeme.

Identification: the anal lobe of the wing is narrow, and the macrotrichia are usually absent in the discal and first basal cell; the top of the thorax usually has no dark stripes.

Loew (1873, Species no. 31) gave a description and it is pertinent to the identification of other *Paradelphomyia* species that he wrote: "Dorsum moderately shining, usually reddish-brown with three darker longitudinal stripes, clearly defined in some specimens, in others blurred, or not at all clear" [*Thoraxrücken ziemlich glanzend, gewohnlich rotbraun mit drei dunkleren, zuweilen deutlich begrenzten, zuweilen verfliessenden oder gar undeutlichen Längstriemen*]. So there is the possibility of three prescutal stripes, though their absence does not exclude *P. fuscula*. The characteristic forked shape of the male ejaculatory apodeme is unique amongst the Palaearctic fauna and the two posterior forks are much longer than in *P. senilis*. The thorough description by

Edwards (1938) included an illustration of the aedeagus, parameres and apodeme (Fig. 10). Edwards noted that "Loew in his original description .... stated that tibial spurs are absent" [***Anmerkung 4:*** *Da der von mir als Cladura fuscula beschreibenen Art die Schienensporen fehlen, so muss sie nothwendig in die Gruppe der Eriopterina gestellt werden.*] but Edwards observed small tibial spurs to be present "as in *P. senilis*".

Habitat, distribution and phenology: a wet woodland species, widespread across Britain with a dearth of records from East Anglia, and also recorded from Ireland. It has been recorded from at least 35 hectads (NBN Gateway). Adults emerge from July to September with the peak in August. There are also a few records from May and June.

***Paradelphomyia nielseni* (Kuntze, 1919)**

First British record: as with *P. fuscula*, this species was first recognised as British by Edwards (1926) when he recorded museum specimens from Crowborough, Sussex and from Logie and Duntochter in Scotland. He first illustrated the long aedeagus and ejaculatory apodeme of *P. nielseni* in this paper. Early records of living specimens are from Fenn's, Whixall and Bettisfield Mosses by Cyril Pugh in September 1930, and from Edwards (1938) from sites across Britain.

Identification: anal lobe of wing very narrow, macrotrichia very few, confined to the extreme wing apex. Top of thorax may have three dark stripes (Kuntze 1919). The aedeagus, parameres and apodeme are figured by Edwards (1938) (Fig. 11).

The extremely long aedeagus extending well beyond the parameres seems to set this species apart from other *Paradelphomyia*. However, the aedeagus can retract, causing a hair-pin bend in the ejaculatory (sperm) duct, which is visible in lateral view (Tjeder 1952) (Figs 12 and 15). The small basal ejaculatory apodeme, as in *P. nigrina*, currently distinguishes *P. nielseni* from the other members of this genus in Britain; *P. nielseni* has a narrow wing with a narrow anal lobe, while in *P. nigrina* the anal lobe is large and distinct (see below for separation of *P. nielseni* from *P. nigrina*).

Habitat, distribution and phenology: widely distributed in Britain and recorded from approximately 39 hectads (NBN Gateway). The adults are recorded as flying in wet woodland from July to September with the main peaks in August. There is also a record from June.

***Paradelphomyia nigrina* (Lackschewitz, 1940). Not yet found in Britain.**

Identification: this is a broad-winged species, like *P. senilis*, but with the macrotrichia confined to the wing apex. Tjeder (1952) used the table below to compare the characteristics of *P. nielseni* and *P. nigrina* (as the synonym *Oxydiscus septentrionalis*).

Character	*nielseni*	*nigrina*
Main colour	yellowish	blackish
Antennae	verticils shorter than flagellar segments	verticils longer than flagellar segments
Wing	pale; anal angle small	dark; anal angle distinct
Vein 1A	bare	hairy
Vesica	flattened	rounded
Dorsal apodeme of vesica	triangular with truncate dorsal margin	deeply excised dorsal margin
Lateral apodeme of vesica	narrow (lateral view)	broad (lateral view)
Penis-sheath	very slender	rather stout
Outer style	inner tooth shorter, placed close to apex	inner tooth longer, placed far from apex

Tjeder (1952) provided a lateral view of the ejaculatory apodeme (Fig. 13) and, like that of *P. nielseni*, it is bent. This may mean that, like *P. nielseni*, specimens may be found with the aedeagus extended well beyond the parameres, and, with its small basal apodeme, this could cause specimens of *P. nigrina* to be misidentified as *P. nielseni*, or vice versa. In the same paper Tjeder compared the dorsal and ventral parts of this very small structure with Edwards' (1938) drawing and suggested that there may be another British species. Its discovery would require some careful work with the microscope. Neither the detailed three-dimensional structure nor the range of intra-specific variation of these apodemes is clear.

***Paradelphomyia senilis* (Haliday, 1833)**

First British Record: the commonest British species with records going back well before 1900. It is '*Limnophila senilis* Hal.' in the list by Verrall (1886); it was described by Haliday from Northern Ireland. Walker (1856) listed it only from Ireland as *Dicranota senilis*.

Identification: broad wing with a strong anal lobe; numerous macrotrichia present in the discal cell and distal apex of first basal cell. Terminal segment and genitalia brown. Strongly marked pleural stripe. The aedeagus, parameres and apodeme were figured by Edwards (1938) (Fig. 14).

Habitat, distribution and phenology: widespread and common over in the British Isles in wet woodland, where it flies from April to September, with peaks in June and September. Known from well over a hundred hectads (NBN Gateway).

Summary, discussion and conclusions:

Characters used for species recognition of adults

a) **The shape of the anal lobe of the wing** is useful, and in practice, the only problem is to display the fully expanded wing, especially the anal lobe. This may be broad or narrow. Floating a detached wing on water or 10% KOH solution may be helpful. Broad anal lobes are found only in *P. senilis* and the non-British *P. nigrina*.

b) Distribution of macrotrichia on wing membrane. It is clear from experience that this is not a discontinuous character as described by Edwards. For example Edwards wrote that, as in the holotype, there are no macrotrichia present in the discal cell of *P. dalei*. When specimens with four dark stripes on the dorsum are examined, a few macrotrichia are frequently seen in the discal cell. Absence of macrotrichia in the discal cell is also claimed for *P. fuscula* and *P. nielseni* and for the non-British *P. nigrina*.

c) Longitudinal stripes on the thoracic dorsum. The presence of four dark longitudinal stripes seems to be diagnostic for *P. dalei*. There is a pair of stripes on top of the dorsum, separated by a central paler area, and also lateral dark areas, again separated from the dorsal stripes by paler areas. In specimens in alcohol the thoracic muscles contract causing an artefact, a transparent white central line between the dark stripes. When dry pinned specimens in the NHM collection were examined, the four stripes described by Edwards on the dorsal surface of the thorax (prescutum) are not clear, or clearly absent, and Edwards (1939) wrote that these traces of four slightly darker stripes are more obvious in living specimens.

From these observations we can perhaps say that presence of four stripes is diagnostic of *P. dalei*, though some specimens have these stripes absent.

In his description of *P. fuscula* (as *Cladura fuscula*) from Danish specimens, Loew described the presence of three dark longitudinal stripes, more or less clear and sometimes absent and Kuntze made a similar observation for *P. nielseni*. So, as in *P. dalei*, although stripes may be present on the prescutum of *P. fuscula*, and of *P. nielseni*, their absence does not exclude these

species. No prescutal stripes have been reported from any other species. It is possible that these darker areas are absent in teneral specimens.

d) Length of aedeagus relative to the parameres. The species previously recognised by the length of the aedeagus was *P. nielseni*. This is described by Edwards as "about twice as long as the rather long parameres". Fig. 10 shows the male hypopygium of *P. nielseni* as drawn by Edwards (1938). When some small narrow-winged specimens are examined and identified as *P. nielseni* by the distribution of macrotrichia, it has been found that that the aedeagus is not longer than the parameres. However, the lateral view indicates that the ejaculatory duct has been bent and withdrawn into the abdomen (Figs 12 and 15) in much the same way as the long sperm ducts of many species of *Tipula* are folded into the abdomen. It is interesting to note that this lateral view corresponds to that of *P. nielseni* (Fig 16) and of *P. nigrina* (Fig. 13), drawn by Tjeder (1952), each of which has a small basal ejaculatory apodeme. Care is therefore needed not simply to use the long aedeagus in the identification of these two species.

In his description of *P. dalei* Edwards (1939) wrote: *Hypopygium differing from that of ecalcaratus chiefly in the length of the penis, which is almost twice as long as the ventral fork, and bent instead of straight.* This means that the external penis (aedeagus) is longer than the parameres, and bent. The difference is not always visible and it may be that this character varies in a similar way to *P. nielseni*, perhaps pre- and post-copulation.

Lateral processes of the 'ventral fork' in *P. dalei* and *P. ecalcarata*

Two slightly different shapes have been observed for the ejaculatory apodeme of *P. ecalcarata* by previous workers. The lateral processes as drawn by Edwards (1938) (Fig. 9) and frequently observed, clearly point towards the head end (as in the photograph by Mick Blythe, Fig. 18), while those observed by Patrick Roper and Martin Drake (*pers. comm.* 2008) are turned towards the posterior at their distal ends (as in Fig. 17). There seem to be two possible explanations. Either some kind of change in shape of the delicate lateral arms has taken place, perhaps during copulation and/or post-mortem drying, or the different shapes observed are due to differing viewing angles – something that happens often with cranefly genitalia. A third option, that this represents a different species, seems unlikely.

When the ejaculatory apodemes of *P. dalei* and *P. ecalcarata* are compared it is clear that they are very similar. There may be slight diagnostic differences in, for example, the thickness of the longitudinal apodeme structures (J. Starý *pers. comm.*); however, more work will be needed with fresh British specimens of certain identity to establish the range of intraspecific variation. There is the possibility that *P. dalei* and *P. ecalcarata* are the same species. The diagnostic characters such as the presence or absence of dark stripes on the dorsum, length of aedeagus and macrotrichia in the discal cell are inconstant. In addition to their shared structural characters, they both also seem to require a similar habitat of shaded, calcareous aquatic conditions. It would not be surprising if, at sites where they are both recorded, *P. dalei* and *P. ecalcarata* were part of the same interbreeding population, but further work is necessary to establish this.

A key to the genus *Paradelphomyia* (based on Stubbs 1997)

This key is based on external features and includes one species not yet recorded in Britain, *P. nigrina*, which is found in Sweden and the Czech Republic. The commonest species, *P. senilis*, is quite easy to recognise, having broad wings and many macrotrichia, but for the identification of the other species the genital apodemes often need to be examined.

1. Wing fairly broad with distinct anal lobe. Anal cell at least four times as wide as median width of femora (at least in *senilis).* Scutellum dark, male genitalia dark orange-brown.....2
- Wing rather wedge-shaped, with narrow anal cell. Scutellum (at least behind) and male genitalia clear yellow (murky in *czizekiana*).....3

2. Wing membrane with macrotrichia in discal cell and even apex of first basal cell: hypopygium brown.....*senilis*
[- Macrotrichia confined to apex (not in discal cell or first basal cell).....*nigrina*]

3. Macrotrichia very few, confined to extreme apex. Anal cell very narrow. Top of thorax may have three dark stripes.....*nielseni*
- Macrotrichia present in apical third. Top of thorax with or without longitudinal stripes.....4

4. Top of thorax with a pair of narrow dark stripes. Sides of dorsum dark. Aedeagus bent, longer than parameres. Genital apodeme with lateral processes.....*dalei*
- Top of thorax without this pattern.....5

5. Macrotrichia extend into discal cell and even apex of first basal cell.....6
- Macrotrichia absent in discal cell and first basal cell. Genital apodeme without lateral processes.....*fuscula*

6. Ejaculatory apodeme with a lateral process, as shown in Figs 9, 17-18.....*ecalcarata*
- Ejaculatory apodeme without lateral process, as shown in Fig. 7.....*czizekiana*

Acknowledgements

Thanks to Patrick Roper for sending me his photograph of the anomalous *P. ecalcarata* apodeme, and thus initiating this exploration. I am grateful to Mick Blythe for his photomicrographs and for many useful discussions, to Alan Stubbs for specimens, to Martin Drake for specimens, drawing, and discussions, to Erica McAlister for permission to use the photographic facilities in the Sackler Lab. at the NHM, London, and to Erica and Duncan Sivell for their practical support while working at the NHM. Thanks are also due to Geoff Hancock and Jaroslav Starý for their helpful suggestions on a previous draft.

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Appendix: Distribution Maps.

Paradelphomyia dalei

Paradelphomyia ecalcarata

Paradelphomyia fuscula

Paradelphomyia nielseni

Paradelphomyia senilis

***Thaumalea truncata* Edwards (Diptera, Thaumaleidae) new to Ireland** – On 7 June 2015 Mr Charlie McConaghy collected some Diptera from the walls of a cave at White Rocks Bay (Co. Antrim, C886407), one of which was a male *Thaumalea truncata* Edwards, identified from R.H.L. Disney (1999. British Dixidae (Meniscus Midges) and Thaumaleidae (Trickle Midges): keys with ecological notes. *FBA Scientific Publication No.56*). Outside the cave mouth a small stream tumbles down to the beach. It is most likely that the specimen spent its early instars in the stream. *Thaumalea truncata* has not previously been recorded for Ireland (Chandler, P.J., O'Connor, J.P. and Nash, R. 2008 An annotated checklist of the Irish two-winged flies (Diptera), published by The Irish Biogeographical Society in association with The National Museum of Ireland 261 pp) – **PETER H. LANGTON,** University Museum of Zoology, Downing Street, Cambridge (address for correspondence: 16 Irish Society Court, Coleraine, Co. Derry, Northern Ireland BT52 1GX)

New records of *Strongylophthalmyia ustulata* (Zetterstedt) (Diptera, Strongylophthalmyiidae) – In Britain, *Strongylophthalmyia ustulata* (Zetterstedt) is a RDB 1, endangered species, first recorded as British from a single specimen caught in a Rothamsted insect suction trap at Monks Wood NNR, Cambridgeshire (Cole, J.H. 1981. *Strongylophthalmyia ustulata* (Zetterstedt) (Diptera: Tanypezidae) new to Britain. *Entomologist's Gazette* **32,** 47-50). In Russia it has been reared from under aspen bark, *Populus tremula* (Salicaceae) (Krivosheina, N.P. 1982. New Palaearctic species of the genus *Strongylophthalmyia* Hell. (Diptera, Strongylophthalmyiidae). *Entomological Review, Washington* **60,** 162-165).

The first British rearing records also came from under bark of dead aspen trees and branches, in Inverness-shire and Nairnshire (Rotheray, G.E. and Robertson, D. 1998. Breeding habits and early stages of seven saproxylic acalypterates (Diptera). *Dipterists Digest* (*Second Series*) **5,** 96-107). This development site is shared with two other endangered flies in Britain, *Hammerschmidtia ferruginea* (Fallén) (Syrphidae) and *Homalocephala biumbrata* (Wahlberg) (Ulidiidae) (MacGowan, I. 1993. The Entomological Value of Aspen in the Scottish Highlands. *Malloch Society Research Report* **1,** 1-43).

On 21 April 2015, about three handfuls each of wet, decaying cambium from the trunks of fallen aspen trees were removed into plastic bags, one sample from a tree at Dulicht (NJ0227) and another from a tree at Speybridge (NJ0326), both near Grantown-on-Spey, Inverness-shire. Bags were stored in cool, dark conditions indoors. A month later, from 21-30 May 2015, 19 male and 19 female *S. ustulata* emerged, 2-8 individuals per day, three from Speybridge, the rest from Dulicht. Males were frequent at first and later, females dominated, a familiar emergence pattern monitored in detail for *H. ferruginea* (Rotheray, E.L., Bussière, L.F., Moore, P., Bergstrom, L. and Goulson, D. 2014. Mark recapture estimates of dispersal ability and observations on the territorial behaviour of the rare hoverfly, *Hammerschmidtia ferruginea* (Diptera, Syrphidae). *Journal of Insect Conservation* **18,** 179–188). Previously, *S. ustulata* was only reared as 1-2 individuals and the emergence of so many from the Dulicht sample, suggests a build-up of abundance. If an increase in abundance has occurred, it may be the result of an unusual number of *P. tremula* trees blown down at Dulicht during the winter of 2012/2013 which, over the past two years, have boosted the amount of development resource. These records are encouraging because *S. ustulata* had not been encountered, at least by the Malloch Society, since 1998.

In Scotland, *S. ustulata* is known from Dulsie Bridge on the Findhorn and Dulicht in Strathspey (Rotheray and Robertson *loc. cit.*), but is apparently unknown from Speybridge. The latter two localities are, however, parts of the same concentration of boreal aspen, one of the largest in Scotland. The records currently available, indicate that this area is the centre of *S. ustulata* distribution in Britain and it appears to be the most restricted geographically of the three endangered Diptera species dependent on aspen. Male and female *H. ferruginea* and *H. biumbrata*, are most readily found on or near dead aspen with wet decay under the bark. *Strongylophthalmyia ustulata* has not been found on dead aspen in Scotland, although its small, inconspicuous appearance might make it difficult to spot. If this is the case, then combined with possible early emergence, it suggests that *S. ustulata* could be under recorded – **GRAHAM E. ROTHERAY**, National Museums, Scotland, 242 West Granton Road, Edinburgh E5 1JA

Dipterists Digest 2015 **22,** 59-60

Macrocera propleuralis Edwards, a synonym of *M. pusilla* Meigen (Diptera, Keroplatidae)

PETER J. CHANDLER
606B Berryfield Lane, Melksham, Wilts SN12 6EL

Summary
Macrocera propleuralis Edwards, 1941 is placed in synonymy with *M. pusilla* Meigen, 1830, syn. nov.

In the Fungus Gnats Recording Scheme Newsletter No 8, distributed with the Spring 2015 Bulletin of Dipterists Forum (Chandler 2015), I suggested that *Macrocera propleuralis* might be conspecific with *M. pusilla* Meigen, 1830. It was described by Edwards (1941) from a female, caught by him on the window of a beach shelter at Sidmouth, Devon on 11 June 1938 (in the Natural History Museum collection). *Macrocera pusilla* was also added to the British list by Edwards (1941) on one female, compared to *M. anglica* Edwards, 1925 as both have vein Sc short and ending well before the tip of the basal cell. Males of *M. pusilla* also resemble *M. anglica* in having three teeth on the gonostylus while most species of *Macrocera* have only two.

Macrocera propleuralis has not been identified by any subsequent authors, so no male has ever been associated with it. It was compared with *M. fasciata* Meigen and, in the key by Hutson *et al.* (1980), it is grouped with that species as having vein Sc reaching the tip of the basal cell (i.e. the level of the radiomedial fusion), as in most *Macrocera* species.

On the other hand, *M. pusilla* has subsequently been recorded from at least 23 hectads in Britain. It is regarded as a Nationally Scarce species, with a scattered but widespread distribution in southern England and Wales. It is found in wooded, woodland edge and open habitats, including bogs and fens. Chandler (*op. cit.*) reported its occurrence at coastal sites in Devon, where Martin Drake had found two males on a coastal landslip at Haven Cliff (SY2689) and two males at seepages on soft rock cliffs at Seaton (SY2389) on 23 September 2014; it was also mentioned that David Gibbs had recorded it from another coastal site in the same area, Culverhole Point (SY2789) on 26 June 2003.

It was variation in the length of vein Sc in these Devon specimens, such that one of those from Seaton would run to *M. propleuralis* in the handbook (Hutson *et al.* 1980), which led to the suspicion that it may be a variant of *M. pusilla*. It had not then been possible to compare these specimens of *M. pusilla* with the holotype of *M. propleuralis*, but a photograph kindly supplied by Erica McAlister, which tended to confirm this conclusion was included, and is also shown here (Fig. 1). During the preparation of the handbook, Tony Hutson had macerated the apical part of the abdomen and had placed it in a tube of glycerine. The holotype has since been obtained on loan and compared with specimens of *M. pusilla*.

The main doubt about its conspecificity with *M. pusilla* related to its size (wing length stated by Hutson *et al.* to be about 5mm), while most *M. pusilla* are 3-4mm wing length. However, Edwards (1941) gave the wing, antenna and body as 4.5mm and the holotype of *M. propleuralis* actually has a wing length of 4.6mm. The Devon specimens of *M. pusilla* vary from 3.6 to 4.3mm, the largest being that with vein Sc longest. Females of *Macrocera* may also be larger than the corresponding males. Other material of *M. pusilla* examined includes four males with wing length 3.1-3.8mm and four females with wing length 3.4-3.8mm, but one female (Brampton, Huntingdonshire, 27.viii.1965, J.H. Cole) has a wing length of 4.5mm, so there is no significant difference in size from the holotype of *M. propleuralis*.

There is often a sexual difference in antennal length in *Macrocera*; the male of *M. pusilla* has the antenna twice the body length but in females it is about as long as the body.

Vein Sc does extend to reach the costa at a level with the base of the r-m fusion (i.e. tip of the basal cell) in the holotype of *M. propleuralis*, and is a little longer in the left than in the right wing; it thus reaches more than halfway from h to R_1. Vein R_1 is described as thickened apically in *M. propleuralis*, as appears in the photograph; this is less evident in specimens examined of *M. pusilla* but other characters are similar. The body is shining brownish yellow with darker brown mesonotal stripes, anepisternum and laterotergite; the basal half of tergites 1-5 and most of tergites 6-8 are also brown.

The proximity of the type locality to the new records of *pusilla* strongly supports the synonymy. The synonymy *Macrocera propleuralis* Edwards, 1925: 23 = *Macrocera pusilla* Meigen, 1830: 293, syn. nov., is here established.

Fig. 1. Holotype of *Macrocera propleuralis* Edwards

Acknowledgements

I thank Erica McAlister for the loan of the holotype of *Macrocera propleuralis*, and for the photograph of this specimen. I am also grateful to Martin Drake for referring his Devon specimens to me, and to David Gibbs for the details of his record mentioned.

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The first pipunculid larva trapped in amber (Diptera, Pipunculidae)

GRAHAM E. ROTHERAY and WILLIAM CRIGHTON
National Museums of Scotland, 242 West Granton Road, Edinburgh EH5 1JP
email: grahamrotheray@nms.ac.uk

Summary
An amber inclusion from Palanga, Lithuania on the Baltic Sea was studied. The specimen is a larva belonging to the family Pipunculidae (Diptera). It shares with other known pipunculid larvae a similar arrangement of segmental sensilla, pattern of impressed lines, posterior breathing tubes originating on a black sclerotised plate and presence of an anal lobe. Comparing the specimen with known pipunculid larvae, it appears most similar to *Pipunculus* Latreille and *Cephalops* Fallén within the Pipunculinae. The larva probably became trapped after emerging from its host high in the vegetation and on its way to the soil to pupate.

Introduction

In 2002, an insect preserved in Baltic amber from Lithuania was purchased by the National Museums of Scotland. It was described as a 'maggot or larva'. On examination, we were surprised to discover that the inclusion was the larva of a big-headed or pipunculid fly (Diptera, Pipunculidae). Apparently, fewer than 20 fossil specimens of Pipunculidae are known and none of these is a larva (Evenhuis 1994, Kozánek *et al.* 1998, Archibald *et al.* 2013, Kehlmaier *et al.* 2014). In this paper, we describe this larva and compare its features with extant forms.

Methods

The specimen was studied using binocular microscopy and ring and directional lighting. Measurements were made by an eyepiece graticule attached to the microscope. The images were taken in 2007, on Fujichrome colour reversal film using a Leica Wild M420 Macroscope. The amber was immersed in light oil, which improved clarity of the image by reducing surface diffraction and reflection.

Results

Name (from the label) 'maggot or larva'; *Museum registration*: NMS G.2002.6.14

Locality: Baltic Sea, Lithuania, Palanga; *Horizon*: upper Eocene to lower Oligocene (52 to 23 Mya)

State of preservation: the specimen is well conserved with external features apparently unaltered. However, the amber has a fracture plane across the larva. With the larva orientated dorsally and the head facing away, the fracture plane circumvents the longitudinal axis of the larva, extending along the right hand, dorsolateral margin and along the mid-ventral line. Another mark in the amber appears as a series of concentric rings, round the head and prothorax (Fig. 1). These features obscure one of the lateral margins and the apex of the larva. Ventrally, segments 4-6 are extended and swollen ventrally and depressed dorsally, except for an upstanding fold extending from the right hand side of abdominal segment 5 to the left hand side of abdominal segment 6. The body is clean but details of the spiracular organs are obscured, possibly by trapped air. The head and antennomaxillary organs are retracted into the thorax and hidden from view (Fig. 1).

Description: length about 2.2mm; maximum dorsal width about 1mm; sub-cylindrical in cross-section; anterior end tapering from about the base of the first abdominal segment; anterior margin of the prothorax about a third as wide as the base of the first abdominal segment; dorsum of prothorax smooth, lacking longitudinal impressed lines; mandibles and head skeleton retracted, only visible as a vague dark line through the integument; posterodorsal margin of prothorax with a pair of anterior spiracular processes, each about as long as broad, apparently with a pair of spiracles across the apex; integument matt and rugose, lacking vestiture; body with segmental arrangement of sensilla and pattern of impressed integumental lines (Fig. 1); sensilla without accompanying setae and slightly raised from the surface of the integument and bordered by impressed lines forming an oval or circular shape; locomotory organs not obvious, i.e. not projecting from the integument or marked with impressed lines; posteriorly, body tapering from base of abdominal segment 5; anal segment about 2x as long as abdominal segment 7 and tapering to about a quarter the width of the base of the anal segment; anal segment divided into two unequal sections; posterior section terminating in a partially collapsed, bar-like lobe; anus in a central position of the ventrum of the anal segment and surrounded anteriorly and laterally by a raised, integumental rim and posteriorly by the partially collapsed, bar-like lobe; posterior breathing organs on the dorsum of the anterior section of the anal segment and mounted on short projections, about as tall as wide; breathing tubes originating on the dorsolateral corners of a black, triangular plate with rounded corners and orientated such that the longest side, bearing the breathing tubes, is on the posterior margin; this margin interrupted by a pair of slight projections (Fig. 2); each posterior breathing organ apparently with a pair of similar-sized, parallel, spiracular openings.

Fig. 1. Whole larva (Diptera, Pipunculidae), included in Baltic amber from Lithuania, dorsal view, head to the left, length 2.2mm.

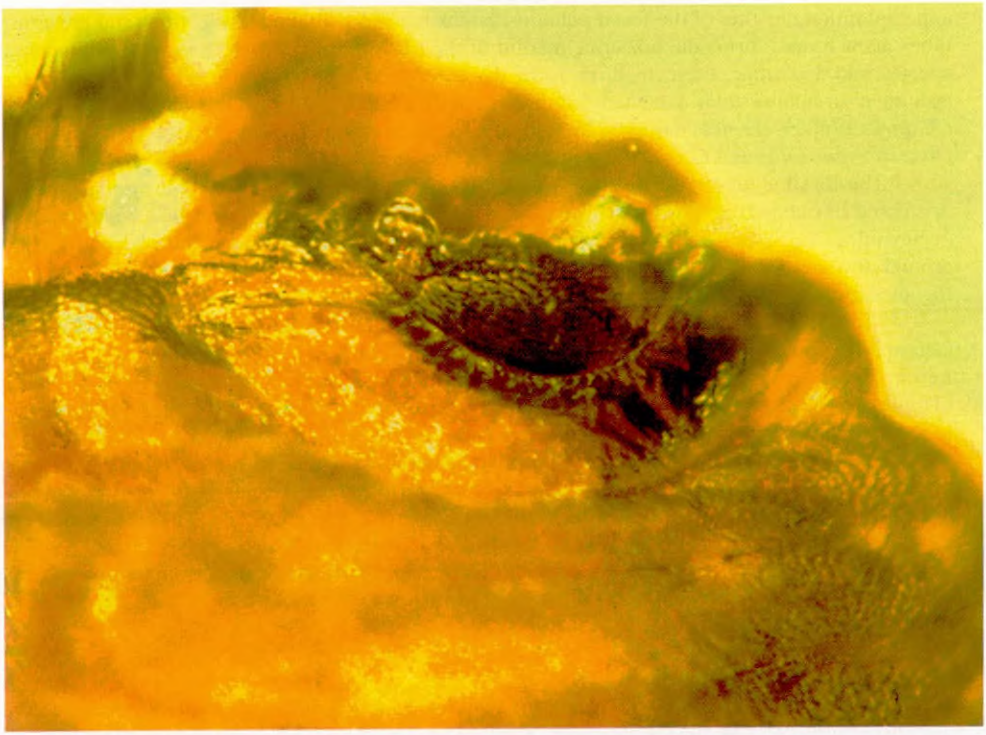

Fig. 2. Larva (Diptera, Pipunculidae), included in Baltic amber from Lithuania, dorsal view, caudal end with black sclerotised plate on the dorsum of the anterior section of the anal segment, apex of the anal segment uppermost.

Discussion

An amber inclusion from Lithuania was studied. The specimen appears to be a larva belonging to the Pipunculidae (Diptera). The arrangement of those sensilla that are visible, the pattern of impressed, segmentally arranged lines on the dorsum of the abdomen, the posterior breathing organs mounted on a black, sclerotised plate and the apex of the anal segment with a lobe, are all features of the Pipunculidae (Ferrar 1987, Rotheray and Gilbert 1999) and are present in this inclusion fossil.

Within the Pipunculidae, it does not appear to belong to the Nephrocerinae since the posterior breathing organs originate from a black, sclerotised plate. Such a plate is absent in known *Nephrocerus* Zetterstedt larvae (Koenig and Young 2007, Kehlmaier and Floren 2010). The shape of the black plate supporting the posterior breathing organs and the position of the breathing organs along one of the sides of the plate is similar to *Verrallia* Mik of the Chalarinae (Coe 1966) and *Pipunculus* Latreille and *Cephalops* Fallén of the Pipunculinae (Williams 1957, Rothschild 1964). Other pipunculid larvae have different shapes and arrangements (examples in Ferrar 1987). However, the fossil shares with *Pipunculus mauritianus* Hardy (Williams 1957) and *Cephalops varipes* (Meigen) [as *C. semifumosus* (Kowarz)] (Rothschild 1964) but not with *Verrallia* sp. (Coe 1966), the margin of the plate between the posterior breathing tubes interrupted by a pair of slight projections (Fig. 2). This margin is smooth and lacks projections in *Verrallia* (Coe 1966); the plates of these three species were reproduced in Ferrar (1987). However, an

apparent unique feature of the fossil plate, is that the margin with these projections and breathing tubes at each end, forms the posterior margin of the plate (Fig. 2), whereas in both pipunculine species and *Verrallia*, these features form the anterior margin (Ferrar 1987). However, the specimen is smaller than expected for these taxa and based on size, the specimen is close to *Chalarus* Walker. Hence, based on limited character and taxon comparisons, the fossil might be close to *Pipunculus* and *Cephalops* within the Pipunculinae, or to *Chalarus*.

The fossil is preserved with part of the ventral surface swollen out and the dorsal surface depressed in one part and up-folded in another. These distortions are consistent with mortality occurring during a peristaltic locomotory wave. This might also explain the concentric rings around the head, reflecting repeated head movements in a viscous medium that inhibits locomotory progress. Alternatively, the larva may have become distorted after death.

Most pipunculids are endoparasitoids of leafhoppers and planthoppers, such as Cercopidae, Cicadellidae, Cixiidae, Delphacidae, Flatidae, Issidae and Membracidae (Coe 1966, Ferrar 1987, Skevington 2008). However, *Nephrocerus* species are known to parasitise craneflies (Tipulidae) (Koenig and Young 2007). When mature, the larva leaves the host through a break in the membranes of the abdomen and pupates in the soil or leaf litter and rarely, on leaves (Ferrar 1987, Coe 1966). After quitting the host, Huq (1986: 283) reported 24-36 hours to form a puparium for *Eudorylas subterminalis* (Collin) bred in captivity and Belcari (1999: 41) reports 3-4 days for *Tomosvaryella frontata* (Becker). In *Chalarus*, pupariation seems to take place more rapidly, within 1-2 hours (Rotheray, unpublished observations). Whether it takes a few hours or up to 1-2 days, the discovery of a pipunculid larva trapped in amber is not only surprising but fortunate. It probably became trapped after it emerged from the host on its way to the ground to pupate.

Acknowledgements

We thank Lyll Anderson (NMS) for pointing out this fossil and making it available to study. We are also grateful to Christian Kehlmaier, Marc de Meyer and Jeff Skevington for comments on the manuscript and help with the literature.

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Corrections and changes to the Diptera Checklist (33) – 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 20 species, and loss of two due to synonymy, resulting in a new total of **7110** species (of which 39 are recorded only from Ireland).

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

Limoniidae. The following additions result from J. STARÝ and A.E. STUBBS (2015. Five species under *Dicranomyia* (*Dicranomyia*) *mitis* (Meigen, 1830) (Diptera: Limoniidae). *Zootaxa* **3964,** 321-334):

Dicranomyia (*Dicranomyia*) ***imbecilla*** Lackschewitz in Lackschewitz & Pagast, 1941
Dicranomyia (*Dicranomyia*) ***lutea*** (Meigen, 1804 – *Limonia*)
Dicranomyia (*Dicranomyia*) ***affinis*** (Schummel, 1829 – *Limnobia*)
Dicranomyia (*Dicranomyia*) ***quadra*** (Meigen, 1838 – *Limnobia*)

Keroplatidae. The following synonymy is established in the present issue:
Macrocera propleuralis Edwards, 1925 = *Macrocera pusilla* Meigen, 1830

Mycetophilidae. The following species were added by P. CHANDLER (2015a. Fungus Gnats Recording Scheme Newsletter **8,** 1-6. *Bulletin of the Dipterists Forum* **79**.):

Brevicornu ***subfissicauda*** Zaitzev, 1985
Mycetophila ***stylatiformis*** Landrock, 1925
Phronia ***bicolor*** Dziedzicki, 1889

The following species was added by P.J. CHANDLER (2015b. A new species of *Grzegorzekia* Edwards (Diptera: Mycetophilidae) from England and France. *Entomologist's Gazette* **66,** 53-60):
Grzegorzekia ***bushyae*** Chandler, 2015

Cecidomyiidae. The following changes result from the on line publication by N. DORCHIN, J.J. ASTRIN, L. BODNER and K.M. HARRIS (2015. Morphological and Molecular Revision of the Genus *Ozirhincus* (Diptera: Cecidomyiidae) – Long-Snouted Seed-Feeding Gall Midges on Asteraceae. PLOS ONE 10(7): e0130981. (DOI: 10.1371/journal.pone.0130981) [*O. millefolii* remains a good species and a fourth species *O. anthemidis* (Rübsaamen, 1916) is recognised and said to be widespread in Europe, but with as yet no British records]:
Ozirhincus ***hungaricus*** Möhn, 1968 [Hosts: *Tanacetum* species, *Tripleurospermum inodorum*] New to Britain.
Ozirhincus longicollis Rondani, 1840 [= *tanaceti* (Kieffer, 1889), new synonym; *chrysanthemi* and *leucanthemi* remain in synonymy] [Hosts: various Anthemideae]

Chironomidae. The following species are described in the present issue:
Chaetocladius ***purbeckensis*** Langton & Armitage, 2015 [= "*Chaetocladius* sp. Dorset" Langton & Armitage, 2010]
Metriocnemus ***albipunctatus*** Langton & Armitage, 2015
Metriocnemus ***ephemerus*** Langton, 2015 ++

The following change results from M. SPIES and A. DETTINGER-KLEMM (2015. Diagnoses for *Nubensia*, n. gen. ((Diptera, Chironomidae, Chironomini), with the first full descriptions of the adult female and larva of *N. nubens* (Edwards, 1929). *Zootaxa* **3994**(1), 109-121):
NUBENSIA Spies in Spies & Dettinger-Klemm, 2015
Nubensia nubens (Edwards, 1929 – *Chironomus*) (transferred from *Polypedilum*)

Empididae. The following changes result from M. CHVÁLA and A.C. PONT (2015. Revision of the European *Empis* (s. str.) *alpicola*-group of species (Diptera: Empididae), with a new synonymy of *Rhamphomyia* subgenus *Aclonempis* Collin with the subgenus *Empis* Linnaeus s. str. *Studia dipterologica* **21**(1), 53-68):
ACLONEMPIS Collin, 1926 = EMPIS Linnaeus, 1758, new synonymy
Empis (sensu stricto) *albohirta* (Collin, 1926 – *Rhamphomyia*)
Empis (sensu stricto) *longipes* Meigen, 1804
[The two latter species are transferred from Subgenus ACLONEMPIS of RHAMPHOMYIA]
Empis (sensu stricto) *vitripennis* Meigen, 1822
Empis (sensu stricto) *volucris* Wiedemann in Meigen, 1822
[The two latter species are transferred from Subgenus COPTOPHLEBIA of EMPIS]

Platypezidae. A revision by G. STÅHLS, O. MIETTINEN and E. RÄTTEL (2014. mtDNA COI in efficient use: clarifying taxonomy, linking morphologically discordant sexes and identifying the immature stages of *Agathomyia* Verrall flat-footed flies (Diptera: Platypezidae). *Journal of Zoological Systematics and Evolutionary Research* (2015) **53**(3), 219-238) restored specific rank to species recently treated as synonyms of *Agathomyia elegantula* (Fallén, 1815) and resulted in the following nomenclatural change:
Agathomyia ***boreella*** (Zetterstedt, 1838 – *Callomyza*) = *A. elegantula*: Chandler, 1991, misident.

Phoridae. The following changes and additions result from R.H.L. DISNEY (2014. Revisionary notes on the *Megaselia sulphuripes* (Meigen) species group (Diptera: Phoridae). *Entomologist's monthly Magazine* **148,** 137-145):
Megaselia fuscohalterata (Schmitz, 1919) = *M. devia* Schmitz, 1936 (transferred from synonymy of *M. sulphuripes*)
Megaselia capronata Schmitz, 1940 = *M. hirticaudata* (Wood, 1910) (transferred from synonymy of *M. subfuscipes*)
Megaselia ***ledburiensis*** (Brues, 1915 - *Aphiochaeta*) = *M. subfuscipes* Schmitz, 1935, new synonymy, the name *ledburiensis* reinstated; it was proposed by Brues as a new name for *M. minutissima* (Wood, 1910 - *Phora*), which was preocc. by Brues, 1905, not a misident. as stated in 1998 checklist and not a synonym of *M. sulphuripes*
Megaselia xanthogastra Schmitz, 1940 = *M. ledburiensis* (transferred from synonymy of *M. sulphuripes*)
Megaselia ***megavesiculae*** Disney, 2014
Megaselia ***novusilvaensis*** Disney, 2014

The following species were added by R.H.L. DISNEY and A. RUSSELL-SMITH (2014. Additions to the British list of *Megaselia* Rondani (Diptera: Phoridae), including two new species, from the crowns of ancient pollarded trees. *Journal of Natural History* 28 pp. http://zoobank.org/urn:lsid: zoobank.org:pub:ICC46F9C-AB02-446C-BF83-4D9529508DFA
Megaselia ***henrydisneyi*** Durska in Disney & Durska, 1998
Megaselia ***russellsmithi*** Disney in Disney & Russell-Smith, 2014
Megaselia ***velutiniclavus*** Disney in Disney & Russell-Smith, 2014

The following species were added by R.H.L. DISNEY and A. RUSSELL-SMITH (2015. Further records of *Megaselia* Rondani (Diptera: Phoridae), including two new species, from the crowns of ancient pollarded trees in England. *Entomologist's monthly Magazine* **151,** 169-175):
Megaselia ***hatfieldensis*** Disney in Disney & Russell-Smith, 2015
Megaselia ***sornectergata*** Disney in Disney & Russell-Smith, 2015

The following error has also been noted. In the synonymy of *Triphleba lugubris*, the original genus for *connexa* (Wood, 1914) was *Phora*, not *Trupheoneura*.

Lonchaeidae. The following species is added in the present issue:
Protearomyia ***withersi*** McGowan, 2014

Scathophagidae. The following genus and species are added in the present issue:
OKENIELLA Hendel, 1907
Okeniella ***caudata*** (Zetterstedt, 1838 – *Cordylura*)

Changes to the Irish Diptera List (21) - 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 five additions cited here bring the total Irish list to 3391.

Thaumaleidae
Thaumalea truncata Edwards (added by Langton in the present issue)

Chironomidae
Glyptotendipes (*Heynotendipes*) *signatus* (Kieffer, 1909) (added by Murray in the present issue)
Harnischia fuscimanus Kieffer, 1921 (added by Murray in the present issue)
Metriocnemus ephemerus Langton, 2015 (added by Langton in the present issue)
Telmatogeton murrayi Sæther, 2009 (added by Langton in the present issue)

More British localities for *Anthomyia plurinotata* Brullé (Diptera, Anthomyiidae)

– This distinctively marked species was added to the British list by Tristram Brelstaff (2014. *Anthomyia plurinotata* Brullé (Diptera, Anthomyiidae) new to Britain. *Dipterists Digest* (*Second Series*) **21,** 201-202), on specimens of both sexes found at Reading, Berkshire. I was surprised to find a female of *A. plurinotata* among samples caught by bottle traps at Aston Rowant NNR in the Beacon Hill West area near Cuckoo Pen (SU7297), Oxfordshire, in the period 14 to 28 July 2014. These traps and a Malaise trap were operated at this site from May to October 2014, but no others of this species were found. The site included longish grassland and scrub composed of purging buckthorn *Rhamnus cathartica*, blackthorn *Prunus spinosa*, hawthorn *Crataegus monogyna* and wayfaring tree *Viburnum lantana*. Judy Webb sorted the catches on behalf of Natural England, and passed them to me for identification. I am grateful to Judy Webb, and to Mick Venters of Natural England, for the opportunity to examine material from Aston Rowant NNR.

Another record has been provided by Rory Morrisey, who photographed a female, apparently feeding on the surface of a blackberry, in the churchyard of All Saints church (SP918248), Leighton Buzzard, on the afternoon of 26 August 2015. I thank him for the opportunity to include his record, which suggests that this species is already widespread in the south-east of England – **PETER J. CHANDLER,** 606B Berryfield Lane, Melksham, Wilts SN12 6EL

Scottish records of *Rhinophora lepida* (Meigen) (Diptera, Rhinophoridae)

– On 27 July 2014, I observed a number of small, black, shiny flies near the harbour of Aberdour (NT196851) by the Firth of Forth in Fife. The flies were flying low down and landing on vegetation under scrub at the foot of a south-westerly facing rocky slope. One of the flies, a male, was captured by sweeping and identified as *Rhinophora lepida* (Meigen).

No Scottish records for *R. lepida* were disclosed by a search of the Scottish Insects Record Index, which was consulted at the National Museums of Scotland (NMS) at West Granton in Edinburgh. There were specimens of *R. lepida* in the Diptera collection at the NMS, which were compared with the Aberdour specimen, but none were labelled as collected in Scotland. F.I. van Emden (1954. Diptera Cyclorrhapha Calyptrata (I) Section (a). Tachinidae and Calliphoridae. *Handbooks for the Identification of British Insects* **10**(4a), 133 pp. Royal Entomological Society of London) gave a distribution for *R. lepida* which is encompassed by Kent, Cornwall, Glamorgan, Herefordshire, Warwickshire and Norfolk. The National Biodiversity Network website, consulted on 26 March 2015, shows 10km square records extending through much of England and Wales, including both coastal and inland records, almost up to a line connecting the Ribble and the Humber estuaries.

Peter Chandler (*pers. comm.*) informs me that he caught two females in a saltmarsh near Kirkcudbright on 21 July 1979, also a coastal location, but this species does not appear to have otherwise been recorded previously from Scotland – **DAVID HORSFIELD,** National Museums Collection Centre, 242 West Granton Road, Edinburgh EH5 1JA

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Diptera recording at Bushy Park, Middlesex

PETER J. CHANDLER
606B Berryfield Lane, Melksham, Wilts SN12 6EL

Summary
Knowledge of the Diptera fauna of Bushy Park, Middlesex is discussed and its diversity is assessed in relation to the principal habitats found in the Park. A list of all species known to have been recorded there is presented, currently standing at 1037 species. This is annotated with the recording compartments in which they have been found, and where there is a known saproxylic association (with decaying wood or associated fungi) this is indicated.

Introduction

Following the discovery of a new species of the genus *Grzegorzekia* (Mycetophilidae) in trap samples obtained from Round Plantation in 2010 (from which Martin Drake referred fungus gnats to me), I first visited Bushy Park on 25 July 2011. I was introduced to the Park by Nigel Reeve, then Head of Ecology at the Royal Parks, who showed me that area and the nearby Canal and Waterhouse Plantations. The finding of a second example of the new species in the latter area on that occasion encouraged me to make further visits, hoping to find out more about the biology of this gnat, and to seek females in order to establish if they were as different as the male from the only previously known British species of this genus *G. collaris* (Meigen). Perhaps surprisingly, in view of this good fortune on my first visit, after one further male was found in the same area on 14 August 2011, no more British specimens of this species have been reported, although it has been found in France. This gnat was formally described as *Grzegorzekia bushyae* sp. n. by Chandler (2015).

Having found Bushy Park to hold much of interest in its range of habitats and diversity of its insect fauna, I continued to make visits in 2011 and subsequent years, and here present the results of my visits and a summary of present knowledge of the Park's Diptera fauna.

Location and history of Bushy Park

Bushy Park comprises 445 hectares (1100 acres) of parkland and woodland plantations, both including a significant number of older trees, close to the River Thames; it adjoins Hampton Court Park (also known as Home Park), and is a low-lying area on the floodplain, but is well-drained and a mainly dry site away from the various ponds and other water features.

The area was enclosed as a deer park in 1529, following its acquisition by Henry VIII from Cardinal Wolsey (together with Hampton Court Palace), and was then used as a royal hunting ground until the 17th century. It is thought that many oaks remained from the pre-enclosure agricultural landscape, but there was much subsequent felling and replanting. The Longford River, a slow-flowing watercourse, near the west end of the Park, which runs 19km from the River Colne at Colnbrook near Slough, Berkshire, was constructed in 1638-9 by Charles I, to increase the local water supply. Heron Pond and Leg of Mutton Pond were excavated as fish ponds in the 1650s, during the rule of Oliver Cromwell. From 1690 onwards, extensive avenues of limes and horse chestnuts were planted and these have been augmented more recently. The existing plantations were mainly early 19th century plantings, but include some older trees. Within the enclosed areas, the woodland gardens have been developed, with planting of more exotic species during the 20th century. Millennium Wood has been added as a newly planted enclosure. Parts of the Park were subjected to military and agricultural use during the 1940s, but much of the grassland habitats survived this treatment, and 130 hectares of acid grassland remain.

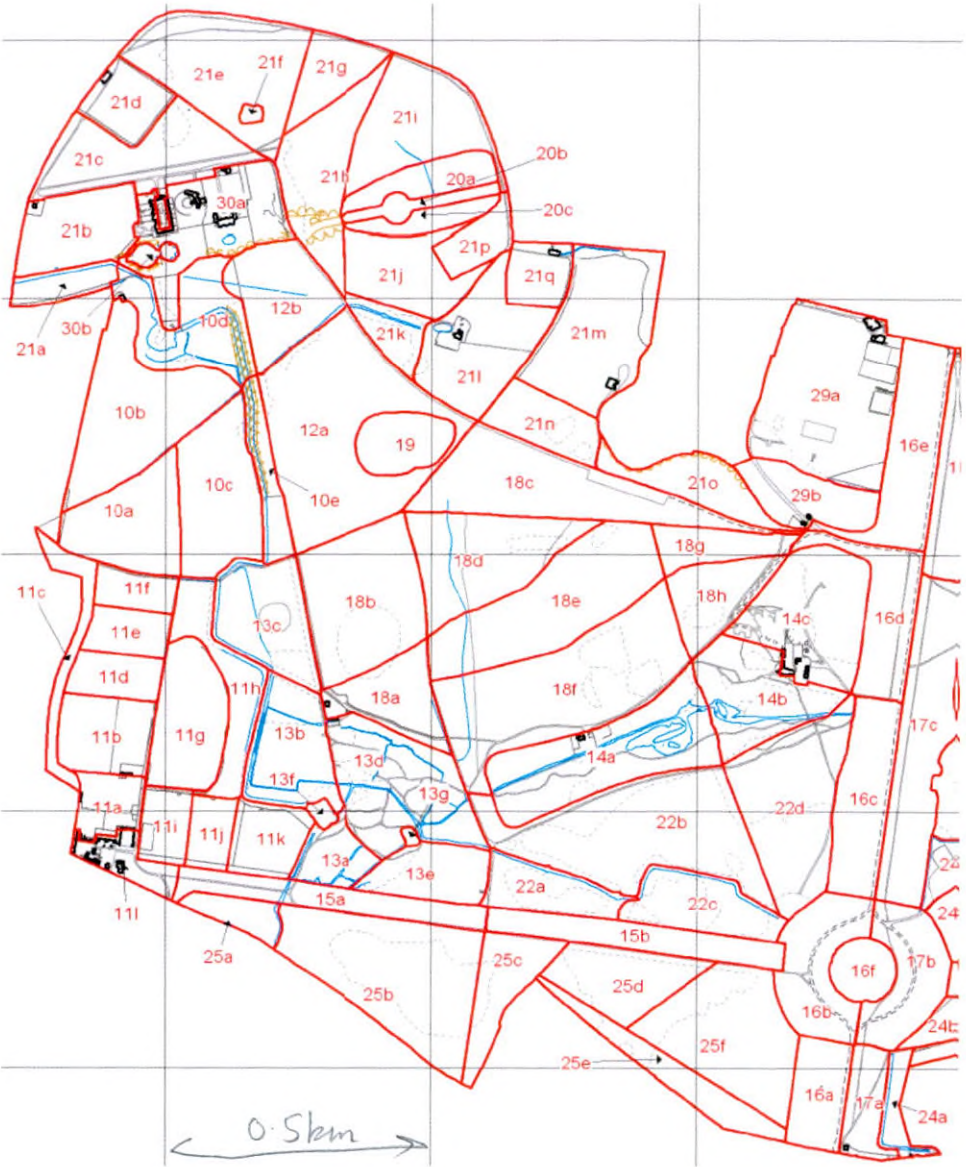

Fig. 1. Western part of Bushy Park, to show numbered compartments; © The Royal Parks.

Recording compartments and habitat distribution in Bushy Park

To reflect the mosaic of diverse habitats within the Park, it is divided for recording purposes into numerous numbered compartments. The maps shown here (Figs 1-2) indicate these numbers, which are those used in this paper, together with the relevant names and habitat types. The grid lines on the map indicate 0.5km squares. The Park overlaps two hectads (10km squares) of the

national grid (TQ16 and TQ17) and the grid line that is the boundary between them runs immediately north of Waterhouse Plantation (13c on map).

The aerial view of the western end of the Park (Fig. 3) includes those areas that have been given most attention in recording of Diptera. Round Plantation (compartment 19) is shown in a central position, surrounded by acid grassland (compartment 12). The Longford River runs through the wooded areas to the west, past the Water Garden (30), through Waterhouse Plantation (13) which is the larger wooded area to the south, then across the lime avenue (15) to enter the Thames. To the west of the Longford River are the hay meadows of Brewhouse Fields (10a-c), and areas 11h and 11k; other parts of compartment 11 are horse paddocks. Part of Heron Pond (23b) can be seen at the eastern edge beyond the central lime and horse chestnut avenues.

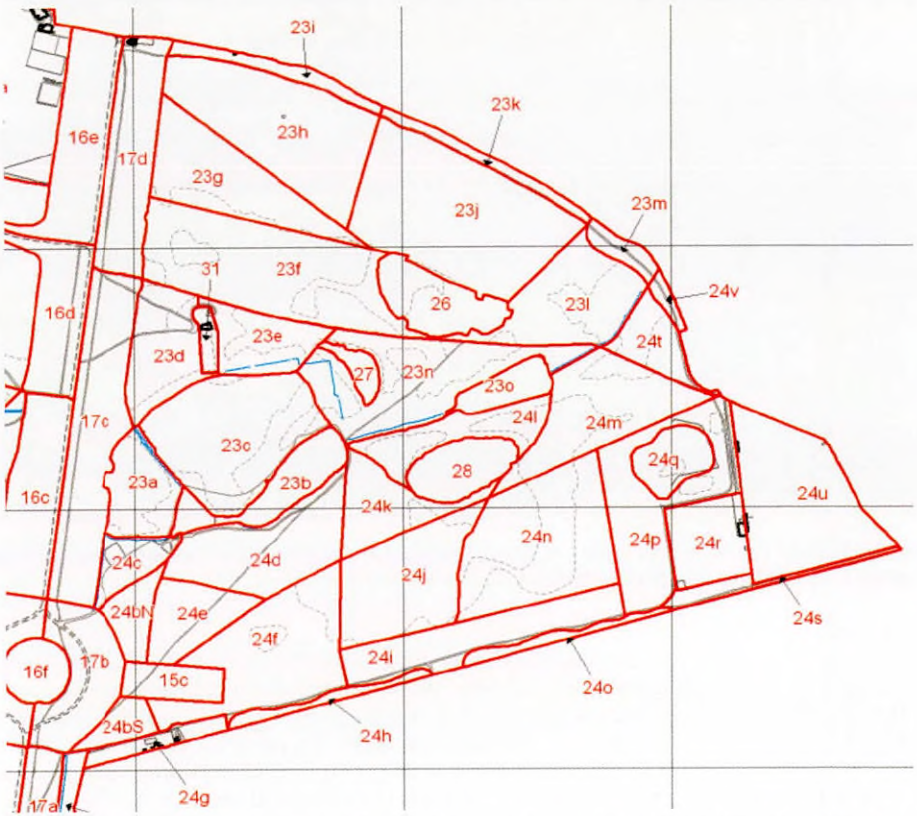

Fig. 2. Eastern part of Bushy Park: as Fig. 1, with some overlap; © The Royal Parks.

There are about 320 deer (red and fallow) in the Park, usually more evident in the eastern half, where the effects of grazing are more apparent in some areas, but there are also large areas of bracken (see cover illustration), and trees are more sparsely distributed outside the plantations than in the parkland areas on the western side of the Park. The unfenced Warren (26), Half Moon (27) and Oval (28) Plantations are browsed and used as shelter by deer, and so lack an understorey or much ground cover. The enclosed Millennium Wood (24q) includes both recent tree planting and acid grassland.

Fig. 3. Aerial view of western part of Bushy Park - yellow spot indicates the location of the ground trap operated in 2010 in Round Plantation (compartment 19).

SSSI status

Bushy Park has recently been awarded SSSI status on the basis of its saproxylic and acid grassland fauna and flora (Natural England 2014a, 2014b). While a complete list of invertebrates recorded at Bushy Park was among the documents cited, the only species mentioned by name were Coleoptera, and the comparison with other sites was inevitably based on the evaluation of the saproxylic beetle fauna. The saproxylic beetles had been well studied by Denton (2006), and the overall beetle fauna was surveyed by Hammond (2011) in 2009-2010, and included the results of the trapping carried out by Nigel Reeve. Using the Revised Index of Ecological Continuity (rIEC) (based on Alexander 2004), both authors compared the results obtained for the saproxylic beetles at Bushy Park with other sites in the London area and nationally. Denton (*op. cit.*) obtained a result of 100 for Bushy Park, on a par with Epping Forest, and compared to 138 for Richmond Park, already indicating it to be of national importance. Hammond, with records now available of a larger number of critical species, increased the rIEC for Bushy Park to 150, while the scores for Epping Forest and Richmond Park were also increased to 141 and 152 respectively. A similar comparison for the top ten national sites was given by Natural England (2014b), with the Bushy score slightly increased to 152 and Richmond to 156; according to this assessment Bushy Park ranked 4th nationally after Windsor Great Park and Forest, the New Forest and Richmond Park.

Hammond omitted the New Forest from his table but his scores would also accord with a 4th place nationally for Bushy Park, though the top ten, based on his unpublished surveys, would include Ashtead Common (Surrey), Burnham Beeches (Buckinghamshire) and Thorndon Park (Essex), sites not mentioned by Natural England (2014b). Hammond (2011) considered that the acid grassland might also support an interesting beetle fauna, but that had yet to be demonstrated; this habitat is also of interest in the large number of ant hills that it contains. It has been noted (Overall 2010a, Natural England 2014b) that there is relatively little fallen dead wood in the Park, which may be attributed to past tidiness, but this is being addressed in current management.

Previous recording at Bushy Park

In 2006, a volume of the *Bulletin of the Amateur Entomological Society* (Volume 65, Number 464, February 2006), was devoted to celebration of the insect fauna of Bushy Park, including an editorial by Peter Sutton, explaining the national importance of this site, which had been largely overlooked by entomologists. In this volume, Sutton (2006a) commented on the paucity of previously published information on the insects of Bushy Park, which referred mainly to aculeate Hymenoptera and, together with David Baldock, he had already built on this with a survey of the aculeate fauna (Sutton and Baldock 2003). In that work they assessed the importance of the Park's habitats in a national context. Baldock and Sutton (2006) updated the aculeate list and Denton (2006), cited above, dealt with the saproxylic Coleoptera. Sutton (2006b) gave an account of his observations at Bushy Park on insects of various orders including Orthoptera, Hemiptera and Odonata, as well as some beetles and aculeates. He included mention of seeing *Volucella bombylans* and *Bombylius major* in numbers at primrose *Primula vulgaris* flowers near the Longford River on 17 April 2004; on 4 June 2013, I saw a female of *B. major* near this area, tilting its proboscis to enter flowers of cleavers *Galium aparine*.

Sutton (2006a) noted that Peter Hodge had visited the Park on three occasions in August and September 1992 and had reported on the invertebrates found, including some Diptera; he had also been there in 1986 as he then beat *Acrocera orbiculus* from hawthorn on 9 August (Martin Harvey *pers. comm.*). Then in 2003 and 2004 further surveys were carried out by Jonty Denton (terrestrial invertebrates) and David Leeming (aquatic invertebrates), of which most results have not previously been published. According to the Royal Parks database, 149 species of Diptera were identified from the 2004 surveys, from which Baldock *et al.* (2006) recorded 34 species of Lower Brachycera (soldierflies and allies) and three species of Conopidae, and compared these results with sites in Surrey at which these groups had been well recorded. They also noted that it had been reported by Peter Hodge that in 1988 a larva possibly belonging to the therevid *Pandivirilia melaleuca* had been found, in dry frass and wood mould in a cavity in a large fallen oak, by Prof. J.A. Owen, but its identity was not confirmed by rearing. The Soldierflies and Allies Recording Scheme database includes an earlier record for *Solva marginata* (Xylomyidae) by Keith Harris in May 1965 (Martin Harvey *pers. comm.*), but the precise location was not recorded.

In 2010, a programme using flight interception traps was organised by Nigel Reeve. This involved a trap at ground level, placed centrally in Round Plantation (compartment 19), and Vane traps placed on trees there and in several other parts of the Park. The ground level trap comprised a single vertical net about two metres wide and about a metre tall, staked out like a Malaise trap but with water traps into which the catch dropped at the base. Round Plantation is a fairly small non-intervention woodland enclosure, fenced off from the surrounding deer park and without public access, thus ensuring the integrity of the trap. Martin Drake identified the Diptera from these traps and passed samples of fungus gnats to me for identification early in 2011. The total of Diptera species identified from this survey was 328 (plus five to genus only), including 63 species of fungus gnats (plus three based only on females to genus only). Only 36 species were in common with the 2003/2004 surveys, and half of those were Lower Brachycera (11 of 14) and Syrphidae (7 of 8), reflecting the methods used and the different habitats sampled.

From recording up to the end of 2010, the Royal Parks database of Diptera records from Bushy Park included 453 species identified to specific level, as well as a number of others identified only to genus. Previously published Diptera records from Bushy Park included three additions to that database. These were *Cratyna vagabunda* (Sciaridae), recorded by Menzel *et al.* (2006) on a 1940 specimen (collector unknown) in the NHM collection, *Neoitamus cyanurus* (Asilidae) and *Physocephala rufipes* (Conopidae), both recorded by Baldock *et al.* (2006). The latter work didn't include two species of aquatic Stratiomyidae recorded earlier by David Leeming in 2004, i.e. *Oxycera nigricornis* and *Oplodontha viridula*, but was evidently a thorough assessment of the fauna, as only eight species of Lower Brachycera and one of Conopidae have been added since 2004; on the other hand, 12 species of this group have not been recorded in more recent years, five of them Stratiomyidae with aquatic larvae, but it is unclear if this is due to changes in the aquatic habitats in the Park, or simply the result of insufficient recording in these areas.

There still remain 160 species of Diptera known from the Park that have not been recorded during my visits. This reflects both recording methods (many species were previously recorded only by trapping) and the incomplete habitat coverage of my visits. My concentration on the more wooded areas is partly responsible for the relatively large number of additional species recorded, as is the coverage of habitats such as the hay meadows that were given less attention in previous surveys. Some families likely to be well represented in the Park, e.g. Ceratopogonidae, Chironomidae, Phoridae, Sphaeroceridae, have not been well studied so there is potential for adding substantially to the list in the future.

There is insufficient information on the Diptera fauna of the other Royal Parks for any meaningful comparison to be made. Apart from the adjoining Hampton Court Park, the nearest and apparently most similar is Richmond Park. As a larger area and with a diversity of habitats, it might be concluded to be a richer site for Diptera, as has been suggested by the results with Coleoptera. However, there has not yet been any detailed assessment of its Diptera fauna. There has been sporadic recording, including a British Entomological and Natural History Society field meeting on 6 June 1992, which I attended. Miles (1993) reported on some of the Diptera species that I recorded on that occasion; these included three species associated with decaying poplars, most notably the ulidiid *Myennis octopunctata*, as well as the soldierfly *Neopachygaster meromelas* and cranefly *Gnophomyia viridipennis*, only the last of which has so far been recorded at Bushy Park (see below). There was recording by Graham Collins and David Baldock in 2003 and 2004, and by Andrew Halstead in the 1990s and 2011. A trapping survey was carried out by Nigel Reeve in 2006, from which the Diptera were identified by John and Barbara Ismay. Altogether these resulted in records of 216 species in the Royal Parks database; together with 63 additional species, of which there are records in the Fungus Gnat and Pipunculidae Recording Schemes, I am aware of 279 species of Diptera having been recorded from Richmond Park, including 62 species of fungus gnats. Of these, 204 overall and 50 of the fungus gnats are in common with Bushy Park, and of 19 species recorded at Richmond Park that have conservation status eleven are also recorded from Bushy Park.

Natural England (2014b) suggested that there had been no detailed survey of Bushy Park for fungi, omitting to mention the report by Overall (2010a), who surveyed most parts of the Park in 2009 and summarised previous records; he also provided accounts of some of the more interesting species recorded at Bushy Park and other Royal Parks in three articles in *Field Mycology* (Overall 2010b, 2010c, 2011). Other than perennial polypores and oyster mushrooms (*Pleurotus* species), few fungus fruiting bodies were observed during my own visits; the abundance of honey fungus *Armillaria* sp. in Round Plantation on 7 October 2011 (see under Platypezidae below) was an exception. Terrestrial species were particularly sparse before mid October, evidently due to the prevailing dry weather conditions. The fungus foray, which I

attended on 8 November 2014, produced a range of interesting species and highlighted the late seasonal appearance of some terrestrial fungi.

Visits to Bushy Park by the author

In 2011, nine visits were made at about fortnightly intervals from 25 July until 10 November, concentrating attention on Round and Waterhouse Plantations, and adjacent areas. In 2012 again nine visits were made, from 13 April to 4 October, with the first five on earlier dates than the start of 2011 visits, also extending recording to other parts of the Park. Erica McAlister assisted with recording in Waterhouse Plantation on 30 September 2011 and 22 August 2012, and also in Round Plantation on the second visit. In 2013 five visits and in 2014 ten visits were made, covering most of the same areas as in previous years, but also including some additional areas of hay meadow and woodland at the west end, outside the public access part of the Park. The latter areas were included after I heard that Martin Harvey had discovered the bee-fly *Villa cingulata* to be present in a hay meadow area (compartment 11k) (Chandler 2014b). There have been four visits so far in 2015, bringing total visits to 37.

My recording regularly included Round and Waterhouse Plantations, both relatively small areas of non-intervention mixed broad-leaved woodland, with a number of fallen trees and good quantities of dead wood. There was also some recording in the more formal areas of the woodland garden, latterly concentrating on a small area of swampy woodland at the east end. Three visits were made to Pheasantry Plantation, also a mainly formally planted area. Of the deer-grazed acid grassland areas most attention was given to the area (compartments 12a and b) surrounding Round Plantation. Attention was also given to the older limes in the lime avenue (15a) on several visits. Of areas in the eastern half of the Park, Heron Pond received two visits in 2013, two in 2014 and one in 2015 together with Leg of Mutton Pond, while Millennium Wood was visited once in each year from 2012 to 2015. The unfenced and deer-grazed Oval, Half Moon and Warren Plantations were also visited, but found to be unproductive.

The compartments I have covered fall in two 10km grid squares (hectads) and the following 1km squares:

TQ1469: 11h (wooded strip by Longford River, opposite bank to Waterhouse Plantation and including the adjacent hay meadow areas), 11k (hay meadow), 13b and 13c (Waterhouse Plantation within woodland garden enclosure), 13d (more formal part of woodland garden, but including a central wooded area and a small area of swampy woodland at the east end), 15a (lime avenue), 25b (parkland with old oaks).

TQ1569: 14a (Pheasantry Plantation), 16c (parkland), 16d (lime avenue).

TQ1669: 23b and 23c (parkland near Heron Pond and pond margins), 23l (parkland), 23n and 23o (near Leg of Mutton Pond), 24q (Millennium Wood), 26 (Warren Plantation), 27 (Half Moon Plantation), 28 (Oval Plantation).

TQ1470: 10a-c (Brewhouse Fields, hay meadows and wet areas, including a newly established reedbed around a small pond), 10d (woodland at north end of Brewhouse Fields), 10e (area within Brewhouse Fields alongside the Longford River), 12a and 12b (parkland with old oaks, surrounding Round Plantation, samples included northern end of adjacent area 18b, all records listed as 12a), 19 (Round Plantation), 20a (Canal Plantation).

Results

From my visits 879 species have so far been identified, of which 580 are new records for Bushy Park, bringing the total of Diptera species recorded from the Park to 1037. This overall total

includes 240 species known to have saproxylic associations (developing in decaying wood, rot holes, sap runs or saproxylic fungi), and 53 with diverse habits that currently have conservation status. Species in these categories are indicated in the full species list presented in the Appendix.

The assessment of which species are indicated to have conservation status accepts recently proposed changes in status in some families: for Syrphidae Ball and Morris (2014), and reviews using the latest IUCN criteria currently awaiting publication for 'Larger Brachycera', Dolichopodidae, Platypezidae and fungus gnats, thus excluding ten species with status in Falk (1991), including seven species of 'Larger Brachycera' that are being proposed for removal of status. In some other cases, e.g. craneflies, tephritids, sciomyzids, statuses are also likely to be reduced in future reviews.

The Diptera fauna is considered below for some of the families that were well represented or provided interesting finds in the Park, and for the habitats and compartments that received most sampling effort.

Fungus gnats (Bolitophilidae, Ditomyiidae, Diadocidiidae, Keroplatidae, Mycetophilidae)

The results obtained from trapping in 2010, including the new *Grzegorzekia* species, indicated that the Park might have an interesting fungus gnat fauna. On most visits in 2011 overall numbers of fungus gnats were low, probably due to the dry conditions, with greater numbers of individuals and species in the Waterhouse Plantation where the watercourses provided greater humidity than in Round Plantation, which has only a small ephemeral pond (that was dry in 2011, but contained some water in 2012). In 2011 123 species of fungus gnats were recorded, bringing the Park total to 142. On most visits in 2012 fungus gnats were generally sparser in numbers of both species and individuals than had been the case in 2011, with records of only 97 species. This was concluded to have been due to the effects of the previous year's drought and, although 2012 was wetter, there was no apparent recovery in their populations during the year, and there continued to be a downward trend in numbers in the subsequent years. The Park had evidently been well recorded for this group by 2012 with 156 species already known by then; only 4 species were added in 2013, 7 in 2014 and one so far in 2015, bringing the overall total for the Park to 168 (30 per cent of the British species), of which all but six had been recorded subsequent to 2010. Some of the more significant finds have been reported in newsletters (Chandler 2011, 2014a, 2015a).

Platypezidae (flat-footed flies)

This is another fungus-feeding group that is also well represented, with 11 of the 33 British species recorded in 2011-2012. They were very sparsely recorded in 2013 and 2014 (four species in each year), but these included three additions to the Park list, two of them in the newly recorded woodland (10d) north of Brewhouse Fields. These were *Paraplatypeza atra* which, like the rarer species of this genus *P. bicincta* recorded in 2011, develops in the gill fungus *Pluteus cervinus* growing on wood, and *Bolopus furcatus*, whose host is *Polyporus squamosus* – there is a colony on a fallen trunk near the Longford River. Three species that develop in honey fungus *Armillaria* spp (*Platypeza consobrina*, *Protoclythia modesta*, *P. rufa*) were recorded in Round Plantation on 30 September 2011, running about on sycamore leaves (where they feed on honeydew), when no honey fungus was apparent. On 7 October honey fungus caps were prolific there but no platypezids were found; they had presumably oviposited when the fungus appeared but it was still too fresh for larvae to have become obvious. By 1 November no trace of honey fungus remained there. Among the other platypezids recorded, *Agathomyia* and *Polyporivora* species develop in *Bjerkandera* and *Trametes* brackets and *Callomyia* species on encrusting fungi.

Syrphidae (hoverflies)

Only 45 species of hoverflies (Syrphidae) had been recorded from the Park up to 2010, and this has only increased to 61 by the present records, of which I have recorded a meagre 37 species, so

there should be plenty of scope for additions. Saproxylic species are surprisingly few in numbers; only five species in this category (*Myathropa florea* and two in each of the genera *Ferdinandea* and *Xylota*) had been recorded up to 2011. It was therefore encouraging to observe a male of the Nationally Scarce species *Mallota cimbiciformis* flying around a partly fallen hollow lime, in the avenue (area 15a) (Fig. 15) on 28 June 2012, having presumably emerged from this or one of the adjacent trees showing evidence of decay. This lime (Fig. 14), which had snapped 1.5m from the base, exposing the rotten heartwood and hollow base, has been left *in situ*, but the wood mould in the hollow base is now exposed so it is probably less suitable as a development site. Then in 2013 *Chalcosyrphus nemorum* was found on logs in the woodland garden, where the bulb fly *Merodon equestris* was also present in numbers. Altogether 10 species of hoverflies were added to the Park list in 2013 and 2014, including some wetland species by Heron Pond – *Anasimyia lineata*, *Helophilus hybridus* and *Neoascia tenur*, and two so far in 2015.

Baldock *et al.* (*op. cit.*) also mentioned an unconfirmed possible sighting of *Pocota personata* near the Willow Plantation (compartment 13c) on 1 July 2004, and I saw a possible *Brachypalpoides lentus* in that area in 2014, but the presence of these species in the Park awaits confirmation. The 28 species of syrphids recorded for Richmond Park include *Psilota anthracina* so that might be expected at Bushy Park. Further recording, and in different areas of the Park, should add substantially to records for hoverflies.

Micropezidae

An exciting addition in 2013 was *Rainieria calceata* (Fallén), a very distinctive saproxylic fly. One was swept around fallen trees in Waterhouse Plantation, and then several were seen running about on logs (Fig. 9) in the adjacent part of the woodland garden (exhibited by Chandler 2014e). It was long known in Britain only from Windsor Forest and Great Park, but was in recent years recorded at Burnham Beeches, Buckinghamshire and at sites in Surrey, including West End Common, Esher (Denton 2001), in the same hectad as the south of Bushy Park. At other sites it is found in association with decaying beech trunks and logs; there is presently no beech in the immediate vicinity of these observations, so it may be able to use decaying wood of other trees.

Conopidae

These were not recorded on my earlier visits, so it was pleasing in 2014 to find all three of the species previously recorded from the Park by Baldock *et al.* (2006) and an additional species *Leopoldius signatus* on 3 October 2014, at ivy flowers in two areas (10d and 11h), representing both hectads. It is a parasitoid of social wasps, known from other sites in S London and Surrey.

Tephritidae

Of 18 species recorded in 2014 11 were new records for the Park, bringing the total for this family to 23 species. Thirteen species, including nine of the additions were from the hay meadow area (11k) where *Villa cingulata* had been recorded and Chandler (2014c) commented on this richness. Most of these species were present in numbers and recorded on several visits. They included all five of the species that develop in flower heads of knapweed *Centaurea nigra*, including *Acinia corniculata* which was often conspicuous; although this species was designated as RDB1 by Falk (1991), it has been recorded more widely in recent years and probably justifies no more than Nationally Scarce status. The other knapweed species were *Chaetorellia jaceae*, *Chaetostomella cylindrica*, *Urophora jaceana* and *U. quadrifasciata*. The host plants of the other species recorded there were ragwort *Senecio jacobaea* (*Campiglossa malaris*, *Sphenella marginata*), creeping thistle *Cirsium arvense* (*Tephritis cometa*, *Terellia ruficauda*, *T. serratulae*), ox-eye daisy *Leucanthemum vulgare* (*Tephritis neesii*) and cat's ear *Hypochoeris radicata* (*Tephritis formosa*, *T. vespertina*). Elsewhere in the Park were found both species developing in burdock *Arctium* spp (*Tephritis bardanae*, *Terellia tussilaginis*), and *Anomoia purmunda* which develops

in hawthorn *Crataegus* fruits is often abundant. *Dioxyna bidentis*, which develops in burr marigold *Bidens*, was a surprising find by Heron Pond.

Clusiidae

Among saproxylic Diptera, Clusiidae were frequently recorded, with five of the 10 British species present; the uncommon species *Clusia* (= *Paraclusia*) *tigrina* was seen on most visits from July to November, and it was distributed through all the wooded areas investigated.

Drosophilidae

This family is well-represented at Bushy Park, with 29 species, more than half of them fungus associated. Although eight of the 19 species identified from the 2010 trapping have not yet been recorded again, there are ten additions, and the Bushy Park records have already been published for two of them (Chandler 2014b, 2014d). These were *Phortica variegata*, recorded in Waterhouse Plantation, which visits sap runs as an adult, though its larval biology is not known, and *Drosophila suzukii*, a recent arrival in Britain (Harris and Shaw 2014), which was found in several parts of the Park in 2014 – it develops in soft fruit including blackberries and elderberries, and has already become widespread at least in S England. *Hirtodrosophila trivittata* is probably also a new arrival, first recorded in Britain in 2008; it develops in oyster mushrooms *Pleurotus* spp and is known from localities scattered across southern England. It was numerous on its host fungus in Waterhouse Plantation in 2011 and 2012, but has not been seen in the subsequent years.

Comments on results in some of the compartments

Because of the trapping in Round Plantation in 2010 and the concentration on recording fungus gnats in the 2011-2012 visits, where most attention was given to that area and to Waterhouse Plantation (both enclosed areas of non-intervention woodland), these remain the best-recorded areas for Diptera in the Park. The total Diptera list for Round Plantation is now 490 species, and for Waterhouse Plantation it is 450 species (521 for the enclosed area also including compartments 13a and 13d). These areas are thus important for woodland Diptera, including saproxylic and mycophagous species, and have a high diversity of fungus gnats with 116 species recorded in Round Plantation, and 132 in Waterhouse Plantation, with 87 species in common, from a Park total of 168. Only seven species of fungus gnats have so far been recorded only from areas of the Park other than Round and Waterhouse Plantations.

As pointed out by Overall (2010a), the enclosed and unenclosed plantations differ considerably, in that the latter (Warren, Half Moon and Oval Plantations) are accessible to deer, and so lack an understorey (see Fig. 16 of Warren Plantation) or (in case of Oval Plantation) any ground vegetation. Though he noted that the enclosed woodlands were affected by invasive sycamore and rhododendron, he found the southern and western parts of the Waterhouse Plantation to be the richest area for fungi in the Park, attributing this to the increased shelter in this area. The detailed compartment lists of fungi show that Round Plantation was not sampled by him, and his reference to the worst overgrazing evidently refers to Oval Plantation.

Round Plantation (compartment 19) (Figs 4-6)

This is a relatively small enclosed woodland, dominated by oaks but infilled by sycamore, other trees and rhododendron, with frequent fallen dead wood. Brambles and other undergrowth restrict access to some extent, though paths have now been laid out (since autumn 2014, Fig. 4). It is surrounded by the open parkland with more scattered oaks. Thanks to the 2010 trapping and frequent subsequent visits this is the best recorded compartment for Diptera at Bushy Park; of the 490 species recorded, a remarkable diversity for such a small area, 117 have yet to be found elsewhere in the Park. As well as *Grzegorzekia bushyae*, a second Diptera species *Trixoscelis canescens* (Loew) (Trixoscelididae) was first recognized as British from specimens trapped here

in 2010. It was also found in 2012 during a survey of the garden of Clarence House, and has in 2015 been found at two other locations in Bushy Park; this species is to be formally added to the British list elsewhere.

Fig 4. Round Plantation, viewed from the entrance: the recently cut path was bramble covered until 2014.

Figs 5-6. Standing dead tree and fallen trunks in shadier parts of Round Plantation.

Figs 7-8. Waterhouse Plantation: one female of *Rainieria calceata* was found around the fallen trunks on the left, and *Chrysopilus laetus* was found near the stump on the right.

Figs 9-10. The woodland garden: several *Rainieria calceata* were found around these logs.

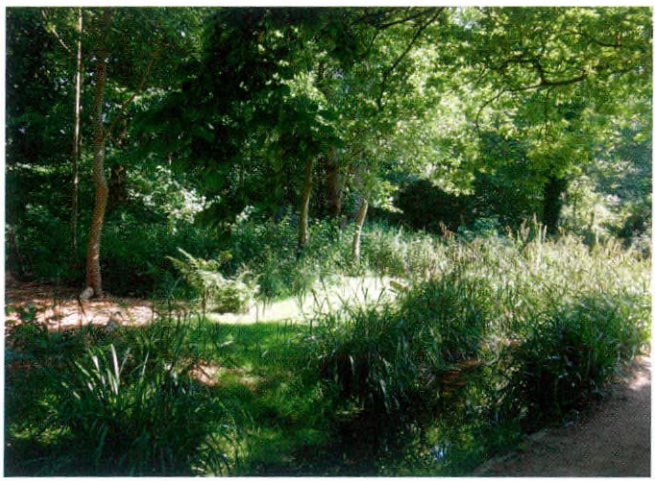

Fig. 11. The woodland garden: the small area of swampy woodland at the west end.

Fig. 12. Acid grassland in compartment 12a, looking towards Round Plantation; ant hills can be seen, most obviously at the bottom left.

Fig. 13. The Longford River, looking north from the bridge at the north end of compartment 10c of Brewhouse Fields, towards the wooded banks in compartment 10d.

Fig. 14. The lime avenue (compartment 15a): the partly fallen tree on which *Mallota cimbiciformis* was observed in 2012.

Fig. 15. The lime avenue, looking east from the tree shown in Fig. 14; most trees have mistletoe in their crowns.

Fig. 16. Warren Plantation, showing fallen trunks and a standing dead tree, which harboured a wasp's nest.

Fig. 17. Compartment 11k: the hay meadow that is the habitat of *Villa cingulata* and many other grassland Diptera, including 13 species of Tephritidae (left looking north; right looking east and including mown path).

Fig. 18. Brewhouse Fields (compartment 10a): in this immediate area *Cistogaster globosa* was visiting the *Daucus carota* flowers.

Fig. 19. Heron Pond, from east end, showing the increasingly vegetated shore line, providing the richest habitat around this pond for Diptera.

Fig. 20. Millennium Wood, showing open planting in acid grassland around the periphery.

Fig. 21. Millennium Wood, the central lime grove.

Waterhouse Plantation (compartments 13b = British Woodland, 13c = Willow Plantation) (Figs 7-8, taken in 13b)
These areas adjoin the woodland garden and together form a more substantial block of woodland, with a greater diversity of trees. It also has a good quantity of fallen dead wood. The cranefly *Gnophomyia viridipennis* was seen in numbers in 13c around a fallen dead poplar on 14 August 2011, and then recorded in 13b on 30 September, but it has not been seen in the Park more recently. A male of *Chrysopilus laetus* (Rhagionidae) was found around a stump here (Fig. 8) on 1 July 2015; otherwise it had been recorded only in the 2010 trapping at Round Plantation. Some other saproxylic species found here (e.g. *Rainieria*, *Phortica* and *Hirtodrosophila trivittata*) are discussed above.

The woodland garden (compartment 13d) (Figs 9-11)
In 2013 the area at the west end (Figs 9-10) near the ponds was where *Rainieria*, *Chalcosyrphus* and *Merodon* were found (see above). The central wooded area surrounded by ditches, and the small swampy wooded area at the east end (Fig. 11) have been most productive of Diptera, adding a number of craneflies to the Park list. These areas provided several cranefly records, with *Molophilus bifidus*, *Phylidorea ferruginea* and *Pseudolimnophila lucorum* in the first area and *Neolimnomyia adjuncta* and *Limonia macrostigma* in the latter, all being new records for the Park. This swampy area also added *Ptychoptera lacustris* (Ptychopteridae), *Hemerodromia unilineata* (Empididae) and *Renocera pallida* (Sciomyzidae). The uncommon saproxylic fly *Megamerina dolium* (Megamerinidae) was found here on 1 July 2015. Altogether 155 species were recorded in compartment 13d, including 17 species of craneflies; a further 34 species had been recorded in earlier surveys, giving a total of 189 species for this area.

Acid grassland (compartments 12a and 12b) (Fig. 12)
Recording was concentrated initially on these compartments because of their proximity to Round and Waterhouse Plantations. The high diversity found indicated this to be a rich habitat in the Park, with the diversity benefiting from the relatively light intensity of grazing. The acid grassland here produced records of 138 species (a further 6 recorded in earlier surveys), suggesting great potential for other areas of acid grassland in the Park.

The abundance of the predatory robberflies (Asilidae) of the genus *Dioctria* (*D. atricapilla*, *D. rufipes*, with *D. baumhaueri* becoming dominant later in the season) in this area indicated that a good range of prey species was present. Sciaridae, Chloropidae, Chamaemyiidae, Pipunculidae, Tephritidae and calyptrates were also present in numbers. Other areas of acid grassland in the Park evidently have potential for contributing to the rich biodiversity of this locality. A single example of the asilid *Dysmachus trigonus*, new to the Park list, was seen in another grassland area (23l) on 28 June 2012. In 2011, both in 12a and the similar compartment 25b, large swarms of the anthomyiid *Calythea nigricans* were using lower branches of the parkland oaks as markers; this species is known to develop in herbivore dung – it has not been recorded from deer dung, but that seems the most likely larval habitat in the Park.

Hay meadow areas (compartments 10a-c, 11k and part of 11h) and wooded margin of the Longford River opposite Waterhouse Plantation (11h) (Figs 17-18)
These areas have a number of species in common with the deer-grazed acid grassland of the public areas of the Park, but also a good number of new records for the Park, particularly reflecting the floristic differences between these habitats. Compartment 11k (Fig. 17), where *Villa cingulata* had been recorded by Martin Harvey in 2013, was visited on seven occasions from 23 May to 29 August 2014. By the last of these dates it had been mown and little was then flying, so it was omitted from later visits in that year; it was also visited on 30 July 2015, when ragwort had been pulled in preparation for mowing. Altogether 118 species of Diptera were recorded; a further two

were recorded by Martin Harvey in 2013. *Villa cingulata* was observed on two occasions in 2014 and a note describing its courtship behaviour was published by Chandler (2014c), who also emphasised the richness of the tephritid fauna. A few *Villa cingulata* and the asilid *Machimus cingulatus* were seen settling on the central mown path on 30 July 2015; Martin Harvey had also observed *V. cingulata* there on 18 July 2015. The tachinid *Zophomyia temula* and the grassland asilids *Dioctria atricapilla* and *Leptogaster cylindrica* occurred here and in the similar habitat in Brewhouse Fields (see below). Overall 32 species were found by the author only in this area, including four of the tephritids and the conopid *Physocephala rufipes*; the tachinid *Nowickia ferox*, recorded by Martin Harvey, has not been seen elsewhere in the Park.

Brewhouse Fields apparently had a less diverse fauna than compartment 11k, although much larger with a similar flora and subject to similar management, and it had produced some good results in earlier surveys. In the wetter areas, the asteiid *Asteia concinna* was present locally. *Empis tumida*, found here in 2014, had previously been seen in Millennium Wood in 2012, when an aerial swarm of males was observed in a glade. Another large tachinid of open habitats, *Estheria cristata*, was previously seen in 2012 near Heron Pond. On 30 July 2015 several of the small rotund tachinid *Cistogaster globosa*, at wild carrot *Daucus carota* flowers in compartment 10a (Fig. 18), provided a welcome addition to the Park fauna.

Compartment 11h includes part of the hay meadows linking 11k to Brewhouse Fields, and a wooded strip alongside the Longford River opposite Waterhouse Plantation. A mixture of 153 grassland and woodland species were recorded in this area (only 16 in common with 11k). The first sighting of *Leopoldius signatus* (see above) at ivy flowers was made here, and then it was seen later in the day in 10d (see below). The dolichopodids *Sciapus longulus* and *Scellus notatus* were new records for the Park, among 12 species of Diptera not recorded in other areas.

Woodland north of Brewhouse Fields (compartment 10d) (Fig.13)
This area of woodland alongside the Longford River contains a number of fallen trees and log piles and evidently supports a similar range of woodland Diptera to Round and Waterhouse Plantations, with a number of additional species not already found at those sites. It was first visited on 1 August 2013 and there were two further visits in that year, five in 2014 and one in 2015, with an overall total of 177 species; only two others had been recorded here previously. These included 49 species of fungus gnats, of which two were new records for the Park. Two additions in Platypezidae and *Leopoldius* (Conopidae) have been mentioned above.

Heron Pond (compartments 23b and c) (Fig.19 and inside front cover)
This was visited twice in June 2013 and once each in July and August 2014 and August 2015, producing a different range of species according to the season, with 118 species of Diptera recorded, including 19 not seen elsewhere in the Park. The narrow fringe of wetland vegetation around the margins was rich in species associated with this habitat, including the ptychopterids *Ptychoptera albimana* and *P. contaminata*, the tephritid *Dioxyna bidentis* (see above), four species of sciomyzids (*Elgiva solicita*, *Limnia unguicornis*, *Pherbina coryleti*, *Tetanocera ferruginea*), three species of wetland syrphids (see above), the scathophagid *Spaziphora hydromyzina* and the muscid *Spanochaeta dorsalis*. It was also pleasing to find the stratiomyid *Vanoyia tenuicornis*.

Millennium Wood (compartment 24q) (Figs 20-21)
This small recently planted enclosure at the east end of Bushy Park, still quite open (Fig. 20) apart from a central grove of limes (Fig. 21), was visited in June 2012, June 2013, July 2014 and August 2015. These visits produced records of 62 species. The remaining grassland here contained ant hills as elsewhere in the Park and probably accounted for the freshly emerged hoverfly *Chrysotoxum cautum* on the 2013 visit. On the 2014 visit, lime flowers were attracting many

insects; the tephritid *Anomoia purmunda*, was numerous on the limes, and on the hawthorns in whose fruit it develops in 2015. The thistle-feeding tephritid *Xyphosia miliaria* was found here and in the acid grassland compartment 12a, but was not seen in the hay meadow areas.

Acknowledgements

I am grateful to Martin Drake for bringing fungus gnats from Bushy Park to my notice, which led me to start visiting the Park; Nigel Reeve for conducting me around Bushy Park on my first visit, for enabling me to continue recording Diptera there subsequently and supplying the map in Fig. 3; the park staff for facilitating access throughout my visits and supplying the compartment map; Claudia Watts for supplying me with previous data on the Diptera and other organisms of Bushy Park; Julia Clark and Samantha Wilkinson for information on the Park and enabling me to take part in a fungus foray there in 2014; Erica McAlister for assistance with recording on two field visits; Martin Harvey for information on his find of *Villa cingulata* and other Diptera recorded by him, and for the Bushy Park data from the Soldierflies and Allies Recording Scheme; Jonty Denton and Peter Sutton for information on their Diptera records; David Gibbs and Peter Langton for identification respectively of Pipunculidae and Chironomidae.

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Species List

All species of Diptera known to have been recorded at Bushy Park are listed, bringing the total Diptera recorded in the Park to 1037 species. Nomenclature follows the latest version of the Diptera checklist (http://www.dipteristsforum.org.uk).

Species recorded during the author's visits from 2011 onwards, and the compartments in which they have been found, are indicated in black type. Where a species had been recorded previously in a compartment, the respective compartment is asterisked; this mostly applies to those species found in compartment 19 in the 2010 survey.

Species recorded in previous surveys but not found by the author are shown in red, as are the additional compartments in which earlier records were made. The recorder's initials are given as follows for the latter records except, for reasons of space, against 22 common and widespread species, where only the compartments are listed:

DB David Baldock, DL David Leeming, JD Jonty Denton, MH Martin Harvey, NR Nigel Reeve, PH Peter Hodge, PS Peter Sutton.

Explanation of symbols used:

* = recorded from this compartment in earlier surveys, as well as by the author
† = saproxylic species without known fungus association (104)
‡ = associated with saproxylic fungi or myxomycetes, some also in terrestrial fungi (129)
†‡ = both dead wood and fungus association (7)
≠ = present conservation status (53)
↕ = recent addition to the British list and as yet without proposed status (6)

Species	Compartments	Months	Latest year
TIPULIDAE			
Nephrotoma appendiculata	12a,13d,23f(JD)	6-8	**2004**
Nephrotoma flavipalpis	10d,13d,19	7,8	**2015**
Nephrotoma quadrifaria	10d,11h,13b,19*	5,6,7	**2015**
†*Tipula confusa*	12a,19	10	**2014**
Tipula fascipennis	11k,13b,23b,24q	6,7	**2014**
Tipula fulvipennis	13b,d	7,9	**2014**
≠*Tipula helvola*	13b,19*	7,8	**2014**
†*Tipula irrorata*	13b	8	**2012**
Tipula lateralis	13b,23b	7,9	**2014**
Tipula lunata	13c	5	**2012**
Tipula oleracea	19,23b	6,7	**2014**
Tipula paludosa	12a*,23b(DL)	9	**2011**
Tipula pierrei	21f(DL)	6	**2004**
Tipula varipennis	19	5,6	**2013**
Tipula vernalis	19,12a,23f,24n(JD)	5,6	**2013**
PEDICIIDAE			
‡*Ula mollissima*	13b,c,19	8,9,10	**2014**
‡*Ula sylvatica*	13b,d,19	9,10	**2014**
LIMONIIDAE			
Chioneinae			
Cheilotrichia cinerascens	14a	11	**2014**
Erioconopa trivialis	15a,11h	6,10	**2013**
Ellipteroides lateralis	13b,d	7	**2015**
Erioptera lutea	10d,13b,d	9,10,11	**2014**
†≠*Gnophomyia viridipennis*	13b,c	8,9	**2011**
Gonomyia recta	13b	6,8	**2012**
Ilisia maculata	10d,13b,14a	7,8	**2015**
Molophilus appendiculatus	13a,d,11h	5,6,7,8	**2015**
Molophilus bifidus	13d	7	**2014**
Molophilus griseus	23b	6	**2013**
Molophilus medius	11h,13b	5,6	**2014**
Molophilus obscurus	11k	8	**2014**
Molophilus ochraceus	13a,d	6,8	**2014**
Ormosia nodulosa	10d,19	5,6,8	**2014**
Rhypholophus bifurcatus	13b	9	**2011**
Symplecta hybrida	19	8	**2011**
Symplecta stictica	10d,12a,13b,19,24q	5,6,7,8	**2015**
Limnophilinae			
†*Austrolimnophila ochracea*	10a(NR),10d,12a,13b,c,d,19*	5,6,7,8,9,10	**2015**
Dicranophragma nemorale	10d,22c(DL)	6,7	**2014**
†*Epiphragma ocellare*	13b,c,19	5,6	**2013**

Neolimnomyia adjuncta	13d	8	**2014**
Paradelphomyia senilis	10d,11h,13a,b,d,19	5,6,7,8,9,10,11	**2014**
Phylidorea ferruginea	13d,23b	7,8	**2015**
Pilaria discicollis	10d,11h,13a,b,d,g(DL)	5,6,7,8,9,10	**2014**
Pseudolimnophila lucorum	13d	7	**2014**
Pseudolimnophila sepium	13b	7,9	**2012**
Limoniinae			
‡*Achyrolimonia decemmaculata*	13b,c,19	8,9,10	**2014**
‡≠*Atypophthalmus inustus*	10d,13b,c	6,7,8	**2014**
Dicranomyia chorea	11h	7	**2014**
Dicranomyia fusca	13b,d	8	**2014**
Dicranomyia modesta	13b,d,19	10,11	**2014**
Limonia macrostigma	13d	8,10	**2014**
Limonia nubeculosa	10d,11h,13a,b,c,d,14a,19*	6,7,8,9,10	**2015**
Limonia phragmitidis	10d,19	5	**2014**
†*Neolimonia dumetorum*	10d,13a,b,c,19*	5,6,7,8,9	**2014**
†≠*Rhipidia ctenophora*	10a(NR)	7	**2010**
Rhipidia maculata	10c,11h,13b,c,d,14a,19,24q	6,7,8,9,10,11	**2015**
BIBIONIDAE			
Bibio johannis	13c	4	**2012**
Bibio lanigerus	13b,c	4	**2012**
Bibio nigriventris	19	6	**2013**
Dilophus febrilis	11k,19,23b,25f(NR)	7,8	**2015**
Dilophus femoratus	11k,12a,13c,19*,24q,25f(NR)	5,6	**2014**
BOLITOPHILIDAE			
‡*Bolitophila saundersii*	10d,13d,19	10,11	**2014**
Bolitophila glabrata	13b	10,11	**2011**
‡*Bolitophila occlusa*	13b,19	9,10	**2013**
‡*Bolitophila pseudohybrida*	14a	11	**2014**
DITOMYIIDAE			
‡*Symmerus annulatus*	13b,c,19*	6,7	**2013**
DIADOCIDIIDAE			
‡*Diadocidia ferruginosa*	10d,11h,13b,c,d,19	4,6,7,8,9,10	**2015**
KEROPLATIDAE			
‡*Cerotelion striatum*	13b,c,19(NR),23b/c,26	6,8,9	**2012**
‡*Keroplatus testaceus*	13b,c	9,10,11	**2011**
†*Macrocera anglica*	19(NR)	7	**2010**
†*Macrocera centralis*	10a(NR),19*,24q	6,7,8,9,10	**2014**
Macrocera fasciata	11h,13b,c,19	6,8,9,10	**2014**
Macrocera lutea	13c,19,	8,9	**2012**
Macrocera nigricoxa	11h,13b,c	9,10	**2014**
Macrocera phalerata	10a(NR),11h,13b,c,19*,24q	5,6,7,8,9,10	**2014**
†*Macrocera stigma*	10a(NR),13b,c	6	**2013**
†*Macrocera stigmoides*	10c,d,13b,c,15a,19	5,6,7,9,10	**2015**
†*Macrocera vittata*	10d,13b,c,19	5,6,8,10	**2014**
†*Macrorrhyncha flava*	13b,19(NR)	7	**2015**
Neoplatyura modesta	10a(NR),11h,13b,19*	8,9	**2014**
‡*Orfelia fasciata*	13b,19*	6,7	**2013**
Orfelia lugubris	13d	7	**2015**
†*Orfelia nemoralis*	19,24q	6	**2013**
‡*Orfelia ochracea* [= *unicolor*]	19(NR)	7	**2010**
Pyratula zonata	13b,19*	6,7	**2012**

MYCETOPHILIDAE			
Gnoristinae			
‡*Apolephthisa subincana*	19(NR)	7	**2010**
‡*Boletina gripha*	13b,c,15a,19*	4,9,10,11	**2012**
Boletina nitida	13b,c,19	9,10,11	**2011**
Boletina sciarina	19(NR)	10	**2010**
Boletina trispinosa	19	9,10	**2012**
‡*Coelosia tenella*	12a,19	8,10	**2012**
‡*Ectrepesthoneura hirta*	23b/c	6	**2012**
↕*Grzegorzekia bushyae*	13b,19(NR)	7,8	**2011**
‡≠*Grzegorzekia collaris*	13b,19(NR)	6,9	**2012**
†*Saigusaia flaviventris*	13c	9	**2011**
Synapha fasciata	19*	5,6,7,8	**2013**
Synapha vitripennis	19*	5,6,7,9,10	**2013**
‡*Tetragoneura sylvatica*	19*	6,7,8,9	**2012**
Leiinae			
Docosia fumosa	19(NR)	7	**2010**
‡*Leia bimaculata*	10a(NR),13b	6	**2014**
Leia fascipennis	10a(NR),10d,11h,13c,19*	5,7,8,9	**2014**
‡*Leia winthemii*	13c,14a,19	7,8,9,11	**2014**
Megophthalmidia crassicornis	19*	5,7,910	**2012**
Mycomyinae			
‡*Mycomya cinerascens*	10d,13a,b,c,19*	6,7,8,9,10,11	**2014**
Mycomya circumdata	13b,c,d,19*	5,6,7,8,9,10	**2014**
Mycomya flavicollis	13b,19(NR)	7,10	**2011**
‡*Mycomya marginata*	10d,13b,c,19(NR)	6,9,10	**2014**
Mycomya parva	13b,19	7,8,9	**2014**
Mycomya tenuis	19	10	**2011**
‡*Mycomya wankowiczii*	13b,c	8,9	**2012**
Sciophilinae			
Acnemia nitidicollis	13b,c,19*	7,8,9,10	**2014**
‡*Leptomorphus walkeri*	19	9	**2011**
Megalopelma nigroclavatum	10d,11h,13c,19*	9,10	**2013**
‡*Monoclona rufilatera*	10c,d,13b,c,19*	4,5,7,8,9,10,11	**2014**
Sciophila fenestella	10c,d	7,10	**2014**
‡*Sciophila hirta*	10d,19	6,8	**2014**
‡*Sciophila lutea*	13c,19	9	**2011**
Mycetophilinae - Exechiini			
‡*Allodia grata*	10d,13b,19	10,11	**2014**
‡*Allodia lugens*	19(NR)	10	**2010**
‡*Allodia ornaticollis*	13a,b,c,19	6,7,10,11	**2014**
Allodia zaitzevi	13b	11	**2011**
Allodiopsis domestica	23b/c	6	**2013**
Allodiopsis rustica	10d,11h,13a,b,c,14a,19*	5,6,7,8,9,10,11	**2014**
Anatella turi	13b	11	**2011**
‡*Brachypeza bisignata*	10d,13b,c,19	7,8,9	**2014**
‡*Brachypeza radiata*	13c	9	**2011**
Brevicornu fissicauda	13d,24q	7,8	**2014**
Brevicornu fuscipenne	10d	10	**2014**
Brevicornu griseicolle	10d,11h,13b,c,d,14a,19	5,6,7,8,9,10,11	**2014**
Brevicornu proximum	13c	9	**2011**
Brevicornu sericoma	13a,b,c,19	6,8,9,10,11	**2014**

Brevicornu verralli	13b	7	**2012**
Cordyla brevicornis	13c,19*,25f(NR)	7,9,10	**2011**
Cordyla crassicornis	10d,13a,b,c,19*	7,8,9	**2015**
Cordyla fissa	15a,19*	6,8	**2013**
Cordyla fusca	19	10	**2014**
Cordyla murina	13c,19*	5,7,8	**2012**
Cordyla pusilla	12a,13b,c,19	7,8,9,10	**2014**
‡*Exechia bicincta*	10d,13b	10	**2013**
Exechia cincta	10d,13b,19*	9,10	**2013**
Exechia contaminata	13b	10	**2011**
≠*Exechia dizona*	13b	10	**2011**
Exechia dorsalis	10a(NR),13b,c,19	9,10,11	**2011**
Exechia exigua	19	11	**2011**
‡*Exechia fusca*	10d,11h,13b,c,14a,19*,26	6,9,10,11	**2014**
Exechia nigroscutellata	19	11	**2011**
‡*Exechia parva*	13b	11	**2011**
Exechia seriata	13b,d,19	9,10,11	**2014**
Exechiopsis intersecta	10d,13b	10	**2013**
Exechiopsis leptura	13b	7	**2012**
Exechiopsis unguiculata	13b	9,10	**2012**
Pseudexechia trivittata	13b,c	9,10,11	**2014**
Pseudobrachypeza helvetica	13c	9	**2011**
Rymosia fasciata	11h,13b,c,d	10,11	**2014**
Rymosia placida	13c	10	**2011**
‡*Stigmatomeria crassicornis*	10d,13b,19	4,6,7,8,9,10,11	**2013**
‡*Synplasta gracilis*	13b,c,14a,19(NR)	10,11	**2014**
‡*Tarnania fenestralis*	11h,19,14a	10,11	**2014**
Mycetophilinae - Mycetophilini			
‡*Dynatosoma fuscicorne*	10d,13b,19	5,7,8	**2013**
‡*Epicypta aterrima*	13b,c,19	7,8,9,11	**2014**
‡*Mycetophila abiecta*	13b,c	10,11	**2014**
‡*Mycetophila adumbrata*	10d,13a,b,19	5,7,8,9	**2014**
Mycetophila alea	13b,c,19*	8,9,10,11	**2011**
‡*Mycetophila autumnalis*	19	7,8,10	**2015**
‡*Mycetophila britannica*	10d,11h,13b,c,d,14a,19*	5,6.7,8,9,10,11	**2014**
≠*Mycetophila caudata*	11h,13b,19	8,9,10	**2014**
‡*Mycetophila cingulum*	10d,13b,c,d,19	7,8,9,10	**2015**
Mycetophila curviseta	10d,11h,13b,19*	8,9,10,11	**2014**
‡*Mycetophila dentata*	13b,c,19	8,9	**2012**
Mycetophila edwardsi	13b	9,10	**2012**
≠*Mycetophila eppingensis*	13c,19*	7,8,10	**2012**
‡*Mycetophila forcipata*	13b	5,6	**2013**
‡*Mycetophila formosa*	13d,16c	8,9,10	**2014**
‡*Mycetophila fraterna*	11h,13b,c,14a	9,10,11	**2014**
‡*Mycetophila fungorum*	11h,13b,c,19*	8,9,10,11	**2014**
‡*Mycetophila ichneumonea*	10d,11h,13b,19*	6,7,8,10,11	**2015**
Mycetophila lamellata	10d,13b	5,6,7,8	**2014**
≠*Mycetophila lastovkai*	13b,19	6,7,8	**2014**
‡*Mycetophila luctuosa*	13c,19	8,9,10	**2012**
‡*Mycetophila lunata*	10d,11h,13b	7,8,9,10,11	**2015**
‡*Mycetophila marginata*	10d,13b,19	6,9,10,11	**2013**
Mycetophila mitis	10d	7	**2014**

Mycetophila occultans	13b,c,19	8,9,10	**2012**
‡*Mycetophila ocellus*	10d,11h,13b,c,19	6,8,9,10	**2014**
‡*Mycetophila ornata*	10a(NR),13b	6,8,10	**2012**
Mycetophila perpallida	13b,19*	9,10,11	**2014**
‡*Mycetophila pictula*	10d,13b	6,7,8	**2014**
‡*Mycetophila pumila*	10d,13b,19	8,9,11	**2013**
Mycetophila rudis	13b,c,19*	8,10,11	**2012**
‡*Mycetophila ruficollis*	13b	11	**2011**
Mycetophila sepulta	13a	8	**2012**
‡*Mycetophila sigmoides*	13b,c,19	8,9,10	**2014**
Mycetophila signatoides	11h,13b,c,19*	9,10	**2014**
Mycetophila strigata	13b,c	9,10	**2011**
Mycetophila stylata	13b	9	**2012**
‡*Mycetophila tridentata*	10d,11h,13b,c,19,25f(NR)	6,7,8,9,10	**2014**
‡*Mycetophila trinotata*	10d,11h,13a,b,c,d,19	6,8,9,10,11	**2014**
Mycetophila unicolor	13b,d	9,10	**2014**
‡*Mycetophila vittipes*	13b,19	9,11	**2012**
‡*Phronia biarcuata*	10d,13b,c,19	7,10,11	**2014**
‡*Phronia braueri*	19	11	**2011**
‡*Phronia conformis*	10d,13b,c,d,19*	7,9,10,11	**2014**
‡*Phronia coritanica*	13b	8	**2011**
Phronia forcipata	13d	7	**2014**
↕*Phronia forcipula*	13b	9	**2011**
‡*Phronia humeralis*	10d,13b,c,14a	7,8,9,11	**2014**
Phronia nigricornis	10d,13b,19*	8,9,10,11	**2013**
Phronia notata	13b,d,19*	7,8,9,10	**2014**
Phronia obtusa	13b	6,9	**2012**
Phronia strenua	13b,19	10,11	**2011**
‡*Phronia tenuis*	10d,13b,c,19*	6,7,9,10	**2014**
Phronia triangularis	13b	6,8	**2012**
‡*Platurocypta punctum*	13b,c,d,19	8	**2014**
‡*Platurocypta testata*	10d,13a,b,c,19*	7,8,9,10	**2014**
Sceptonia cryptocauda	10d,26	6,8	**2013**
Sceptonia flavipuncta	13b,19	7,8,9	**2014**
Sceptonia fumipes	11h,19	8,9,10	**2014**
Sceptonia membranacea	10d,11h,13b,c,d,19*	5,7,8,9,10,11	**2014**
Sceptonia nigra	10d,12a,13b,c,d,19	6,7,8,9,10,11	**2014**
≠*Sceptonia tenuis*	19	10	**2011**
Trichonta clavigera	19	8	**2012**
‡*Trichonta melanura*	13b,c,19	9,10,11	**2014**
‡*Trichonta vitta*	13b,19	5,8,9,10	**2014**
Zygomyia humeralis	10d,11h,13b,c,14a,19*	5,6,8,9,10,11	**2014**
Zygomyia notata	19*	8,9,10,11	**2011**
‡*Zygomyia pictipennis*	13a,c,d,19*	8,9,10	**2013**
‡*Zygomyia pseudohumeralis*	13b,c,19(NR)	9,10	**2011**
Zygomyia valida	13b,19*	8,10,11	**2014**
Zygomyia vara	10d,19*	10	**2014**
SCIARIDAE			
Bradysia cinerascens	13c	11	**2011**
†*Bradysia fungicola*	10c	10	**2014**
Bradysia giraudii	12a	10	**2012**
Bradysia nitidicollis	12a,15a,23o,24q,26	6,7,8	**2015**

Bradysia placida	13a,b,19,28	6,8,9,10,11	**2012**
Bradysia signata	10c	10	**2014**
Bradysia trivittata	12a,19,23b,24q	7,8,10	**2014**
Corynoptera flavicauda	13b,c,15a,26	5,6	**2013**
‡*Corynoptera forcipata*	13b,19	7,8,9	**2014**
†*Cratyna nobilis*	12a,16d	7,8	**2015**
Cratyna vagabunda	?(6/1940,? collector),12a	7	**2012**
‡*Ctenosciara hyalipennis*	13b,c,d,19*,24q,28	6,7,8,9	**2015**
Leptosciarella fuscipalpa	12a,13c	4,9	**2012**
†*Leptosciarella rejecta*	10d,11h,13b,c,14a,15a,19	5,6,7,8,9,10	**2014**
†*Leptosciarella scutellata*	19	8	**2012**
Leptosciarella subpilosa	13c,19*	7,8,10	**2012**
†*Leptosciarella trochanterata*	10d,13b,c,19,24q	5,6,8,9	**2014**
‡*Lycoriella ingenua*	11h,13c	7,10	**2014**
Phytosciara flavipes	10d,11h,12a,13b,c,d,14a,19	5,6,7,8,9,10,11	**2014**
†‡*Scatopsciara atomaria*	13b,19,28	6,9	**2012**
Scatopsciara multispina	12a	8	**2012**
Schwenckfeldina carbonaria	10d,11k,12a,13a,b,c,d,15a,19	8,9	**2014**
†*Scythropochroa radialis*	13b	6	**2012**
Trichosia confusa	11h,13b,c,19	6,7,9	**2013**
†*Trichosia morio*	10d,13b,c,d	5,6,8,9	**2014**
Trichosia splendens	13b	7,8,9	**2012**
†‡*Zygoneura sciarina*	10c,13b,c,d,19	5,6,7,8,9,10,11	**2014**
PSYCHODIDAE			
Boreoclytocerus ocellaris	10d,11h,13a,c,23o	4,8,10	**2015**
Pericoma compta	19,11h	9,10	**2014**
Pericoma fuliginosa	10d,11h,13a,b,c	6,7,8,9,10	**2014**
Pericoma nubila	11h,12a,13b,c,d,19,23b	6,7,8,9,10	**2014**
Pericoma pilularia	11h	9	**2013**
Pericoma trivialis	10c*,d,11h,13a,b,c,d,g,21j,23b,3c	5,6,7,8,9,10,11	**2015**
Peripsychoda auriculata	23b	8	**2015**
Peripsychoda fusca	21j(DL)	6	**2004**
Philosepedon humeralis	10d,11h,13b,c,19	5,6,7,8,9,10	**2014**
Psychoda albipennis	19	10	**2011**
‡*Psychoda cinerea*	19	8	**2012**
†*Telmatoscopus advenus*	13b	6	**2012**
Telmatoscopus goetghebueri	13c	5	**2012**
Telmatoscopus morulus [= *vaillanti*]	13b	5	**2012**
Tonnoiriella pulchra	10e,13c,f,30a(DL)	6,7,9	**2012**
†*Trichomyia urbica*	10d,13a,b,c,19	6,7	**2015**
Vaillantodes [= *Vaillantia*] *miksici*	20a	7	**2011**
TRICHOCERIDAE			
‡*Trichocera annulata*	10d,11h,13b,d,14a,19*	9,10,11	**2014**
‡*Trichocera hiemalis*	10d,13b,19	10,11	**2014**
Trichocera major	13b,19	10,11	**2014**
Trichocera regelationis	11h,13b,13d,14a,19	9,10,11	**2014**
‡*Trichocera rufescens*	13c	10	**2011**
‡*Trichocera saltator*	10d,12a,13b,14a,19	4,9,10,11	**2014**
ANISOPODIDAE			
†‡*Sylvicola cinctus*	10a(NR),d,11h,13a,b,c,d,14a,19,20a	5,6,7,8,9,10	**2015**
Sylvicola punctatus	10a(NR),13c,d,19*,20a,25f(NR)	7,8,9	**2012**

MYCETOBIIDAE			
†*Mycetobia pallipes*	19(NR)	7	**2010**
SCATOPSIDAE			
Apiloscatopse picea	19	9,11	**2011**
‡*Apiloscatopse scutellata*	13c	9	**2011**
Colobostema triste	12a	9	**2012**
PTYCHOPTERIDAE			
Ptychoptera albimana	23b,o(DL)	6	**2013**
Ptychoptera contaminata	23b	6,8	**2015**
Ptychoptera lacustris	13d	8	**2014**
Ptychoptera minuta	14a,22c(DL)	7	**2004**
DIXIDAE			
Dixa nebulosa	10c,d,e,11h,13b,d*,14a,22c,25a,30a(DL)	6,7,8,9,10,11	**2015**
Dixella autumnalis	10b,c,22c,30a(DL)	6,7	**2010**
CHAOBORIDAE			
Chaoborus flavicans	10c,14a,b,21f,21j(DL)	6,7,8	**2014**
CULICIDAE			
Anopheles claviger	13d,21l(DL)	6,10,11	**2014**
Anopheles maculipennis agg.	10c,12b,13g,16f,17a,21f,22c,23a,n,o,30a	6,7	**2004**
Anopheles plumbeus	11h,13b,19	7,8,9,10,11	**2014**
Culex pipiens	10d,11h,13b,c,d,19,23o,24n,25f	6,7,8,9,10,11	**2014**
Culiseta annulata	10a,d,13a,b,c,14a,19	5,6,8,9,11	**2014**
Dahliana geniculata	13b	6	**2012**
Ochlerotatus annulipes	10d,13b	5	**2014**
SIMULIIDAE			
Simulium angustipes	19(NR)	7,8	**2010**
Simulium argyreatum	19(NR)	7	**2010**
Simulium aureum	25a(DL)	6	**2010**
Simulium erythrocephalum	10a,25f(NR)	6,7,8,10	**2010**
Simulium lundstromi	13d,30a(DL)	6,7	**2010**
Simulium noelleri	10a,23b(DL,NR)	6,10	**2010**
Simulium ornatum complex	13d,25a,f(DL,NR)	6,8	**2010**
CERATOPOGONIDAE			
Atrichopogon muelleri	10d,11h,13c,19	7,8,9,10	**2014**
Mallochohelea nitida	13d	7,8	**2015**
Palpomyia armipes	10d,13b	7,8	**2014**
Palpomyia flavipes	13b,d,23b	6,7	**2015**
Palpomyia grossipes	23b	7	**2014**
Palpomyia praeusta	13b	7	**2014**
Stilobezzia gracilis	13d	7	**2014**
Stilobezzia ochracea	10d,13b,d	7	**2015**
CHIRONOMIDAE			
Ablabesmyia monilis	16d	8	**2015**
Apsectrotanypus trifascipennis	11k	8	**2014**
Chironomus riparius	13b	7	**2014**
Cricotopus annulator	19	7	**2015**
Cricotopus bicinctus	11h,k,23o	7,8	**2015**
Cricotopus sylvestris	10d	7	**2015**
Dicrotendipes nervosus	11h	7	**2015**
Endochironomus tendens	10b,23o	7,8	**2015**
Glyptotendipes glaucus	10b,23o	8	**2015**
Microtendipes confinis	11k	8	**2014**

Microtendipes pedellus	11h,13b,16d,19	7	**2015**
Paratendipes albimanus	16d,19	7,8	**2015**
Polypedilum nubeculosum	11h,23o	7,8	**2015**
Procladius choreus	23b	8	**2015**
Procladius flavifrons	23b,o	8	**2015**
Procladius sagittalis	11h	7	**2015**
Stenochironomus gibbus	10d,11h,13b,15a	6,7,8	**2014**
Tanypus punctipennis	23b,c,o	8	**2015**
Thienemannimyia pseudocarnea	11k,19	7,8	**2015**
RHAGIONIDAE			
Chrysopilus asiliformis	10d,11h,13b,20a	7,8	**2015**
Chrysopilus cristatus	10d,13b,23c	6,7,8	**2015**
†≠*Chrysopilus laetus*	13b,19(NR)	7	**2015**
Rhagio lineola	10d,13b,d(JD),14c(DB)	7,8,9	**2015**
Rhagio scolopaceus	10a(NR),b,14c(DB,JD),19,23b,30a(JD)	6	**2013**
Rhagio tringarius	11k,12a,13b	6,7	**2014**
TABANIDAE			
Chrysops caecutiens	10d,11k,13b,c,14c(DB,PS)	6,7,8	**2015**
Chrysops relictus	10b,13d(JD)	7	**2004**
Haematopota pluvialis	10,13*,14,19,20,22,23,25,30	6,7	**2015**
Tabanus bromius	10a-c,11k,12a,13d*,14c,19*,23f,24n,23e	6,7,8,9	**2014**
XYLOMYIDAE			
†*Solva marginata*	?(5/1965,K.M. Harris),14c(DB),30a(JD)	6,7	**2004**
STRATIOMYIDAE			
Beris chalybata	10b,13d*,14b,c,19,21j,22b,30a(JD)	6,7	**2013**
Beris fuscipes	19(NR)	8	**2010**
Beris geniculata	14b,c(JD)	7	**2004**
Beris morrisii	13b,d,14c(DB)	5,6,7,8	**2015**
Beris vallata	10b,d,12a,13d,14b,c,30a(DB,JD)	5,6,7,8	**2015**
Chloromyia formosa	10b,11k,12a,14b,c,18e,22b,d,23f,24n,30a	6,7,8	**2014**
†*Chorisops nagatomii*	13c,14c(DB),19*,30a(JD)	6,7,8,9	**2012**
†*Chorisops tibialis*	10a,12a,13b,d,14b,c,19*,24q,25f,28,30a	6,7,8	**2015**
Microchrysa polita	14c(DB),30a(JD)	5,7	**2004**
Oplodontha viridula	23o,30a(DL)	6,7	**2010**
Oxycera morrisii	12b(DL),13d(JD),14c(DB)	6,7	**2004**
Oxycera nigricornis	10c(DL),11h,30a(DL)	7	**2014**
Oxycera rara	30a(JD)	7	**2004**
Oxycera trilineata	23a(DL),30a(JD)	7	**2004**
†*Pachygaster atra*	10b,12a*,13d,15a,18e,19,22b,23,24,25f	6,7,8	**2014**
†*Pachygaster leachii*	10b,11h,13b,c,d*,14b,c,23f,24n,25e,30a	6,7,8	**2015**
Sargus bipunctatus	13b,14c(DB),19	8,9	**2011**
Stratiomys potamida	10b,c,12b(DL),13a,23b(PS),30a(JD)	7,8	**2015**
Stratiomys singularior	14c(DB),22c(DL),23b(PS),f(JD)	6,7	**2004**
Vanoyia tenuicornis	22c(DL),23b,o(DL),30a(JD)	6,7	**2013**
ACROCERIDAE			
Acrocera orbiculus	23c(PH),25e(JD)	8	**2004**
BOMBYLIIDAE			
Bombylius major	11h(PS),13b,14c(PS)	4,6	**2013**
≠*Villa cingulata*	11k	6,7	**2015**
THEREVIDAE			
†≠*Pandivirilia melaleuca*	23c, larva unconfirmed (J.A. Owen)		**1988**
Thereva nobilitata	14c(DB),19(NR),24q	7	**2014**

ASILIDAE			
Dioctria atricapilla	10b,c,11k,12a,13d(JD),14c(DB)	6	**2014**
Dioctria baumhaueri	10a(NR),12a,13c,14c(JD),19*,23l,28	6,7,8	**2012**
Dioctria linearis	13b,c,d	6,7	**2014**
Dioctria rufipes	12a,13c,14c(DB,PS),19,23l,28	5,6	**2013**
Dysmachus trigonus	23l	6	**2012**
Leptogaster cylindrica	10b,c,11k,14b,c,22b,d,23f,n,24*,25e,30a	6,7	**2014**
Machimus atricapillus	10a,b,11h,k*,13c,14c,19*,24n,25e,f,30a	7,8	**2014**
Machimus cingulatus	11k,14c(DB),23n	7,8	**2015**
Neoitamus cyanurus	30a(JD)	8	**2004**
HYBOTIDAE			
Bicellaria nigra	19(NR),24q	6	**2013**
Bicellaria vana	10c,10d,12a/b,13b,15a	6,8,9,10	**2014**
†*Drapetis parilis*	19(NR)	7,8	**2010**
†*Drapetis simulans*	19	8	**2011**
Drapetis ephippiata	11h,12a,13b,d,15a,19*,24q	6,7,8,9,10	**2015**
Hybos culiciformis	13c,d(JD),23b,24q,27	6,7,8,9	**2015**
Hybos femoratus	13b	9	**2011**
†*Leptopeza flavipes*	26	6	**2012**
Ocydromia glabricula	10d,11h,13a,b,c,d,14a,19*,24q	6,7,8,9,10,11	**2015**
†*Oedalea holmgreni*	10a(NR),13b,c,d,19	5,6,7	**2015**
†*Oedalea stigmatella*	10d,13b	6,7	**2015**
†*Oedalea tibialis*	19(NR)	7,8,9	**2010**
Oropezella sphenoptera	13a	7	**2012**
Platypalpus annulipes	11h,13b,c,19*,23b	5,6,7,8	**2014**
Platypalpus aristatus	19(NR)	7	**2010**
Platypalpus calceatus	19(NR)	7	**2010**
Platypalpus ciliaris	13b,19*	7,8,9	**2014**
Platypalpus clarandus	19(NR)	7	**2010**
Platypalpus cothurnatus	11h	5	**2014**
Platypalpus coarctatus	13d	7	**2014**
Platypalpus cursitans	10a(NR)	6	**2010**
Platypalpus exilis	10d,19*,24q	6,7	**2014**
Platypalpus longicornis	10d,13b,c,15a,19	5,8,9,10	**2013**
Platypalpus longiseta	19*	7	**2014**
Platypalpus minutus	13c,19	8	**2012**
Platypalpus notatus	19(NR)	7	**2010**
Platypalpus nigricornis	13a	6	**2012**
Platypalpus optivus	13b	6	**2012**
Platypalpus pallidiventris	10a(NR),d,11h,k,15a,19,23c,24q	6,7,8	**2014**
Platypalpus pallipes	13c,19	8	**2012**
Platypalpus pectoralis	10d,13b,c,19*	7,8,9,10	**2015**
Platypalpus ruficornis	11k	7	**2014**
Platypalpus verralli	10a,19,25f(NR)	6,7	**2010**
Tachydromia arrogans	19(NR)	7,10	**2010**
Tachydromia umbrarum	10a(NR)	6,7	**2010**
Tachypeza nubila	19*,23b,25f(NR)	6,7,8,9,10	**2013**
Trichina elongata	19	8	**2012**
Trichinomyia flavipes	19	9	**2011**
EMPIDIDAE			
Dolichocephala irrorata	13c	7,8	**2012**
Empis aestiva	13a,b,d	6	**2013**

Empis albinervis	10a(NR),11k,12a,15a,19(NR)	5,6,7	**2014**
Empis femorata	24q	6	**2013**
Empis grisea	11k,19(NR)	5,7	**2014**
Empis livida	13d,14b,c,24n(JD)	6,7,8	**2004**
Empis nigritarsis	19	6	**2013**
Empis picipes	13c,19(NR)	5,6	**2012**
Empis planetica	11k	7	**2014**
Empis praevia	13b,c,23b	5,6	**2013**
Empis scutellata	10a(NR),d,23b,24q	5,6	**2014**
Empis tessellata	10b,13b,d,14b,c,30a(JD)	5,6,7	**2012**
Empis tumida	10c,24q	6	**2014**
Hemerodromia unilineata	13d	8	**2014**
Hilara beckeri	13b,c	7,8	**2012**
≠*Hilara brevivittata*	13b,c	4,5	**2012**
Hilara flavipes	10d,19,23b	7,8	**2014**
Hilara fuscipes	10a(NR)	6	**2010**
Hilara interstincta	10d,13c,d,19	5	**2012**
Hilara litorea	10a(NR),d,13a,b,c,d,19*,25f(NR)	6,7,8,9	**2015**
Hilara longifurca [= *monedula*]	10d,11h,13b	5,6	**2014**
†*Hilara lurida*	13a,b,d	6,7	**2013**
Hilara manicata	13b,c,19*,23b	7,8	**2014**
Hilara maura	10a(NR),13b,c,23b	5,6	**2013**
Hilara obscura	15a	6	**2012**
Hilara ternovensis [= *griseifrons*]	11k,13b,19*,23b,c,26	6,7	**2012**
Hilara thoracica	10d,11h,13b,c,19*	5,6,7	**2014**
Phyllodromia melanocephala	19(NR)	7	**2010**
Rhamphomyia crassirostris	13b	6	**2013**
Rhamphomyia erythrophthalma	13b,19	9,10	**2014**
Rhamphomyia e. form *hirsutipes*	19*	9	**2011**
≠*Rhamphomyia lamellata*	13c	8	**2011**
Rhamphomyia longipes	13b,c,15a	6,7	**2013**
Rhamphomyia nigripennis	10d,11h,13a,b,c,d,15a,19	5,6,7	**2014**
Rhamphomyia tarsata	11k,13b,c,15a,19,23b,24q	5,6,7	**2014**
Rhamphomyia variabilis	11k,11h,13b,19,23b	8,9,10	**2014**
DOLICHOPODIDAE			
Anepsiomyia flaviventris	13a,30a(JD)	6	**2012**
Argyra leucocephala	10b(JD),d	8	**2014**
Campsicnemus curvipes	10b,d,11h,k,13b,d,14b,c,19*,20a,30a	6,7,8,9,10,11	**2014**
Campsicnemus scambus	13b,19*	7,8,9,10	**2014**
Chrysotimus flaviventris	13c,19	7,8	**2013**
Chrysotimus molliculus	10d,11k,13b,d,15a,19*	6,7,8	**2015**
Chrysotus cilipes	10c,15a,23b,o	6,7,8	**2015**
Chrysotus gramineus	10c,12a,13c,23b,24q,19*,26,28	6,7	**2014**
Chrysotus kowarzi	23b	7,	**2014**
Chrysotus laesus	10c,11k,12a,15a	6	**2014**
Chrysotus neglectus	13b,19	6,7	**2014**
Dolichopus brevipennis	24q	6	**2012**
Dolichopus festivus	11h	7	**2015**
Dolichopus griseipennis	10c,d,13a,b,19,24q	6,7,8,10	**2015**
Dolichopus trivialis	11h,16d,19	7,8	**2015**
Dolichopus ungulatus	10c,11h,12a,13b,d,14b,c(JD),15a,23b	6,7	**2015**
Dolichopus wahlbergi	19	8	**2012**

Ethiromyia chalybea	10d(PH)	8	**1992**
Gymnopternus aerosus	19(NR)	7,8	**2010**
Gymnopternus brevicornis	19(NR)	7	**2010**
Gymnopternus cupreus	23b	7	**2014**
Gymnopternus metallicus	19(NR)	7,8	**2010**
Gymnopternus silvestris	19(NR)	7	**2010**
Hydrophorus litoreus	23o	8	**2015**
†*Medetera dendrobaena*	10a(NR),12a/b,13c,19*,25f(NR)	7,8,9	**2014**
†*Medetera impigra*	13b,19*	7,8	**2014**
†*Medetera jacula*	23b,24q	7,8	**2014**
†*Medetera jugalis*	19(NR)	8	**2010**
†*Medetera pallipes*	10a(NR),19(NR),23b	7,8	**2014**
†*Medetera petrophiloides*	14a	8	**2014**
†*Medetera saxatilis*	15a	8	**2012**
†*Medetera truncorum*	10a,c,12a,13c,d,15a,16d,19,25f,23b,o,27	6,7,8,9,10	**2015**
Microphor anomalus	10a,19(NR)	6,7	**2010**
Microphor crassipes	13d,19(NR)	7	**2015**
†*Neurigona pallida*	19(NR)	7	**2010**
†*Neurigona quadrifasciata*	10d,13b,c,19*,25f(NR)	6,7	**2015**
Rhaphium appendiculatum	10d,13a,d,19*,23f(JD)	6,7,8	**2014**
Rhaphium caliginosum	13b	8	**2011**
Scellus notatus	11h	8	**2014**
Sciapus longulus	11h	6	**2014**
†*Sciapus platypterus*	10a(NR),d,13a,b,c,d(JD),19*,20a	6,7,8,9,10	**2014**
Sybistroma obscurellum	10d,11h,13a,b,d	6,7,8,9	**2015**
Sympycnus desoutteri	10d,13a,b,15a,23b,o,27	5,6,8,9	**2015**
Syntormon denticulatum	13b	9	**2011**
Syntormon pallipes	11h,19,23b	6,8,10	**2014**
†*Systenus mallochi*	19(NR)	7	**2010**
Thrypticus laetus	23o	8	**2015**
Xanthochlorus galbanus	10d,13a,b,d,19*	6,7,8,9,10	**2015**
Xanthochlorus ornatus	24q	6	**2013**
OPETIIDAE			
†*Opetia nigra*	19*	5,9	**2012**
PLATYPEZIDAE			
‡*Agathomyia antennata*	13b,c	5,8,9	**2012**
‡≠*Agathomyia falleni*	13b,19	9,10	**2011**
‡*Agathomyia unicolor*	10d,13b,d,19	9,10	**2014**
≠*Agathomyia woodella*	13c	10	**2011**
‡*Bolopus furcatus*	10d	8	**2013**
‡*Callomyia amoena*	13b,c,19	8,9,10	**2012**
‡*Paraplatypeza atra*	10d	8	**2013**
‡≠*Paraplatypeza bicincta*	13b	10	**2011**
‡*Platypeza consobrina*	13c,19*	9,10	**2014**
‡*Platypeza fasciata*	13b	10	**2014**
‡*Polyporivora ornata*	13c	5,8	**2012**
‡*Polyporivora picta*	13c,19	9,10	**2012**
‡*Protoclythia modesta*	13b,19*	9,10	**2012**
‡*Protoclythia rufa*	10d,13b,c,d,15a,19*	9,10	**2014**
PHORIDAE			
†*Anevrina thoracica*	13b,26	7,8	**2015**
Chaetopleurophora erythronota	13b	7	**2014**

Diplonevra florescens	11h	8	**2014**
Spiniphora dorsalis	12d	10	**2014**
LONCHOPTERIDAE			
Lonchoptera bifurcata	11k	7	**2014**
Lonchoptera lutea	10,11,12,13,14,15,19*,20,23,28	6,7,8,9,10,11	**2015**
SYRPHIDAE			
Anasimyia lineata	23b	6	**2013**
Baccha elongata	19	7	**2012**
†*Chalcosyrphus nemorum*	13d	6	**2013**
Cheilosia albitarsis	13c,14b,c,22b,d(JD)	6,7,8	**2013**
Cheilosia bergenstammi	10b,14c(JD)	7,8	**2004**
Cheilosia illustrata	11h,13c,d,14c(JD)	6,7	**2014**
Cheilosia pagana	11h	7	**2015**
Chrysogaster solstitialis	4c(JD),19(NR),30a(JD)	7,8	**2010**
Chrysotoxum bicinctum	10b,12a,11k,13d,18e(PH),19,30a(JD)	6,7,8	**2014**
Chrysotoxum cautum	24q	6	**2013**
Chrysotoxum festivum	10b(JD)	6-8	**2004**
Epistrophe eligans	10b,14b,c,30a(JD)	6,7,8	**2004**
Epistrophe grossulariae	30a(JD)	6-8	**2004**
Episyrphus balteatus	10,11k,13b,d,14,19,20,22,23,24,25,30	7,9	**2015**
Eristalis arbustorum	10b,13b,14b,c,20a,30a(JD)	6,7,8	**2012**
Eristalis horticola	30a(JD)	6-8	**2004**
Eristalis intricarius	10b,13b,14c(JD)	6-8	**2004**
Eristalis pertinax	10b,e,13b,d,14b,c,19*,20a,30a(JD)	8,10	**2013**
Eristalis tenax	10b,e,13b,d,14b,c,30a(JD)	6,7,8,10	**2013**
Eumerus strigatus	16d	8	**2015**
Eupeodes corollae	10b,14b,c,201,22b,23f(JD),25f(NR),30a	6,7,8	**2010**
Eupeodes luniger	10b,13d,14b,c,30a(JD)	6-8	**2004**
†*Ferdinandea cuprea*	13d,14c,24n,25e(JD)	6-8	**2004**
†≠*Ferdinandea ruficornis*	25e(JD)	6-8	**2004**
Helophilus hybridus	23b,n	8	**2015**
Helophilus pendulus	10b,c,e,11k,14b,c,18e,19*,23b,30a(JD)	6,7,8,9,10	**2014**
Helophilus trivittatus	30a(JD)	6-8	**2004**
Lejogaster metallina	11k,23b	6,7	**2014**
Leucozona glaucia	13c	6	**2013**
Leucozona laternaria	14b(JD)	7	**2004**
Leucozona lucorum	10b(JD),13c	7	**2012**
†≠*Mallota cimbiciformis*	15a	6	**2012**
Melangyna labiatarum	10d(PH),13b	8,9	**2013**
Melanogaster hirtella	10b(JD),11g(JD),k	5,6-8	**2014**
Melanostoma mellinum	10c,11k,12a,13d,14c,21j(JD)	6,7,8	**2014**
Melanostoma scalare	10b,d,13b,d,23f,n,30a(JD)	6,7,8,9,10	**2014**
Meliscaeva auricollis	10a(NR),12a,13d(JD)	6-8	**2004**
Meliscaeva cinctella	22b,25e(JD)	6-8	**2010**
Merodon equestris	13d	6	**2013**
†*Myathropa florea*	10*,13,14,15,18,19*,20,22,24,25,30	5,6,7,8,9,10	**2014**
Neoascia tenur	23b	6,7,8	**2015**
Paragus haemorrhous	11k,30a(JD)	7	**2014**
Pipizella viduata	10a,c,11k(MH),12a,23b	6,7	**2015**
Platycheirus albimanus	10b,14b,c,22b,30a(JD)	6,7,8	**2004**
Platycheirus angustatus	12a,23b	6,7,8	**2014**
Platycheirus clypeatus	11k,23b	7,8	**2015**

Rhingia campestris	10b,14b,c,22b,d,30a(JD)	6,7,8	**2004**
Riponnensia splendens	19(NR)	10	**2010**
Scaeva pyrastri	10b,14b,c,22b,25f,30a(JD)	6,7,8	**2010**
Sphaerophoria scripta	11k*,12,13,14,18,20,22,23,24,25,30(JD)	6,7,8	**2014**
Sphaerophoria taeniata	10b(JD),11k	7	**2014**
Syritta pipiens	10b,12a,13d,14b,c,23b,f,24n,25e,30a	6,7,8	**2013**
Syrphus ribesii	10,11,12,13,14,18,20,23,24,25,30(JD)	6,7,8	**2004**
Syrphus vitripennis	14b,c,30a(JD)	6,7,8	**2004**
Volucella bombylans	11h(PS),14c,30a(JD)	4,6-8	**2004**
Volucella inanis	10b(JD),d(PH),13b,c,14c(JD),19,30a(JD)	7,8	**2015**
Volucella pellucens	10b,12a(JD),13b,c,d,14b,(JD)	7,8	**2013**
Volucella zonaria	10b(JD),11h,13b,d	8,9	**2014**
Xanthogramma pedissequum	10b,14c,30a(JD)	7,8	**2004**
†*Xylota segnis*	12a,13d,14b,c,23f,30a(JD)	6-8	**2004**
†*Xylota sylvarum*	13b,d	7,8	**2014**
PIPUNCULIDAE			
Eudorylas obliquus	11k,13d	8,	**2014**
Eudorylas subfascipes	12a,19	5,8,10	**2012**
Eudorylas subterminalis	19	7	**2014**
Pipunculus campestris	11k,13d,14c,30a(JD)	8	**2014**
Pipunculus lenis [= *thomsoni*]	12a,26	6,7	**2012**
Tomosvaryella sylvatica	12a	6,8	**2012**
MICROPEZIDAE			
Neria cibaria	13d(JD)	6-8	**2004**
†≠*Rainieria calceata*	13b,d	6	**2013**
MEGAMERINIDAE			
†≠*Megamerina dolium*	13d	7	**2015**
PSILIDAE			
Chamaepsila rosae	10d,13b,19*	5,6,8,9	**2014**
Imantimyia albiseta	12a,13b,19*,21j(JD),23b	8,9	**2015**
Loxocera aristata	19(NR)	9	**2010**
CONOPIDAE			
Conops quadrifasciatus	10b(JD,PH),11h,23f,n,25e,30a(JD)	8	**2014**
≠*Leopoldius signatus*	10d,11h	10	**2014**
Physocephala rufipes	11k,30a(JD)	7	**2014**
Sicus ferrugineus	10b(JD),11k,18e,30a(JD)	6	**2014**
LONCHAEIDAE			
†*Dasiops spatiosus*	11h	7	**2014**
†*Lonchaea caucasica*	13b,15a	7,9	**2012**
†*Lonchaea contigua*	13d	7	**2015**
†*Lonchaea fugax*	13c,d	7	**2015**
†*Lonchaea obscuritarsis*	13c	6	**2012**
†*Lonchaea scutellaris*	13c	8	**2011**
Lonchaea tarsata	13d	7	**2015**
Protearomyia sp ♀	13b	6	**2014**
Silba fumosa	15a	7	**2012**
PALLOPTERIDAE			
†*Palloptera muliebris*	10d,13b,c,14c(JD),19,30a(JD)	6,7,8,9	**2014**
Palloptera quinquemaculata	10a(NR),13c	5,6	**2012**
Palloptera scutellata	12a,13c,23b	6,10	**2013**
Palloptera trimacula	13d	7,8	**2015**
Palloptera umbellatarum	10d,11h,13b,c,14b,c(JD),15a,19*	6,7,8,9,10	**2014**

†*Palloptera ustulata*	10d,13b,d,19*	6,7,8,9,10	**2015**
PIOPHILIDAE			
Allopiophila luteata	13b	7	**2014**
ULIDIIDAE			
Seioptera vibrans	13d,19(NR)	7	**2015**
PLATYSTOMATIDAE			
Rivellia syngenesiae	10c	8	**2013**
TEPHRITIDAE			
Acidia cognata	19	9	**2012**
≠*Acinia corniculata*	10a,11k	6,7,8	**2015**
Anomoia purmunda	11h,13d,24q	7,8	**2015**
≠*Campiglossa malaris*	11k	7	**2014**
Chaetorellia jaceae	10a,11h,k	6,7	**2015**
Chaetostomella cylindrica	10b(JD),c,11k,13d(JD)	5,6,8	**2014**
≠*Dioxyna bidentis*	23b	8	**2014**
Philophylla caesio	13c,19	8,9	**2012**
Sphenella marginata	11k	7,8	**2014**
Tephritis bardanae	11h,13b	6,7	**2014**
Tephritis cometa	10b(JD),11k,30a(JD)	8	**2014**
Tephritis formosa	11k,24q	7,8	**2015**
Tephritis hyoscyami	10b(JD),12a	6-8,10	**2012**
Tephritis neesii	10a,b(JD),11k,12a,23f,n,30a(JD)	5,6,7,8,10	**2015**
Tephritis vespertina	10c,11k	5,6,7	**2015**
Terellia ruficauda	11k	7	**2014**
Terellia serratulae	11k	6,	**2014**
Terellia tussilaginis	10c,12a,13a,b	7,8	**2015**
Trypeta zoe	13b,c	5,6	**2013**
Urophora cardui	10b(JD),c,14b,c,22b,d(JD)	6,7,8 (gall)	**2013**
Urophora jaceana	10b(JD),11k,23f,24n,30a(JD)	6,7,8	**2014**
Urophora quadrifasciata	10a,b(JD),c,11h,k,14c(JD)	6,7,8	**2015**
Xyphosia miliaria	10b(JD),12a,13d(JD),24q,30a(JD)	6,7,8	**2014**
LAUXANIIDAE			
≠*Aulogastromyia anisodactyla*	13d,19,25f(NR)	7,9,10	**2015**
Calliopum aeneum	12a,13b,d,19	6,7,8	**2015**
Calliopum simillimum	13b,14a	8,11	**2014**
↕*Homoneura interstincta*	11k,13d	5,7	**2015**
≠*Homoneura notata*	13d,19(NR)	7,8	**2015**
≠*Homoneura tesquae*	10d,11h	7	**2015**
Meiosimyza decempunctata	10d,11h,13b,d,14a,19	7,8,9,10	**2015**
Meiosimyza platycephala	11h,13b,19*	7,8,9,10	**2014**
Meiosimyza rorida	10d,11h,12a/b,13b,c,d,19	5,6,7,8,9,10	**2015**
Meiosimyza subfasciata	12a,19	9	**2011**
Minettia fasciata [= *rivosa*]	10a,d,11h,k,14c(JD),15a,16d,23b,24q	5,6,7,8,9	**2015**
Minettia inusta	10d	6,7	**2014**
Minettia longipennis	13b,19	6,7,8	**2013**
†*Peplomyza litura*	10d,12a,13b,19	6,8,10	**2013**
†*Pseudolyciella pallidiventris*	13b,c,19,25f(NR)	7,8,10	**2015**
†*Pseudolyciella stylata*	10a(NR),d,15a,19*,23c,25f(NR),26	6,7,9	**2014**
Sapromyza halidayi	10d,11h	7,8,10	**2015**
Sapromyza opaca	11k	8	**2014**
Sapromyza quadripunctata	10a,11k,19(NR),23c,24q	6,7,8	**2015**
Tricholauxania praeusta	10d,11h,13b,c,d,15a,19*,24q,26	6,7,8,9,10	**2015**

CHAMAEMYIIDAE			
Chamaemyia aridella	11k,12a/b,16d,19(NR),23c,24q,27,28	6,7,8	**2015**
Chamaemyia herbarum	11k,23c	6,7	**2014**
Chamaemyia polystigma	12a,19(NR),25b	8,9,10	**2012**
DRYOMYZIDAE			
Dryomyza [= *Neuroctena*] *anilis*	10a(NR),d,11h,19*	7,8,9,10	**2015**
SCIOMYZIDAE			
Coremacera marginata	11k,12a	6,8	**2014**
Elgiva solicita	12a,23b	6,8	**2015**
Limnia unguicornis	10a,11k,12a,13b,16d,23b,o,27	6,7,8	**2015**
Pherbellia cinerella	10b(JD),15a	6-8	**2012**
≠*Pherbellia griseola*	11k	8	**2014**
Pherbellia pallidiventris	13b	7	**2014**
Pherbellia ventralis	11h,19	7,9,10	**2014**
Pherbina coryletti	23b	6,8	**2014**
Renocera pallida	13d	8	**2014**
Sepedon sphegea	10c,12a,23o	8,9,10	**2015**
Tetanocera arrogans	10c	8	**2013**
Tetanocera elata	11k,12a	6,8	**2014**
Tetanocera ferruginea	19*,23b	8,9	**2014**
Tetanocera hyalipennis	19(NR)	9	**2010**
Trypetoptera punctulata	30a(JD)	6-8	**2004**
SEPSIDAE			
Nemopoda nitidula	10c,12a,19,23o	8,9,10	**2015**
Sepsis cynipsea	10b(JD),12a,13d,23b,30a(JD)	6-8,9	**2015**
Sepsis fulgens	12a	9	**2012**
Sepsis punctum	10d,12a,19,23c,o,26	6,7,8	**2015**
Themira lucida	11h,k,23b,o	6,7,8	**2015**
Themira putris	23b	7	**2014**
Themira superba	23b	6	**2013**
CLUSIIDAE			
†*Clusia flava*	10b(JD),11h,13b,c,d(JD),19,30a(JD)	6,7,8,9,10,11	**2014**
†≠*Clusia* [= *Paraclusia*] *tigrina*	10d,13b,c,19*,20a	7,8,9,10,11	**2014**
†*Clusiodes albimanus*	10d,11h,13b,c,d(JD),19	5,6,7,8,9	**2015**
†*Clusiodes gentilis*	10d,11h,13b,c,19*	5,6,8,9	**2014**
†*Clusiodes verticalis*	10d,13b,d,19*	7,8,9	**2015**
ACARTOPHTHALMIDAE			
‡*Acartophthalmus nigrinus*	13c,19	5,10	**2012**
ODINIIDAE			
‡*Odinia boletina*	13b,19(NR)	6,7	**2012**
†≠*Odinia trinotata* [= *maculata*]	19(NR)	7	**2010**
AGROMYZIDAE			
Agromyza idaeiana	10b(mine,JD)	6-8	**2004**
Agromyza mobilis	11h,13b,d,15a	7,8,9	**2014**
Agromyza nigrella	12a	7	**2012**
Agromyza pseudoreptans	11h,12a,13a,b,c,d*(mine,JD),19,24q	5,6,7,9	**2015**
Aulagromyza hendeliana	10b,30a(mines,JD)	6-8	**2004**
Cerodontha angulata	13d	8	**2014**
Cerodontha atra	12a,13c,24q	6,7,8	**2014**
Cerodontha bimaculata	11k,12a	7,8	**2014**
Cerodontha capitata	23c	6	**2012**
Cerodontha denticornis	11k,12a,15a,16d,23b	5,8,9	**2015**

Cerodontha luctuosa	11k,12a,19,23b,24q,26	5,7,8	**2015**
Cerodontha muscina	13d	7	**2015**
Cerodontha suturalis	23o	8	**2015**
Liriomyza flaveola	10d,13c,19,24q	5,6,7	**2014**
Melanagromyza cunctans	11k	7,8	**2014**
Napomyza lateralis	11k	5,7	**2014**
Phytoliriomyza melampyga	13b(mines)	8	**2012**
Pseudonapomyza atra	23b	8	**2015**
Chromatomyia milii	10d,11h,k,12a,13b,d	6,7,8	**2015**
Chromatomyia nigra	11k,15a	6,7	**2014**
Phytomyza albipennis	12a	6	**2012**
Phytomyza cecidonomia	10b,11k	5,10	**2014**
Phytomyza crassiseta	13b,15a	4,6	**2012**
Phytomyza ilicis	10b,11g,14c(mines,JD)	6-8	**2004**
Phytomyza plantaginis	11h,11k,12a	6,8	**2014**
Phytomyza ranunculi	10b,11g(mines,JD)	6-8	**2004**
Phytomyza spondylii	30a(mine,JD)	6-8	**2004**
OPOMYZIDAE			
Geomyza tripunctata	10b(JD),12a,14c(JD),15a,16d,26	4,6,7,8,9,10	**2015**
Opomyza florum	10b(JD),13b,c,d,10b(JD),19,30a(JD)	7,8,9,10	**2014**
Opomyza germinationis	10*,11,12,13,16,19*,24,27	6,7,8,9,10	**2015**
Opomyza petrei	13d	8	**2014**
ANTHOMYZIDAE			
Anthomyza gracilis	10c,11h,k,12a/b,13b,23b,24q,26	6,7,8,9	**2015**
Paranthomyza nitida	13b	8	**2011**
PERISCELIDIDAE			
†≠*Periscelis annulata*	10a(NR)	7	**2010**
†≠*Periscelis winnertzi*	10a,25f(NR)	8,9	**2010**
ASTEIIDAE			
†*Asteia amoena*	13b,19	5,7	**2012**
Asteia concinna	10c	8	**2013**
‡*Leiomyza birkheadi/laevigata* ♀	10d	7	**2015**
MILICHIIDAE			
Phyllomyza equitans	10a(NR)	6	**2010**
Phyllomyza flavitarsis	10a(NR)	6	**2010**
Phyllomyza securicornis	10a(NR)	6	**2010**
CARNIDAE			
Meoneura minutissima	19(NR)	6	**2010**
CHLOROPIDAE			
Chloropinae			
Cetema elongatum	23c	6	**2013**
Cetema neglectum	12a	8	**2012**
Chlorops calceatus	11k,12a	6,7	**2014**
Chlorops hypostigma	10a(NR),d,11h,13b,c,d,15a,19,23b,o	5,6,7,8,9	**2015**
Chlorops limbatus	26	6	**2013**
Chlorops pumilionis	10b	9	**2013**
Chlorops ringens	10b,11k,12a	9,10	**2013**
Chlorops serenus	10b,12a,19	6,9	**2013**
Chlorops speciosus	12a	6	**2012**
Lasiosina herpini	11k	8	**2014**
Thaumatomyia glabra	12a	6	**2012**
Thaumatomyia hallandica	11k	7,9	**2014**

Thaumatomyia notata	12a,15a,19*,23b,c,26	7,9	**2015**
Oscinellinae			
Calamoncosis glyceriae	10b,23b	7,8,9	**2015**
Conioscinella frontella	12a,25f(NR)	6	**2013**
Conioscinella sordidella	19,25f(NR)	6,7	**2010**
Dicraeus ingratus	12a	6	**2012**
Dicraeus vagans	10c,11k,12a	6,7	**2014**
Elachiptera cornuta	12a,19*	8,9,10	**2012**
Elachiptera megaspis	10c,23b	6,7,10	**2014**
‡*Gaurax fascipes*	19(NR)	7,8	**2010**
Incertella albipalpis	28	6	**2012**
†≠*Lasiambia brevibucca*	10b,19,25f(NR)	6,7,8,9	**2010**
Oscinella frit	11k,12a,15a,16d,23c	4,6,7	**2015**
Oscinella nitidissima	12a,16d,23b	6,8	**2015**
Oscinella vindicata [= *hortensis*]	12a,23c	6,7	**2012**
Oscinimorpha arcuata	11k,23q	6,7	**2014**
Oscinimorpha minutissima	10b,11k,12a,26	6,7,8	**2014**
Oscinisoma germanicum	11b,19*	7,9	**2014**
Rhopalopterum fasciola	12a	6,	**2012**
Speccafrons halophila	10c	10	**2014**
‡*Tricimba cincta*	12a,19*,25f(NR)	6,7,8,9	**2012**
Tricimba lineella	10a(NR),12a,13b,19*	6,7,8,9,10	**2012**
HELEOMYZIDAE			
Eccoptomera longiseta	13b	6	**2013**
‡*Heteromyza oculata*	10a(NR),b,19	8,9,10	**2013**
Heteromyza rotundicornis	10d,13b,19	7,9	**2014**
Morpholeria ruficornis	11h,13b,c,19*,24q	6,9,8,10,11	**2014**
≠*Neoleria propinqua*	19	10	**2014**
Suillia affinis	10a(NR),d,11d,h,13b,c,d,16d,19*,24q	4,6,7,8,9,10,11	**2015**
‡*Suillia atricornis*	13b,c,19*	8,9,10	**2014**
‡*Suillia bicolor*	10d,13b,c,d,19*,24q,25f(NR)	6,7,8,9,10,11	**2015**
Suillia flavifrons	13d	8	**2014**
Suillia humilis	13b	9	**2011**
Suillia imberbis	11h,24q	6,10	**2014**
Suillia laevifrons	11k	8	**2014**
Suillia notata	19*	9,10	**2011**
Suillia pallida	13b,c,19*	5,6,8,10	**2012**
Suillia parva	10d,11h	8,10	**2014**
Suillia ustulata	19	7	**2015**
‡*Suillia variegata*	10d,13a,b,c,14a,19*	7,8,9,10,11	**2015**
‡*Tephrochlamys flavipes*	10d,11h,13b,c,d,14a,19*	7,8,9,10,11	**2014**
Tephrochlamys rufiventris	13b,c,14a,19*	6,7,8,9,10,11	**2015**
TRIXOSCELIDIDAE			
↕*Trixoscelis canescens*	11h,16d,19(NR)	7,8	**2015**
Trixoscelis frontalis	10c,11h,12a,20a,26,28	6,7,9	**2013**
SPHAEROCERIDAE			
Copromyza equina	26	6	**2012**
Copromyza nigrina	13a,b,19	6,7,9	**2012**
Copromyza stercoraria	12a,13b	4,9	**2012**
‡*Crumomyia fimetaria*	13a,b,d	7,10	**2014**
‡*Crumomyia roserii*	10d,19	10	**2014**
Leptocera fontinalis	10d	10	**2013**

Limosina silvatica	14a	11	**2014**
Lotophila atra	11k,12a,28	6,8,9,10	**2014**
Sphaerocera monilis	19	7,8	**2012**
CHYROMYIDAE			
†*Gymnochiromyia inermis*	19(NR)	7,8	**2010**
DROSOPHILIDAE			
Drosophilinae			
‡*Drosophila busckii*	19	9	**2011**
‡*Drosophila funebris*	13b	7	**2011**
Drosophila helvetica	13d,19(NR)	7,8	**2014**
‡*Drosophila histrio*	19(NR)	9,10	**2010**
Drosophila hydei	19(NR)	8,9,10	**2010**
Drosophila immigrans	10d,13b,19*	7,8,9,10	**2015**
‡*Drosophila kuntzei*	13a,b,19*	7,8,9,10,11	**2012**
†*Drosophila littoralis*	11h,19	9,10	**2014**
‡*Drosophila melanogaster*	19(NR)	9	**2010**
‡*Drosophila obscura*	10a,19,25f(NR)	6,7,8,9,10	**2014**
‡*Drosophila phalerata*	10d,11h,13b,c,d,14a,19*	7,8,9,10	**2014**
Drosophila simulans	19(NR)	8	**2010**
‡*Drosophila transversa*	13b,c,19	8,9,10	**2012**
‡*Drosophila subobscura*	13b,c,19*,23c	6,7,8,9,10,11	**2014**
↕*Drosophila suzukii*	10c,11h,13b,d,19	8,10,11	**2014**
†*Drosophila tristis*	19(NR)	8,10	**2010**
‡*Hirtodrosophila cameraria*	10d,11h,13a,b,d,14a,19*	6,7,8,9,10	**2014**
‡*Hirtodrosophila confusa*	10d,13b,c,19,25b	6,7,8,9	**2015**
‡↕*Hirtodrosophila trivittata*	13b,c	9,10	**2012**
Lordiphosa andalusiaca	10d,12a,13b,c,19	8,9,10	**2013**
Scaptodrosophila deflexa	19,25f(NR)	7,8	**2010**
Scaptodrosophila rufifrons	19(NR)	10	**2010**
Scaptomyza graminum	11h,13b,d,19,23o	5,6,7,8	**2015**
Scaptomyza pallida	10*,11,12,13,15,19,23,26	6,7,8,9,10,11	**2015**
Scaptomyza flava	13b,c,14a,19*	7,8,10	**2014**
Steganinae			
≠*Amiota basdeni*	10d,13b,19(NR)	8	**2013**
‡*Leucophenga maculata*	10d,13b,14a,19*	7,8,9	**2015**
†≠*Phortica variegata*	13b	7	**2014**
‡*Stegana similis*	13b,19*	7	**2015**
CAMPICHOETIDAE			
Campichoeta punctum	10d,13b,d	5,6,8	**2014**
DIASTATIDAE			
Diastata costata	12a,19	7,8,10	**2013**
Diastata fuscula	10d,11h,12a/b,13c,d,19	5,6,8,9,10,11	**2014**
CAMILLIDAE			
Camilla flavicauda	13b,c,19*	6,7,8,9,10	**2014**
Camilla glabra	19(NR)	7	**2010**
EPHYDRIDAE			
Ditrichophora calceata	19(NR)	8	**2010**
Ditrichophora fuscella	19(NR)	8	**2010**
Gymnoclasiopa plumosa	13b,13c	5,7	**2012**
Hyadina scutellata	12a	8	**2012**
Hydrellia griseola	13c	5,8	**2012**
Hydrellia maura	11h,12a,13a,19,23b,o,24q	6,7,8,9	**2015**

Limnellia quadrata	13b,c,19	8,9,10	**2012**
Notiphila cinerea	23b	8	**2014**
Notiphila graecula	23b,o	8	**2015**
Notiphila riparia	23b	8	**2014**
Notiphila venusta	23b,o	7,8	**2015**
Paracoenia fumosa	23o	8	**2015**
Parydra coarctata	11h,23c	7,8	**2015**
Philygria picta	25f(NR)	8	**2010**
Philygria sexmaculata	10d	7	**2014**
Psilopa nitidula	11k,12a	7,8,9	**2014**
Scatella tenuicosta	12a,13a,23o	8,9	**2015**
HIPPOBOSCIDAE			
Lipoptena cervi	10a(NR),d,14c(JD),15a,19*,24n(JD)	6-8,10	**2014**
Ornithomyia avicularia	19(NR)	8	**2010**
SCATHOPHAGIDAE			
Cordilura albipes	10d,11h,13d,14a,19,24q	5,6,7,8,9	**2015**
Nanna fasciata	13c	4	**2012**
≠*Norellia spinipes*	13d,15a	7	**2015**
Norellisoma spinimanum	13d	8,10	**2014**
Scathophaga furcata	10b(JD),d,14c(JD),19*,23b,30a(JD)	5,6,7,8	**2014**
Scathophaga inquinata	10d,13b,19*	8,9	**2013**
Scathophaga lutaria	13d,19	7,8,10	**2014**
Scathophaga stercoraria	10,11,12*,13,19,21,22,23,24,25(JD)	6,7,8,9,10	**2015**
Scathophaga spurca [= *suilla*]	10d,12a,13d,19*,23b,24q	5,6,7,8,9,10	**2014**
Spaziphora hydromyzina	23b	6,7	**2014**
ANTHOMYIIDAE			
Anthomyia imbrida	19(NR)	7,8	**2010**
Anthomyia liturata	11k,15a,19(NR),23c,24q,26	6,7,8	**2015**
Anthomyia pluvialis	13b	8	**2011**
†*Anthomyia procellaris*	13b,19*	7,8	**2011**
Botanophila brunneilinea	11h,k	6,7,8	**2015**
Botanophila discreta	10c	7	**2015**
Botanophila fugax	10c,d,13b,c,19*,24q	6,7,8,9,10	**2014**
Botanophila spinosa	10a(NR)	9	**2010**
Calythea nigricans	12a,24q,25b	7,8,9	**2014**
Chirosia flavipennis	23c	6	**2012**
Delia criniventris	19(NR)	10	**2010**
Delia florilega	11k	5	**2014**
Delia platura	12a,13b	6,8	**2013**
Emmesomyia socia	13b	9	**2011**
†≠*Eustalomyia hilaris*	13d	8	**2011**
Hydrophoria lancifer	11k,19	5.8	**2014**
Hydrophoria linogrisea	19	6,8	**2013**
Hydrophoria ruralis	10d	9	**2013**
†*Hylemya nigrimana*	19(NR)	7,9	**2010**
Hylemya urbica	19(NR)	9,10	**2010**
Hylemya vagans	10c,d,11h,13b,d,14a,16d,19*,20a	6,7,8,9,10	**2015**
Hylemya variata	11k,12a,19(NR),23o,24q	5,6,7,8,9,10	**2015**
Hylemyza partita	13a,b,c,d,19*,26	6,7,8,9,10	**2014**
Lasiomma picipes	23c	8	**2014**
Mycophaga testacea	11h,13b,19	7,8,9,10	**2015**
Paradelia brunneonigra	19(NR)	9	**2010**

Paradelia intersecta	10d,13d	7,9	**2015**
Paregle audacula	13c	4	**2012**
Pegoplata aestiva	11k,12a,15a	6	**2014**
Pegoplata infirma	11k,13b,23b,25b	6,7,8	**2014**
Pegoplata juvenilis	13a,b,19*	6,7,8,9,10	**2014**
Phorbia bartaki	12a,13c,15a	4	**2012**
Pegomya bicolor	11h,15a	5,7,8	**2014**
Pegomya fulgens	19	9	**2011**
‡*Pegomya geniculata*	13b,c,d,19	6,7,8,9,10,11	**2015**
Pegomya laticornis	13c	6	**2012**
Pegomya solennis	10a(NR),13b,c,15a,19,23b	4,5,7,8,9	**2014**
Pegomya winthemi	12a,13b	8,9	**2011**
FANNIIDAE			
†≠*Fannia aequilineata*	10a,19(NR)	6,7,8,9,10	**2010**
Fannia armata	13b,c,14a,15a,19,24q,26	6,7,8	**2014**
‡*Fannia canicularis*	19*	7,8	**2014**
≠*Fannia clara*	10c,11h,12a/b,13b,c,d,19	6,7,8,10,11	**2014**
Fannia fuscula	19(NR)	7	**2010**
†≠*Fannia gotlandica*	10d,19	8	**2013**
Fannia lucidula	19(NR)	7	**2010**
Fannia lustrator	19(NR)	7	**2010**
‡*Fannia monilis*	19(NR)	7	**2010**
Fannia pallitibia	10d,13b,c,d,19*	8,9,10,11	**2014**
Fannia parva	10d,11h,13b,c,d,19	7,8,9,10,11	**2014**
†*Fannia polychaeta*	12a,19*	6,7,8	**2013**
†*Fannia postica*	15a	8	**2012**
Fannia rondanii	13d,19	7,8	**2015**
Fannia scalaris	19	7	**2011**
Fannia serena	11h,k,13b,d,15a,19	6,7,8	**2015**
Fannia sociella	13a,15a,19	6,8,9	**2013**
Fannia vesparia	19(NR)	8	**2010**
Piezura pardalina	13b,19*	7,8,10	**2014**
MUSCIDAE			
Azelia cilipes	10d,13b,c,d,14a,19*	6,7,8,9,10	**2015**
Azelia gibbera	13a	8	**2012**
Azelia nebulosa	10d,11h,13a,b,c,d,19	5,7,8,9,10	**2015**
Azelia triquetra	10d	8	**2013**
Azelia zetterstedti	13b,d	7,8	**2015**
Coenosia agromyzina	10d,13b,c,14a,19	5,6,7,8,9	**2014**
≠*Coenosia atra*	11h,k,23b	6,7,8	**2015**
Coenosia infantula	12a,13d,25b	7,8	**2012**
Coenosia mollicula	10d,11h,13b,c,19*,23b,c,o,24q,27	6,7,8,9	**2015**
Coenosia testacea	11h,k,12a/b,13b,c,d,15a,19,23b,24q	5,6,7,8,9,10	**2014**
Coenosia tigrina	10c,11k,12a,13b,15a,23b,23l	6,7,8,9,10	**2015**
Eudasyphora cyanella	10a,19(NR)	7,8	**2010**
Graphomya maculata	13b,30a(JD)	6-8	**2012**
Gymnodia humilis	13b	10	**2013**
Hebecnema nigra	11h,13a,b,19	7,8,9,10	**2014**
Hebecnema nigricolor	10d,13a,b,d,19	6,7,8,10	**2014**
Hebecnema umbratica	19(NR)	7	**2010**
Hebecnema vespertina	19	8	**2012**
Helina anceps	11k,12a,24q	6,7,8	**2015**

Helina depuncta	10a(NR),d,13c,19*	7,8,9,10	**2015**
Helina evecta	12a,13b,16d,19*,23b	6,8,10	**2015**
Helina impuncta	10a,d,12a,13b,c,d,15a,19*,24q,25f(NR)	6,7,8,9,10	**2014**
Helina latitarsis	11k	8	**2014**
†*Helina pertusa*	19,25f(NR)	8,9,10	**2010**
Helina reversio	11k,12a,15a,19*,23b,c,o	6,7,8,9	**2015**
Hydrotaea dentipes	10d	7	**2014**
Hydrotaea irritans	10d,13b,d,15a,19	7,8,9	**2015**
Limnophora riparia	13b,d,25a(DL)	6,10	**2012**
Limnophora tigrina	11h,23b	6,8	**2015**
Lispe tentaculata	23o	8	**2015**
Lophosceles mutatus	10d	8,	**2013**
Mesembrina meridiana	11g,14c,21j,24n,25e(JD)	6-8	**2004**
Morellia aenescens	13b	8	**2012**
Musca autumnalis	24n(JD)	6-8	**2004**
Musca domestica	11g,12a,13d,14c(JD)	6-8	**2004**
‡*Muscina levida*	19(NR)	7	**2010**
Muscina prolapsa	19,25f(NR)	7,8,9	**2010**
Mydaea affinis	19(NR)	9	**2010**
Mydaea ancilla	10a(NR)	9	**2010**
Mydaea corni	19	10	**2012**
‡*Mydaea urbana*	19*	8,9,10	**2012**
Myospila meditabunda	12a,24q,25f(NR)	7,8,10	**2014**
†≠*Phaonia cincta*	25f(NR)	10	**2010**
Phaonia errans	10a,19(NR)	7,8,9,10	**2010**
Phaonia fuscata	13b,d	4,6,7	**2015**
†‡*Phaonia gobertii*	19(NR)	7,8,9	**2010**
Phaonia halterata	12a/b	8	**2014**
†≠*Phaonia laeta*	19(NR)	8,9	**2010**
†*Phaonia pallida*	19(NR)	7,8,9,10	**2010**
†*Phaonia palpata*	13b,19(NR)	8,9,10	**2013**
Phaonia rufipalpis	15a	7	**2015**
†‡*Phaonia rufiventris*	10d,11h,13c,14a,19*	5,8,9,10,11	**2014**
†‡*Phaonia subventa*	13b,d,19*	6,7,8,9,10,11	**2015**
Phaonia tuguriorum	10a(NR),d,19*	7,8,9,10	**2015**
Phaonia valida	10a(NR),13b,19*	7,8,9,10	**2012**
Polietes albolineatus	11h	7	**2014**
†*Potamia littoralis*	19(NR)	7,8	**2010**
Schoenomyza litorella	10c,12a,13c,15a,23b	4,6,7,8,9	**2015**
Spanochaeta dorsalis	23b	6	**2013**
Stomoxys calcitrans	27	8	**2015**
Thricops diaphanus	13c,d,19*	7,9,10,11	**2014**
Thricops simplex	19	7,9	**2015**
RHINOPHORIDAE			
†*Melanophora roralis*	12a,25f(NR),26	6,7,9,10	**2012**
†*Paykullia maculata*	19(NR)	9,10	**2010**
Phyto discrepans	25f(NR)	7	**2010**
†*Rhinophora lepida*	10d,11h,k,13a,19*,24q,25f(NR),26	6,7,8	**2015**
CALLIPHORIDAE			
Bellardia viarum	10a(NR),11k,19(NR)	6,7,8	**2014**
Bellardia vulgaris	10a(NR)	7	**2010**
Calliphora vicina	19*,25f(NR)	7,8,9,10	**2010**

Calliphora vomitoria	19(NR)	7,8,10	**2010**
Lucilia ampullacea	19(NR)	7,8,9,10	**2010**
Lucilia caesar	13b,19(NR)	7,8,10	**2012**
Lucilia illustris	19(NR)	9,10	**2010**
Lucilia sericata	19(NR)	7,8	**2010**
Melanomya nana	11h,k,12a,13b,d,20a,23b	5,6,7,8,9	**2015**
Pollenia griseotomentosa	19(NR)	7	**2010**
Pollenia pediculata	10c,11h,12a,13c,19*	6,7,9,10	**2015**
Pollenia rudis	10b,11g,14c(JD),23b,30a(JD)	7,8	**2014**
Pollenia vagabunda	10a,25f(NR)	7,8,9,10	**2010**
Pollenia viatica	19(NR)	10	**2010**
SARCOPHAGIDAE			
≠*Blaesoxipha plumicornis*	11k,12a	7,8	**2014**
≠*Macronychia griseola*	24q	8	**2015**
†≠*Macronychia striginervis*	19(NR)	7	**2010**
Nyctia halterata	24n(JD)		**2004**
Ravinia pernix	23o	8	**2015**
Sarcophaga carnaria	10a,b,12a,14b,c,19*,22b,d,30a(JD)	7	**2012**
Sarcophaga dissimilis	11k	6	**2014**
Sarcophaga incisilobata	11k	8	**2014**
Sarcophaga nigriventris	11h	6	**2014**
≠*Sarcophaga subulata*	12a,19*	7	**2014**
Sarcophaga pumila	13c	6	**2013**
Sarcophaga vagans	19(NR)	7	**2010**
Sarcophaga variegata	10a(NR),11h,12a,19(NR)	6,7,8	**2015**
TACHINIDAE			
≠*Cinochira atra*	10a(NR)	7	**2010**
≠*Cistogaster globosa*	10a	7	**2015**
Dexiosoma caninum	19	7,10	**2014**
Dinera grisescens	23c	6	**2012**
Dufouria chalybeata	11h,13a	6	**2014**
Eriothrix rufomaculata	10a,b,c,11k*,12a,14b,c,22b,d,24q,25e,30a	7,8	**2015**
Estheria cristata	10a(NR),c,11h,23c,25f(NR)	6,7,8,9	**2014**
Eurithia consobrina	23n	8	**2015**
Exorista rustica	11k,12a/b	6,8	**2014**
≠*Freraea gagatea*	25f(NR)	6	**2010**
Gymnocheta viridis	15a	4	**2012**
Lydina aenea	10a(NR)	8	**2010**
Macquartia grisea	19	8	**2012**
Medina collaris	12a	7	**2012**
Nowickia ferox	11k(MH)	7	**2013**
Ocytata pallipes	19(NR)	7	**2010**
Pales pavida	11k	6	**2014**
Phasia barbifrons	13b	7,8	**2015**
Phasia pusilla	10a,b(JD),11k,13c,30a(JD)	5,7	**2015**
‡*Phytomyptera cingulata*	13c	7	**2012**
Ramonda spathulata	25f(NR)	8	**2010**
Siphona geniculata	10b,11k,g(JD),13b,14b,c(JD),23b,30a(JD)	7,8,9	**2015**
Tachina fera	10b,c,13b,14b,c,18e,19,21j,23f,24n,25e	7,8,9	**2014**
†*Triarthria setipennis*	13c,25f(NR)	7,8	**2012**
Zophomyia temula	10c,11k	6	**2014**

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