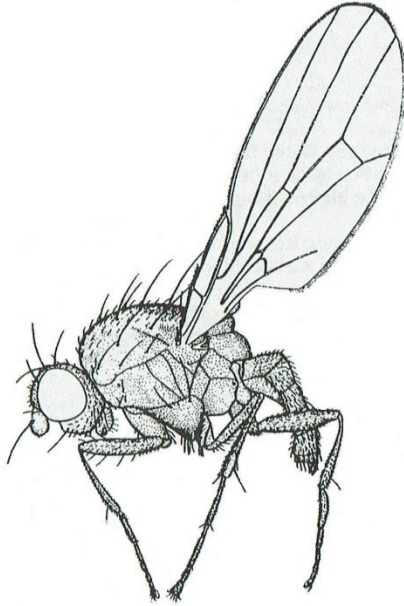# Dipterists Digest

2019 Vol. 26 No. 1

Cover illustration: *Eliozeta pellucens* (Fallén, 1820), male (Tachinidae). PORTUGAL: Póvoa Dão, Silgueiros, Viseu, N 40º 32' 59.81'' / W 7º 56' 39.00'', 10 June 2011, leg. Jorge Almeida (photo by Chris Raper). The first British record of this species is reported in the article by Ivan Perry (pp. 61-62).

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Dipterists Digest is the journal of the **Dipterists Forum**. It is intended for amateur, semi-professional and professional field dipterists with interests in British and European flies. All notes and papers submitted to Dipterists Digest are refereed. Articles and notes for publication should be sent to the Editor at the above address, and should be submitted with a current postal and/or e-mail address, which the author agrees will be published with their paper. Articles must not have been accepted for publication elsewhere and should be written in clear and concise English. **Contributions should be supplied either as E-mail attachments or on CD in Word or compatible formats.**

The scope of **Dipterists Digest** is:

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- new and improved techniques (e.g. collecting, rearing etc.);
- the conservation of flies;
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- records and assessments of rare or scarce species and those new to regions, countries etc.;
- local faunal accounts and field meeting results, especially if accompanied by ecological or
         natural history interpretation;
- descriptions of species new to science;
- notes on identification and deletions or amendments to standard key works and checklists.

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

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

Authors will be provided with twenty separates of papers of two or more pages in length, and a pdf of their contribution if requested.

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The pupa of *Molleriella calcarella* Sæther & Ekrem; *Molleriella algerica* comb. nov. for *Chaetocladius algericus* Moubayed (Diptera, Chironomidae)

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Summary
The pupa of *Molleriella calcarella* Sæther & Ekrem, 1999 is described. The pupa and adult male of *Chaetocladius algericus* Moubayed, 1989 conform in most details to those of *Molleriella* and this species is here transferred to *Molleriella*.

Introduction
Henk Moller Pillot reared an adult male *Molleriella calcarella* Sæther & Ekrem, 1999 on 30 July 2017, from an *Alnus/Salix* copse (pH 6-7.6; soil wet, sometimes very wet) at Twijzel, The Netherlands, and retrieved the pupal exuviae. He generously donated the specimen along with other conspecific males and females to my collection. When preparing to describe the previously unknown pupa of *M. calcarella*, it occurred to me that I had seen it before: it is keyed in both Langton (1991) and Langton and Visser (2003) as *Chaetocladius algericus* Moubayed, 1989. Inspection of the *Chaetocladius algericus* holotype reveal characters that place the species in the genus *Molleriella*.

Description of the pupa of *Molleriella calcarella* (n=1)
Transparent, colourless. Total length 2.2mm. Wing sheath 0.7mm long, with a prominent nose.
Thoracic horn absent. Frontal setae absent. Base of antennal sheaths with a short conical projection and neighbouring tubercles (Fig. 1a). Anteronotal setae 2, 16, 12 μm long. Precorneal setae 48, 36, 20 μm long. Dorsocentral setae apparently absent. Posterior thoracic mound weakly developed.
Abdominal tergites II-VIII covered with small points and with a posterior narrow band/row of narrow spines (30-36μm long, longer on more posterior segments), the width of the tergite (Fig. 1b). Sternites unarmed. Lateral setae (4) 8, 40, 32, 10 μm long. Dorsal and ventral setae minute or absent, not detected.
Anal lobes more or less parallel-sided, obliquely truncate apically, postero-lateral corners armed with a short tooth, which may be bifid; at the inner corner there is a further short tooth. Tergite X with a median patch of points. Male genital sacs 1.4 x length of anal lobes, densely minutely toothed ventrally in two patches, the posterior patch attached to the anterior laterally (Fig. 1c).

Systematics
The pupa of *Molleriella calcarella* runs to *Chaetocladius algericus* Moubayed in Langton (1991) and Langton and Visser (2003).
The genus *Molleriella* is well characterised by Sæther and Ekrem (1999). The adult male morphological characters of *Chaetocladius algericus* that comprise the characteristics of *Molleriella* incorporated in the description by Moubayed (1989) are the apical seta on the antenna, bare eyes, reduced tibial apical spurs and triangular projection between the gonocoxite bases, coupled with the hairy wings and general features of the hypopygium. The holotype additionally

reveals that the eyes have no dorsal extension, there is a costal extension of 0.1mm and no acrostichals are visible (contrary to Moubayed's description). These characters, except for the costal extension, are not found in the genus *Chaetocladius*; *C. algericus* is a *Molleriella*.

The pupae of *M. algerica* and *M. calcarella* may be separated by inserting the following into Langton's (1991) Orthocladiinae key at couplet 172:

172. Each anal lobe with the macrosetae reduced to strong points on the posterior margin (Plate 61h). Tergites II-VIII covered with even-sized points except for the adhesion marks……………………………………………………………………………..172a

172a. Posterior spines of tergites III-VIII longer on each successive segment (longest spine on tergite VIII 50μm long, 1.2x as long as longest spine on III). Total length < 2.5mm …………………………………………….. **Molleriella calcarella** Sæther & Ekrem
Posterior spines of tergites III-VIII shorter on each successive segment (longest spine on tergite VIII 45μm long, 0.8x as long as longest spine on III). Total length >2.5mm ……………………………………………… **Molleriella algerica** (Moubayed)

This key can also be inserted in Langton and Visser (2003) on page 768a.
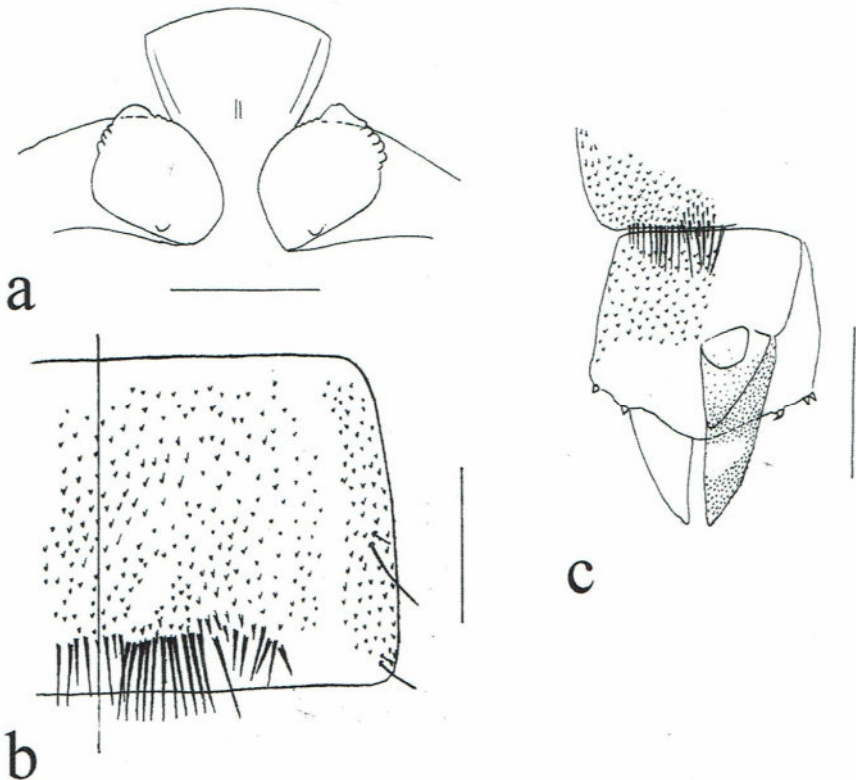

Fig. 1. *Molleriella calcarella* pupal exuviae: a, frontal apotome and antennal sheath bases; b, segment VI dorsal; c, anal segment, dorsal left, ventral right. Scale lines 0.1mm.

The adult males of these two species are very alike. *Molleriella algerica* is larger (wing length calculated from pupal wingsheath length (Langton 2002) 1.4mm); *M. calcarella* is smaller, wing length 1.2-1.3mm. The inferior volsella of *M. algerica* is thumb-like, rounded at apex (Moubayed 1989, figs 4 and 5), whereas that of *M. calcarella* is more or less triangular, with posterior edge nearly straight and at right angles to the gonocoxite (Sæther and Ekrem 1999, fig.7; Langton, 2019, fig 1).

A pharate adult male *Molleriella* collected by H. Laville in May 1999 (in coll. PHL) from the River Ortolo, Corsica, conforms as pupa and adult to *M. calcarella* as above. This is the first record for the species from the Mediterranean islands.

There are now three species included in *Molleriella*: *M. calcarella* Sæther & Ekrem from Europe, *M. algerica* (Moubayed) comb. nov. from Algeria and *M. kaputu* Andersen (2014) from Tanzania.

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Carcelia puberula **(Mesnil) (Diptera, Tachinidae) new to Ireland –** On 31 May 2018, I carried out an invertebrate survey for Ulster Wildlife at Edenderry Nature Reserve in County Down. The site is located along the banks of the River Lagan about 3 miles south of Belfast (Irish Grid Reference: J3176568141); the reserve is rather small, only 1.12 hectares. The site comprises deciduous woodland with a good range of tree species: ash, beech, elm, hazel, hawthorn, holly, sweet chestnut and yew. A tachinid fly was seen resting on beech foliage; I swept up and pootered the specimen and awaited further inspection. Once the specimen was stage mounted, I used the key by R. Belshaw (1993. Tachinid flies. Diptera: Tachinidae. Handbooks for the Identification of British Insects. 64 pp. Royal Entomological Society, London). To my surprise it keyed to *Carcelia puberula* (Mesnil, 1941). I was fortunate enough to have collected a male so I could check the terminalia for confirmation (see Figs 1 and 2). The specimen was later checked by Chris Raper and confirmed as *C. puberula*. The voucher specimen has been retained and deposited at the Ulster Museum in Belfast with Accession number BELUM.Mr2019.1.

This seems to be a scarce species and was deemed as rare by Belshaw (*op. cit.*). There are currently 23 records in England, with a widespread distribution on the National Biodiversity Network Atlas, which is regularly updated by the Tachinid recording scheme (National Biodiversity Network. 2019. *Carcelia puberula* Mesnil, 1941. Available at: https://species.nbnatlas.org/species/NBNSYS0000001999 [Accessed 4 January 2019]). I have seen very few tachinids at this site; only *Gymnocheta viridis* (Fallén), *Dexiosoma caninum* (Fabricius) and *Siphona* species have been previously recorded.
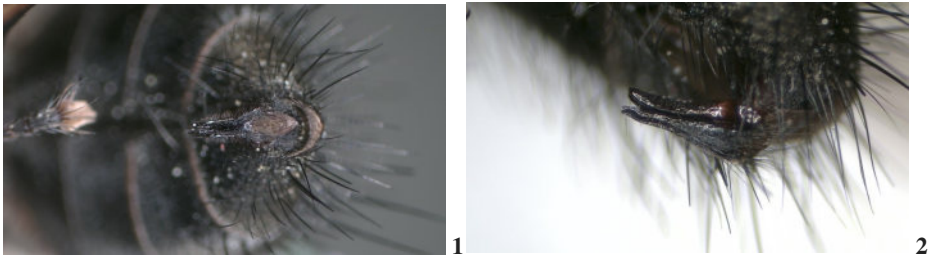
Figs 1-2, *Carcelia puberula* **(Mesnil), terminalia: 1, ventral view; 2, lateral view.**

There is one host record of black arches moth, *Lymantria monacha* (Linnaeus, 1758), in Europe (Belshaw *op. cit.*). Due to the scarcity of *L. monacha* in Ireland, with only three records on the National Biodiversity Data Centre maps, none of which are recent and located in Counties Sligo and Wexford, a considerable distance from Edenderry Nature Reserve, it seems unlikely that *C. puberula* is using only this species as a host. There are four species in Ireland of the tribe Lymantriini, which a number of British species of *Carcelia* use as hosts but not exclusively. This is the third species of *Carcelia* to be recorded in Ireland; only *C. lucorum* (Meigen, 1824) and *C. gnava* (Meigen, 1824) have been recorded previously (Chandler, P.J. (Ed.) 2019. An Update of the 1998 Checklist of Diptera of the British Isles [Updated 27 February 2019] http://www.dipterists.org.uk/resources/checklist/pdf).

I am very grateful to Chris Raper for being very helpful and confirming species identification at the Natural History Museum, London **– RYAN MITCHELL,** Natural Sciences Curator, Department of Natural Sciences, National Museums Northern Ireland, Cultra, Holywood, Co. Down, BT18 0EU

Organoxeny within *Phytomyza ranunculi* (Schrank) (Diptera, Agromyzidae) larvae

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Summary
The larvae of *Phytomyza ranunculi* (Schrank, 1803), a common leaf-miner of Ranunculaceae, are confirmed to be internal and external stem-miners, an example of organoxeny. Details and illustrations are provided. A comparison with *Phytomyza caulinaris* Hering, 1949 is included, along with the removal of that species from the British list.

Introduction
During June 2018, whilst searching meadow buttercup (*Ranunculus acris*) for the larval signs of *Ophiomyia ranunculicaulis* Hering, 1949, several external stem mines, with feeding larvae, were discovered and collected for rearing.

The closely-spaced grains of frass ruled out *O. ranunculicaulis* and suggested the causer was a *Phytomyza* species, of which there are several known stem-miners of *Ranunculus* in Britain: *Phytomyza albipennis* Fallén, 1823, *P. caulinaris* Hering, 1949, *P. enigmoides* Hering, 1937, *P. evanescens* Hendel, 1920 and *P. nigritula* Zetterstedt, 1838.

The collected stems were placed into rearing containers and within a few days, the larvae had vacated the mine to pupariate, with 17 puparia being obtained. As the larvae left the mines to pupariate, *P. albipennis*, *P. enigmoides, P. evanescens* and *P. nigritula* were ruled out as these species form their puparium within the stem.

The afore-mentioned species also only form their primary mine (up to the first 10cm) on the surface of the stem, with the larva soon mining internally and pupariating therein. Therefore, the only other possible causer was considered to be *P. caulinaris*, which is known to form upper surface stem mines, with the larva leaving the mine to pupariate; this species and its removal from the British list are discussed later.

Puparia obtained from the *R. acris* stems were placed into rearing jars and within a few weeks, 16 adults (4♂ 12♀) had emerged. They keyed readily to *P. ranunculi* var. *flava* and detailed examination of the male genitalia confirmed the determination. The adults and puparia were compared to *P. ranunculi* reared from leaf mines, with the specimens proving to be identical.

Discussion
Individual species will usually choose the same specific parts of the plant in/on which to construct a mine, but these parts must possess chlorophyll-containing parenchymal tissue. This tissue is found in the leaves, stems, unripe fruits, parts of the flower and sometimes in the root.

Hering (1951) mentioned that species whose larvae normally only mine the leaf, may be found quite frequently mining the stem if the leaves are too small and providing insufficient nutrition. For example, Buhr (Hering 1951) observed that when the mines of *Liriomyza strigata* (Meigen, 1830) were present in the small, uppermost leaves of the (Asteraceae) host plant, the larva would continue into the parenchyma of the stem, which provides adequate nutrition to allow normal development of the larva. Although the leaves of *R. acris* are rather narrow, Buhr's observation does not appear to apply here as no leaf mines were observed on the plants containing the stem mines.

The mines on *R. acris* clearly started on the stem; quite often the start would be in the central section of an internode. The larvae were observed feeding in a downward (Fig. 1) or upward (Fig. 3) direction and when a larva reached a node, it would either carry on mining past the node or, more frequently, turn back on itself and recommence mining (Fig. 2). The length of mines ranged from 8cm to 17cm. In most cases, the mines were relatively straight with only a few spiralling around the stem, the latter being a feature of the initial mines of *P. albipennis*, *P. evanescens* and *P. nigritula*. The frass within the mines was deposited in closely-spaced grains, forming long pearl chains (Fig. 3), along one side of the corridor. As previously mentioned, the larvae vacated the mine to pupariate, via an exit slit along the edge of the mine, with the puparium being brown, each posterior spiracle possessing 18-20 bulbs.

1

2

3

Figs 1-3. Tenanted larval stem mines of *Phytomyza ranunculi* on *Ranunculus acris*.

The collecting site contained abundant creeping buttercup (*Ranunculus repens*), with *R. acris* being sparsely scattered here and there, making the decision of female *P. ranunculi* to utilise *R. acris* stems intriguing. Interestingly, despite *P. ranunculi* being a frequently heavily parasitised species (c. 75% of larvae: Charles Godfray *pers. comm.*), chiefly by the braconid *Dacnusa laevipectus* Thomson, 1895, no parasitoids were reared. Other sites were examined for similar mines, but none were discovered.

During his extensive study of the Agromyzidae on some genera of Ranunculaceae between 1980 and 2003, Pakalniškis (2004) collected their early stages and reared 47 species of Agromyzidae, which naturally included *P. ranunculi*. Within his excellent paper, there is no mention of the species ever forming true stem mines. Dr Willem Ellis has also dedicated much time to the larval stage of the Agromyzidae and has (*pers. comm.*) never encountered the species stem-mining, despite the abundance of the species and the host plant.

Organoxeny, a term used to describe the occurrence of a phytophagous insect on other organs of the plant than those it normally frequents (Voigt 1932), is seldom encountered but it appears that the stem mines discussed within this paper are a rare example of such behaviour.

Removal of *Phytomyza caulinaris* Hering, 1949 from the British list
This species was added to the British list by Bland (2001), on the basis of 'Agromyzid larvae mining the stems of *Ranunculus repens* at Blackford, Edinburgh on 6.vii.1998 produced a single male fly of *P. caulinaris* on 19.vii.1998. Identity checked by examination of male genitalia'. Keith Bland (*pers. comm.*) clarified these details by reference to his original notebook, which stated "06.vii.1998. Internal stem mines in *Ranunculus repens* flower stems – 2 puparia found [i.e. 2 puparia were present in the mines within the stem], 19.vii.1998 1 male agromyzid *Phytomyza caulinaris* emerged". These notes apparently contradicted the literature, which describes *P. caulinaris* as an external stem-miner, with pupariation occurring externally, in the ground. Keith Bland had in his collection four adults reared from "stem lumen miners that pupariated within the stem", three from *R. repens* and one from *R. acris*, all determined as *P. caulinaris.* The male, upon which the addition to the British list was based, was reappraised and

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it possesses some damage to the tubules of the distiphallus, so could be either *P. caulinaris* **or** *P. ranunculi*. Dissection by Keith and myself of two more of these males found them to possess identical genitalia (Fig. 4) to the adults reared from external stem mines, and all the specimens identified as *P. caulinaris* were confirmed to be *P. ranunculi*.
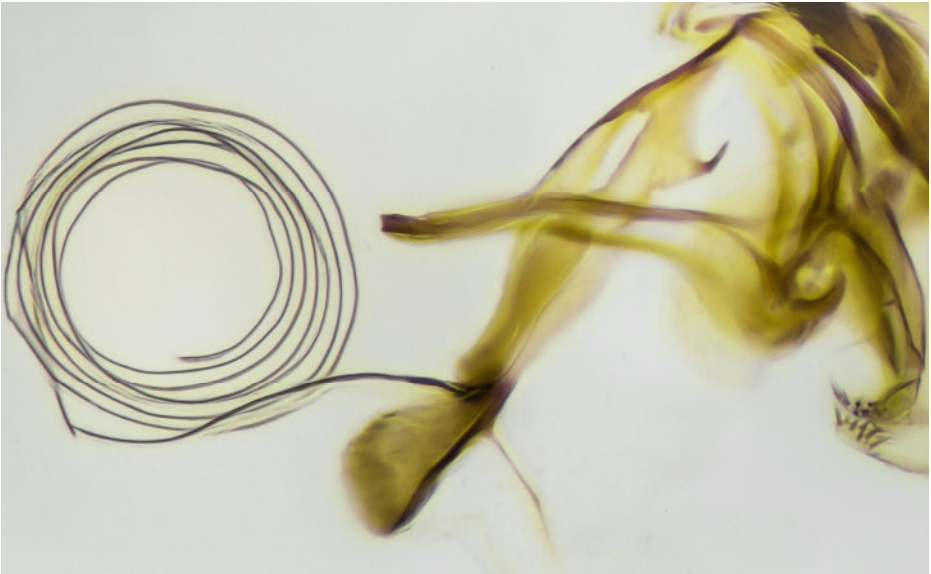

Fig. 4. ***Phytomyza ranunculi*** **phallus (lateral view) of male reared from internal stem mine.**

The specimen forwarded to me also agreed morphologically with my reared material, with only the following differences noted:

	Adult reared by Bland	Adults reared by BPW
Sternopleuron	Yellow	Brown
Hypopleuron	Yellow	Brown
Mesonotum	Yellow, banding orange	Yellow, banding brown
Legs	Tibiae and tarsi yellow	Tibiae and tarsi dark

Phytomyza ranunculi is highly variable in coloration, with a pale form (var. *flava*), dark forms (var. *flavoscutellata,* var. *islandica*) and further varieties (var. *albipes*, var. *pentalinearis,* var. *praecox*) and many variants in-between. The puparium of Bland's specimen is pale grey, whilst it is pale brown in the adults reared by BPW, both agreeing with the description by Spencer (1976). The minor differences in coloration between the specimens are not considered to be of any taxonomic significance.

Paratypes of *P. caulinaris* (1♂, 1♀) were loaned from the Natural History Museum, London, for comparison with the adults reared by Keith Bland and myself. Using the keys of Spencer (1972, 1976), both specimens ran to *P. ranunculi*. The sternopleuron and hypopleuron of both specimens is brownish, with the banding on the mesonotum similar in coloration, therefore agreeing with my reared adults. Legs of both specimens are yellowish-brown, darker than Bland's adult but paler than those reared by me. All other morphological features agree with

all the reared specimens. The second costal section of the *P. caulinaris* paratypes are x3.75 that of the fourth in the male, x3.6 in the female [in *P. ranunculi* this is normally x3.3, range x2.6-4.0 (von Tschirnhaus 1969)].

Hering (1949) described *P. caulinaris* (as a subspecies of *P. ranunculi*) as being only slightly different from *P. ranunculi*, stating 'it is easiest to distinguish them by the extent of black on the back of the head, which is deeply incised behind the *vti* in *P. caulinaris*, not the case in *P. ranunculi*'. This feature was checked in the paratypes, the adults reared by Keith Bland and myself, along with additional specimens of *P. ranunculi* reared from *Ranunculus* leaf mines; within the paratypes, the black behind the *vti* is only noticeably cut-away on the left side (Fig. 6) of the male. The female paratype, the adults reared by Keith Bland (Fig. 7) and by myself (Fig. 8) do show an incision in the black behind the *vti*, as do *P. ranunculi* reared from typical *Ranunculus* leaf mines (Fig. 9). The extent of the black is seemingly quite variable within individuals and therefore, Hering's statement must be considered unreliable.

Upon examination of the male genitalia, although slightly damaged, the distiphallus (Fig. 5) agrees with the description and illustration in Spencer (1976 and 1990), with three coils, coiling in a downward direction [see Coiling], quite different to that of *P. ranunculi*.
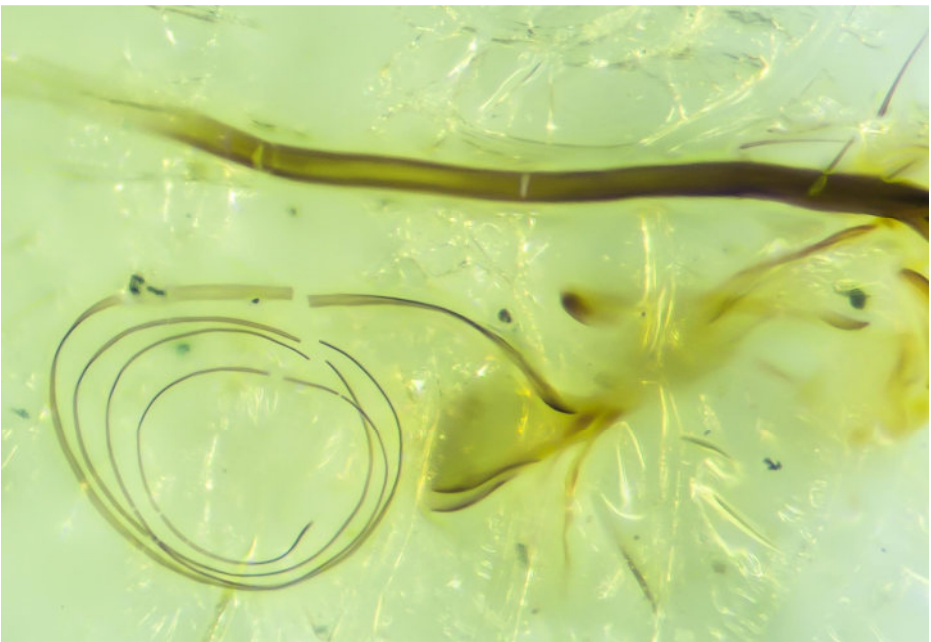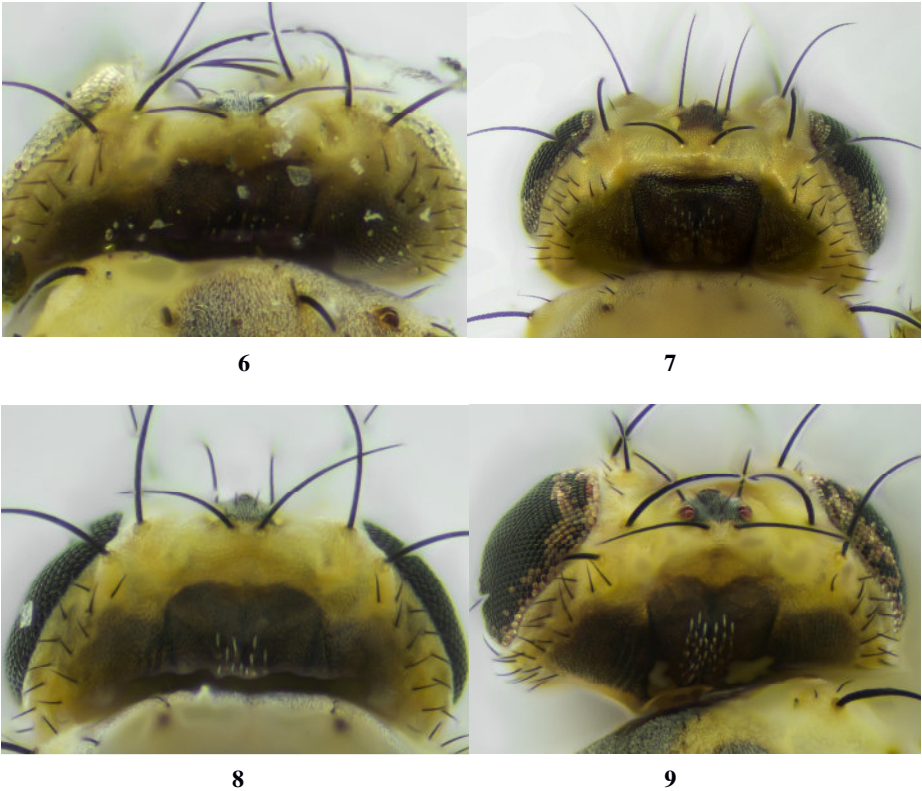

Fig. 5. *Phytomyza caulinaris* paratype: phallus (lateral view).

Figs 6-9. Back of head detail: 6, *Phytomyza caulinaris* male paratype; 7, *Phytomyza ranunculi* reared from internal stem mine; 8, *Phytomyza ranunculi* reared from external stem; 9, *Phytomyza ranunculi* reared from leaf mine

Keith Bland also recorded *P. caulinaris* based on vacated external stem mines on *R. acris* (with frass agreeing closely with Figs 1-3); however, the findings discussed within this paper suggest these may have also belonged to *P. ranunculi*.

The likelihood of these mines being caused by *P. ranunculi* is supported by Hering's (1957) *Ranunculus* miner key. The mines, described and illustrated earlier, run to couplets 7 or 8, depending on whether the mines are straight or spiralling. Within couplet 7, Hering stated 'If the faeces are very dense, lie pearly, puparium outside of the mine, then *Phytomyza ranunculi*'; this description agrees with the stem mines in question. The only option within couplet 8 is *Phytomyza caulinaris*; however, Hering describes the mines as 'mostly without faeces', which does not apply here.

Therefore, in light of the misidentified adults and the uncertainty surrounding vacated external stem mines, *Phytomyza caulinaris* is hereby removed from the British list.

The following key should be referred to when recording stem mines encountered on *Ranunculus* species:

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Provisional key to the British *Ranunculus* stem miners (including *P. caulinaris*)

1. Whole mine under epidermis of stem …………………………………………….………...…2
- Mine initially under epidermis of stem, soon becoming internal or wholly internal; pupariation within lumen of stem …..…………………………………………………..….….4

2. Pupariation within mine; posterior spiracles 3-branched ……....... ***Ophiomyia ranunculicaulis***
- Pupariation external; reared imagines required ..………………………………………........ 3

3. Distiphallus with 5-8 coils, coiling upwards [see Coiling] ……………. ***Phytomyza ranunculi***
- Distiphallus with 3 coils, coiling downwards [see Coiling] ……………. ***Phytomyza caulinaris***

4. Check by rearing imagines:
 Imago with first and second antennal segments yellow, third segment black, 1 *ors* [if upper *ors* present, greatly reduced], 1 *ori* …….….……………………………. ***Phytomyza ranunculi***
 Imago otherwise …………...……………………..…………………………………………… 5

5. Proboscis conspicuously elongate ...……….......………………………………...…………. 6
- Proboscis short, normal, third antennal segment distinctly elongate ..…… ***Phytomyza nigritula***

6. Wings conspicuously pale ....…. ***Phytomyza albipennis***
- Wings hyaline, normal …………………..…………………………………...……… 7

7. Third antennal segment small; surstyli free, abnormally extended ventrally into a flap-like appendage …......................…….. ***Phytomyza evanescens***
- Third antennal segment larger; surstyli normal ……………………….. ***Phytomyza enigmoides***

Coiling
Phytomyza caulinaris was originally described as a subspecies of *P. ranunculi* by Hering but was raised to full specific status in Spencer and Martinez (1987); this was done without an analysis of function-morphology. At present, the key defining feature separating the two species is the coils and coiling of the distiphallus, which upon first glance, appears reasonable.

 At rest, the coiling of the distiphallus lies horizontally within the abdominal cavity, whereas when outside the body, the coiled distiphallus, in its natural morphological position, is perpendicular; there is not enough space within the abdominal cavity to store the distiphallus perpendicularly.

 The upward or downward coiling is not morphologically a true representation but is really caused by other factors: the lack of space within the abdominal cavity, or the dissection process, or the embedding in mounting medium placing forcible contortion upon the distiphallus. These factors result in the base of the long distiphallus turning 90° to the left or right, causing the coiling to be in an anti-clockwise or clockwise direction respectively (viewed from above on the horizontally orientated coils) and transformed to a downward direction if returned by 90° to the natural position or to an upwards direction if turned by 180° left or right.

 Therefore, the upward or downward direction of the coiling is considered to be artificial, an incidental effect, which should not define a species. Also, natural variation may account for the number of coils present. The true status of these two species and others in the *ranunculi*-group may not be possible to determine without the results of barcoding from reared and fresh material kept under low temperatures in absolute ethanol.

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The Pipunculidae, a neglected family of Diptera in Morocco

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Summary
A preliminary account of the Moroccan species of Pipunculidae is given, with 16 new species records for the country. Taxonomic remarks are given for some species.

Introduction
Previous studies and numerous excursions to Morocco by many dipterists over the years resulted in many publications giving records of Diptera, but very few provided a comprehensive overview of individual families. One family, the Pipunculidae has been almost totally neglected. The World Catalogue of Pipunculidae (De Meyer 1996) has no records of any species of this family from Morocco. Likewise, Mouna (1998) had no Pipunculidae on his list of the invertebrates, a list largely based on literature records and some specimens in the collections at the Scientific Institute in Rabat, Morocco. Since then, there appeared only one published record of this family (Kehlmaier 2005), that of *Dasydorylas setosus* (Becker, 1908). Recently collected material, despite it consisting of relatively few specimens, has enabled us to add another 16 species. Not all could be named to species level for various reasons, mainly for inadequate material. However, there are many more that should occur in Morocco, given what is known from adjacent countries and the wide distribution of many species. Our contribution should only be considered as a very preliminary report, one that hopefully will stimulate interest in this family.

Methods
Most of the material has been obtained in recent years by KK in the period 2015–18 using Malaise traps and sweeping. Several students contributed material from samples they collected for their own studies of other Diptera. Taxa are listed in alphabetical order with all available collecting data in date order. The depository for all material is added in parenthesis. Localities are listed with the commonly accepted transliteration names. Altitude is given in metres above sea level (m asl.). Persons' initials and codons of institutions are abbreviated thus: KK – Kawtar Kettani (Tétouan, Morocco); MJE – Martin J. Ebejer (Cowbridge, UK); NPT – National Park of Talassemtane; PPNB – Project of Natural Park of Bouhachem. The letter "P" before the initials in parenthesis indicates the depository of those specimens being in the personal collection of the named individual.

Results
We list 17 species in seven genera, including 4 species identified only to genus as follows: 1 in *Chalarus* Walker, 1834, 1 in *Claraeola* Aczél, 1940 and 2 in *Tomosvaryella* Aczél, 1939.

List of species

Chalarus brevicaudis Jervis, 1992
Material examined
1♀, Chefchaouen, Dardara, 35°06.015'N 05°20.324'W, 730 m asl, 11.vi.2013, flowery meadow, pond, pine forest, MJE (PMJE); 1♀, damaged, Rif, Talassemtane, Azilane, Ain Tissemlal, mixed forest, 35°10'18"N 05°11'53"W, 1255 m asl, 4.vii–13.viii.2013, Malaise trap, KK (PKK); 1♀, Rif, El Hamma, mixed forest, 35°23'05"N 05°30'46"W, 338 m asl, 6.vi–21.vi.2016, Malaise trap, KK (PKK).

Remarks. Although the frons (examined in alcohol) in the specimen from El Hamma is a little wider than the vertex, which would take it to form A near *C. brevicaudis* according to Jervis (1992), it agrees well with the type series and with the illustrations of the ovipositor given in both Jervis (1992) and Kehlmaier and Assmann (2008). The specimen from Azilane lacks the head and one wing but on the basis of the very distinctive ovipositor it is considered to be *C. brevicaudis*. This species appears to be monophagous (Jervis 1992) on *Empoasca vitis* (Göthe, 1875) (Cicadellidae, Typhlocybinae), a very widespread, polyphagous agricultural pest present also in North Africa.

Chalarus sp.
Material examined
1♀, Rif, Talassemtane, Azilane, Ain Tissemlal, mixed forest, 35°10'18"N 05°11'53"W, 1255 m asl, 4.vii–13.viii.2013, Malaise trap, KK (PKK).

Remarks. This specimen, which is probably an undescribed species, is in good condition but lacks the postpedicels of both antennae. It is close to *C. brevicaudis* from which it differs in the ovipositor having an even shorter piercer with the distal part itself shorter than the basal part and the transition from the base to the piercer being clearly less abrupt than that in *C. brevicaudis*; the anterior ommatidial facets are only slightly enlarged, the frons is wide such that its width at the narrowest part is about 3.5 times the diameter of the largest ommatidial facet; the frons bears a small midline depression (pit) at the junction of the upper and lower third.

Claraeola sp. aff. *halterata* (Meigen, 1838)
Material examined
1♀, Rif, Akchour, Chellal Sghir, cascade, 35°14'21"N 05°10'37"W, 424 m asl, 7.vi–14.vii.2017, Malaise trap, KK (PKK).

Remarks. This is probably an undescribed species. It comes closest to *C. halterata* from which it differs because it has the postpedicel brownish yellow, the haltere black, a shorter stigma, narrower cell r_{4+5}, vein M_1 hardly undulating, a longer ovipositor, and the anterior tibiae have a short apical spine. Keys to species and helpful notes on the genus are given in Coe (1966) and Kehlmaier (2005).

Clistoabdominalis dilatatus (De Meyer, 1997)
Material examined
1♀, Rif, Talassemtane, Jebel Talassemtane, forest of *Abies maroccana*, 35°06'47"N 05°08'04"W, 1546 m asl, 13.v.2009, sweep net, A. Taheri (PKK); 2♀♀, Rif, El Hamma, mixed forest, 35°23'05"N 05°30'46"W, 338 m asl, 6.vi–21.vi.2016, Malaise trap, KK (PKK).

Dasydorylas setosus (Becker, 1908)
Collected from Essaouira by J.P. Haenni and recorded by Kehlmaier (2005).

Eudorylas ibericus Kehlmaier, 2005
Material examined
2♀♀, Rif, Talassemtane, Jebel Talassemtane, forest of *Abies maroccana*, 35°06'47"N 05°08'04"W, 1546 m asl, 13.v.2009, sweep net, A. Taheri (PKK and 1♀, PMJE).

Pipunculus carlestolrai Kuznetzov, 1993
Material examined
1♂, 2♀♀, Rif, Talassemtane, Jebel Talassemtane, forest of *Abies maroccana*, 35°06'47"N 05°08'04"W, 1546 m asl, 13.v.2009, sweep net, A. Taheri (PKK and 1♀, PMJE).

Remarks. The species *P. tumbarinus* Kehlmaier, 2010, described from Sardinia is very close to *P. carlestolrai*, differing only in detail of the male postabdomen. Recently, *P. tumbarinus* has been found in Tunisia (Kehlmaier *et al*. 2019). The differences between these two species are very subtle and according to Kehlmaier (2010) centre on the shape of the surstyli. An examination of more material from across their range of distribution would help clarify with greater certainty the taxonomic position of these two species. Our specimen agrees more closely with the species described by Kuznetsov and Diptera from the Rif in Northern Morocco are as similar if not more so to species from Iberia as to those from the east of the Maghreb.

Tomosvaryella cilifemorata (Becker, 1907)
Material examined
1♀, Rif, Taghzout, Adrou (PNPB), mixed forest, 35°22'39"N 05°32'28"W, 556 m asl, 14.vii–15.viii.2013, Malaise trap, KK (PKK).

Tomosvaryella debruyni De Meyer, 1995
Material examined
1♀, Rif, Taghzout, Adrou (PNPB), mixed forest, 35°22'39"N 05°32'28"W, 556 m asl, 14.vii–15.viii.2013, Malaise trap, KK (PKK).

Tomosvaryella frontata (Becker, 1897)
Material examined
1♀, Rif, Ben Karrich, Oued Mhajrate, river bank, 35°30'39"N 05°26'27"W, 67 m asl, 20.vii–13.x.2016, Malaise trap, KK (PKK).

Tomosvaryella geniculata (Meigen, 1824)
Material examined
1♂, High Atlas, Imilchil (Parc national Haut Atlas Oriental), Lac Tislite, 32°11'53"N 05°37'44"W, 2254 m asl, 29.vi.2017, Fekrani and El Ouazzani (PKK).

Tomosvaryella kuthyi Aczél, 1944
Material examined
2♀♀, Rif, El Hamma, mixed forest, 35°23'05"N 05°30'46"W, 338 m asl, 6.vi–21.vi.2016, Malaise trap, KK (PKK); 1♂, 1♀, Rif, Akchour, Chellal Sghir, cascade, 35°14'21"N 05°10'37"W, 424 m asl, 7.vi–14.vii.2017, Malaise trap, KK (PKK); 1♂, 1♀, Rif, M'Diq, Barrage Smir, riparian vegetation near dam, 35°41'06"N 05°22'51"W, 27 m asl, 18.vi–27.vii.2017, Malaise trap, KK (PKK).

Tomosvaryella minima (Becker, 1897)
Material examined
1♂, 3♀♀, Rif, M'Diq, Koudiat Taifour, forest, 35°40′29″N 05°19'02″W, 100 m asl, 31.v–14.vi.2018, Malaise trap, KK (PKK).

Remarks. These specimens answer to the description and illustrations given by Földvári and De Meyer (2000) in their detailed discussion of this species' taxonomy.

Tomosvaryella mutata (Becker, 1897)
Material examined
1♂, Talassemtane, Jebel Lakra, 35°07.182'N 05°07.953'W, 1596 m asl, 12.vi.2013, mixed forest, MJE (PMJE).

Tomosvaryella trichotibialis De Meyer, 1995
Material examined
1♂, Rif, M'Diq, Koudiat Taifour, forest, 35°40′29″N 05°19'02″W, 100 m asl, 31.v–14.vi.2018, Malaise trap, KK (PMJE).

Tomosvaryella sp. *subvirescens* group
Material examined
1♀, Larache, 35°12.503'N 06°08.873'W, 5 m asl, 11.v.2012, beach and dunes, MJE (PMJE); 1♂, Larache, Loukkos marsh, 35°09.445'N 06°06.220'W, 2 m asl, 4.vi.2013, MJE (PMJE).

Remarks. This species is probably undescribed. It is close to *T. inermis* De Meyer, 1995, described from Israel, but it has a shiny black occiput over its entire dorsal half and long silvery-white pubescence on the thorax, scutellum and abdomen. The scutum, more so in the male, is largely covered with dense silver-grey pollinosity beneath the pubescence whereas the abdomen is totally shining black beneath the silvery pubescence. The basitarsomere of the hind leg is dilated in both sexes. More material is required for study.

Tomosvaryella sp.
Material examined
1♂, 1♀, Chefchaouen, Dardara, 35°06.354'N 05°17.971'W, 484 m asl, 13.vi.2013, oak forest, light trap, MJE (PMJE).

Remarks. These two specimens were collected simultaneously, but were not "*in copula*". They are identical to each other on external characters except for the postabdomen. Both have no long setae along the posteroventral margin of the hind femur. Other than that, the female fits the description of *T. hildeae* De Meyer, 1997 from Spain and the ovipositor is extremely similar to that De Meyer illustrated for this species. However, the male differs from that of *T. hildeae* primarily in having a very large membranous area to syntergosternite 8 and a deep dorsal slit that reaches the margin of the fifth tergite. This may represent a new species. More material to allow for detailed examination of dissected specimens would be helpful.

Discussion
Unsurprisingly, most of our species are from the very speciose genus *Tomosvaryella*. On the other hand, *Eudorylas*, another genus with numerous species, is represented by only one species in our material, undoubtedly as a result of limited collecting. We have not encountered a number of West Palaearctic genera. *Dorylomorpha* Aczél, 1939, has a mainly central to northern

distribution in Europe, although four species reach Spain, but not Portugal. *Nephrocerus* Zetterstedt, 1848, the only pipunculid that does not parasitise Auchenorrhyncha, but another dipteran group – Tipulidae, is uncommon, but it occurs in Spain and may also occur in North Africa. *Jassidophaga* Aczél, 1939 is known in the south from Iberia to Israel, it is widespread and could easily occur in North Africa. Likewise, *Verrallia* Mik, 1899, which occurs in Southern Spain can also be expected to occur in Morocco. One species of *Cephalops* Fallén, 1810 was found in Madeira (De Meyer *et al.* 2001) and three on mainland Portugal along with one species of *Cephalosphaera* Enderlein, 1936 (Kehlmaier and Andrade 2016). Other than these, no others are known from the south of the Mediterranean and neither are any species of *Microcephalops* De Meyer, 1989. Finding any of these genera in North Africa would be a significant extension of their range of distribution in the West Palaearctic.

Our records of *P. carlestolrai*, a species that Kuznetzov (1993) described from specimens collected near Barcelona, and *E. ibericus*, a species described by Kehlmaier (2005) from specimens collected near Madrid and Barcelona, extend the distribution of both of these beyond Iberia. All the rest of the species listed in this article are widespread and were expected to occur in Morocco.

The family is in great need of further study throughout North Africa. Many more species can be expected from all over Morocco. The fauna of Iberia, including the Canary Islands, consists of as many as 101 species (De Meyer 1997, De Meyer *et al.* 2001, Kehlmaier 2003, 2005, Kehlmaier and Andrade 2016, Kehlmaier and Alonso-Zarazaga 2018, Kehlmaier *et al.* 2019). We estimate that more than half of these should be found in Morocco. Also, many of the species described from Israel and Egypt (De Meyer 1995) have since been found as far west as Spain. Indeed, two are now recorded from Morocco and therefore all species described from the eastern Mediterranean will need to be considered when studying further the Moroccan fauna.

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The second British record for *Muscina pascuorum* (Meigen) Diptera, Muscidae) from Sizewell Marshes SSSI, Leiston cum Sizewell, Suffolk

— The record of one male specimen of *Muscina pascuorum* (Meigen, 1826) from Sizewell Marshes SSSI, Suffolk on 12 August 2017 constitutes the second British record for this species, the first having been found during a pitfall-trapping survey at RSPB Minsmere Suffolk in 2005 undertaken by M.G. Telfer and identified by P. Skidmore (Skidmore, P. and Pont, A.C. 2008. *Muscina pascuorum* (Meigen, 1826) (Diptera, Muscidae) in Britain. *Dipterists Digest* (*Second Series*) **15,** 20-22). The specimen was collected from an area of extensive grazing marshes by sweeping alongside vegetated drainage dykes with some poaching by cattle. The site lies within 2km of the original 2005 Minsmere record. Identification was undertaken using the keys by F. Gregor, R. Rozkošný, M. Barták and J. Vaňhara (2002. *The Muscidae (Diptera) of Central Europe.* Masaryk University) and this was subsequently confirmed by N. Wyatt of the Natural History Museum, London.

Muscina pascuorum is considered to be the rarest of the European species of *Muscina;* it is present in most of Western Europe from southern France to southern Sweden and Finland. It seems possible that as *Muscina* species are powerful fliers that these individuals were casual migrants from the near continent, east Suffolk being well-positioned to receive such migrants, although, a small resident population could possibly be established on the coastal marshes of Suffolk — **PETER J. VINCENT**, Pennyfields, Rectory Road, Middleton, Saxmundham, Suffolk, IP17 3NW

Chymomyza caudatula Oldenberg (Diptera, Drosophilidae) new to Britain

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Summary

Chymomyza caudatula Oldenberg, 1914 (Diptera, Drosophilidae) is recorded from Britain for the first time. Its distinction from the similar *C. costata* (Zetterstedt) is given and notes on other species of *Chymomyza* are provided.

Introduction

On 18 August 2018, I visited Flitwick Moor NR (TL046351), Bedfordshire and found that I had collected a male of *Chymomyza caudatula* Oldenberg, 1914. It was in a sample where I had been sweeping around the fallen branch of an oak *Quercus robur*, which had been sawn into smaller sections. I returned to the site on 1 September 2018, and in the morning carefully inspected the cut ends and bark of the branch, but did not see any *Chymomyza*. However, when I returned in the afternoon for a further look, I found several *Chymomyza* wing waving and running around on the cut ends of the branch. I tubed all the specimens I could see and found that I had collected a further three males of *C. caudatula* along with seven males of *C. fuscimana* (Zetterstedt).

Biology

Apart from the Nearctic species *C. amoena* (Loew) now established in Britain (Clemons 2009, 2012), the four native Western Palaearctic *Chymomyza* species develop under the bark of trees and cut logs and adults are rarely found away from these sites. Larvae and puparia of *C. caudatula* have been found under the bark of beech *Fagus sylvatica* in Switzerland (Burla 1995, 1997). There are no beech trees at Flitwick Moor, but it seems highly likely that it is able to utilise other deciduous trees, the main requirement being that the wood is fresh and contains decaying sap under the bark. The opportunity to use oak in this condition at Flitwick Moor is rather limited, but in recent years a large number of birch *Betula pendula* have been cut down and the resulting timber placed in log piles, and these may have proved suitable for development and helped to sustain a population.

Identification

Amongst British *Chymomyza* species, *C. caudatula* closely resembles *C. costata* in having the frons and scutum predominantly black or grey and lacking a milky white wing-tip. In *C. caudatula* the wings are hyaline with the costa yellow, whereas in *C. costata* the costal cell is dark with a diffuse black shadow along the costa. In *C. caudatula* both sexes have the fore leg black with the apical four tarsal segments yellow. In male *C. costata* the fore leg is completely black, the apical tarsal segments being paler in the female. The male genitalia of *C. caudatula* are very distinctive as illustrated by Bächli *et al*. (2004). The cercus and ventral lobe of the epandrium are well developed and directed laterally, with the cercus having three long terminal bristles which are as long as the cercus itself. In *C. costata* the epandrium is less developed with the cercus projecting ventrally and lacking the long terminal bristles.

Discussion

In Britain *C. costata* and *C. fuscimana* are widely distributed and have been found in association with a variety of tree species. In Scotland *C. costata* has been reared from conifers and *C. fuscimana* from *Populus* (Rotheray and Robertson 1998). I have found both species on timber of different tree species and reared *C. fuscimana* from pine in the Kings Forest, Suffolk (TL810715), a male emerging on 27 April 1991. *Chymomyza distincta* (Egger), which is much more restricted, appears to favour conifers and has been reared from spruce in Switzerland (Burla 1995). In Britain adults have been recorded on pine logs at Windsor Forest, Berkshire (Chandler 1978) and at Edwinstowe, Nottinghamshire (Gibbs 2008). I found a male on pine logs at Broomhill Cott, Thetford Forest, Norfolk (TL790880) on 13 August 1986, where it was accompanied by three females of *C. costata*. I also found two males on a standing conifer from which a branch had been removed and which was oozing resinous sap, at Cambridge Botanic Garden (TL454572), Cambridgeshire on 2 September 2007. Adults of *C. costata* have been found on the fruiting bodies of the bracket fungus *Fomes fomentarius* where courtship occurs and I have observed this in Rannoch Forest, Perthshire (NN590560) on 25 and 30 May 2015. This fungus was present close to where *C. caudatula* was found at Flitwick Moor and was examined on several occasions, but no *Chymomyza* were seen there.

   Chymomyza caudatula is Holarctic in distribution and is widespread in Europe, but usually rather rare. It is present in neighbouring countries such as Holland and Belgium and is known from Northern Sweden and Finland in Scandinavia. Given its distribution its appearance in Britain is not unexpected, although how it has remained undetected for so long is a mystery. It seems quite likely that it may be a recent colonist, and it will be interesting to see if it subsequently becomes more widely distributed.

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A population of the cranefly *Limonia maculipennis* (Meigen) (Diptera, Limoniidae) on a North Norfolk sea wall

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Summary
A good population of the uncommon cranefly *Limonia maculipennis* (Meigen, 1818) was discovered by the authors on the sea wall at Burnham Overy Staithe in North Norfolk in mid-April 2019. With so few records, there is some ecological uncertainty over the precise habitat for this species, and the population here suggests similar habitats in East Anglia and elsewhere may have been overlooked.

The cranefly *Limonia maculipennis* (Meigen, 1818) is an uncommonly encountered species, known only from some 29 sites, with mostly a southern and eastern distribution in Britain. There are northern and western outlier records from Shropshire (V.C. 40); Cyril Pugh (1890-1973) recorded the fly from the Oswestry area in the 1920s (specimen in Manchester Museum) (Boardman 2016), Andy Godfrey recorded the species from SJ59 in South Lancashire in 1994 (Brighton 2017), and it listed in the Cumbria (V.C. 70) checklist from 2004 (Hewitt 2014). Stubbs (*in prep.*) notes it as often associated with hedgerow habitat, but probably overlooked due to an early flight period (mid-April to early June with the peak in April and May). It is a very smart species with spotted wings, striped black and orange legs, a glossy black thorax, and an orange and black abdomen (Fig. 2). Within continental Europe it occurs in Belgium, France, Germany, Italy (incl. Sicily), Portugal and Spain (Oosterbroek 2019).

PB happened to note a Twitter post on the evening of 16 April 2019 by SH in which she included some photographs of this cranefly following a trip to Burnham Overy Staithe (TF845443) on the North Norfolk coast (V.C. 28). She confirmed to him the location and that she had seen approximately 5 or 6 mating pairs of the flies. Very fortunately, PB was working with AG in North Norfolk at the time so they were able to visit Burnham on the following day (17 April 2019) to see if the centre of population of the flies could be found. PB and AG arrived mid-morning and spent approximately an hour searching on both sides of the sea wall (western-facing side, Fig. 1). Conditions when SH and PB/AG visited were similar: sunny, but with a moderate sea breeze. A good number of mating pairs and singletons were seen during our search, totalling around 50 flies. Our search area was only a small fraction of the available habitat at the site, which extended for several hundred metres.

The sea wall was vegetated with a band of shrubby sea-blite *Suaeda vera* along the extreme lower edge of the western side, but then dominated by sea beet *Beta vulgaris* subsp. *maritima* and particularly alexanders *Smyrnium olusatrum*. This latter plant was at a maximum height of approximately 30-40cm and just coming into flower. The flies were seen to use alexanders to sit upon as mating pairs (Fig. 2) but also to hide lower on the stem and underside of the leaves. It is to be presumed that the larvae are feeding at this location within detritus on the sea wall. Alan Stubbs (*pers. comm.*) suggests that the species may nectar upon alexanders as previously he was aware of this species nectaring upon hogweed *Heracleum sphondylium* at the edge of a wood in Cambridgeshire.

Sea wall habitat like that at Burnham Overy Staithe, or similar to this, is presumably relatively common in Norfolk and elsewhere along the coast of south-eastern England and could be a hitherto unexplored habitat for the fly.

Fig. 1. Sea wall at Burnham Overy Staithe (P. Boardman).

Fig. 2. A mating pair of *Limonia maculipennis* on alexanders (P. Boardman).

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Recent records for *Helina pulchella* (Ringdahl) (Diptera, Muscidae)

– *Helina pulchella* (Ringdahl, 1918) can be regarded as a very scarce fly across Europe. F. Gregor, R. Rozkošný, M. Barták and J. Vaňhara (2016. Manual of Central European Muscidae (Diptera). *Zoologica* **162,** 219 pp) stated that it is known only from Great Britain and Sweden, and the online database *Fauna Europaea* also lists its presence in Norway and mainland Spain (Pont, A.C. 2004. Muscidae. **In** Pape, T. and Beuk, P. (Eds) Fauna Europaea: Diptera, Brachycera. Fauna Europaea. Version 2017.06. Available from: https://fauna-eu.org (accessed 4 April 2018)). In Britain the species has been recorded just six times since 1969. Details of the records are given below. According to A.C. Pont (*pers. comm.*) it is now also known from Austria, Czech Republic and European Russia.

S.J. Falk and A.C. Pont (2017. *A Provisional Assessment of the Status of Calypterate Flies in the UK*. Natural England. Commissioned Reports, Number **234**, p. 142) detailed just eight British records for *H. pulchella* from four localities in Berkshire, Gloucestershire, Somerset and Oxfordshire between 1957 and 1969. Six additional records from four new locations are reported here. Peter Skidmore collected a puparium from Cusworth Park, Yorkshire, from which emerged a *H. pulchella* ♀ on 30 April 1975. This specimen remained undetermined for some time, and it is thought that it was determined during the 1990s (Andrew Grayson *pers. comm.*) and was eventually published as an addition to the Yorkshire list in 2009 (Grayson, A. 2009. Additions and corrections to the Yorkshire Diptera list (Part 4). *The Naturalist* **134,** 27-29). Thirty five years after the Cusworth Park record, on 4 September 2010, IP collected a single male specimen from the Warburg Nature Reserve, Bix, (Vice County Oxfordshire OS grid ref. SU715879). Two more males were collected from the same area on 8 May 2011 and 1 June 2011.

All three specimens were swept from a shady track through mainly ash and beech deciduous woodland. A fourth male specimen was swept by NJ, on 11 July 2018, at about six metres height from an ash tree in his suburban Shrewsbury garden (V.C. Shropshire, OS grid ref. SJ4911) (Fig. 1). Finally, G. Ekins collected a specimen of *H. pulchella* from a light trap in an Essex garden, OS grid ref. TL754098, 11-23 May 2018. This specimen was determined by A.C. Pont and is held in the Essex Field Club museum at Pitsea (Del Smith *pers. comm.*).

Fig. 1. *Helina pulchella* **male collected from ash tree in Shrewsbury.**

IP continued to visit the Warburg location for a further five years but has not seen *H. pulchella* again. The six records reported here indicate that the species has a long flight season (April - September), possibly consisting of two generations.

The Shrewsbury specimen has been deposited in the World Muscidae collection at Oxford University Museum of Natural History. IP exhibited the 2011 specimens at the Annual Exhibition of the British Entomological and Natural History Society on 5 November 2011 (Perry, I. 2012. *British Journal of Entomology and Natural History* **25,** 167-168).

NJ would like to thank Adrian Pont for confirming his determination of *H. pulchella* and Michael James for suggesting the correct taxon. James McGill, Andrew Grayson and Del Smith kindly researched and provided details of the *H. pulchella* records from Yorkshire and Essex –
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Digital photography improves assessment of winter-active hoverflies (Diptera, Syrphidae)

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Summary

A total of 84 hoverfly species have been recorded (by all methods) between November and March in the years 1980 to 2018, of which 35 occurred between December and February. Of these, 13 regularly occur throughout the winter months.

We show how digital photography and social media have revolutionised some aspects of biological recording. This method makes it possible to generate high-quality data for readily recognisable species, but is not suitable for recording some genera where there is plasticity in coloration and where key characters are difficult (or impossible) to see on photographs. The phenology of four species [*Episyrphus balteatus* (De Geer, 1776), *Eristalis pertinax* (Scopoli, 1763), *Eristalis tenax* (Linnaeus, 1758) and *Meliscaeva auricollis* (Meigen, 1822)] is examined using records from 2013 to 2018.

Introduction

It is well-known that some adult hoverflies can be found throughout the year, including the coldest months of winter (see species accounts in Stubbs and Falk 2002). Until recently, however, our understanding of winter activity was considerably poorer than for other seasons in the year. This was because recording during the winter demands persistence and very few dipterists are active because the range of species is small and the numbers of individuals correspondingly low. At best, data reaching the UK Hoverfly Recording Scheme (HRS) were intermittent and difficult to interpret. Furthermore, few recorders recorded the gender of the flies that they reported. Our knowledge of what was happening over winter months was therefore extremely weak.

The situation changed with the advent of cheap high-resolution digital photography, but has evolved further as camera technology has advanced and photo-stacking systems have become more readily available. Fig. 1 shows that the impact of digital photography started around 2006. This technology expanded opportunities for the enthusiastic wildlife observer who, hitherto, would have paid little attention to flies. As a result, a new cohort of recorders was empowered to log the occurrence of wildlife throughout the year; and, unlike the dipterists who preceded them, their fascination continues during the winter months. A significant number of the most active recorders now present comprehensive data for almost every day of the winter by photographing everything that they see. Furthermore, the development of social media such as 'Facebook' and 'Flickr' has allowed them to post their photographs for specialists to identify. As a result, photographic recording is now an established part of Recording Scheme activity.

The HRS has been amongst the most prominent Diptera schemes to engage with photographic recorders and can now demonstrate some of the benefits. The UK Hoverflies Facebook Group (Facebook 2019) was established in the summer of 2013, since when membership has grown to 4130 (at 25 April 2019). Many of its most active members record on an almost daily basis throughout the year, providing as comprehensive an account of hoverfly abundance and assemblage composition that we are likely to see. Some recorders maintain their own spreadsheets, but a large proportion of the records are extracted directly from the website (by RKAM until autumn 2018 and subsequently by a team of data extractors).

This new approach to data extraction means that not only are the determinations made by a single person/small group of reliable specialists, but it has been possible to make sure that the gender and flower-visits are also noted. Consequently, the data that come from photographic recorders contain information that conventional recorders often omit.

Most records prior to 2014 would have been assembled without the use of artificial lures but, in the years following, a substantial number of the more assiduous recorders have used sugar water sprayed on leaves in sunny locations to attract hoverflies. This approach, allows more detailed observation of winter-active hoverflies and is a useful innovation.

Data

Records of all hoverflies recorded in at least one of the months from November and March for the years 1980 to 2018 were downloaded from the HRS database.
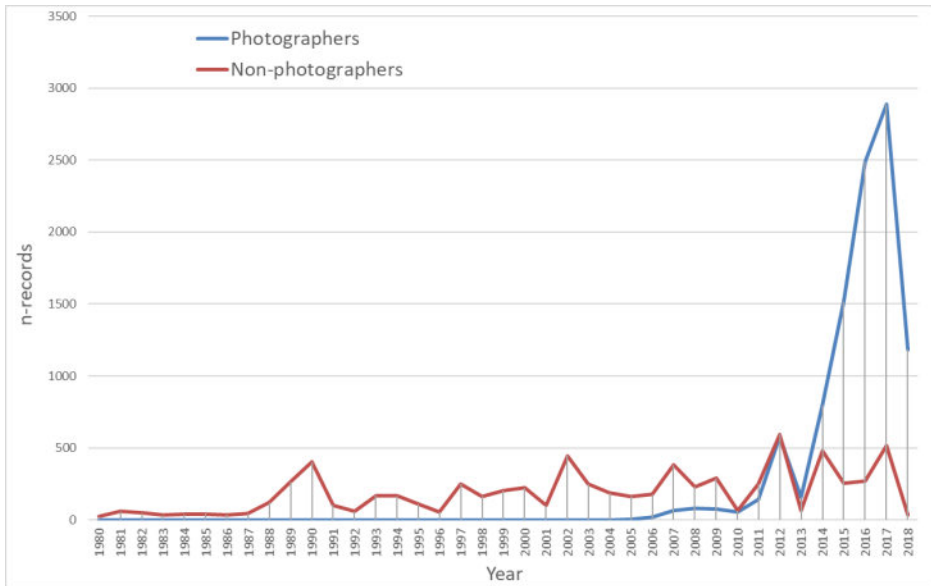
Fig. 1. Numbers of records of hoverflies recorded in the period November to March between 1980 and 2018. Data from long-standing recorders and new recorders known to retain specimens are presented as 'non-photographers'.

Results

A total of 84 species have been recorded. These species fall into two categories:
- Species that clearly occur regularly during the winter and appear in every month, e.g. *Melanostoma scalare* (Fabricius, 1794) and *Eupeodes luniger* (Meigen, 1822); and
- Species such as *Sericomyia silentis* (Harris, 1776) and *Cheilosia albipila* Meigen, 1838 that occur when conditions are exceptional (either a long, warm autumn, or a very early spring).

This long list is clearly un-representative of species that might normally be considered to be winter-active hoverflies. Many of the records involve warm autumns or early springs that

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extend or advance flight times and amount to just one or two individuals over a 38-year timeframe. The data were therefore further refined to cover the period December to February, which are the coldest months of the year in the northern Hemisphere. This list comprises 35 species and is presented in Table 1. Species that appear to be capable of occurring throughout these months are marked with an asterisk.

Species	Number of records from 1980 to 2018		
	December	January	February
Baccha elongata (Fabricius, 1775) *	2	1	2
Cheilosia albipila Meigen, 1838	0	0	1
Cheilosia grossa (Fallén, 1817)	0	0	1
Cheilosia vernalis (Fallén, 1817)	0	0	2
Dasysyrphus albostriatus (Fallén, 1817)	0	0	1
Episyrphus balteatus (De Geer, 1776) *	371	253	509
Eristalinus aeneus (Scopoli, 1763)	0	5	8
Eristalis arbustorum (Linnaeus, 1758)	0	0	1
Eristalis pertinax (Scopoli, 1763) *	59	20	109
Eristalis similis (Fallén, 1817)	1	0	0
Eristalis tenax (Linnaeus, 1758) *	184	195	661
Eupeodes corollae (Fabricius, 1794)	1	0	2
Eupeodes latifasciatus (Macquart, 1829)	0	1	1
Eupeodes luniger (Meigen, 1822) *	35	9	31
Helophilus pendulus (Linnaeus, 1758) *	4	2	1
Melangyna lasiophthalma (Zetterstedt, 1843)	0	0	3
Melangyna quadrimaculata (Verrall, 1873)	0	0	6
Melanostoma mellinum (Linnaeus, 1758)	1	1	0
Melanostoma scalare (Fabricius, 1794) *	31	11	6
Meliscaeva auricollis (Meigen, 1822) *	174	137	262
Meliscaeva cinctella (Zetterstedt, 1843)	1	0	0
Merodon equestris (Fabricius, 1794)	0	4	0

Myathropa florea (Linnaeus, 1758)	2	0	0
Neoascia podagrica (Fabricius, 1775)	1	0	1
Platycheirus albimanus (Fabricius, 1781) *	24	4	5
Platycheirus scutatus sl.	1	0	1
Scaeva pyrastri (Linnaeus, 1758)	2	0	0
Scaeva selenitica (Meigen, 1822) *	6	7	14
Sericomyia silentis (Harris, 1776)	2	0	0
Sphaerophoria scripta (Linnaeus, 1758)	1	0	0
Syritta pipiens (Linnaeus, 1758)	1	0	0
Syrphus ribesii (Linnaeus, 1758) *	15	2	5
Syrphus torvus Osten Sacken, 1875	7	1	17
Syrphus vitripennis Meigen, 1822*	6	1	2
Xanthandrus comtus (Harris, 1780) *	10	6	3

Table 1. Hoverfly species for which at least one record exists on the HRS dataset for the months December, January and February from 1980 to 2018. (Note: records of *Eristalinus aeneus* relate to hibernating adults).

Species phenology

Although 13 species occur sporadically throughout the winter (i.e. records in every month), only four: *Episyrphus balteatus, Eristalis pertinax, E. tenax* and *Meliscaeva auricollis* occur sufficiently frequently for detailed phenology plots to be presented. One further species, *Eupeodes luniger*, occurs in relatively high numbers but doubts about the reliability of many records mean that this species is often logged just as *Eupeodes* sp. and is therefore not analysed in detail. Records from the photographic dataset covering the period 1 January 2013 to 31 December 2018 have been combined to generate phenology histograms presented here.

Episyrphus balteatus (Fig. 2) is resident but its populations are substantially augmented by migration events. Adult female longevity is reported to be around six weeks (Branquart and Hemptinne 2000). Data gathered from photographic recorders make it clear that there is a not-insubstantial population during winter months, at least in urban areas. The evidence also suggests that females are over-wintering in a similar manner to *Eristalis tenax*, whereas males are rarely seen in January and February. This difference in the abundance of males and females during the winter also rules out the possibility of *E. balteatus* being continuously brooded throughout the winter because the proportions of males and females recorded at other times of year seem to be broadly similar. From April onwards, the numbers of records gradually climb towards a peak in mid to late July.
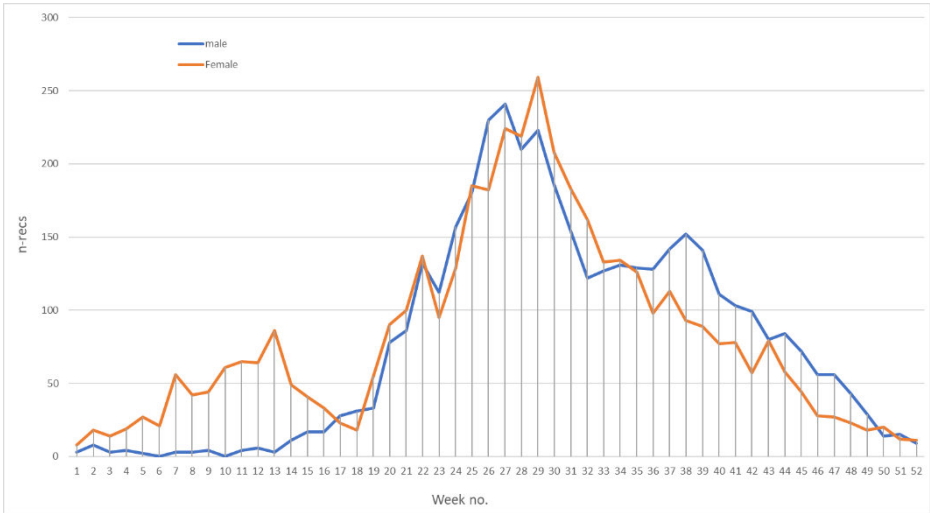
Fig. 2. Phenology of *Episyrphus balteatus*.

Eristalis pertinax (Fig. 3) largely disappears by the end of November but in some years can still be found in December in suitable locations. Records from the end of November through to late February are sporadic before numbers start to rise in early March. It is noteworthy that there is a gap of between 3 and 4 weeks between the start of the male emergence and any significant emergence of females. A similar gap separates the end of the spring flush of males and the first generation of females. The high counts of females in the autumn are at least in part influenced by the extended warm autumn of 2016, during which many recorders were able to make multiple records until the middle of December.

Eristalis tenax (Fig. 4) is well-known for female hibernation (Stubbs and Falk 2002) and photographic recorders do find such aggregations. In the years since the Facebook group was launched, it has become clear that females emerge as soon as there is a warm spell in February and records usually peak before the start of April. It is noteworthy, however, that female *E. tenax* almost completely disappear in mid-May whilst a new generation of males start to emerge about the same time. The phenology plot in the Provisional Atlas (Ball *et al*. 2011) does not reveal this feature. The most likely explanation for the lack of definition in older data is that they span too long a time-frame and that warmer springs have led to greater differentiation between over-wintering females and the emerging spring generation. It is possible, however, that the older data contain a higher number of mis-identifications! If the latter is true, this graph illustrates the benefits of photographic recording coupled with identification by a very narrow suite of specialists.
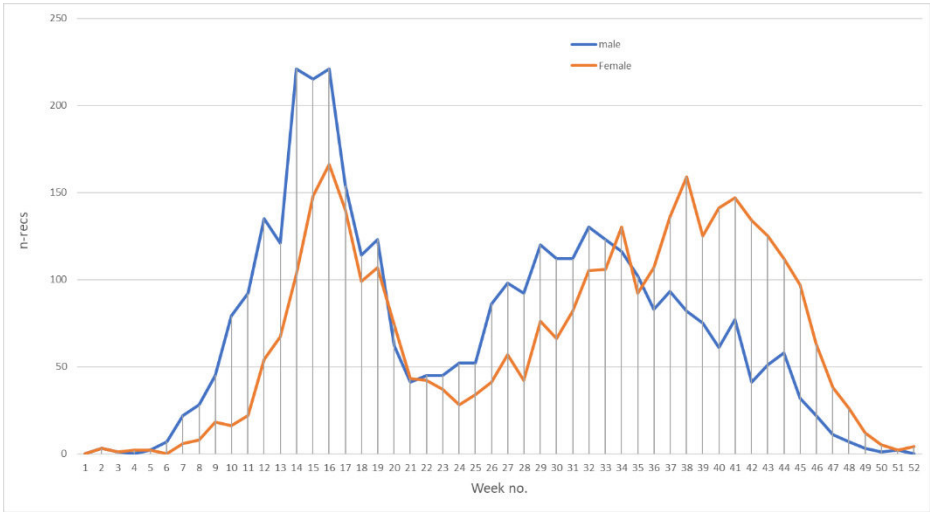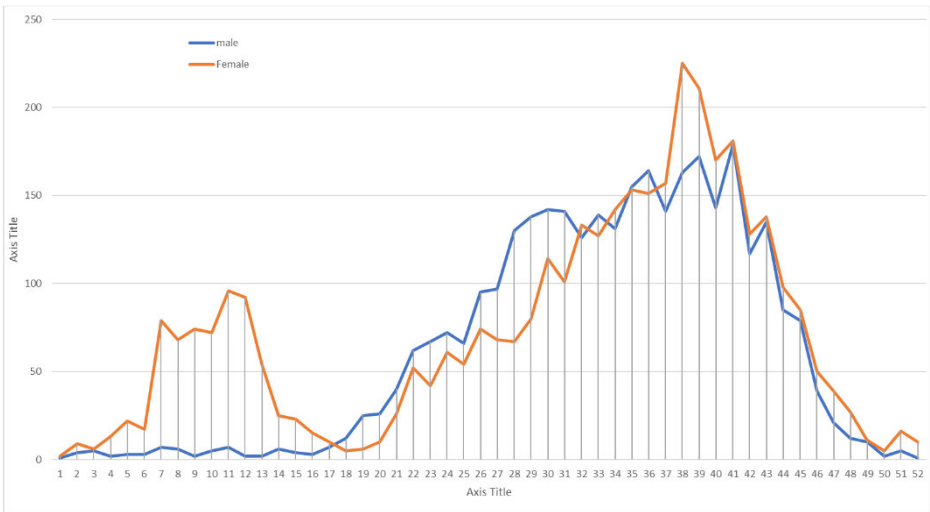
Fig. 3. Phenology of *Eristalis pertinax*.

Fig. 4. Phenology of *Eristalis tenax*.

Meliscaeva auricollis (Fig. 5) presents an entirely different picture. The phenology of males and females is very similar throughout the winter months, although females do appear to have a more extended flight period in the spring that might be indicative of mating in late winter followed by oviposition as the males die off. We suspect that it has the potential to be continuously brooded but, in the absence of any supporting evidence, this remains conjecture. Efforts to capture and dissect females during the winter would be needed to establish their state

of maturity. Anecdotally, this species seems to be able to tolerate quite low temperatures and when conditions are still and sunny even if they are below the optimal temperature for other winter-flying species.
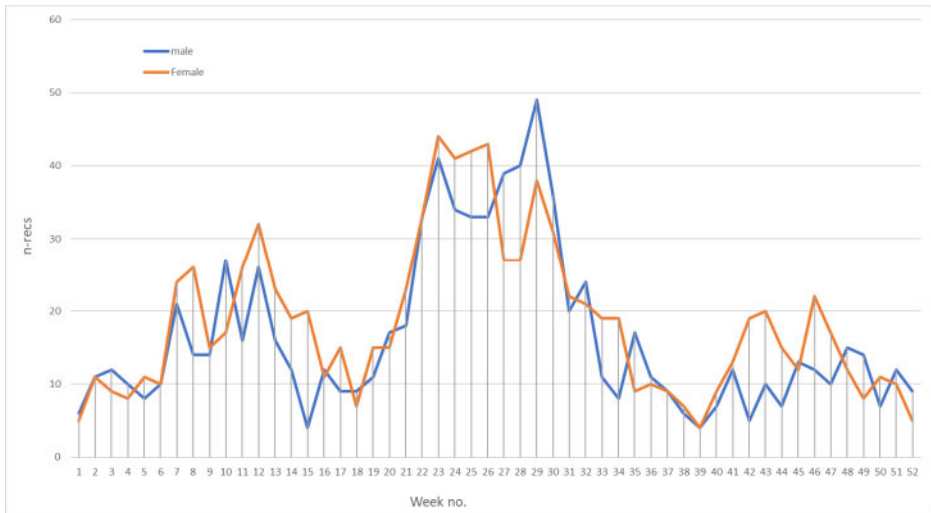
Fig. 5. Phenology of *Meliscaeva auricollis*.

Discussion

This analysis highlights the limitations of opportunistic data for examining historic changes in hoverfly activity. Traditional recorders that were once the mainstay of data collection generated (together) an average of 376 records per year for the months November to March, between 1980 and 2018. Photographic recorders from 2014 onwards have generated an average of 1820 records per year. In other words, photographic recording has advanced the dataset by an order of magnitude.

      Almost all the species involved are relatively abundant and, perhaps with the exception of *Xanthandrus comtus* and *Scaeva selenitica*, none is likely to arouse the interest of traditional recorders unless they are intent upon year-round recording. To put this into context, the highest average records between November and March per year (n-records/n-years with records) achieved by a traditional recorder is 33.6 (with three others above 20). In comparison, the highest average per year recording for photographic recorders is 194, with a further five contributors above 100 per year and nine more above 50. Records prior to digital photography are therefore, at best, intermittent. This more restricted dataset makes it difficult to be sure that winter-activity in hoverflies was at a similar scale to the current paradigm. For example, we know that spring emergence times are advancing (Hassell *et al*. 2017), and that for this to happen preceding winter temperatures must be higher. These warmer conditions may mean that there is far more hoverfly activity than there was, say, in the 1980s or during the exceptionally cold 1960s.

      In the course of the last 40 years, the North Atlantic Oscillation (NAO) has become warmer in comparison to the cold period of the 1960s (Jenkins *et al*. 2009), but shows no discernible upward trend over a longer timeframe. We must therefore not assume that the situation today mirrors the occurrence of hoverflies during the winters of the 1980s or 1990s.

      Once a run of more than a decade's worth of detailed photographic recording is reached, a much clearer picture of the winter-active fauna should become available. Even so, there is a

proportion of potential records that cannot be accurately identified (and probably never will be). Colour forms of the genus *Eupeodes* are substantially influenced by winter temperatures, making identification tricky; a problem that is compounded in males where most important features are poorly depicted or obscured in photographs. Some female *E. luniger* are recognisable, but many are not. Male *E. luniger* present many more problems. When specimens are retained, the majority prove to be *E. luniger* but they differ greatly in their markings. In photographs, they can occasionally be confused with dark *E. corollae* if the genital capsule is obscured, and with *E. latifasciatus* when abdominal markings are large. As a rule, no attempt is made to name male *E. luniger* from photographs and, consequently, the data continue to be deficient. The occurrence of a significant number of *Eupeodes luniger* during the winter is, however, consistent with the findings of Jamali *et al.* (2018) who investigated aphidophagous hoverflies occurring between November 2016 and March 2017 in Pakistan.

A similar problem exists for the genus *Syrphus*. The majority of photographic records of *Syrphus* cannot be taken beyond genus, although good photographs of *Syrphus torvus* do capture evidence of substantial eye hairs. This feature is complicated because both *S. ribesii* and *S. vitripennis* bear minute eye hairs that are sometimes depicted in exceptional photographs and can lead to misidentification. If photographed from an appropriate angle, female *S. ribesii* can also be recognised. These problems mean that accurate identification of this genus is too complicated to generate a complete picture of winter activity amongst the three species (records of *S. vitripennis* derive from captured specimens checked under the microscope). More detailed recording by retaining and checking specimens under the microscope is therefore essential if the activity patterns within this genus are to be fully understood.

Hassell *et al.* (2017) reported that flight times of multi-brooded species were advancing more markedly than those of univoltine species. Species such as *Eristalis pertinax* and *E. tenax* undoubtedly respond to warm spells during the winter, and this might be inferred as an advance in flight times. It has to be borne in mind, however, that the data may be influenced by the rise in winter recorder activity too. The extensive records for the winter of 2016/17, when the numbers of hoverflies recorded in November/December 2016 were exceptionally high, also suggest that elevated temperatures extend the flight period of many species. Unfortunately, the weakness of the data prior to 2013 makes it difficult to draw many conclusions about early emergence because year-on-year data for February and March from 1980 to 2013 are very sparse and may be affected by the activity (or lack of) by a comparatively small number of people.

Unlike summer months, when observers are actively visiting wild places and are more likely to visit sites beyond the urban fringe, records in the winter months are primarily from gardens and other urban situations. In the urban environment, there are more winter-flowering plants and sheltered sunny corners that encourage hoverfly activity or enhance their visibility. An indication that nectar sources improve the visibility of winter-active hoverflies is provided by recorders who use a sugar-spray solution on leaves to attract hoverflies. In these cases, substantial numbers of hoverflies have been reported, suggesting that they are present, but are not visible to the observer unless there is a nectar source to attract them.

It is also possible that 'urban heat island' (UHI) effects on winter-flying hoverflies are being detected rather than providing a picture of events in the wider countryside. Kaiser *et al.* (2016) provided evidence to suggest that species that are associated with open habitats rather than enclosed forests are likely to be more responsive to UHI effects because of the buffering effects of tree cover. This hypothesis has yet to be rigorously tested but, anecdotally, our own field experience suggests that there are far fewer winter-active hoverflies in the open countryside than in urban areas.

Acknowledgements

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Corrections and changes to the Diptera Checklist (41) – 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 deletion of one species, loss of another due to synonymy and addition of 8 species, resulting in a new total of **7187** species (of which 41 are recorded only from Ireland).

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

Limoniidae. The subgenus *Oxyrhiza* and its synonym *Oxydiscus* are no longer associated with the genus *Paradelphomyia* following the article on this genus in the present issue.

Cecidomyiidae. The following species was restored from synonymy in recent world catalogues: *Rabdophaga **rosaria*** (Loew, 1850 – *Cecidomyia*). Host: *Salix alba*, *Salix* spp. (Salicaceae). (restored from synonymy in Gagné 2004 under *R. strobilina* (Bremi)).

Phoridae. The following change, replacing *Gymnophora quartomollis* of the British list, results from R.H.L. DISNEY (2017. Systematic review of the European *Gymnophora* Macquart (Diptera: Phoridae), with five new species. *Fragmenta Faunistica* **60**(1)**,** 23-46): *Gymnophora **forresteri*** Disney, 2017 = *G. quartomollis*: authors, misident., not Schmitz, 1920

Agromyzidae. The following generic change was proposed by M. VON TSCHIRNHAUS (2000. Agromyzidae. **In** J. ZIEGLER and F. MENZEL (Eds) Die historische Dipteren-Sammlung Carl Friedrich Ketel: Revision einer zwischen 1884 und 1903 angelegten Sammlung von Zweiflüglern (Diptera) aus Mecklenburg-Vorpommern. *Nova Supplementa entomologica* **14,** 133-149): *Hexomyza simplex* (Loew – *Agromyza*) [transferred from *Ophiomyia*]
        The following species is deleted in the present issue:
Phytomyza caulinaris Hering, 1949
        The following species are added in the present issue:
*Agromyza **macedonica*** Černý, 2011
*Phytomyza **penicilla*** Hendel, 1935

Cryptochetidae. This family, genus and species are added in the present issue:
CRYPTOCHETUM Rondani, 1875
*Cryptochetum **iceryae*** (Williston, 1888 – *Lestophonus*)

Drosophilidae. The following species is added in the present issue:
*Chymomyza **caudatula*** Oldenberg, 1914

Muscidae.   The following species were added by D.G. NOTTON, N.P. WYATT, D. HORSFIELD and K.P. BLAND (2019. Two species of tiger fly, *Coenosia* Meigen (Diptera: Muscidae) new to Britain. *British Journal of Entomology and Natural History* **32,** 9-15); both are introduced species found in a temporary tropical butterfly house at the Natural History Museum, London, though *C. attenuata* was also found in a church at Edinburgh, all records in 2017:
*Coenosia **attenuata*** Stein, 1903 [a Mediterranean species, now cosmopolitan in heated houses]
*Coenosia **punctigera*** Stein, 1918 [probably sub-Saharan African in origin]

Sarcophagidae. The following new synonymy, having first been suggested in *Fauna Europaea*, was accepted by D. WHITMORE (2011. New taxonomic and nomenclatural data on *Sarcophaga* (*Heteronychia*) (Diptera: Sarcophagidae), with description of six new species. *Zootaxa* **2778,** 1-57):
Sarcophaga (*Heteronychia*) *compactilobata* (Wyatt, 1991) = *S.* (*H.*) *depressifrons* Zetterstedt, 1845
        The following subgeneric synonymy was proposed by D. WHITMORE, T. PAPE and P. CERRETTI (2013. Phylogeny of *Heteronychia*: the largest lineage of *Sarcophaga* (Diptera: Sarcophagidae). *Zoological Journal of the Linnean Society* **169,** 604-639):
DISCACHAETA Enderlein, 1928 = HETERONYCHIA Brauer & von Bergenstamm, 1899

Tachinidae. The following genus and species are added in the present issue:
ELIOZETA Rondani, 1856
*Eliozeta **pellucens*** (Fallén, 1820 – *Tachina*)

The incidence of *Pegomya solennis* (Meigen) (Diptera, Anthomyiidae) leaf mines on *Rumex acetosa* (Polygonaceae)

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Summary

In 2016 the incidence of *Pegomya solennis* (Meigen, 1826) (Diptera, Anthomyiidae) leaf mines on common sorrel, *Rumex acetosa* (Polygonaceae) was assessed in the Boreland Hills, Dumfriesshire, Scotland. Oviposition in the middle of leaves each side of the midrib and single mines per leaf were features. An estimate of leaf area required for larval development suggested that most leaves provide sufficient tissue to support a single mine, but switching to secondary mines in new leaves accounted for about 20% of sampled mines. Switching is probably elicited by leaves becoming unsuitable due to damage and feeding by other folivores. Larval feeding rates were elevated in secondary mines perhaps as a consequence of starvation experienced during switching.

Introduction

Distinguished by its thin, bare leaves and backwardly directed basal lobes, common sorrel *Rumex acetosa* (Polygonaceae) is widespread in Britain (Stace 2010). In July 2016 on the Boreland Hills in Dumfriesshire and confirmed by identifying reared adults using manuscript keys (M. Ackland *in litt.*) and by comparison with named material in the National Museums of Scotland, many leaves of this perennial were mined by larvae of the anthomyiid, *Pegomya solennis* (Meigen, 1826) (= *Anthomyza nigritarsis* Zetterstedt, 1838: syn. Michelsen (1985)) (Diptera, Anthomyiidae).

Leaf-mining *Pegomya* females stick egg clutches on the abaxial or undersurface of food plant leaves (Cameron 1914, Stork 1936). Godfray (1986) reported that on leaves of several *Rumex* species including *R. acetosa*, the size of the *P. solennis* egg clutch varies according to leaf size in the direction of the larger the leaf the larger the clutch. First stage, leaf-mining *Pegomya* larvae excavate a hole through the egg at the micropylar end directly into the leaf (Cameron 1914). Initially the mine is serpentine or linear, but it soon changes to a blotch shape which correlates probably to sideways feeding in large larvae. In third stage larvae, sideways feeding is facilitated by remarkable trophic features, such as an asymmetrical pseudocephalon or external head which enables it to fit against the mine face, overlapping mandibles that enable both to rasp the thin layers of leaf tissue and a prothoracic, fleshy lobe below the mouth to help contain loosened tissue prior to being sucked into the foregut by the head skeleton pump (Rotheray and Lyszkowski 2015). Larvae are able to quit their mines and make new ones in other leaves and when feeding is complete, they leave the plant and pupate in the leaf litter or soil (Cameron 1914, Godfray 1986).

On the Boreland Hills observations suggest that mined *R. acetosa* leaves are exclusive to the part-shaded fringes of bracken stands (*Pteridium aquilinum*, Dennstaedtiaceae), empty eggs remain attached to the leaf and small leaves under 30mm long are not used for oviposition. These features prompted an investigation into two particular aspects of *P. solennis* mines on *R. acetosa*, the results of which are reported here. The first part of the investigation attempted to discover whether particular positions are preferred for eggs on leaves and whether this affects subsequent mine development. The aims of the second part of the investigation were to determine how frequent switching is between leaves and whether it correlates to running out of leaf tissue or in

other words, whether leaves selected for oviposition provide sufficient tissue for larvae to complete development.

Fig. 1. Field site, Boreland Hills, Gatehouse of Fleet, Dumfriesshire, 27 July 2016, view north.

Materials and Methods
The field site
The Boreland Hills form a western boundary to Gatehouse of Fleet, Dumfriesshire and are about 1km from the coast. They comprise a raised, north to south, diamond-shaped area about 2km long by 1km wide with an uneven summit of peaks and troughs rising to 47m altitude. The approximate 55m^2 field site is at the northern end of the hills (NX 587566) and is grazed by cattle. The vegetation comprises chiefly grazed turf and *P. aquilinum* stands (Fig. 1).

Egg position and mine development
On each of several collecting trips between late July and late August 2016 the fringes of bracken stands were examined (Fig. 2) and as they were encountered, mined leaves were removed from *R. acetosa* plants by detaching them by their petioles and placing them in plastic bags. Within an hour of collection each mine was photographed from the adaxial or upper surface. From the abaxial surface the positions of eggs were assessed (Fig. 3). Eggs appeared to be orientated more or less parallel to the midrib with the micropyle facing the leaf base. To confirm this, the orientation of each egg along its longitudinal axis was compared to the midrib using a ruler and protractor and the position of the micropyle was recorded as facing the base, side or the apex of the leaf.

Fig. 2. *Rumex acetosa* in about a metre length of a bracken stand fringe, Boreland Hills, Dumfriesshire; black arrow points at leaves, bracken fronds lifted to provide access, cattle-cropped turf along the lower margin.
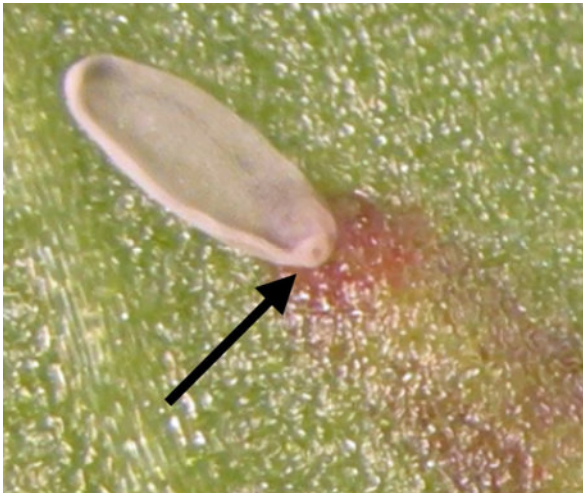

Fig. 3. Empty egg of *Pegomya solennis* from the abaxial surface of a *Rumex acetosa* leaf; red line within the leaf is the start of a linear mine visible from the start point under the micropylar end of the egg; arrow points to the micropyle, egg about 1mm long.
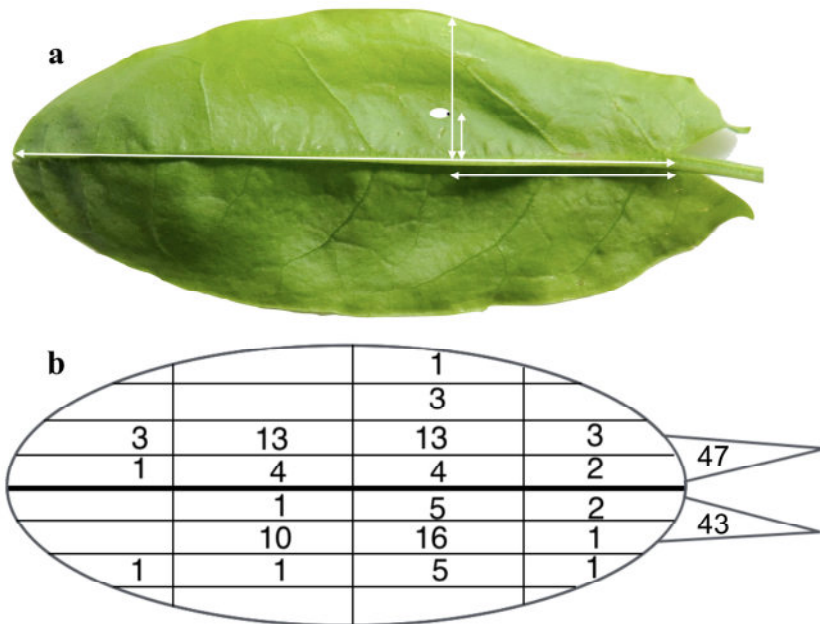
Fig. 4. *Pegomya solennis* egg position plots on leaves of *Rumex acetosa*: **a,** calculating egg positions, egg with micropyle indicated by white oval and black dot in the upper section of the leaf, arrows indicate measurements taken to plot egg position on a model leaf; **b,** model leaf divided into quarters according to length and quarters according to width each side of the midrib, figures represent egg plots per section, figures in the triangular basal lobes are the numbers of eggs recorded each side of the midrib, total number of egg positions plotted = 90.

   To compare egg positions on leaves of different sizes, the distance from the leaf base, the point where the basal lobes meet, to the micropyle was calculated as a proportion of total leaf length measured along the midrib. At the micropyle the width of each leaf was measured and the position of the micropyle calculated as a proportion of leaf width from the midrib to the leaf edge (Fig. 4a). To determine if left or right sides of leaves were used equally, positions of eggs to the right or left of the midrib were recorded based on leaves orientated with the abaxial surface uppermost and the apex facing away. These data were used as coordinates to plot egg positions on a model leaf divided into quarters according to length and for width into quarters each side of the midrib (Fig. 4b). To assess variability in the linear phase of mining, the direction and length of the linear mine produced by the larva on first entering the leaf was measured from photographs of mines using the image processing software, ImageJ v1.51a (ImageJ 2016). Mine photographs were compared visually in an attempt to recognise commonalities in the directions and shapes of linear and blotch-mines relative to egg position, mine size, leaf margins and veins, etc.

Mine type, size and switching

For each mined leaf the number of mines and their type were recorded. Primary mines were recognised by the presence of an egg on the underside and a linear section that is often red due to a reaction of leaf tissue to damage (Figs 3 and 5a). Secondary mines are those resulting from a

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larva switching to a new leaf and were recognised by the presence of an entry hole on the abaxial surface often near the midrib (Fig. 5b). The frequency of secondary mines in bracken fringes was recorded as a proportion of the number of blotch-mines sampled.
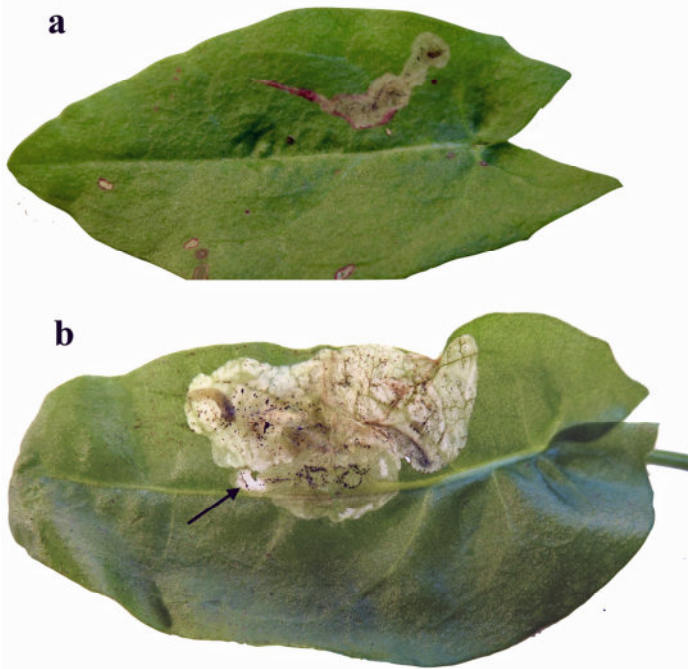

Fig. 5. *Pegomya solennis* **blotch-mines in** *Rumex acetosa* **leaves, black specks are faecal pellets: a, primary mine with a linear section (red), trumpet-shaped apex indicating the switch from dorso-ventral to sideways feeding, larva at the apex of the blotch; b, secondary mine, arrow = entry hole on the abaxial surface visible from the adaxial surface, larva in upper left hand corner, leaves about 60mm long.**

To determine whether the size of leaves with primary mines matched the pattern of leaf size variation in bracken fringes, the lengths of mined and mine-free leaves were compared. Mined and mine-free leaves were collected in August 2016 by walking along bracken fringes and removing every 5th mined leaf encountered and every 5th mine-free leaf encountered above 30mm long and their lengths along the midrib were measured. Monitoring mines in the field to determine whether leaves provide sufficient tissue to complete larval development proved too difficult. Hence an estimate of mine area at the end of larval feeding was obtained from the relationship between larval length and mine area which changes in the direction of the larger the larva the larger the blotch-mine. This relationship can be used to estimate how much tissue is removed during blotch-mining from the lengths of larvae that have completed feeding and are fully grown. Fully grown larvae quit their mines and have little or no black material in the hind gut and large fat bodies. From mined leaves in culture, 18 fully grown larvae were preserved and their lengths measured. Photographs of mined and mine-free leaves and ImageJ were used to calculate the areas of primary blotch-mines, the lengths of associated larvae that are visible in the

mine (Fig. 5b) and the areas of mean length, mine-free leaves. The relationship between mine area and larval length was determined by Pearson's correlation and the plot used to estimate mine areas for the lengths of preserved larvae.
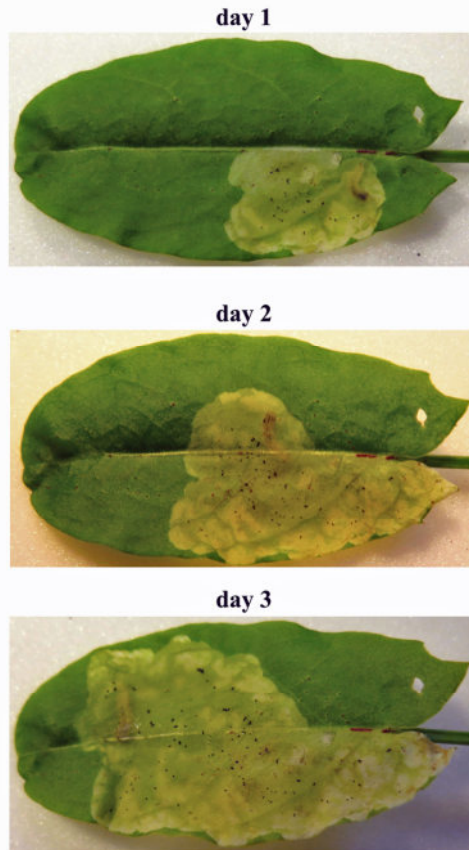

Fig. 6. Changes in the area of a secondary *Pegomya solennis* blotch-mine in a *Rumex acetosa* leaf over three consecutive days and photographed at the same time each day.

Observations of leaf mines in culture suggested that compared to larvae in primary mines those in secondary mines fed more frequently. To compare feeding rates in primary and secondary mines daily increases in mine size were calculated. Primary and secondary mines were collected in August 2016 and those with larvae 6-7mm long were separated. To maintain leaf turgor, the petiole of each mined leaf was placed in water, the leaf placed in a plastic bag and bags stored in cool, part-shaded, outdoor conditions. At the same time each day over a three day period the adaxial surface of each mined leaf was photographed (Fig. 6). After this period photographing ended under the assumption that leaves beyond three days were stressed and influencing larval feeding rates. Based on these photographs and using ImageJ, daily increments to mine area were calculated.

Fig. 7. Responses of *Pegomya solennis* linear mines to contact with the midrib of *Rumex acetosa* leaves: a, mine at right angles crosses over; b, mine at an oblique angle follows the midrib and deflects from it; c, mine takes a U-turn in response to being 'caught' in the angle between the midrib and a lateral vein.

Results
Egg position and mine development
Most of 132 leaves assessed with primary mines had one mine per leaf (118 versus 11 with 2 and 3 with 3 mines per leaf) and the positions of 90 empty eggs attached to the abaxial surface of leaves with one mine were able to be monitored. The longitudinal axis of the majority (75.5%) was more or less parallel to the midrib (< 10° inclination). A majority (82.2%) had the micropyle facing the leaf base. Of 22 eggs with more than 10° inclination, only 4 were above 60° and their micropyles faced the lateral margins of leaves. Relative to the midrib, no preference for left or right hand sides of the leaf was apparent, 47 v 43 eggs per side (Fig. 4b). The most frequent positions for eggs on leaves was in the first and second quarters according to length (73%) and the second and third quarters according to width each side of the midrib (84%), i.e. each side of the midrib most eggs are in the middle region of leaves (Fig. 4b).

With eggs in the middle of the leaf and the micropyle facing the base most linear mines, 48 (64%) of 75 assessed, extended in a straight to gentle curve towards the leaf base with no sharp turns, or changes in direction (Fig. 5a). Of the remaining 27 linear mines contact with the midrib occurred and the response varied according to the angle of approach. At right angles the midrib was crossed over, n = 8, at shallow angles the mine continued parallel to it or was deflected from it, n = 11, and if caught in the acute angle between the midrib and the base of a lateral vein, a U-turn occurred, n = 8 (Fig. 7). Forty-one linear mines were clear enough to be measured and mean length was 1.2 ± 0.29 cm.

Fig. 8. Secondary mine of *Pegomya solennis*: arrow points to successive feeding strips bordered by thin green lines of tissue remaining on the abaxial epidermis, entrance hole in the upper right hand side of the blotch, larva in the lower section of the blotch with black material in the gut, black specks are faecal pellets.

In blotch-mines, larvae fed sideways and observation showed that either the whole body turned laterally or just the front end. The course of blotch-mining consists of individual feeding strips, one succeeding another that extend the mine anteriorly and laterally and rarely leave behind remnants of leaf tissue (Fig. 8). As with linear mines, at first, primary blotch-mines tended not to cross the midrib and were contained to one side of the leaf, but they often reached the leaf edge. Later, the midrib was crossed and the blotch extended to the other side of the leaf.

Mine type, size and switching

In bracken fringes most blotch-mines were of the primary type, 132 (77%) of 171 blotch-mines assessed, meaning that about one in five were secondary. About 25% of leaves with primary mines were damaged with holes, tears and areas removed by other folivores (Fig. 9). Larval length and mine area were strongly correlated, Pearson's correlation r = 0.93, t = 16.177, df = 44, p-value < 2.2e-16 (Fig. 10). The mean length of post-feeding larvae was 8.3 ± 0.7mm, n = 18. Using the fitted line in Fig. 10 values read off for lengths of preserved larvae provide estimates of leaf areas required to complete feeding which were mean 8.6 cm^2, range 7.6-9.5 cm^2. Mean length leaves (69.5 ± 22.6mm, n = 90) varied in area from 16.3 to 18.1 cm^2 (n = 25), which means that enough tissue exists for the development of one larva, but two is close to the limit. In bracken fringes while mined leaves were longer (mean 74 ± 25.0 SD) there was no significant difference between the lengths of mined and mine-free (58 ± 22.9 SD) leaves, suggesting that most leaves encountered are large enough for one mine (Fig. 11, P > 0.05).

Fig. 9. *Rumex acetosa* leaf with a mine of *P. solennis* and reductions in leaf area due to holes, tears and possibly feeding by other folivores, scale shown by a millimetre ruler (lower margin of the image).

Although the number of larvae monitored was low, four in each treatment and monitored for only three consecutive days, a t-test confirmed observations that amounts of tissue mined were significantly greater in secondary than primary mines. Mean area of tissue in primary mines removed per day was 1.17 ± 0.65 cm^2, whereas in secondary mines mean area of tissue removed per day was 3.2 ± 1.32 cm^2, t $= 2.7$, P $= 0.0329$.

Discussion

The main aims of this investigation were to determine if *P. solennis* eggs occur in certain positions on *R. acetosa* leaves, whether egg position effects mine development and whether *R. acetosa* leaves are large enough for larvae to complete development.

Plots of egg positions on *R. acetosa* leaves confirm observations that eggs occur typically in the middle region of leaves either side of the midrib and are orientated more or less parallel to it with the micropyle facing the leaf base (Fig. 4b). These features suggest that during oviposition female *P. solennis* use visual cues to locate middle leaf regions, based possibly on leaf edges or the midrib. The significance of oviposition in this location is unclear, it might be a mechanism to escape from natural enemies that search preferentially along leaf edges and along prominent leaf veins or more prosaically, it might optimise adherence of eggs to a relatively flat area of the *R. acetosa* leaf. With the micropyle and hence the larval head facing the leaf base, the linear mine progresses in that direction, which minimises encounters with leaf edges and the midrib and is consistent with the idea of avoiding natural enemies.

A change from linear to blotch-mining is a feature of many leaf-mining Diptera (British Leafminers 2016). The change is probably due to larvae becoming too large to complete dorso-ventral feeding lunges at or near the change from the first to the second larval stage (Rotheray and Lyszkowski 2015). In *P. solennis*, the change to blotch-mining can be identified by the trumpet-shaped apex to the primary mine (Fig, 5a). Blotch-mining consists of successive removal of tissue strips (Fig. 8). Strip-mining is a feature shared with other blotch-miners, such as the larva of *Acidia cognata* (Wiedemann) (Tephritidae) that mines leaves of coltsfoot *Tussilago farfara* (Asteraceae) (Rotheray and Lyszkowski 2015). Strip-mining is efficient on the basis that mines are completed with few remnants of leaf tissue left behind.
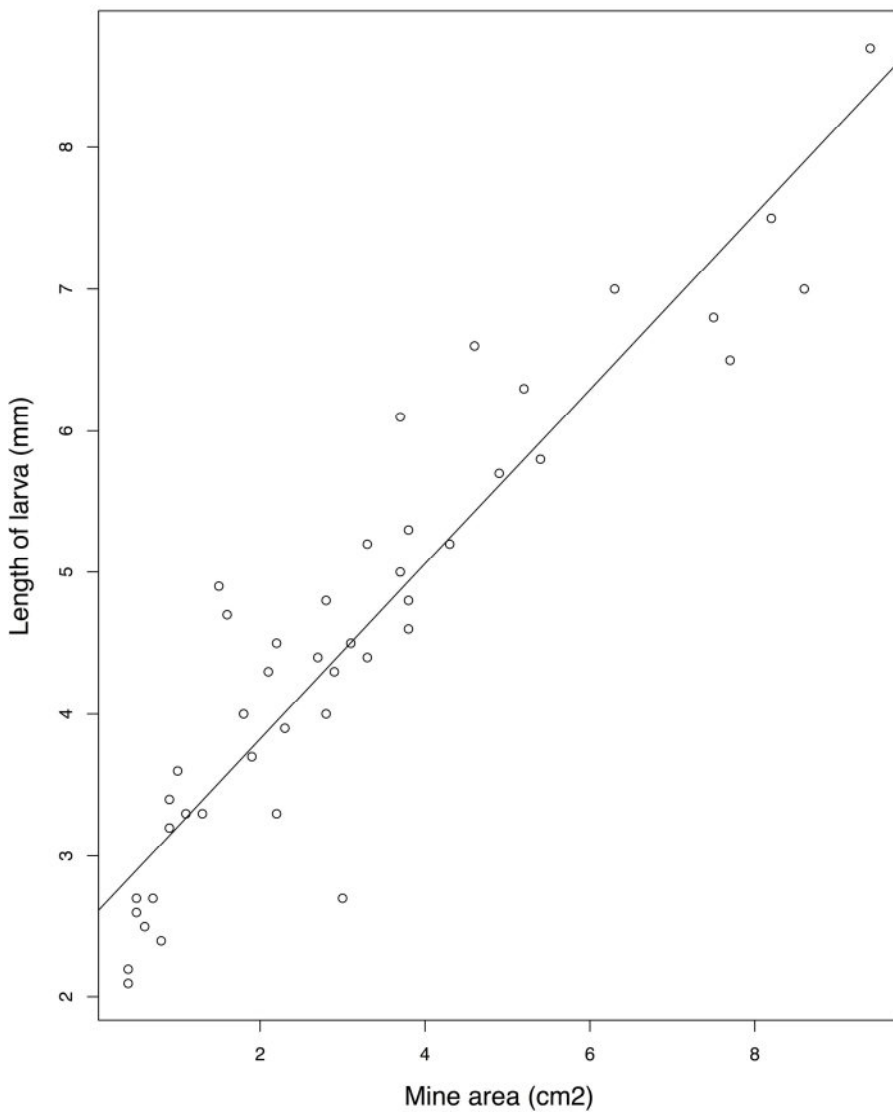
Fig. 10. Relationship between *Pegomya solennis* larval length (mm) and blotch-mine area (cm^2) in leaves of *Rumex acetosa*, n = 44; a linear model was used to represent the relationship between length of larva and mine area.
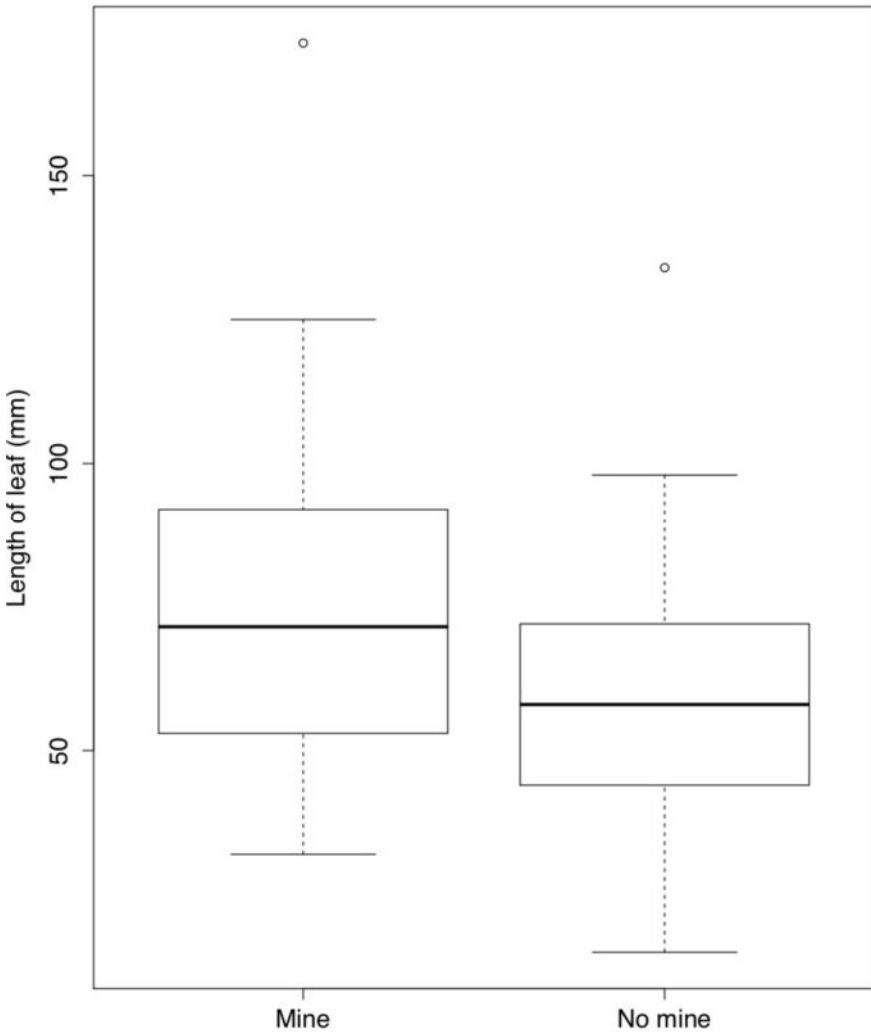
Fig. 11. Box plot comparing lengths of mined (n = 90) and mine free leaves (n = 90) from bracken fringes.

Estimates of leaf area required by a single larva to complete development are less than areas of mean-sized *R. acetosa* leaves, suggesting that one larva can readily subsist on a single leaf, but the summed requirements of two larvae per leaf is close to the limit of mean-sized leaves. This may explain why the majority of *R. acetosa* leaves only had one mine and leaves below 30mm long lacked primary mines altogether. These results are congruent with those of Godfray (1986), and support the idea that differential responses to leaf size by females is explained by larval requirements for food.

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Observations revealed that contact with leaf edges and occasionally the midrib, caused blotch-mining larvae to modify the direction of the mine or the larva moved to another part of the mine to continue feeding. Observations also showed that moving to feed in a different part of the mine could be elicited by abrupt changes in light or wind striking the leaf. This suggests that disturbance can also be a factor influencing mine shape. Although disturbance and contacts with leaf margins or midrib can explain the variable shapes of blotch-mines they probably have trivial effects on rates of larval development, which also seems to be the case with the initial linear mine. Although the direction of the linear mine may be influenced by contact with the midrib (Fig. 7), no relationship was found in the length of linear mines and contacts with it.

Moving position within a blotch-mine is straightforward compared to moving out of the mine altogether and establishing a new one on a different leaf. Most leaves in bracken fringes had one mine and were apparently large enough to provide for larval development so switching between leaves should be rare, but about 20% of sampled mines were due to switching. Switching may be elicited by reductions in leaf areas below the developmental requirements of *P. solennis* larvae that are caused by holes, tears and feeding by other folivores (Fig. 9). Supporting this possibility, leaves with primary mines and areas reduced by tears, holes and other folivores comprised about 25% of mines sampled in bracken fringes. Under these circumstances an ability to switch leaves is an advantage, but is probably risky. For example, outside their mines larvae are potentially exposed to an extensive range of invertebrate and vertebrate predators, desiccation and threats of being drowned or washed away in heavy rain. Rates of successful switching were not investigated, but during switching larvae are unable to feed and if searches are prolonged, starvation will result. Starvation during switching is suggested by the significantly higher daily increments to mine size recorded between larvae in secondary compared to primary mines.

Over the course of this study, bracken stands were trampled by cattle which broke them up and destroyed their fringes, but trampling also created new fringes. *Rumex acetosa* plants growing in grassland between bracken stands were cropped and kept small by cattle grazing. In the middle of bracken stands a canopy of overlapping fronds shielded the ground from light and few live plants were present. Hence, constrained by cattle grazing on one side and by the bracken canopy on the other, vigorous *R. acetosa* growth was limited to the part-shaded fringes of bracken stands where plants were randomly destroyed by cattle trampling. Greater growth of *R. acetosa* plants in bracken fringes not only attract *P. solennis* but also, natural enemies of the latter. Although parasitism was not assessed in detail, on 24.ix.2016, third stage *P. solennis* larvae were collected from mines in bracken fringes and from a nearby ungrazed area of grassland at Venniehill on the western flank of the Boreland Hills. Larvae were dissected for parasitoid eggs and larvae and the number of parasitised *P. solennis* larvae counted. In the bracken fringes, 39.7% (27 of 68 larvae) were parasitised while at Venniehill, only 12.7% (6 of 47 larvae) were parasitised. These figures are indicative of a significant impact of parasitism on *P. solennis* in bracken fringes compared to open, ungrazed grassland. Cattle trampling, damaged *R. acetosa* leaves and high rates of parasitism suggest that bracken fringes are a poor habitat for *P. solennis*.

Although certain replicates presented here are low in number this investigation shows that the leaf-mining habit is a substantial source of information that is amenable to study and assessment. For example, using imaging freeware, such as ImageJ, to relate mine areas and shapes to leaf characteristics and stages in larval development. The work presented here could be developed in a number of directions, for instance, comparing the incidence of mines in other habitats, such as ungrazed grassland, where parasitism may be less frequent and leaves were noticeably longer and thinner compared to their more ovate shapes in bracken fringes. Stace (2010) referred to such leaf shape variability in *R. acetosa*, but how leaf shape affects *P. solennis* leaf choice, egg positions and mine development is unknown. Another direction is investigating the incidence of mines on plants such as broad-leaved dock *Rumex obtusifolius*, that has bigger

leaves and on which egg clutches are typically larger (Godfray 1984). Large leaves and egg clutches provide a contrast with *R. acetosa* and potential to compare these foodplants relative to egg positions, interactions between larvae, patterns of mine development, leaf switching, rates of parasitism, etc.

Perhaps this study will encourage others to take up and develop investigations of Diptera larvae, and include other than leaf-miners. A considerable and largely untapped potential for developing and extending knowledge exists in determining how larvae carry out basic life functions, such as feeding and locomotion and an informative approach is one in which explanations of larval features are sought by matching them against variables at development sites (Rotheray 2019).

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Occurrence of *Dioctria baumhaueri* Meigen (Diptera, Asilidae) in the Western Isles –

On 11 April 2019, one of us (WN) noticed an unfamiliar insect on the window inside his sun lounge in Askernish, South Uist (NF738237, V.C. 110). Images were sent to MM, who recognised it as an asilid of the genus *Dioctria*, probably *D. baumhaueri* Meigen, 1820. He sent it to Martin Harvey who confirmed it as a male of that species.

This find raises many puzzles. A. Stubbs and M. Drake (2014. *British Soldierflies and their Allies*. British Entomological and Natural History Society, Reading) say that *D. baumhaueri* is typically found in wooded or scrub habitats and is rarely found north of Cheshire and South Yorkshire, where its season runs from early May. South Uist has little of these habitats and is

some 540km NW of the most northerly record in the Soldierflies and Allies Recording Scheme (SARS) database. That was found at Busbridge Woods (SE8983), N Yorkshire in 2009 by A. Halstead (Fig. 1). Also, despite the northerly location, the fly was active a few weeks before it would be expected to appear even in England. SARS has only a single plausible record in April, and only 75 of the scheme's 1241 records for this species are as early as May. The only species of this genus recorded from the north of Scotland (Harvey, M.C. 2018. *Provisional atlas of soldierflies and allies*. Draft version [Available from http://www.brc.ac.uk/soldierflies-and-allies/atlas]) are *D. cothurnata* Meigen, 1820 (most frequently found), *D. oelandica* (Linnaeus, 1758) and *D. rufipes* (De Geer, 1776). Although there had been a long spell of strong southerly winds in the days before its appearance, the probability of the Uist *Dioctria* having arrived accidentally with human assistance must be high.

Fig. 1. Location of the Uist *Dioctria baumhaueri* in 2019, and the nearest record in Britain. All other British records are south of here.

According to D.S. Dennis, J.K. Barnes and L. Knutson (2013. *Review and analysis of information on the biology and morphology of immature stages of robber flies (Diptera: Asilidae). Zootaxa* **3673**(1)**,** 1-6), and Stubbs and Drake (*op. cit.*), larvae of *Dioctria* live in the soil. We have found no specific information on the length of larval life in *Dioctria*, but in many asilids it may last several years. The fly was found indoors in a sun-room with exotic plants, and there is the ever-present possibility of import of soil containing larvae or pupae into the house or the wider area in horticultural or agricultural material. While the origin will never be known for certain, the circumstances strongly suggest a human-assisted import, the early emergence date perhaps explained by development indoors at a relatively high temperature.

We are grateful to Martin Harvey for confirming the identity of the fly, and for details of unpublished records in the Soldierflies and Allies Recording Scheme. The map was prepared with DMAP **– WILLIAM NEILL,** 'Rannachan', Askernish, S. Uist, HS8 5SY and **MURDO MACDONALD,** 'Tigh nam Beithe', Strathpeffer, Ross & Cromarty, IV14 9ET

Some records of craneflies (Diptera, Tipuloidea) from Kola peninsula, Russia

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Summary

A small collection of craneflies (Diptera, Tipuloidea) has been identified from the Kola peninsula, Murmanskaya, Russia. There were three species of Tipulidae, five Limoniidae and three Pediciidae. None are rare or unusual for the northern European Palaearctic Region but there are few records with specific data from Kola and so the list is presented below.

Description

A list of species of Tipuloidea (Tipulidae, Limoniidae and Pediciidae) from two sites in the Kola peninsula in north-western Russia, within the Murmanskaya Oblast (area), is provided. The samples were collected from along banks of the Umba River (66.69N, 34.31E) and the Varzuga River (66.42N, 36.53E) during August 1992 by F.R. Woodward. The co-ordinates mark the approximate midpoint of the two sampling locations, which are not available in more detail. Woodward's main purpose was working along lengths of these two rivers assessing the location and health of populations of the freshwater pearl mussel, *Margaritifera margaritifera* (Linnaeus, 1758). The status of this mollusc was giving, and continues to give, concern throughout many parts of its range in Europe. He responded kindly to my suggestion to collect craneflies at any opportunity.

All the specimens have been identified by the author. The species are known already from the northern parts of the western Palaearctic but specific details of their occurrence within Murmanskaya are not generally available from the Catalogue of the Craneflies of the World. This resource gives data on Russian distributions by certain quite broadly defined areas, "NET" for Tipulidae as used in the 1992 Catalogue of Palaearctic Diptera, "RUN" for Limoniidae and Pediciidae as used at the Fauna Europaea website; corresponding maps for these areas are given in the manual of the CCW (Oosterbroek 2019).

The specimens are deposited in The Hunterian Museum (Collection Entry No. HUG: Z306) and are either direct pinned or carded according to size.

List of species

TIPULIDAE
Tipula (*Lunatipula*) *circumdata* Siebke, 1863. Umba River (1 male); Varzuga River (2 males). Starý and Salmela (2004) described this species as poorly known.
Tipula (*Platytipula*) *luteipennis* Meigen, 1830. Umba River (1 male); Varzuga River (1 male).
Tipula (*Savtshenkia*) *gimmerthali* Lackschewitz, 1925. Varzuga River (1 male).

LIMONIIDAE
Dicranomyia (*Dicranomyia*) *modesta* (Meigen, 1818). Umba River (1 female); Varzuga River (3 males, 4 females).
Dicranomyia (*Dicranomyia*) *patens* (Lundström, 1907). Varzuga River (1 male, 1 female).
Dicranomyia (*Idiopyga*) *halterella* (Edwards, 1921). Varzuga River (1 male).

Dicranomyia (*Melanolimonia*) *rufiventris* (Strobl, 1900). Varzuga River (2 males, 1 female).
Limonia sylvicola (Schummel, 1829). Umba River (3 males, 3 females); Varzuga River (1 male, 5 females).

PEDICIIDAE
Dicranota (*Dicranota*) *guerini* Zetterstedt, 1838. Varzuga River (1 male, 1 female).
Dicranota (*Paradicranota*) *gracilipes* Wahlgren, 1905. Varzuga River (1 female).
Dicranota (*Rhaphidolabis*) *exclusa* (Walker, 1848). Varzuga River (1 male).

Discussion
According to Salmela (2010), whereas a total of 406 species of Tipuloidea are known from all the Nordic countries (excluding Iceland) addition of the Kola Peninsula and Russian Karelia province would then only slightly exceed 410.   Therefore, from present knowledge, it appears that including the boreo-alpine and northern forest habitats at similar latitude of these adjacent parts of Russia does not materially increase the species list. The above species records do not alter that view. Of the above eleven species four, namely *Tipula gimmerthali*, *Dicranomyia rufiventris, D. patens* and *Dicranota exclusa*, are listed specifically as already known from Murmanskaya in CCW. All of the species listed are already well-known from Scandinavian areas. In addition, *T. circumdata* is confirmed for Murmanskya following its first published occurrence there as given by Savchenko (1964: 282).

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Eristalis arbustorum (Linnaeus) (Diptera, Syrphidae): discovery of a new larval development site

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Summary

In July 2018, fourteen eristaline larvae were found in a rock-pool containing decaying storm-thrown seaweed just above the tideline at Boddin Point, Angus. A sample of larvae were reared in captivity and produced two adult *Eristalis arbustorum* (Linnaeus) and nine adult *Eristalinus aeneus* (Scopoli). There appear to be no published accounts of *E. arbustorum* using coastal rock-pools or decaying seaweed as a larval development site.

Introduction

Eristalis arbustorum (Linnaeus) is found throughout Britain and is often abundant (Ball *et al.* 2011). Its known larval development sites are freshwater with a high degree of animal pollution such as farmyard drains and temporary pools (Hartley 1961). Dussaix (2005) reported rearing records from compost and manure heaps. A review of the available literature indicates that congeners develop in nutrient-rich stagnant water, liquid animal manure, moist decaying sewage and decaying plant matter in various types of freshwater bodies (Hartley 1961, Rotheray 1993, Speight 2018). There appear to be no published accounts of *Eristalis* larvae developing in coastal rock-pools or decaying seaweed, although reports exist for *Eristalinus aeneus* (Scopoli) (Lamb 1911, Lamerton 1993) and *Eristalinus sepulchralis* (Linnaeus) (Rotheray and Britton 2014). This paper provides evidence that *Eristalis arbustorum* can successfully use coastal rock-pools with decaying seaweed as a larval development site.

Method

Boddin Point on the Angus coast of north-east Scotland is a spur of land jutting into the sea, founded on limestone and sedimentary rock capped by ancient marine deposits of sand, silt and gravel. The northern shoreline is composed of tilted rock and boulders sheltering many pools of water, some of which accumulate decaying storm-thrown seaweed beyond the normal tidal range. This site is particularly good, in a local context, for seeing *Eristalinus aeneus*. In the summer months, adults forage on blooms of scurvy-grass *Cochlearia officinalis* (Brassicaceae); they overwinter nearby in tight, mixed-sex groups within the ceiling crevices of an old lime kiln.

On 21 July 2018 a stretch of shoreline within NO713535 was walked and any sheltered pools just above the tideline were inspected for eristaline larvae. The salinity of the rock-pools was not firmly established during this survey but they appeared free of freshwater inputs from streams and seepages. Examination of the rock-pools involved stirring the water and its contents to dislodge any larvae present, and hand-searching of submerged material. A particularly oily and smelly pool (~ 60 x 30 x 17 cm) was investigated by lifting out a large handful of decaying seaweed onto a flat rock (Fig. 1). This action alone dislodged several eristaline larvae into the pool with a few more tangled within the seaweed. A small handful of seaweed from the rock-pool was dropped into a sealable freezer bag and water was added until the material was submerged at the bottom of the bag. Finally, I added the 14 eristaline larvae.

At home the contents of the bag were examined on a flat white tray and the eristaline larvae re-found. Using Rotheray (1993) it was possible to separate the larvae into two cohorts: *Eristalis* species and *Eristalinus* species. The larvae of *Eristalinus* are distinguished from *Eristalis* by their

possession of a transverse row of spicules just in front of the last pair of prolegs (Fig. 2). It was easier to view this feature under a stereo microscope at x45 magnification from an oblique lateral perspective.

Fig 1. Rock-pool with decaying seaweed at Boddin Point, Angus.

From the sample of 14 eristaline larvae, three *Eristalis* and two *Eristalinus* were retained as voucher specimens: they were killed and cleaned in lightly boiling water for approximately 3-4 minutes and preserved in 70% isopropyl alcohol in glass tubes with plastic stoppers. The remaining nine larvae were kept in captivity for rearing to adulthood. The seaweed and water were emptied into a plastic food tray (19 x 15 x 6 cm), which was then sleeved within a large sealable freezer bag (29 x 27 cm) and left in a cool, dark shed. Over subsequent weeks the sample was checked and the bag periodically opened for a change of air.

Results
On 9 August 2018, a male and female *Eristalis arbustorum* emerged (Fig. 3). The remaining seven eristaline larvae had formed their puparia in the crevices of the enclosing freezer bag or were wedged under the tray. Six female *Eristalinus aeneus* emerged between 12 and 29 August 2018. A single puparium failed to produce an adult.

No adults were observed around the rock-pools or along the shoreline on the day the larvae were found. The cool and cloudy conditions likely inhibited adult activity. On a return visit in late September 2018, it was not possible to relocate the rock-pool: it had either dried up or was scoured clean by recent storm tides.

Discussion
There appear to be no previous published records of *Eristalis* using rock-pools or decaying seaweed as larval habitat. However, Rotheray and Britton (2014) did observe *Eristalis intricaria* (Linnaeus) and *Eristalis pertinax* (Scopoli) egg-laying on expansive accumulations of decaying seaweed on the Hebridean Island of Sanday on the west coast of Scotland. Although they did not

rear these species from the sample of larvae they brought in to captivity, they did confirm that some *Eristalis* were highly attracted to this medium and willing to egg-lay on it. The discovery of fully grown *E. arbustorum* larvae in a rock pool of decaying seaweed, as reported here, further indicates that *Eristalis* can use this habitat for development.
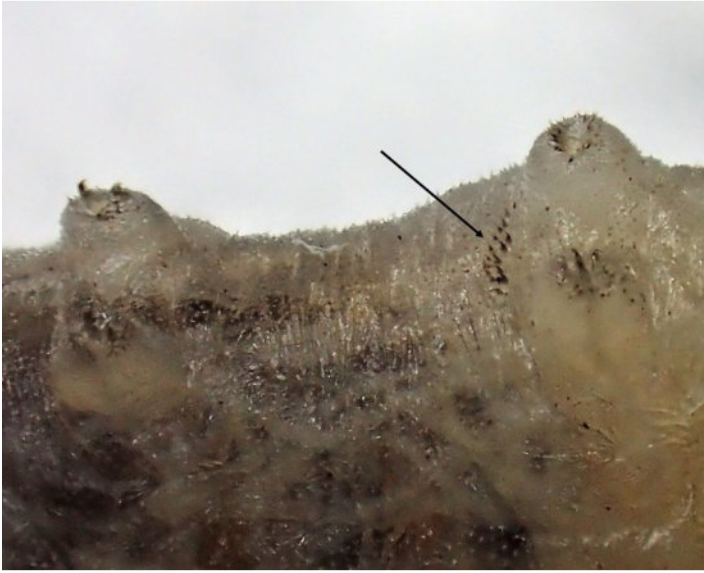

Fig. 2. *Eristalinus* **larva showing transverse row of spicules just in front of the last pair of prolegs.**

Fig 3. Male *Eristalis arbustorum* reared from decaying seaweed in a rock-pool.

The rock-pool at Boddin Point was only temporary and had disappeared by late September 2018. Rock-pools near the tideline are vulnerable to scouring by storm-driven tides, particularly during the winter; shallow pools are at risk of drying out as summer progresses. Both these factors potentially influence larval survival and perhaps make rock-pools a sub-optimal habitat, given that most *Eristalis* species appear to overwinter entirely in the larval stage. Angus is intensively farmed for livestock and arable production and local freshwater can be highly enriched by nutrient run-off which likely provides a more stable and extensive larval breeding habitat throughout the year. For instance, in Britain *Eristalinus aeneus* seems to overwinter entirely in the adult stage with larval development, which predominantly occurs in rock-pools, restricted to the summer months (Lamerton 1993). This could allow them to avoid the volatile conditions rock-pools experience during the winter. However, other more resilient forms of decaying seaweed such as that described by Rotheray and Britton (2014) may be of local importance to *Eristalis*, especially on the west coast of Scotland where decaying seaweed often accumulates over successive years potentially providing habitat throughout the year.

Eristalis arbustorum has several generations per year and the non-wintering generations are capable of completing their larval and puparial development within two months (Ottenheim and Holloway 1995, Dussaix 2013). This allows them to take advantage of temporary pools and likely provides some explanation for the fluctuations in adult abundance following periods of heavy rainfall. Such opportunism could set *Eristalis* apart from other eristaline genera such as *Anasimyia* and *Parhelophilus* that appear restricted to more permanent wetlands (Roger Morris *pers. comm.*).

The salinity of the rock-pool containing eristaline larvae was never established. How tolerant *E. arbustorum* and congeners are to saline conditions is unknown. It is possible that after the rock-pool's initial creation during winter storms, it received no further inputs of seawater during calmer months and was subsequently sustained by rainwater thus diluting its salinity. Given the rapid development of larval *Eristalis*, they could use such rock-pools during a short period when minimally saline during the summer.

In conclusion, it is likely that rock-pools with decaying seaweed and other accumulations of decaying storm-thrown seaweed that retain moisture can be used by *Eristalis* larvae. The importance of this habitat for *Eristalis* will depend upon its location, i.e. whether a coastline has a propensity for accumulating storm-thrown seaweed and exposure to tidal waters during storm events. Further work is required to quantify the extent and importance of rock-pools and decaying seaweed as breeding habitat for *Eristalis* and the effect salinity has on larval development.

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Recent records of *Sarcophaga villeneuvei* (Böttcher) (Diptera, Sarcophagidae) from Iffley Meadows, Oxfordshire and Gatwick Airport, West Sussex in 2018 –

Two new records of the poorly known *Sarcophaga villeneuvei* (Böttcher, 1912) are reported. A single male was swept by SF at Iffley Meadows SSSI (SP522038), Oxford, Oxfordshire, on 22 May 2018 during a series of surveys at this site, which is unimproved floodplain grassland with marshy areas, carr and scrub (Fig.1).

The specimen was identified using T. Pape (1987. The Sarcophagidae (Diptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* **19**) and D. Povolný and Y. Verves (1997. The Flesh-Flies of Central Europe. *Spixiana*, Supplement **24**). Later that year, RM collected a further male during fieldwork at Gatwick Airport, West Sussex on 3 September 2018. The specimen was swept from grass on the flood meadows adjacent to the river Mole (Fig. 2). The site is situated on the north-west of the airport (at TQ2541); the habitat is species-rich in flora and fauna with a few notable species of invertebrates recorded in a short space of time (around 45 minutes). The specimen was later imaged and provisionally determined by SF via Twitter based on genitalia (then confirmed by RM).

This species was regarded as pNear Threatened by S.J. Falk and A.C. Pont (2017. A Provisional Assessment of the Status of Calypterate flies in the UK. Natural England. Commissioned Reports, Number 234), which gave the known distribution as scattered localities in the southern half of England: Chew Valley lakes, Somerset (2003), Flordon Common, Norfolk (2010), Dorset, Oxfordshire and Gloucestershire; also South Wales: Carmarthenshire (1989). The Norfolk record was provided by S. Paston (2011. *Sarcophaga villeneuvei* Böttcher (Diptera: Sarcophagidae) new to East Anglia. *Dipterists Digest* (*Second Series*) **17**(2010)**,** 101).

The National Biodiversity Network (https://species.nbnatlas.org/species/NBNSYS 0000156299; accessed 14 January 2019) includes records for Shapwick Heath, Somerset (2005) and Stalham Fen, Norfolk (2008), both identified by Martin Drake.

Fig. 1. Iffley Meadows SSSI (Photo SF).

Fig. 2. Flood meadows and the river Mole (photo kindly provided by Rachel Bicker).

Most records indicate a liking for damp or marshy habitats, not dissimilar to the habitat preferences of *S. sexpunctata* (Fabricius, 1805) and *S. sinuata* Meigen, 1826. The Oxfordshire specimen has been retained in SF's personal collection. The Sussex specimen has been retained and stored in the Ulster Museum (Accession Number Mr2019.213) **– RYAN MITCHELL,** National Museum Northern Ireland, Cultra, Holywood BT18 0EU: Ryan.Mitchell@nmni.com and **STEVEN FALK,** 10 Fishponds Road, Kenilworth CV8 1EX: falkentomology@gmail.com

Some notes on the genus *Paradelphomyia* Alexander (Diptera, Limoniidae)

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Summary

The subgeneric classification of the genus *Paradelphomyia* Alexander, 1936 is abolished due to insufficient differences between the subgenera *Paradelphomyia* s. str. and *Oxyrhiza* de Meijere, 1946. Redescriptions of the male terminalia of *Paradelphomyia ecalcarata* (Edwards, 1938) (Europe) and *P. dalei* (Edwards, 1939) (Great Britain) are provided and respective genital details are illustrated.

Introduction

The genus *Paradelphomyia* Alexander, 1936 has posed some unresolved problems, both from global and local points of view. Two of these issues are addressed in this paper, viz. general classification of the genus and differences in the structure of the male terminalia between *Paradelphomyia* (*Oxyrhiza*) *ecalcarata* (Edwards, 1938) and *P.* (*O.*) *dalei* (Edwards, 1939).

Material and methods

The morphological terminology adopted here essentially follows McAlpine (1981). A special term, ventral fork, is referred to in Fig. 3. Male terminalia were prepared by boiling in a solution of 10% KOH and preserved in glycerine in a sealed plastic tube pinned with the appropriate specimen. Line drawings were made using a drawing tube (camera lucida) attached to a compound microscope. Distributions of the two species commented upon are given as summarised by Oosterbroek (2019). All specimens listed in the Material examined sections are deposited in the collection of the author.

Genus *Paradelphomyia*

The genus *Paradelphomyia* was described by Alexander (1936) as a subgenus of *Adelphomyia* Bergroth, 1891, with the type species *A.* (*P.*) *crossospila* Alexander, 1936 (China), fixed by original designation. After a period when relevant species were classified in *Oxydiscus* de Meijere, 1913 or *Oxyzhiza* de Meijere, 1946, the classification stabilised, treating the group in the genus *Paradelphomyia*. The latter genus, as now understood, is subdivided into the subgenera *Paradelphomyia* s. str. and *Oxyrhiza* (cf. Alexander 1948). Currently, this genus comprises 90 species distributed in all zoogeographic regions, except for the Australian/Oceanian (Oosterbroek 2019). It should be emphasised that all species belong to the subgenus *Oxyrhiza*, but one, the type species of *Paradelphomyia*, *P.* (*P.*) *crossospila*. The nominotypical subgenus differs from *Oxyrhiza* by a single character, the presence of a supernumerary crossvein between R_3 and R_4. Based on the description and illustrations by Alexander (1936), both external characteristics and the structure of the male terminalia in *P.* (*P.*) *crossospila* clearly place it to what is regarded as the subgenus *Oxyrhiza*. Moreover, I have found that some specimens from my collection, especially those of the common *P.* (*O.*) *senilis* (Haliday, 1833) possess exceptionally a supernumerary crossvein between R_3 and R_4, sometimes on both wings. Even if, admittedly, the supernumerary crossvein in *P.* (*P.*) *crossospila* would represent a stable character and not a variation in the single specimen available, this, in no case, can be a reason for separation at

subgeneric level. Therefore, I here propose to abolish the subgeneric classification in the genus *Paradelphomyia*.

It seems, however, that the subgenus *Oxyrhiza* cannot be simply regarded as a junior synonym of *Paradelphomyia*. Based on de Meijere (1913: 350-351, Fig. 16), the type species of *Oxydiscus*, *O. nebulosus* de Meijere, 1913 (Java, original designation) seems not to have much in common with *Paradelphomyia*. The wings in the latter species are abundantly spotted, and the macrotrichia on the wing membrane are not mentioned in the description, nor are they illustrated in the figure. From a classificatory point of view, the subsequent change of the name *Oxydiscus* to *Oxyrhiza* due to homonymy (de Meijere, 1946) is irrelevant.

Paradelphomyia ecalcarata **and** *P. dalei*

Since *Paradelphomyia dalei* (Edwards, 1939) is reliably only known from Great Britain, this issue is intended to appeal especially to British cranefly students. Edwards (1938) described *Oxydiscus ecalcaratus* from two localities in Great Britain, in South England and Wales, and he illustrated details in the structure of the outer gonostylus and aedeagal complex. A year later, he (Edwards 1939) described *Oxydiscus dalei* from two localities in South England. In his description of the latter, the structure of the male terminalia was briefly characterised, but no illustration was provided. The two species are best distinguished from other European congeners by the so-called ventral fork that has an outer arm about mid-length of each prong (Edwards 1938). Edwards (1939), in describing *O. dalei*, probably considered differences between the species in the length and curvature of the aedeagus sufficiently distinctive to express them only in words. Maybe he was right, yet, since that time, British cranefly students have seemed to be uncertain in differentiating the two species, largely relying on external characters in spite of the fact that differences in the male terminalia of the two are quite profound. The body coloration in *Paradelphomyia ecalcarata* is in general brown whereas it is much paler, rather yellow, and more contrasting in *P. dalei*, with a distinct dark longitudinal stripe on the pleura. Unfortunately, the material preserved in ethanol, a method commonly preferred in recent decades, may not be satisfactorily conclusive in this respect. Therefore, I give here descriptions and illustrations of the male terminalia of the two species.

Paradelphomyia ecalcarata **(Edwards, 1938)** (Figs 1-3)

Male terminalia: Outer gonostylus rather long and slender, with largest terminal tooth conspicuous, distinctly curved rearwards; subterminal (inner) tooth rather long (Fig. 1). Aedeagus short and rather broad, straight in lateral aspect, reaching to about half length of short parameres; apodeme of vesical short; ventral fork with its outer arms broad proximally (Figs 2-3).

Material examined. Bulgaria: Belogradchik env., 15.vii.1987, 1♂ (J. Starý leg.). **Czech Republic:** Moravia: Rešov, waterfall, 5.viii.1972, 1♂; Moravičany, 1.vii.1972, 1♂; Slatinice, Kosíř, 21.vii.1973, 1♂; Tichá nr. Frenštát pod Radhoštěm, 30.vi.1994, 1♂; Kletné nr. Suchdol nad Odrou, 29.vii.1977, 1♂; Hostýnské vrchy [hills], Vlčková, 7.vii.1973, 1♂; Brno, "Kočičí žleb", 14.vii.1974, 1♂; Brno, Bobrava valley, 2.vii.1977, 1♂; Radějov, Lučina, 30.vii.1977, 1♂; Bílé Karpaty Mts, Javorník, "Machová" 1.vii.1993, 1♂; Bílé Karpaty Mts, Javorník, "Megovka, 6.vii.1994, 6♂, 1♀; Strání, 7.vii.1994, 2♂ (all J. Starý leg.). **Slovakia:** Malá Fatra Mts, Vrátna valley, 9.vii.1967, 1♂ (J. Martinovský leg.); Stankovany, brook, 3.vii.1986, 1♂, 9.viii.1989, 1♂; Belianske Tatry Mts, Tatranská Kotlina, Belá valley, 29.vii.1974, 2♂; Ruský Potok, valley, 5.viii.1985, 1♂, 11.vii.1993, 26♂; Ubľa, Kosmatec, 23.vi.1983, 1♂; Nová Sadlica env., 9.vii.1993, 2♂, 1♀ (all J. Starý leg.).
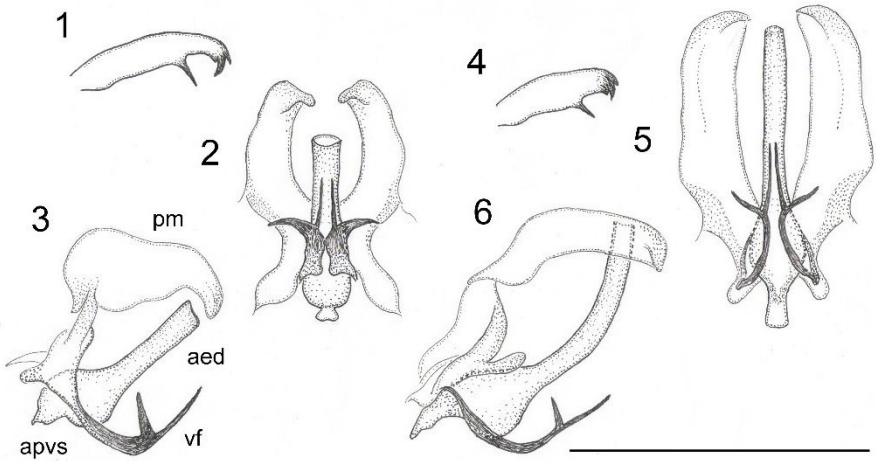
Figs 1-6. 1-3: *Paradelphomyia ecalcarata* **(Edwards, 1938), male terminalia (Czech Republic: Moravia: Bílé Karpaty Mts, Javorník): 1, outer gonostylus, dorsal; 2, aedeagal complex, ventral; 3, aedeagal complex, lateral. 4-6:** *Paradelphomyia dalei* **(Edwards, 1939), male terminalia (U.K.: England: Worton Wood): 4, outer gonostylus, dorsal; 5, aedeagal complex, ventral; 6, aedeagal complex, lateral. Scale bar – 0.25mm. Abbreviations: aed = aedeagus; apvs = apodeme of vesical; pm = paramere; vf = ventral fork.**

Distribution: Austria, Bulgaria, Czech Republic, Germany, Great Britain, Hungary, Poland, Slovakia, Switzerland, Ukraine.

Paradelphomyia dalei **(Edwards, 1939)** (Figs 4-6)

Male terminalia: Outer gonostylus shorter and broader, with largest terminal tooth less conspicuous and less distinctly curved rearwards; subterminal (inner) tooth shorter than that in *P. ecalcarata* (Fig. 4). Aedeagus very long, about twice that in *P. ecalcarata*, slender, distinctly bent dorsally in lateral aspect, reaching to tips of long parameres; apodeme of vesical long; ventral fork as two separate structures, each with its outer arm slender (Figs 5-6).

Material examined. Great Britain: Scotland: Cromarty, Braelangwell Woods, 3.viii.2003, 2♂ (A. Godfrey leg.). England: Oxfordshire, Worton Wood, 7.vii.2017, 4♂, 1♀ (J. Webb leg.).

Distribution. Great Britain. The record from Georgia (Savchenko 1986, 1989) is to be checked.

Acknowledgements

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Changes to the Irish Diptera List (28) – 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. The gain of 2 species cited here brings the total Irish list to 3446.

Asilidae

Dioctria baumhaueri Meigen, 1820 (added by P. Woodworth, 2018. Nature is all around us in the city. *The Irish Times* 20 January, 2018). Woodworth states: "Insect specialist Leon van der Noll found a species new to Ireland, the robberfly *Dioctria baumhaueri*, in a Cork city park". This record was first reported on the Dipterists Forum website, with a photograph posted by the recorder, on 20 January 2015 and its identity was confirmed by those responding, but this is apparently the first published reference to the occurrence. It seems likely to have been a recent arrival, and there have since been several more records in the Cork area (Brian Nelson *pers. comm.*).

Tachinidae

Carcelia puberula Mesnil, 1941 (added by Mitchell in the present issue)

Eliozeta pellucens (Fallén) (Diptera, Tachinidae) new to Britain

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Summary
Eliozeta pellucens (Fallén, 1820) is added to the British List from Lode, Cambridgeshire. Details of its known distribution and biology are given.

Introduction
Whilst scanning the flowers of shrubby hare's ear *Bupleurum fruticosum* in my garden at Lode (TL531626), Cambridgeshire on 6 August 2018, amongst the numerous small phasiine tachinids present, one stood out by being golden-brown in appearance rather than the usual black or grey coloration. Once captured and examined under the microscope, it proved to be a female with a piercer type ovipositor (which retracted during drying), typical of the Phasiini in appearance but one I had not encountered before. In particular I noticed that wing cell r_5 was not petiolate as it is in the genus *Phasia.*

Identification
Using Belshaw (1993) it ran to couplet 150 but did not agree with either option, having diverging ocellar bristles and the postpronotal lobe with bristles in a line. However, when it was put through the key to the Central European Tachinidae (Tschorsnig and Herting 1994), it came out as *Eliozeta pellucens* (Fallén, 1820). Distinguishing *Eliozeta* from *Clytiomya* is not easy and with *C. continua* (Panzer, 1798) already recorded from Britain (Plant and Smith 1997), care is needed. In *Eliozeta* there are three katepisternal bristles, two in *Clytiomya,* but the lower one in *Eliozeta* can be difficult to differentiate from the hairs present. In female *Eliozeta* there are hairs on the parafrontalia outside the line of the frontal bristles, these hairs being absent in *Clytiomya*. Another species, *Eliozeta helluo* (Fabricius, 1805), is known from Southern and Central Europe. In that species the arista is thickened to at most a third of its length, whereas in *E. pellucens* this extends to two thirds.

The specimen (Figs 1-2) was unusually small, having a body length of only 4mm, while the typical body length for this species is about 7mm, including continental specimens of both sexes provided for comparison by Chris Raper. The male has more extensive yellow abdominal markings (see cover photograph of this issue).

Biology
On the Continent *E. pellucens* has been reared from shieldbugs of the family Cydnidae (Hemiptera, Heteroptera) (Tschorsnig and Herting *op. cit.*). One of its known hosts is the pied shieldbug *Tritomegas* (*Sehirus*) *bicolor* Linnaeus, 1758 which is widespread in southern and central England.

Discussion
In Europe *E. pellucens* is widely distributed including Scandinavia and is locally common. It favours dry, warm, open countryside and is on the wing from mid May to early September (Tschorsnig and Herting *op. cit.*). Its capture came at a time of very high temperatures with southerly winds and may be the result of a casual migration. However, with many of the Phasiinae

expanding their ranges northwards in recent years, the prospect that *E. pellucens* could become established here seems highly likely. It will be interesting to see if further records ensue in the coming years.

Figs 1-2, *Eliozeta pellucens* **(Fallén), female: 1, lateral view; 2, dorsal view (photos C. Raper).**

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Botria subalpina (Villeneuve) (Diptera, Tachinidae) in north Scotland

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Summary

Botria subalpina (Villeneuve, 1910) is frequent and widespread in the Highland Council area in Scotland, on the wing from March to early June in open woodland and edges. It might be expected to occur much more widely to the east and south of its current known range.

Introduction

Until 2013, *Botria subalpina* (Villeneuve, 1910) was not recognised in Britain (Horsfield *et al*. 2013). That paper added it to the British fauna on the basis of one specimen collected (but not recognised) in 1994, and six specimens collected in 2012-13. To date we have accumulated a total of 20 records, enough to draw some preliminary conclusions about its ecology in Scotland.

   Botria subalpina ranges in northern Europe from Scotland to Russia and south to Switzerland and Germany (Tschorsnig and Herting 1994, Tachi 2013). Very little seems to have been published on its biology so far.

Identification in the field

Recognition of *Botria* in the field is aided considerably by the fact that it flies so early. In the north, only two other tachinids of similar size and build – *Tachina ursina* (Meigen, 1824) and *Gymnocheta viridis* (Fallén, 1810) – are likely to be encountered in April, both very distinctive and not to be confused with any other species.

   At first glance, the fly appears like many others. It has the typical tachinid jizz at rest, with antennae held forward. From a distance, it looks essentially greyish, with grey and black chequering on the abdomen, but in the hand with a lens the orange on the legs and scutellum become obvious. Any fly fitting that general description in March or April in north Scotland should be netted to check these features.

   During May, it might overlap with other superficially similar tachinids, such as *Appendicia truncata* (Zetterstedt, 1838) and *Exorista larvarum* (Linnaeus, 1758). These also have orange on the scutellum, but lack orange on the legs and dark clouding on the cross-veins so any confusion will be short-lived.

   As eight of the 20 records came from naturalists with no specialist interest in Diptera, it is clear that *Botria* makes itself conspicuous, inviting closer attention, perhaps especially because so few flies of that size are active in the north in the spring. All these reports were confirmed by me from specimens or images.

Habitat and distribution

Typical habitat is forest edge and clearings, including forest tracks. It is usually seen basking on tree-trunks, rocks, fence posts or sunlit vegetation, though it has turned up a short distance from trees and even indoors.

   All current records are in Highland Region (the dotted boundary in Fig. 1) in V.Cs 96, 97, 104 and 106, from Raasay east to Strathspey, and from Lochaber north to the Cromarty Firth (Fig. 1). It is likely that the lack of resident dipterists in other areas of Scotland accounts for the lack

of records elsewhere. It seems very likely to be present in other areas – E Sutherland (V.C. 107), NE Scotland (V.Cs 91 - 95), Perthshire and Angus (V.Cs 88 – 90), and Argyll (V.C. 98), and maybe more widely.

Phenology

Our extreme dates are 21 March to 2 June, with 10 of the 20 records falling in April. This is distinctly earlier than in Scandinavia and Austria (Fig. 2). The Scottish dates closely resemble those of *Tachina ursina*, another early flier which has been largely overlooked in the north until recently (17 March to 8 June, 17 of 30 records in April; data from the Highland Biological Recording Group).
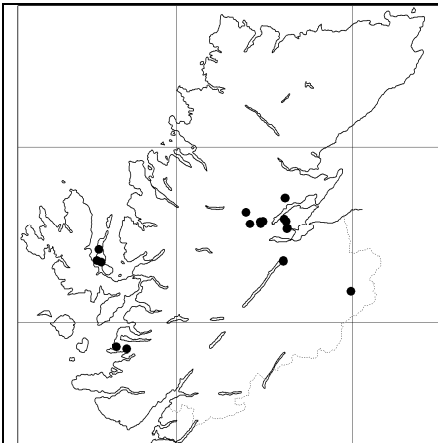
| **Fig. 1. Current known British distribution of *Botria subalpina*.** | **Fig. 2. Phenology of *Botria subalpina* in N Scotland (from the Highland Biological Recording Group) and Europe (from GBIF)[1].** |
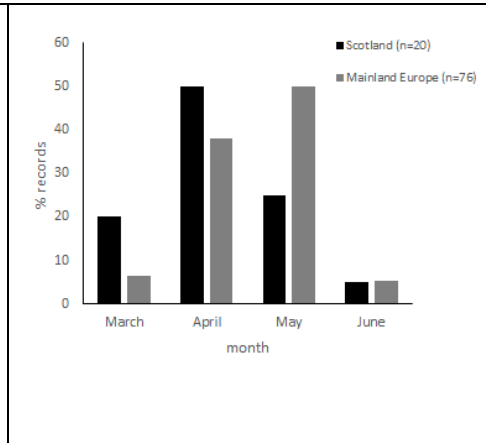
Discussion

Since it was first recognised as a British species, it has become obvious that *Botria subalpina* is widespread and frequent in the north of Scotland. While we have established its basic ecology and phenology, much remains unknown. Although Tschorsnig and Herting (1994) stated that it is 'rare' in mainland Europe, the data from GBIF suggest that it is not too rare in parts of Scandinavia at least. Scotland must be considered an important region for the species within the British Isles if not in Europe more widely.

The earlier flight period in Scotland might be explained by our milder more oceanic climate. There is little information on its host and that is based on observations in Europe. Lutovinovas *et al.* (2014) list only dun-bar *Cosmia trapezina* (Linnaeus, 1758) (Noctuidae, Lepidoptera). This moth is widespread in Scotland[2,3], so potentially is a host here also.

It is likely that increased spring effort by dipterists would extend the known range considerably. There are no reasons to be concerned about its conservation status here as its woodland habitats are commonplace over much of the area.

[1] GBIF.org (19 May 2019) GBIF Occurrence Download https://doi.org/10.15468/dl.hd3crc.

[2] https://easymap.nbnatlas.org/Image?tvk=NBNSYS0000006414&w=400 accessed 19 May 2019.

[3] https://ukmoths.org.uk/species/cosmia-trapezina/ accessed 19 May 2019.

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A second English record of *Sciophila rufa* Meigen (Diptera, Mycetophilidae) – Whilst walking along a wooded track between Stow Bedon and Thompson Common, West Norfolk (V.C. 28) on 19 May 2019, I came across a pile of rotting birch logs with numerous brackets of the hoof fungus *Fomes fomentarius* at TL938960. Several of the brackets were covered with webbing on the underside (Fig. 1). Examining them more closely, I could see active pale white/grey larvae moving in the webbing and some obvious pupae in cylindrical cocoon webbing cases on the edge of the webbing. Recognising these as probable larvae and pupae of a fungus gnat of the genus *Sciophila*, I removed a few larvae (Fig. 2) and cases and kept them in damp moss.

A few days later mature gnats started to emerge, two males and two females, from 21-23 May 2019, and further adults have since continued to emerge. A photograph of a mating pair (Fig. 3) was sent to Peter Chandler, who kindly confirmed them as *Sciophila rufa* Meigen, 1830. This fungus gnat has been recorded over a wide area of the Scottish Highlands and has the conservation status of Lower Risk (Nationally Scarce) according to S.J. Falk and P.J. Chandler (2005. Species Status No. 2. A review of the scarce and threatened flies of Great Britain. Part 2 Nematocera and Aschiza not dealt with by Falk (1991). *Species Status* 2. 189 pp. Joint Nature Conservation Committee, Peterborough).

Figs 1-3. *Sciophila rufa* Meigen: **1**, *Fomes fomentarius* **bracket with larval webs beneath; 2, larva of** *S. rufa***; 3, mating pair of** *S. rufa***.**

This is a second very southerly record for *Sciophila rufa*. The first southern record was on 23 September 2017 by Ivan Perry from Flitwick Moor Bedfordshire, reported in the latest Fungus Gnat newsletter (Chandler, P.J. 2018. Fungus Gnats Recording Scheme Newsletter **10** Spring 2018. 10 pp. *Bulletin of the Dipterists Forum* No. **85**). These may represent either spreading from northerly sites or result from a recent invasion from the continent; the species is widespread in Europe and may be found on the same host fungus where it grows on beech in northern France ─ **JUDY WEBB,** 2 Dorchester Court, Blenheim Road, Kidlington, Oxon OX5 2JT; judy.webb@virgin.net

Agromyza macedonica **Černý (Diptera, Agromyzidae) new to Britain**

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Summary
The discovery of the agromyzid fly *Agromyza macedonica* Černý, 2011 from Staffordshire, Great Britain is reported and its identification is discussed. First records from Croatia, Germany, and Spain are added. *Vicia* seems to be the host plant genus.

Introduction
In 2004, samples were sent for identification to DG, collected by Andy Godfrey while he was surveying an industrial area of north Stafford, Staffordshire. Amongst them was a small, largely black *Agromyza* immediately distinct from most members of the genus in lacking the posterior cross-vein dm-Cu (Fig. 1). On dissection, DG was unable to identify it from the literature at his disposal so the specimen was sent to MvT, who confirmed that it was an undescribed species, so it was put aside until time was available to describe it. In 2017, DG included the specimen in a small batch sent to Miloš Černý who identified it as *Agromyza macedonica*, a species he had described from Greece in 2011.
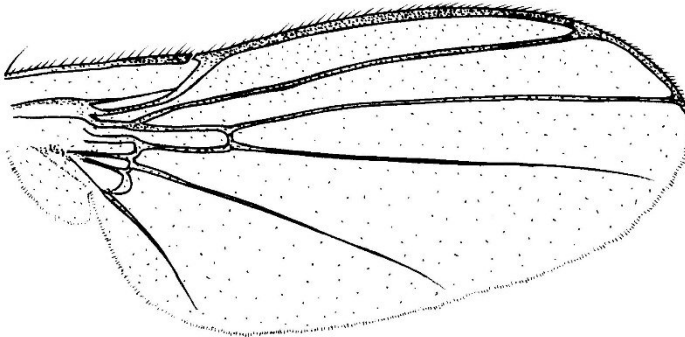
Fig. 1. *Agromyza macedonica* **Černý, wing.**

Identification
Amongst British *Agromyza* only one other species normally lacks cross-vein dm-Cu, *Agromyza intermittens* (Becker, 1907), but this species has a very different aedeagus. Occasionally many *Agromyza* species can lack cross-vein dm-Cu, often just on one wing or partially, repeatedly observed in Europe by MvT in *A. intermittens*, *A. megalopsis* Hering, 1933, *A. nigripes* Meigen, 1830, *A. rondensis* Strobl, 1900, and *A. vicifoliae* Hering, 1932. But in Britain this variation is

infrequent enough that the absence of dm-Cu on both wings is indicative of *A. macedonica* or *A. intermittens* (Nowakowski 1962) (Barry Warrington *pers. comm.*).

Zlobin (2000) published an overview on world species belonging in the genus *Agromyza* with hostplant genera in Fabaceae (as "Leguminosae"), placing 16 species in the *A. orobi* Hendel-group, a group name introduced by Hendel (1931-1936: 96) and subsequently also named *nana* Meigen-, *frontella* Rondani- or *johannae* de Meijere-group. One year later, Zlobin (2001) added two further new species from Mongolia to this monophylum, *A. latifrons* and *A. paucineura.* The latter one is most similar to *A. macedonica* concerning the missing cross-vein dm-Cu, the shape of head and male genitalia. A further similar sibling species is *A. vicifoliae* which sometimes also lacks cross-vein dm-Cu. After the shape of the aedeagus we also include the Nearctic species *A. leechi* Spencer, 1969 in the *A. orobi*-group. Spencer (1969) described it in the *spiraeae* Kaltenbach, 1867-group (which is here renamed as the *idaeiana* Hardy, 1853-group, based on the senior synonym of *spiraeae*).

Relative to many *Agromyza* species, *A. macedonica* has the gena deep and triangular, giving the head a wedge-shaped appearance (Fig. 2). The latter three small species easily could be misidentified as dark *Aulagromyza* Enderlein species if the male and female stridulation file at the lateral edge of syntergite 1+2, which is characteristic for the genus *Agromyza* (von Tschirnhaus 1972), is overlooked. In Spencer (1976) the British specimen will run to couplet 6, but the colour of the squamal fringe and that of the frons are ambiguous so cannot be taken further. In Papp and Černý (2015) it runs to couplet 9, where again the condition of the British specimen makes further progress impossible just on external characters. The same applies for couplet 25b in Hendel (1931-1936), amended by Hering (1932) for *A. vicifoliae* Hering, 1932 and by Hering (1933) for *Agromyza phytomyzina* Hering, 1933, a junior synonym of *Phytomyza gymnostoma* Loew, 1852. Reference to the male genitalia (Figs 3-5) should readily eliminate all species falling within these parts of the above keys.

Typical features of this small fly (wing shorter than 2mm): long male cerci; distinct epistome present, its depth equal to the depth of the third antennal segment; 3rd antennal segment small and often slightly axe-shaped; distal end of subcostal and first radius mostly less typically fused than normally in *Agromyza* species; mid tibia without one or two posterolateral setae; wing tip closer to vein R_{4+5} than to M_{1+2}, the costal vein fading away between those two vein tips; squamal edge and fringe brownish; presutural dorsocentral seta only slightly shorter than the three postsutural ones; the pair of prescutellar acrostichals well developed; all knees dark.

Distribution and status in Britain
Agromyza macedonica was described from Lake Kerkini in the northern Greek province of Central Macedonia and at the time only known from the type locality (Černý 2011). Subsequently, specimens have been identified from Bohemia, Czech Republic (Černý and Heřman 2015). Below we add identifications from three further countries. This scatter of records across Europe from Britain, Germany, Czech Republic, Croatia, Greece and Spain strongly suggests that it has been overlooked and it likely to occur between these locations.

The British specimen was swept from an area of rank grassland, surrounded by industrial land-uses. Most of the site comprised semi-improved grassland (about 80-85%) with some minor patches of improved grassland (1-2%). Tall ruderals, scattered broadleaved trees and a scrub mosaic form the remainder (A. Godfrey *pers. comm.*). MvT, in one case on 11.vi.1967, swept 14 specimens on *Vicia cracca* intermixed with *Tanacetum vulgare* on a ruderal area. Hitherto, *Vicia* spp. are known as the hostplant genus for eight species of the *A. orobi*-group (Zlobin 2000). The species was already mentioned in three publications: Hering (1956: 112) mentioned it as an abnormal *A. vicifoliae*; von Tschirnhaus (1992: 471, 475) treated it as no. 75, *Agromyza* sp.n. 2

and later (1994: 490, 493, 496, 502, 513) as no. 54, *Agromyza* sp.n. 1, in both cases already presuming *Vicia* as being the host plant genus.
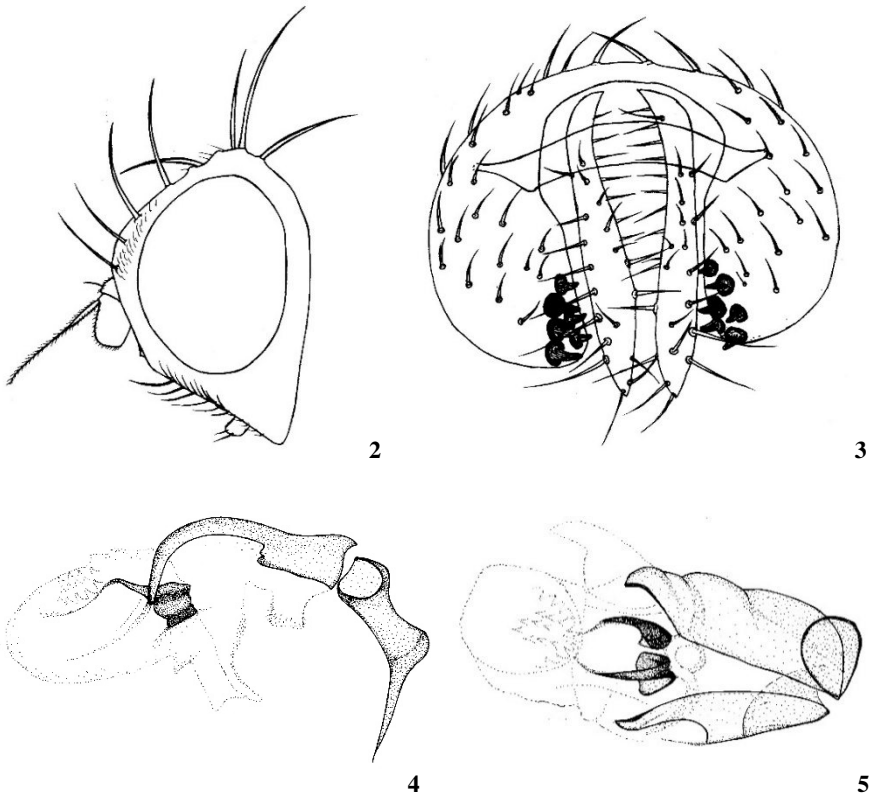
Figs 2-5. *Agromyza macedonica*: 2, head, lateral view; 3, epandrium; 4 and 5, phallus.

Material examined
BRITAIN: Staffordshire, V.C. 39, St Albans Road, SJ9225, 1♂ swept 16 June 2004 (leg. A. Godfrey, det. M. Černý 2011) in coll. DJG. (Wing 1.74mm, costal sections 2:3:4 as 67:20:15, depth of eye : depth of jowl as 30 : 11, measurements by MvT 14.v.2005).
CROATIA: Istria, valley of river Čipri W of Vidulini, 17km ENE of Rovinj, 45°08'37"N 13°50'26"E, 1♂1♀ swept 18.iv.1981 (leg. et det. MvT).
GERMANY: Land Schleswig-Holstein: Ihlkate W of Kiel, 54°17'31"N 10°02'40"E, 9♂5♀ swept on *Vicia cracca* and *Tanacetum vulgare*, 11.vi.1967 (leg. et det. MvT); ditto, 1♂2♀, 22-23.vi.1969; ditto, 1♂ swept 30.v.1971; ditto, 1♂1♀ swept 5.vi.1971; ditto, Dosenbek, 13 km S of Kiel, 54°10'22"N 10°08'33"E, 1♂ swept 17.vi.1968; ditto, E of Wankendorf, 54°06'43"N 10°13'22"E, 1♂ swept 10.vii.1982; ditto, inland dune Rimmelsberg, 22km SW of Flensburg, 54°37'09"N 9°16'09"E, 1♂ swept 10.vi.1970; Land Brandenburg: Western bank of river Oder,

4km S of Lebus, 52°23'28"N 14°31'55"E, 1♂ swept 30.v.1992; Land Nordrhein-Westfalen: Köln(Cologne)-Dünnwald, gravel pit, 51°00'56"N 7°02'29"E, 1♀ Malaise trap 20-27.vi.1989 (leg. Jutta Wehlitz, det. MvT); Land Rheinland-Pfalz: "Alte Ahrschleife" near Altenahr (Eifel), 50°30'43"N 6°59'23"E, 6♂8♀, Malaise trap 23.v.-4.vii.1987 with 11 specimens between 20.vi. and 4.vii. (leg. K. Cölln, N. Mohr, S. Risch and M. Sorg, det. MvT).

SPAIN: Province Huesca, western Pyrenees, Val de Bozo, close to Aísa (42°40'44"N 0°37'16"W), between 1500m and 2500m, 1♀ in pitfall or eclector traps in herbaceous flora containing four species of Fabaceae: *Lotus alpinus*, *Trifolium alpinum*, *T. repens*, and *T. thalii*, year 1986 (leg. Josefina Isern-Vallverdú and C. Pedrocchi, det. MvT).

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The family Cryptochetidae (Diptera) new to Britain, with the first European record of *Cryptochetum iceryae* (Williston) –

On 15 May 2018, one of us (DN) collected two small dipterans as part of routine sampling of the Natural History Museum's Wildlife Garden (London, South Kensington). The specimens were swept from the meadow habitat of the garden, in an area rich in flowering herbs. They were immediately identified as belonging to the family Cryptochetidae and the finding was briefly mentioned by C. Ware *et al.* (2018. The Wildlife Garden at the Natural History Museum: developments of the flora and fauna update 2017-2018 – twenty three years of species recording. *London Naturalist* **97,** 135-152). This was later confirmed when these specimens were identified as males of *Cryptochetum iceryae* (Williston, 1888), after comparison with specimens in the Natural History Museum collection (NHMUK) and California State Collection of Arthropods (CDFA, Sacramento). Both specimens have body and wing lengths of *ca* 2 mm, metallic bluish-purple reflections on the head and thorax, a metallic green abdomen, a broad ocellar triangle occupying most of the frons width at vertex and about 0.25 of the frons width anteriorly, and modified setation on the fore tarsus (Figs 1-2).

Cryptochetidae is a small family of acalyptrate flies in the superfamily Ephydroidea, possibly closely related to Braulidae ("bee lice") (Wiegmann, B.M. *et al.* 2011. Episodic radiations in the fly tree of life. *PNAS* **108**(14)**,** 5690-5695). The larvae are parasitoids of scale insects and the adults are easily recognised by their small but stout appearance and large antennae, which lack an arista in species of *Cryptochetum* Rondani, the largest and most widespread genus (Marshall, S.A. 2012. Flies: the natural history and diversity of Diptera. Firefly Books, Buffalo/Richmond Hill). The family is native to the Old World, with about 30 species in two genera in the Afrotropical, Palaearctic, Oriental and Australasian Regions (McAlpine, J.F. and Thompson, F.C. 2010. Cryptochetidae (cryptochetid flies), pp. 1121-1123. **In** Brown, B.V. *et al.* Manual of Central American Diptera. Vol. 2. NRC Research Press, Ottawa). Three species, all in the genus *Cryptochetum*, were so far known to occur in Europe (Nartshuk, E. 2013. Cryptochetidae. **In** Beuk, P. and Pape, T. (Eds) Diptera: Brachycera. Fauna Europaea, www.faunaeur.org).

Figs 1-2. Male _Cryptochetum iceryae_ (Williston) from the NHM's Wildlife Garden; 1, NHMUK012809016, arrow showing modified setae on fore tarsus; 2, NHMUK012809017. © Trustees of the Natural History Museum.

Cryptochetum iceryae, originally described from Australia, has been introduced to North and South America and Israel for biocontrol of the widespread pest _Icerya purchasi_ Maskell, 1878 (Homoptera: Monophlebidae) or cottony cushion scale (Mendel, Z. and Blumberg, D. 1991. Colonization trials with _Cryptochetum iceryae_ and _Rodolia iceryae_ for improved biological control of _Icerya purchasi_ in Israel. _Biological Control_ **1**(1)**,** 68-74; McAlpine and Thompson, _op. cit._). The current records of _C. iceryae_ are the first in Europe and the first for the family Cryptochetidae in Britain. It is likely that these specimens arrived in Central London with imported plants infested with their host. _Icerya purchasi_ has been intercepted numerous times on imported ornamental plants in Britain and has been recorded as breeding outdoors at several sites in South East England, particularly in Greater London (Watson, G.W. and Malumphy, C.P. 2004. _Icerya purchasi_ Maskell, cottony cushion scale (Hemiptera: Margarodidae), causing damage to ornamental plants growing outdoors in London. _British Journal of Entomology & Natural History_ **17,** 105-109). Cottony cushion scale has also been recorded on gorse (_Ulex europaeus_) in the NHM's Wildlife Garden by C. Ware _et al._ (2016. Further developments of the flora and fauna of the Wildlife Garden at the Natural History Museum, London: twenty years of species recording. _London Naturalist_ **95,** 45-159), but was not observed at the time of collection of _C. iceryae_ in 2018. _Cryptochetum iceryae_ was not collected again despite several searches of the same habitat during the weeks following its discovery. It is difficult to assess, with the limited available data, whether or not a population has become locally established.

Records: _Cryptochetum iceryae_: 2 males, UK, London, Natural History Museum Wildlife Garden, TQ26557903, 15.V.2018, D. Notton. Both specimens are deposited at NHMUK (specimen numbers 012809016 and 012809217).

We thank Steve Gaimari and Martin Hauser (CDFA, Sacramento) for the donation of _C. iceryae_ specimens from California **– DANIEL WHITMORE,** Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, 70191 Stuttgart, Germany; daniel.whitmore@smns-bw.de, **DAVID G. NOTTON,** Department of Life Sciences, Natural History Museum, Cromwell Road, London SW7 5BD, United Kingdom, and **BARBARA ISMAY,** 67 Giffard Way, Long Crendon, Aylesbury, Buckinghamshire HP18 9DN, United Kingdom

Diptera at two inland saltmarshes in Cheshire and Staffordshire

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Summary
Rapid surveys of Diptera from two inland saltmarshes in Cheshire and Staffordshire show that the sites support a coastal assemblage, comprising 3-16% of all species recorded. Unexpected finds of uncommon species included a rare western record of the dolichopodid *Campsicnemus magius* (Loew) and a far-inland record of *Platypalpus albocapillatus* (Fallén). The paucity of knowledge of Diptera of these unusual sites is highlighted in the context of better site protection and management.

Introduction
Saltmarshes support a fascinating suite of specialist Diptera. Flies represent a high proportion of saltmarsh biodiversity, including perhaps several hundred breeding species (Stubbs 2010). While dipterists know much about the fauna of coastal saltmarshes, almost nothing is recorded about the bizarre inland saltmarshes. Chatters (2017) raised the profile of these sites by using them as the starting point in his book on saltmarshes, rather than relegating them to the end as may have been expected, and he also provided an inventory of sites where at least two saltmarsh plants have been recorded. Several of these sites were within striking distance of the Dipterists Forum's summer field meeting in 2018 based at Stoke, Staffordshire, providing an opportunity to discover whether the flies matched the botanical interest.

Most English inland saltmarshes are linked to rocks of the Mercia Mudstone Group, in which salt was deposited during the desert climate of the Triassic, and through which percolating water arises as brackish springs. Many deposits have been exploited industrially, particularly those around Northwich, Winsford and Middlewich in Cheshire where the rock-salt deposits are very thick (Cooper 2002, Wilson 1993). Here over-zealous mining and brine pumping resulted in severe subsidence in the 19th and 20th centuries, leading to ponds and lakes, called flashes, sometimes named after the owner of the mine that collapsed. The largest of these just north of the town of Northwich were formed in 1873 – Neumann's Flash – and in the Great Subsidence of 1880, in which Aston's Flash developed within a few days, and both continued to expand over the following decades to form the huge expanse still present (Wallwork 1956). Most of these flashes north of Northwich have been in-filled but Neumann's Flash and Aston's Flash remain, although also partly in-filled with lime waste from the thriving soda-ash (sodium carbonate) works that used the rock-salt as a raw material. A much smaller saline seepage occurs at Pasturefields Saltmarsh, one of a cluster in this part of Staffordshire from Stafford eastward about 15km, and also fed by salt from the Mercia Mudstone Group. Unlike the Cheshire flashes, this seepage is a natural feature.

Inland saltmarshes also occur in continental Europe, derived from salt deposits in several rock types including late Permian or more recent Miocene rocks. In central and western Europe they have been recently classified as Endangered in the European Red List of Habitats (Janssen *et al.* 2017). Their extent in Europe, with the exception of Hungary, which has a large area of

inland saltmarsh, is just a few square kilometres, and for the UK (which is just England – there are no inland saltmarshes in the rest of the UK) is given as $0.005km^2$ (0.5ha) (Janssen and Piernik 2016). It is estimated that 60% of the area of European sites has been degraded due to several mainly man-induced causes. There would seem to be a good case for documenting the fauna of such sites in England.

Sites

Northwich Flashes, Cheshire. Three areas were visited within Marbury Country Park and another just outside the park boundary. These areas were within about 800m of each other and may be considered a single site. They are about 15km from the nearest coast.

- Neumann's Flash SJ667750. This slightly brackish and alkaline lake is fringed with reedbed (*Phragmites australis*) over a white substratum of lime waste which was exposed in the dry summer of 2018. Much of it was inaccessible. The shoreline appeared to be fly-ash and had been recently planted with trees, mainly birch *Betula* sp., growing over a diverse ground flora.
- Neumann's Flash SJ669750. A small freshwater pond dominated by fool's watercress *Helosciadium* [formerly *Apium*] *nodiflorum* and reedmace *Typha latifolia* and partly shaded by grey willow *Salix cinerea*. Surrounding vegetation was dry rank grassland and scrub.
- Witton Bridge SJ662747. Here the Wade Brook at Worthington Flash becomes the Witton Brook, passing through braided small islands a few metres across dominated by coarse grass. As at Neumann's Flash, the substratum and margins around the islets were white with lime deposits.
- Worthington's Flash SJ669743, adjacent to the country park. This is rough horse-grazed grassland adjacent to Wade Brook, a small river, and a large unnamed stream. The main feature of interest was a shallow pond which, in the drought of summer 2018, was considerably reduced, leaving a broad muddy drawdown zone. A weak seepage fed the pond where a small area was dominated by *Helosciadium nodiflorum* and celery-leaved crowfoot *Ranunculus sceleratus*.

Pasturefields Saltmarsh SSSI, Staffordshire, SJ991248. This site is the only UK Special Area of Conservation for 'Inland salt meadows' as it is the country's only surviving natural saline spring unmodified by industrial extraction of brine. It comprises cattle-grazed pasture divided by a central freshwater drain dominated by watercress *Nasturtium officinale*. Owing to the drought, the pasture was completely dry, although under normal conditions areas of saltpan would be at least damp or probably flooded in winter. Among the more obvious saltmarsh plants was abundant sea arrowgrass *Triglochin maritima*, but other saltmarsh plants listed in the SSSI citation include sea plantain *Plantago maritima*, common saltmarsh-grass *Puccinellia maritima*, lesser sea spurrey *Spergularia marina* and saltmarsh rush *Juncus gerardii*. The site lies in the Trent valley, about 75km from the nearest coast.

Pasturefields was visited on 24 June 2018 by CMD, SMC, CRS and RJW and the Northwich sites on 27 June 2018 by CMD and NPJ, as well as other Dipterists Forum members who did not contribute records to this note. All the records have been submitted to the Dipterists Forum and will be forwarded to the NBN Atlas and local records centres.

Results

At the five sites 250 species were recorded, most of which were common and of relatively low conservation interest. Twelve species were categorised as coastal, based on information from Diptera recording schemes, personal knowledge, NBN Atlas and the analytical tool *Pantheon* (Webb *et al*. 2018) (Table 1). Some of these are not confined to brackish habitats but are most

abundant and most predictably recorded here, and include the widespread species *Argyra vestita* (Wiedemann)*, Dolichopus nubilus* Meigen*, Paracoenia fumosa* (Stenhammar) and *Symplecta stictica* (Meigen). Some common saltmarsh or brackish-marsh species are occasionally recorded inland, not necessarily at obviously brackish sites, and both *Nemotelus notatus* Zetterstedt and *N. uliginosus* (Linnaeus) fall into this category (Harvey 2018). The remaining six species are almost entirely coastal and may depend on saline conditions for their larval development. A few further species show strong coastal tendencies in their distribution but cannot be regarded as obligatorily coastal; these include the dolichopodids *Hercostomus plagiatus* (Loew) at Pasturefields and *Hydrophorus praecox* (Lehmann) at Witton Brook, and the empid *Hilara pseudocornicula* Strobl. The last of these is most frequently found on grazing marshes, particularly coastal marshes, but is hardly confined to this habitat and Plant (2004) did not suggest that it belongs to the coastal assemblage. However, its occurrence at both Pasturefields and Worthington's Flash may be related to slightly brackish grassland.

The largest assemblage of coastal species was found at Witton Brook, which is also where fewest species were recorded altogether, making the coastal element particularly prominent. Low numbers at the lake margin of Neumann's Flash were almost certainly due to the site's near inaccessibility, being fenced-off and with dangerously soft sediment, although the small freshwater pool was easily sampled. The higher number of species at Worthington's Flash may have reflected the ease of sampling here, shown by the count of all species being about double that at the other Northwich sites.

Among the coastal species, the dolichopodid *Campsicnemus magius* (Loew) was the only species with a conservation status. The hybotid *Platypalpus albocapillatus* (Fallén) is probably the next least common species among this group but lacks a rarity status. Records of all species with a conservation status, although not necessarily coastal in nature, are:

Campsicnemus magius (Dolichopodidae)
  Vulnerable, 1♂, Witton Brook, SJ662747, leg. C.M. Drake.

Campiglossa malaris (Séguy) (Tephritidae)
  Neumann's flash, SJ6576; Worthington's Flash, SJ670742, both leg. N.P. Jones. This species was once apparently confined to Kent but has been recorded far more widely recently, westward to Devon and northwards to Cheshire and Southwest Yorkshire (Clemons 2018). Its RDB1 status is now far too extreme, and provisionally Nationally Scarce may be more realistic.

Themira gracilis (Zetterstedt) (Sepsidae)
  Provisionally Nationally Scarce, ♂ and ♀, Pasturefields Saltmarsh, SJ992248, cattle-grazed pasture, leg. S.M. Crellin.

Typhamyza bifasciata (Wood) (Anthomyzidae)
  Provisionally Nationally Scarce, 1♀, Neumann's Flash, SJ669750, at the small freshwater pond with dense *Typha latifolia*, leg. C.M. Drake. The larvae develop within decaying stems of both British species of *Typha* (Roháček 2006).

Phytomyptera nigrina (Meigen) (Tachinidae)
  Nationally Scarce, Worthington's Flash, SJ670742, leg. N.P. Jones.

Table 1. Coastal species recorded at each of the inland saltmarsh sites in 2018.

Family	Species	Status	Neumann's Flash	Witton Bridge	Worthington's Flash	Pasturefields Saltmarsh
Chloropidae	*Aphanotrigonum inerme* Collin	Unknown		+		
Dolichopodidae	*Argyra vestita* (Wiedemann)	Local		+		
	Campsicnemus magius (Loew)	Vulnerable		+		
	Dolichopus nubilus Meigen	Common				+
	Dolichopus sabinus Haliday	Local		+		
Ephydridae	*Ephydra macellaria* Egger	Local		+	+	
	Paracoenia fumosa (Stenhammar)	Local	+	+		
	Psilopa nana Loew	Local	+	+	+	
Hybotidae	*Platypalpus albocapillatus* (Fallén)	Local				+
Limoniidae	*Symplecta stictica* (Meigen)	Common	+	+	+	+
Stratiomyidae	*Nemotelus notatus* Zetterstedt	Local		+	+	+
	Nemotelus uliginosus (Linnaeus)	Local		+	+	+
Total coastal species (and percentage of all species)			3 (4)	10 (16)	5 (3)	5 (5)
Total of all species recorded			76	64	153	101

Discussion

Our records almost certainly represent a small fraction of the coastal Diptera at inland saltmarsh sites but it is difficult to substantiate this statement as there appears to be very little published about this fauna. No exhaustive literature search was made but the following few references reflect the meagre knowledge. Chatters (2017) listed flies from only Upton Warren Flashes in Worcestershire: *Melanum laterale* (Haliday) (Chloropidae), *Molophilus pleuralis* de Meijere (Limoniidae), *Stratiomys singularior* (Harris) (Stratiomyidae), and from Mickletown Ings in West Yorkshire: *Rhaphium antennatum* (Carlier) (Dolichopodidae) (as *Porphyrops antennae*). The dolichopodid *Campsicnemus magius* made an uncommon inland appearance for a few years at a saline outflow of a colliery on Thorne Moors, in South-west Yorkshire (Chandler 2009) and was found by Peter Kirby at a disused claypit on Peterborough's eastern edge in Cambridgeshire (Drake 2015). At another nearby disused Peterborough claypit about 40km from the nearest sea coast, high salinity levels had been recorded, originating most probably from the Jurassic Oxford Clay. Here, along with coastal water-beetles, there was a small assemblage of coastal Diptera, represented by the dixid *Dixella attica* (Pandazis), the dolichopodids *Dolichopus nubilus*, *D. signifer* Haliday and *Schoenophilus versutus* (Haliday), the ephydrids *Ephydra riparia* Fallén, *Notiphila nubila* Dahl, *Paracoenia fumosa*, *Scatella lutosa* (Haliday) and *S. silacea* Loew, and the stratiomyid *Stratiomys singularior*; almost all of these occur inland at apparently freshwater sites too, but the assemblage represents a substantial coastal element (Drake 2002).

A bald inventory of the Northwich Woodlands, which covers the flashes, includes eight Diptera with affinities with brackish water; in addition to species found in the present survey it includes *Molophilus pleuralis*, *Stratiomys singularior*, *Ephydra riparia* and *Platycheirus immarginatus* (Zetterstedt) (Syrphidae) (Hill 2010).

A more concerted effort to study the fauna of inland saline sites was made by Frederick Burke whose interest within Diptera lay mainly with mosquitoes. He made repeated excursions to a small brine pit south of Malpas, on the Shropshire / Clwyd border, where he reared *Ephydra riparia*, whose larvae were present in very large numbers, *Nemotelus notatus* whose larvae were also abundant and a single *Atissa pygmaea* (Haliday) (Ephydridae), a species which was present as adults in small numbers (Burke 1942). Burke may have correctly identified his *Ephydra riparia* but, as this was the only name used at that time for the two species we now know (Collin 1963), it may have been *E. macellaria* which was recorded at Neumann's Flash in the present survey. Burke later visited several more saline sites in Cheshire to collect mosquito larvae, which he reared. Of most interest was *Ochlerotatus dorsalis* (Meigen), which is an uncommon coastal species, and to a lesser extent *O. detritus* (Haliday) which is common but also mainly coastal (Burke 1946, 1950; Snow *et al*. 1998). Two of his sites, which he called Anderton and Marston, are close to or even the same as the Northwich sites of the present survey.

An unpublished survey of Worthington's Flash undertaken in mid May 2002 recorded a very different suite of uncommon species, including the micropezid *Neria femoralis* (Meigen) which remains unrecorded elsewhere in Britain, and the saltmarsh dolichopodid *Syntormon filiger* Verrall as well as abundant *Symplecta stictica* (Drake 2003 and unpublished).

Janssen and Piernik (2016) quoted a few flies as examples of the invertebrates recorded at European inland saltmarshes in their assessment of the status of this habitat for the recent European Red List of Habitats, but do not say from which country the records were obtained. The list has 14 species of dolichopodids that include three of those recorded at the Northwich flashes: *Campsicnemus magius*, *Dolichopus sabinus* and *Syntormon filiger*.

Of the species we found in the present survey, the most unexpected was *Campsicnemus magius*. This species has Vulnerable status and in Britain is usually confined to brackish marshes above the upper saltmarsh zone, such as can be found in coastal grazing marsh ditch systems (Drake 2015, 2018). Almost all the records are from marshes between Kent and Suffolk, with rare records elsewhere. The two inland records mentioned above are now joined by that from Witton Brook, and all serve to show that tiny flies do manage to find geographically miniscule resources over wide distances from their presumed source on the coast. The other interesting aspect of the Witton Brook record is its proximity to Weston Lagoons, Runcorn, on the Mersey estuary, where a single female had been recorded by Richard Underwood, and which appears to be correctly identified; this marsh happens to be the section of sea coast nearest to Witton Brook, 15km away. The male from Witton Brook confirms that a population of *C. magius* is present on the west coast of Britain.

Perhaps almost any of these species recorded as a singleton would have been dismissed as a stray but the assemblage is very clearly well-established both at Northwich, which is relatively close (about 15km) to the Mersey estuary, and at Pasturefields some 75km from the sea. Colonisation of the Northwich flashes was probably preceded by pre-industrial occupation of natural saline seepages now subsumed by subsidence flashes but colonisation of the apparently isolated Staffordshire sites would seem to suggest that insects will fly or get wind-blown large distances from their preferred habitat. If the chances of colonisation occurring are good within decades, rather than centuries, this gives some hope that good management of sites may conserve the uncommon assemblage in the long term, even if site quality is currently strongly compromised by intensive land use. Support for the suggestion of moderately rapid colonisation comes from the inland occurrence of *Campsicnemus magius* at the recently formed saline South-west Yorkshire site resulting from industrial activity. However, the SSSI citation for Pasturefields saltmarsh suggests that the periglacial Midlands landscape some 10,000 years ago may have been the source of some of the original saltmarsh plant colonists, leaving open the possibility that the fauna is similarly ancient.

Apart from *C. magius*, three other species from these inland saltmarshes were previously thought to be confined to the coast: the records represent the first authenticated inland ones. These are *Platypalpus albocapillatus*, *Dolichopus sabinus* and *Syntormon filiger* (recorded at Worthington's Flash in 2002). The occurrence of *Platypalpus albocapillatus* at Pasturefields is interesting as it was thought to be a strictly coastal species (Plant 2015), although the habitats where it has been recorded include a large proportion of dune systems as well as a few saltmarsh or brackish marsh habitats (Empidid and Dolichopodid Recording Scheme database). Pasturefields has no structural resemblance in common with dunes and this suggests that its national distribution is controlled by salinity, and not by dry sandy conditions.

The threat status given to inland saltmarshes in the European Red List of Habitats (Janssen *et al.* 2017) is reflected in four English SSSIs being notified in part because of the saltmarsh flora: Pasturefields Salt Marsh and Sandbach Flashes in Staffordshire, Upton Warren Pools in Worcestershire, Mickletown Ings in North Yorkshire, and Orton Pit in Cambridgeshire. Several others are Local Nature Reserves. The post-industrial origin of most of these sites is recognised, Pasturefields being the exception as it is a natural and industrially unexploited saline seepage. The question of whether good examples of a brackish-water fauna deserve more protection, for example by SSSI designation, cannot be answered on the basis of the sparse results presented here, although our rapid and unstructured survey of just two areas has highlighted an assemblage that deserves better description. This may help provide reasons for sympathetic management of sites, particularly for continuity of hydrological conditions, if not for site designation.

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Some Recent Records of *Sepsis luteipes* Melander & Spuler (Diptera, Sepsidae)

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Summary

The British distribution of *Sepsis luteipes* Melander & Spuler, 1917 is updated with the addition of several new records.

Sepsis luteipes Melander & Spuler, 1917 belongs to a group of species including *S. punctum* (Fabricius, 1794) and *S. violacea* Meigen, 1826. They are all characterised by the basal medial cell being mainly or wholly devoid of microtrichia and the male fore femur having a spinose tubercle at about the apical quarter (Pont and Meier 2002). These species can be separated using the identification keys of Pont and Meier (2002), where characteristics of the male fore femora, configuration of the dorsocentral bristles of the thoracic dorsum, male genitalia and dusting of the anepimeron are used to separate *S. luteipes* from *S. punctum* and *S. violacea*. I have found that the presence of two pairs of dorsocentral bristles with the anterior pair being much shorter than the posterior pair to be a useful initial pointer to *S. luteipes* (*S. punctum* usually only has one pair while *S. violacea* has two pairs of roughly equal length), but is still important to confirm the identification using the other characters, particularly the male genitalia.

Sepsis luteipes was added to the British checklist by Ozerov (1999) but according to Chandler (2002, p.151) no information was given other than "GB" being listed against this species. In fact, the addition was on the basis of five specimens in the collection of the Oxford University Museum that were identified by Ozerov. Details of these specimens can be found in Table 1. The most recent of these records was collected in 1967 and not until 2015 were any more records reported to the Sepsidae Recording Scheme for which I am the national Recorder.

Table 1. Specimens of *Sepsis luteipes* in the Oxford University Museum.

Location	Grid Ref.	V.C.	Date	Details	Collector
River Spey, Grantown, Inverness-shire	NJ0326	96	1933	1 male	Hobby, B.M.
Bagley Woods, Berkshire	SP5102	22	30/04/1966	1 male	Ackland, D.M.
Craigellachie N.R., Inverness-shire	NH8812	96	03/09/1966	1 female	Ackland, D.M.
Loch an Eilein, Inverness-shire	NH8908	96	14/06/1967	1 male	Ackland, D.M.
Aviemore, Inverness-shire	NH8912	96	15/06/1967	1 male	Ackland, D.M.

I attended the Dipterists Forum field week between 11 and 18 July 2015 based at the University of Nottingham and, in my capacity as the national Recorder for the Sepsidae Recording Scheme, volunteered to look at any specimens of Sepsidae that were collected during the field trips. Amongst a small sample of specimens collected by Chris Spilling at the Spa Ponds nature reserve (SK570634, V.C. 56) on 15 July 2015 was a small male *Sepsis* which I was able to tentatively determine as *S. luteipes*. A subsequent examination of the genitalia confirmed my view that it was *S. luteipes*. The fly has since been checked by Adrian Pont who confirmed it as *S. luteipes*. Spa Ponds nature reserve consists of a mixture of dry grassland and woodland and a series of spring-fed ponds.

In May 2016, Ian Andrews sent me two male *Sepsis* that he had caught on 8 May in Dalby Forest, N.E. Yorkshire (SE871902, V.C. 62). Ian suspected that both specimens were *S. luteipes* and sought my opinion. The males were clearly the same species, although one had lost its abdomen, and examination of the intact male's genitalia showed it to be a match to the Nottingham specimen and to the figure in Pont and Meier (2002).

During February 2018, I was contacted by David Horsfield, voluntary entomology curator at the National Museums of Scotland, asking me if I would be able to look at some specimens of Sepsidae including a single *S. luteipes* collected by Keith Bland. When the specimens arrived, I was able to confirm that the male *Sepsis* was indeed *S. luteipes*. This specimen was collected at Dollar Glen, Clackmannanshire (NS9699, V.C. 87) on 4 May 2017.

On 23 April 2017, I collected a single male *S. luteipes* from a cattle-grazed meadow in Ballaugh Glen, Isle of Man (SC354918, V.C. 71). The field abuts Ballaugh Plantation and is bounded along one side by a stream emerging from the plantation. A permanently wet area, possibly spring fed, occupies the central part of the field. The specimen was collected along with specimens of *S. cynipsea* (Linnaeus, 1758), *S. fulgens* Meigen, 1826, *S. orthocnemis* Frey, 1908, *S. punctum* and *S. violacea*.

A further two Isle of Man specimens were swept during a survey of the Manx Wildlife Trust's Cooildarry reserve (SC319896, V.C. 71). Both males, they were swept from the ground flora, most likely ramsons, *Allium ursinum*, on 7 May 2018. Cooildarry is a deep wooded valley forming the upper part of Glen Wyllin through which the Ballalonna river runs in a series of waterfalls over an ancient bed of Manx slates. The reserve is noted for its spring flora.

From the details of the ten records and the distribution map (Fig. 1), it can be seen that in Britain *S. luteipes* is apparently widespread and is present from late April till early September, possibly with a bias towards spring. As the mix of habitats of these records varies from woodland, grazing pasture to the Cairngorms, little can be inferred as to habitat preferences of this species in Britain. Adults have been found on goose droppings and have been reared from cow dung (Pont and Meier *op. cit.*). In Europe, Pont and Meier (2002) stated that it is a little-known species but it is to be expected to be widespread across northern and central Europe. It would appear that *S. luteipes* is under-recorded, perhaps due to its small size and similarity to smaller specimens of the common species *S. punctum* and *S. violacea*. A careful examination of specimens of *S. punctum* and *S. violacea* may uncover more specimens of *S. luteipes*.

equally grateful to Martin Drake for his review of this paper and his helpful comments. The map was produced by the DMAP program.
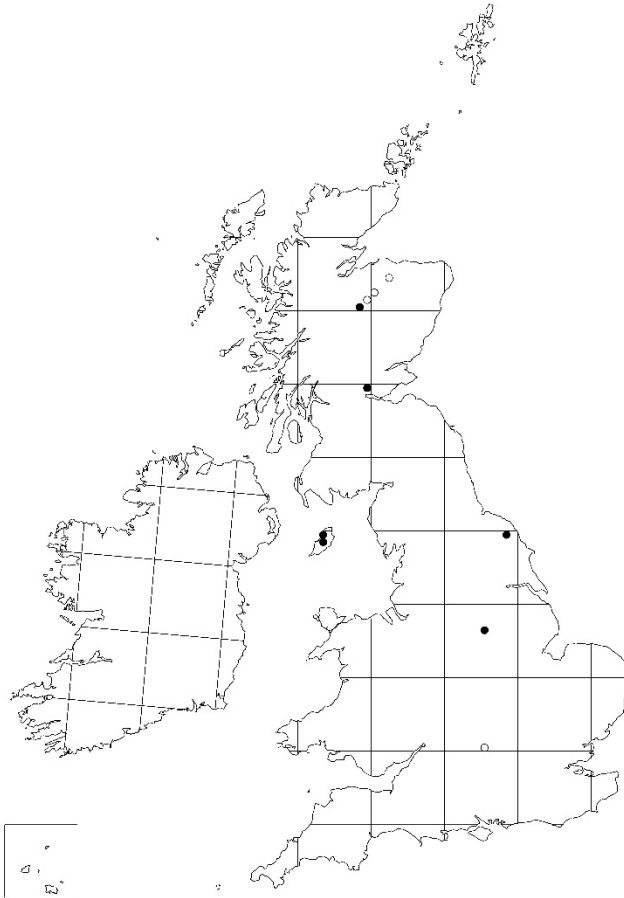

Fig. 1. Distribution map of *Sepsis luteipes* based on records held by the Sepsidae Recording Scheme (open circles = Table 1 records; closed circles = recent records).

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Craneflies (Diptera, Tipuloidea) of the Ravin de Valbois, France

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Summary
Samples were collected in ethanol from Malaise traps set up from 2009 to 2016 and a list is provided of the species that have been identified. In May 2017 and May 2018 visits were made to the Ravin de Valbois to record craneflies. Some 69 species of Tipuloidea have been identified and these include five species new to France.

Location
Map: Carte de Randonnée 3324ET Arc-et-Senans Quingey
The Ravin de Valbois National Nature Reserve [47° 05' 2.84"N 6° 05' 39.51"E, Centroid 5218 N. 279 E. WGS84] is situated in eastern France in the Département Doubs, Commune Cléron (Réserves Naturelles de France 2014). It is near to the River Loue, east of Cléron, between Cléron and Chassagne-Saint-Denis, near Ornans, about 25km south of Besançon (the D101 is the nearest road). The wooded gorge (Plates 1-3) starts at the Château Saint Denis, is 3km long, and lies between 330 and 550m altitude. It forms part of the Loue/Lison Natura 2000 site. There is a waterfall at the south-eastern end and the stream (Le Ruisseau de Valbois) flows north-westward into the R. Loue on a bearing of 320°. The cliffs are Jurassic limestone, while the floor of the ravine, where the stream flows, is clay, Oxford and Argovian Marls. The bed of the stream and the exposed riverine shingle is of Jurassic limestone pebbles. The reserve is 234 ha in extent, mostly woodland (206 ha), and part of it (25 ha) has been left uncut since 1910. Old trees are frequent and there is much dead and moss-covered wood. The ecological details of the site are as follows:

Macro-habitat: On the slope, beech (*Fagus sylvatica*) is dominant (Asperulo-fagetum – Corine 41.13) with large-leaved lime (*Tilia platyphyllos*), ash (*Fraxinus excelsior*), and sessile oak (*Quercus petraea*). *Quercus robur,* the pedunculate oak, is found only by the river at the bottom of the ravine, together with maples (mainly sycamore *Acer pseudoplatanus*) and dominant ash trees (*Fraxino-quercion* - Corine 41.24).

Supplementary Habitats: The steep slope of the ravine causes the trees to fall before reaching their full age. Some of these fall across the stream, providing a wet wood habitat. Rocks fall from the limestone cliffs into the gorge and both these and the trees are covered in mosses. There are some cliffs with seepages and so are covered with algae and bryophytes. At the south-eastern end the waterfall provides a splash-zone with wet moss-covered rocks. This may dry up during the summer months. **Tufaceous Springs**: *Cratoneurion* - Corine 54.12. **Altitude:** 450 m to 330m by the river.

Materials and Methods
Malaise traps were set up in the ravine by the Conservation Officer (DL), from 2009 as part of a much larger survey for the initial purpose of recording the hoverflies in French nature reserves, organised with Martin Speight. The aim was to compare the observed with the expected species lists to try and detect any disfunction in the ecosystems (Tissot *et al*. 2013). Eventually a large number of specialists were involved in the project, which permits a detailed overview of the

ecosystems present (Langlois *et al*. 2016). Phil Withers widened the project to include other groups of Diptera and it was through receiving samples from Phil that JK became involved. The Malaise-trapped craneflies, received in ethanol and identified by JK, were therefore a by-catch from the original project. In addition, sweep net samples were taken during visits by JK to the Ravin de Valbois from 21-25 May 2017 and from 1-3 May 2018. Several craneflies were also collected by window traps and by hand-netting by DL. References used for identification were: Geiger (1986), Mannheims and Theowald (1980), Podenas *et al*. (2006) and Pierre (1924).

Location of the Malaise Traps (see Map)

TM 1 Dry woodland. High on the slope, with thermophilous western aspect. Sampled 4 May - 6 October 2009.

TM2 Dry woodland. High on the slope, with thermophilous western aspect. Sampled 4 May - 6 October 2009.

TM3 Damp woodland. Below the waterfall. Sampled 4 May - 6 October 2009.

TM4 Wet woodland. By stream. Sampled 4 May - 6 October 2009.

TM5 Dry woodland. High on the slope, with thermophilous western aspect. Sampled 23 April - 24 September 2010.

TM6 Dry woodland. High on the slope, with thermophilous western aspect. Sampled 23 April - 24 September 2010.

TM7 By stream. Sampled 23 April - 24 September 2010.

TM8 By stream at north western end of the reserve. Sampled 23 April - 24 September 2010.

TM9 Meadow, meso-xerophile. Sampled 12 April - 19 October 2016.

TM10 Meadow, meso-xerophile. Sampled 12 April - 19 October 2016.

Malaise traps

Window traps

Hand-netting

Ravin de Valbois National Nature Reserve

Ruisseau de Valbois

Background map : IGN. 2017. Orthophotoplan. Sources : Conservatoire d'espaces naturels de Franche-Comté. 2019
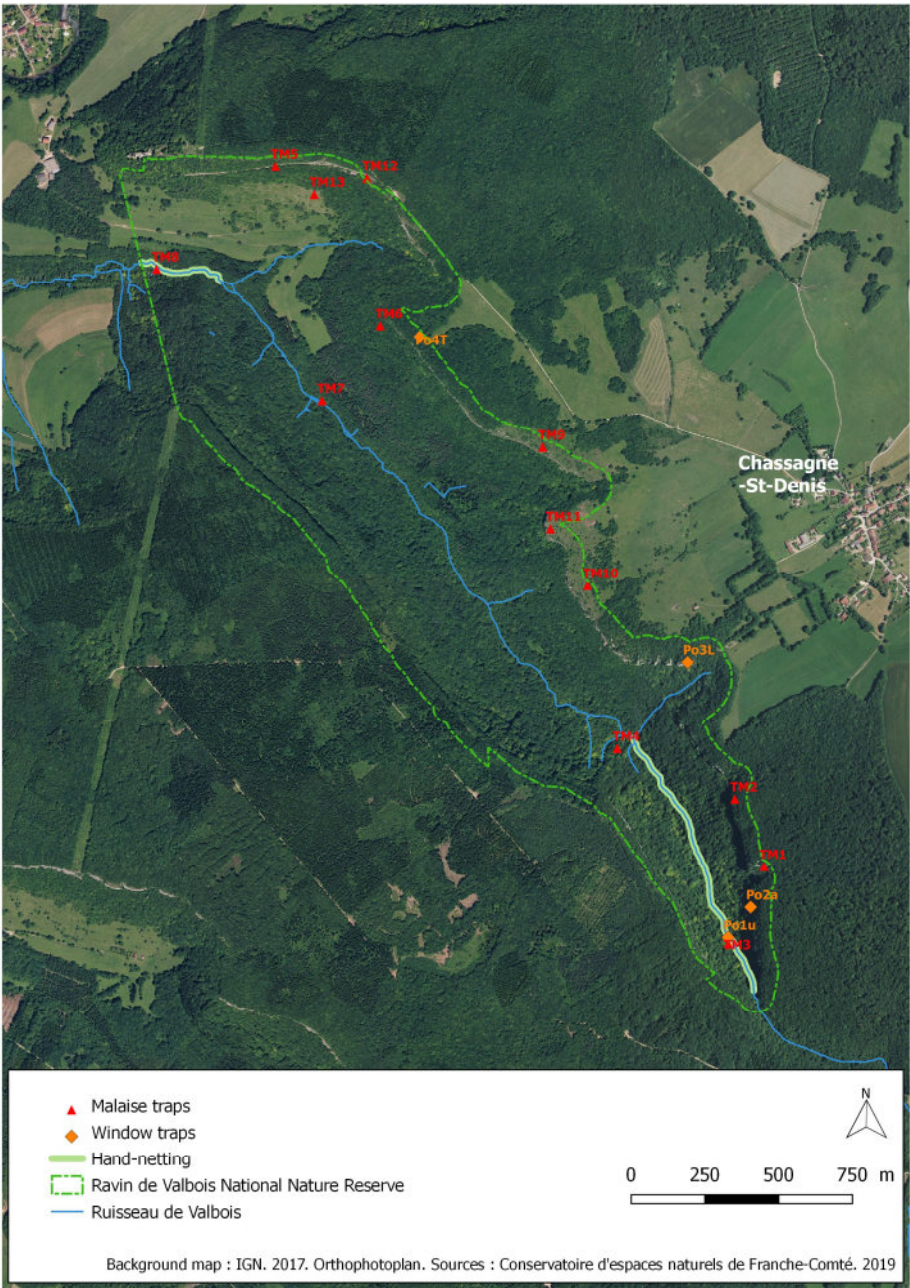
Results

A total of 69 species have been recorded so far (see Species List). The identification of most of these is relatively unproblematic. In some cases, where identification has been made from a single female specimen, e.g. *Ula mollissima*, *Dactylolabis denticulata* and *Dicranomyia conchifera*, the evidence is not conclusive and more specimens, including males, together with detailed microscopical work are needed for confirmation.

Separate papers have already been published presenting the evidence for the presence of *Tipula stigmatella*, and *T. trifascingulata* (Kramer 2014, 2017). The record of *T. stigmatella* was the first for France, while the Ravin de Valbois is the second site known in France for *T. trifascingulata* and for *T. mutila* (Kramer 2012). *Rhabdomastix subparva* and *Lipsothrix nervosa* are also new records for France.

Critical Species

Evidence for the occurrence of the species either rare or new to France is presented below, where this is thought necessary.

Tipulidae

Tipula (Lunatipula) bullata Loew, 1873
Specimen 18/039. 3 May 2018, Ravin de Valbois, Sect. 8, Cascade. Hand netted.
The inner dististyle of this specimen is bifurcated with two distinct points. The hairs on sternite 8 are situated along most of the posterior edge (de Jong 1995a)

Tipula (Pterelachisus) bilobata Pokorny, 1887 (Figs 1-2) (New to France)
Specimen in TM2. 18 May 2009. The hind edge of tergite 9 is diagnostic of this species.

Limoniidae, sub-family Chioneinae

Molophilus species
Specimens 18/027, 18/028. 2 May 2018. An unidentified black species of *Molophilus*, which seems to be new to science. Hand-netted from vegetation under cliff over-hang, stream margin, Sector 7. A separate paper will present the evidence for this species.

Molophilus variispinus Starý, 1971 (Fig. 4) (New to France)
Specimens. 2 May 2018. Both *M. serpentiger* (Fig. 3) and *M. variispinus* (Fig. 4) were found in the ravine and have Z-shaped styles. The lateral view of the coxites of each are significantly different.

Rhabdomastix subparva Starý, 1971 (Figs 5-7) (New to France)
Specimens 18/019, 18/020. 2 May 2018. Hand-netted from vegetation under cliff over-hang, stream margin, Sector 7.
The coloration of the pleuron is dark grey and the male antennae are of normal length, reaching to mid-thorax with a normal pubescence and pedicel. Among the dark grey-bodied species, these specimens are closest to *R. corax* Starý, 2004, *R. crassa* Starý, 2004, *R. edwardsi* Tjeder, 1967 and *R. subparva*. Like these, they have a narrower blade on the interbase and a long narrow 'tail' to the male genital apodeme. It is separated from *R. edwardsi* by the presence of macrotrichia on vein R_4, from *R. crassa* by the larger number of macrotrichia on R_4, from *R. corax* by the width of the inner style and by the larger number of macrotrichia on R_4; *R. crassa* has a rounded end to the interbase. The shape of the apodeme and interbase is closest to *R. corax* with its evenly arched outer gonostylus but separated from that by the larger number of macrotrichia on vein R_4.
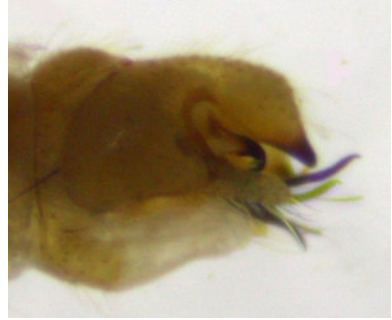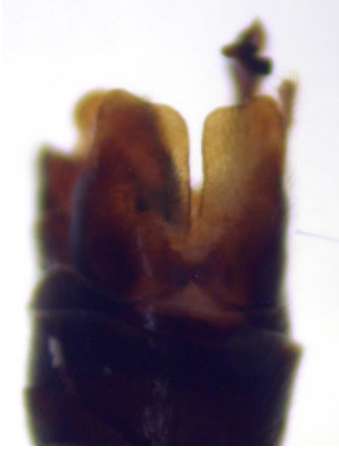
Figs 1-7. 1, *Tipula bilobata,* tergite 9; 2, *Tipula bilobata*, inner and outer claspers; 3, *Molophilus serpentiger,* hypopygium, lateral view; 4, *Molophilus variispinus,* hypopygium, lateral view; 5, *Rhabdomastix subparva,* coxite, styles and interbase; 6, *Rhabdomastix subparva,* male apodeme and interbases; 7, *Rhabdomastix subparva,* interbases.

Species List. * Historical Records.   ** Species new to France

Tipulidae (25)
Ctenophora festiva Meigen, 1804*
Ctenophora flaveolata (Fabricius, 1794)*
Ctenophora pectinicornis (Linnaeus, 1758)*
Dictenidia bimaculata (Linnaeus, 1761)
Nephrotoma appendiculata (Pierre, 1919)
Nephrotoma cornicina (Linnaeus, 1758)
Nephrotoma quadrifaria (Meigen, 1804)
Tanyptera atrata (Linnaeus, 1758)
Tipula maxima Poda, 1761
Tipula flavolineata Meigen, 1804
Tipula bullata Loew, 1873
Tipula lunata Linnaeus, 1758
Tipula vernalis Meigen, 1804
Tipula stigmatella Schummel, 1833
Tipula bilobata Pokorny, 1887**
Tipula mutila Wahlgren, 1905
Tipula pabulina Meigen, 1818
Tipula pseudovariipennis Czizek, 1912
Tipula submarmorata Schummel, 1833
Tipula varipennis Meigen, 1818
Tipula trifascingulata Theowald, 1980
Tipula cheethami Edwards, 1924
Tipula rufina Meigen, 1818
Tipula variicornis Schummel, 1833
Tipula hortorum Linnaeus, 1758

Cylindrotomidae (2)
Cylindrotoma distinctissima (Meigen, 1818)
Diogma glabrata (Meigen, 1818)

Pediciidae (3)
Pedicia occulta (Meigen, 1830)
Tricyphona immaculata (Meigen, 1804)
Ula mollissima Haliday, 1833

Limoniidae – Chioneinae (10)
Cheilotrichia cinerascens (Meigen, 1804)
Erioptera verralli Edwards, 1921
Molophilus appendiculatus (Staeger, 1840)
Molophilus lachschewitzianus Alexander, 1953

Molophilus serpentiger Edwards, 1938
Molophilus unidentified**
Molophilus variispinus Starý, 1971**
Ormosia lineata (Meigen, 1804)
Rhabdomastix subparva Starý, 1971**
Scleroprocta pentagonalis (Loew, 1873)

Limoniidae – Dactylolabinae (3)
Dactylolabis denticulata (Bergroth, 1891)
Dactylolabis sexmaculata (Macquart, 1836)
Dactylolabis transversa (Meigen, 1804)

Limoniidae – Limnophilinae (6)
Austrolimnophila ochracea (Meigen, 1804)
Dicranophragma adjunctum (Walker, 1848)
Dicranophragma nemorale (Meigen, 1818)
Epiphragma ocellare (Linnaeus, 1761)
Neolimnomyia filata (Walker, 1856)
Prionolabis hospes (Egger, 1863)

Limoniidae – Limoniinae (20)
Dicranomyia conchifera (Strobl, 1900)
Dicranomyia chorea (Meigen, 1818)
Dicranomyia caledonica Edwards, 1926
Dicranomyia fusca (Meigen, 1804)
Discobola caesarea (Osten Sacken, 1854)
Elliptera hungarica Madarassy, 1881
Limonia albifrons (Meigen, 1818)
Limonia dilutior (Edwards, 1921)
Limonia flavipes (Fabricius, 1787)
Limonia hercegovinae (Strobl, 1898)
Limonia nigropunctata (Schummel, 1829)
Limonia nubeculosa Meigen, 1804
Limonia phragmitidis (Schrank, 1781)
Lipsothrix nervosa Edwards, 1938**
Lipsothrix remota (Walker, 1848)
Metalimnobia bifasciata (Schrank, 1781)
Metalimnobia quadrimaculata (Linnaeus, 1761)
Metalimnobia quadrinotata (Meigen, 1818)
Neolimonia dumetorum (Meigen, 1804)
Rhipidia maculata Meigen, 1818

Cranefly larval habitats in the Ravin de Valbois
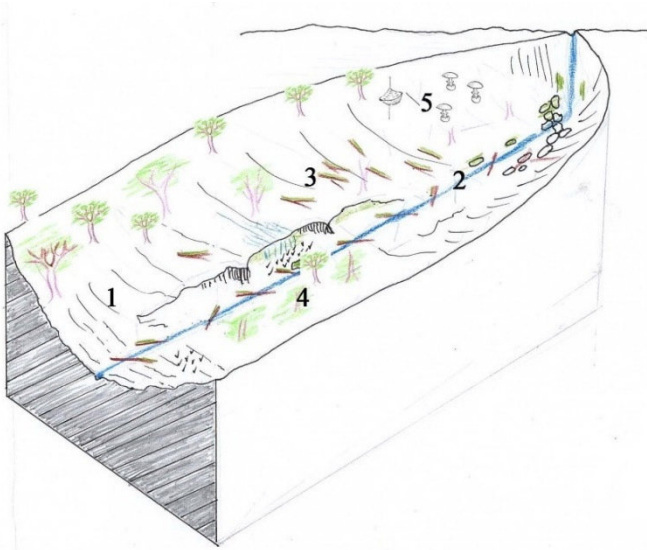
1, Soil; 2, Aquatic; 3, Wood; 4, Mosses; 5, Fungi; 6, Vegetation.

The ravine provides a wide range of cranefly larval habitats. The tree cover provides shade, a high humidity and shelter from wind, which is well-suited to many species of cranefly larvae and adults. Details of larval habitats were obtained from Brindle (1960, 1967) and Dufour (1986).

1. Soil
This is a very complex environment with many interacting factors, the resource partitioning of which accounts for the large number of cranefly species that live in the ravine. Most cranefly larvae live in damp soil feeding on the vegetable detritus, which is especially rich in well-established forest soils. Important factors include:

i) Soil water. The sloping sides of the ravine provide a gradient of soil water content. The tops of the limestone slopes are well-drained, while in the bottom of the ravine there is marsh with soil saturated mainly by the seepages and also by the stream from the waterfall which is flowing for most of the year. Larvae of some species can tolerate relatively dry biotopes, such as exposed pasture grassland (*Nephrotoma appendiculata, Tipula vernalis*) while many others are confined to marshy ground. Species trapped by TM1 on the dry woodland include *Nephrotoma appendiculata, Tipula flavolineata, T. stigmatella, T. vernalis, Epiphragma ocellare* and *Limonia hercegovinae*. However, most cranefly larvae prefer damp soil (e.g. *Tricyphona, Dicranophragma, Erioptera, Molophilus* and *Scleroprocta* species).

ii) The **mineral content** of the soil-water also seems important to some species and some are confined to base-rich soils such as are found on limestone rocks (*Tipula pabulina, Dactylolabis denticulata, D. sexmaculata, Limonia nigropunctata*). It may be that the larvae of some species, perhaps those with thinner cuticles, are less tolerant of more acid ground water, with a lower pH.

iii) Aeration. The more saturated a soil is, the less oxygen there is available, and this may be especially important for the respiration of those active predatory larvae. Many soil bacteria will also remove dissolved oxygen, especially in organic soils.

iv) Vegetable detritus. Many cranefly larvae live in soil, feeding on the vegetable detritus (humus) found there (*Tipula lunata, Limonia nubeculosa*). The woodland environment provides a very wide variety of material and this must be an important reason for the variety of craneflies found at these sites. The humus derived from beech, oak and pine wood are different, as also is the humus produced from their leaves, and the leaves of rotting herbaceous plants such as ramsons (*Allium ursinum*), golden-saxifrage (*Chrysosplenium*), grasses or mosses. Different plant assemblages provide different types of plant detritus, with different fungal, protoctistal and invertebrate communities. Larvae may also feed on soil algae.

2. Aquatic habitats
i) Le Ruisseau de Valbois.
There are many tipuloid species with aquatic larvae for all or part of their life-cycle.
Tipulidae: many species live in water until nearing metamorphosis (*Tipula maxima*, *T. variicornis*). They will then migrate to the bank, pupate in moist soil and the adult will emerge a few weeks later into the air. Most of these are large flies but they have not been captured in the Malaise traps. They may remain very close to the stream margin.
Pediciidae: have aquatic predatory larvae. The adults tend to remain close to the water and are usually hand-netted from the marginal vegetation. Only one aquatic *Pedicia* species, *P. occulta*, has so far been recorded on the Reserve.

We would expect to find the genus *Dicranota*, but these emerge early, are small, and are weak fliers and therefore unlikely to be caught by Malaise traps away from the stream banks. If they were caught they may have escaped notice during sorting. Although the stream bed remains wet, the flow of water often ceases in mid-summer. It may be that larvae of *Dicranota* cannot withstand this change. NB: *Dicranota pavida* was found in May at the Lac de Remoray Reserve, but was not netted during two visits in May to the Ravin de Valbois, despite a thorough search.

ii) The waterfall.
In May, the rate of flow was already low and this greatly slows or ceases during the summer. The area immediately below the waterfall has been scoured clear of vegetation during spate flows (Plate 1), is exposed to the sun and wind and is therefore relatively dry for much of the year. Species recorded in the more vegetated area further below include *Molophilus lackschewitzianus*, *Epiphragma ocellare*, and *Dicranomyia* (*Melanolimonia*) *caledonica,* and only the latter has madicolous larvae.

iii) The seepages (from the sides of the ravine)
These cliffs (Plate 2) provide an important source of water for the stream and important habitats for such early species as *Dicranomyia caledonica*, and *D. fusca*. It is expected that more species will be found in this biotope in mid-season e.g. *Elliptera, Orimarga*. Unlike the Valbois stream above the waterfall, the large volume of the limestone rock on each side of the ravine and above the stream provides a large reservoir, holding the winter rainfall which continues to be released throughout the year. The insect larvae in this habitat are well protected from the consequences of even severe drought.

Plate 1. Waterfall, May 2018.

Plate 2. Cliff with seepages and stream

Plate 3. Side of ravine with rotting logs.

3. Rotting wood
i) Dry rotting wood
The different trees and stages of decay provide an important biotope in the reserve for a number of craneflies. The trees in part of the reserve have remained uncut for over 100 years and tall trees are unstable, falling over more frequently in the steep-sided gorge (Plate 3). The nourishment from the wood may be derived by larvae secondarily, from the saprophytic fungi and other micro-organisms which are themselves feeding on, and digesting the wood. Rotting beechwood is known to be a habitat for ctenophorine species, although nothing is known about the partitioning of food resources. Saproxylic: *Ctenophora* species, *Dictenidia bimaculata, Tipula flavolineata, T. irrorata* (in cortical wood under bark), *Austrolimnophila ochracea*, *Epiphragma ocellare* (in cortical wood under bark). Woody detritus: *Limonia nubeculosa, Rhipidia maculata.*

ii) Inside wet wood (WWD – Wet Woody Debris) in or near the stream:
The larvae of *Lipsothrix* species live under the bark or near the surface of logs, which have fallen into water (Hancock *et al*. 2009). *Lipsothrix nervosa, L. remota*. Other *Lipsothrix* species may be present.

4. Mosses:
The ravine contains a rich moss flora. These may be covering living or dead tree trunks, and on relatively dry, or very wet rocks.

i) Mosses on decaying tree trunks

A number of species have been found under the mosses on dead wood and for these species it is not known how much nourishment is derived from the moss and how much from the fungi/decaying wood. *Tipula mutila, T. hortorum.*

ii) Mosses on rocks/soil:

Larvae living in moss cushions include *Tipula stigmatella* (de Jong 1995b), *Dactylolabis* species, and *Diogma glabrata* (Brindle 1967).

iii) Mosses on wet rocks:

Dactylolabis species, Dicranomyia (*Melanolimonia*) *caledonica. D.* (*Numantia*) *fusca, Elliptera hungarica*. The larvae of these species also possibly feed on algae. There is a distinct cranefly assemblage associated with wet rocks and these are unlikely to occur away from this habitat. (They will usually be absent from the Malaise traps). The main emergence for some of these is in June and July and so more remain to be found.

5. Fungi

The large and conspicuous mycophagous *Metalimnobia* species are very common in the Malaise trap samples and this indicates the importance of this habitat in the ravine. The usually commoner small yellow-brown *Ula* species, also mycophagous, are rare in the samples from the ravine. It is expected that the adults of these species will be very mobile as they search for fresh fungi in which to lay their eggs. *Metalimnobia* species (Limoniidae), *Ula* species (Pediciidae).

    Discobola caesarea has also been found. Their larvae have been reared from the fungus *Amylocystis lapponica* (Komonen *et al.* 2001), from rotting wood of a range of deciduous trees and from sap and slimy masses of myxomycetes. It would seem that their larvae are mycophagous (Krivosheina 2009).

6. Herbaceous vegetation

The family Cylindrotomidae are unusual in the Tipuloidea in that their larvae feed on the leaves of dicotyledonous plants. *Cylindrotoma distinctissima* larvae have been found on the leaves of *Caltha, Chrysosplenium, Viola* and *Petasites.*

Discussion: Le Ravin de Valbois – un laboratoire faunistique (Dufour 1986)

The species-rich climax community in the Ravin de Valbois provides an opportunity to investigate the niches of each of the species occurring here, and to try to define their specific habitat requirements. What species of cranefly larvae live here? Where are they living? What are the larvae doing? How are the resources partitioned between them?

    We cannot yet fully answer these questions for many species and, indeed, the larvae of some rarer species found here are not known at all. This is perhaps not surprising. The first step in any investigation is to produce a species list for the adult flies at the site. Then to collect the larvae and feed them through to the adult stage so that they can be identified with confidence. If sufficient numbers of known species can be found, they can be used in investigations to determine such things as food and environmental tolerances. We can produce hypotheses which we can test by examining gut contents and testing the effects of environmental factors such as pH. Associations with plants such as mosses may also provide a clue to specific micro-habitat requirements such as the range of humidity and pH. Experiments on tolerance to desiccation and behavioural responses to pH and humidity may be carried out. None of this is easy. Many larvae are bulk-feeders and their guts contain a mass of organic material from which they derive nourishment, together with mineral detritus. To identify, for example, fungal hyphae, in this mass requires some additional microscopical work (DNA analysis would also do the job).

In a holistic survey such as this, where many specialists are involved, it is also possible to describe the role of the different cranefly larval species in the food webs of their aquatic and terrestrial communities. Numerous riverflies, spiders, beetles, flies and other invertebrates feed on craneflies. They also support populations of all of the classes of vertebrates such as bats, other small mammals, and birds. They are a key group in recycling materials in any damp or wet biotope and without them the community in the Ravin de Valbois would be very different.

Suggestions for further work

This report describes a work in progress and there is a need for further visits by a dipterist throughout the year, to cover the emergence of all the different species and to produce a complete species list for the site.

The seepages form an important site in the ravine which is difficult to sample using traps. Site visits should be made in to search for adults and larvae of madicolous species such as those of the genera *Elliptera, Melanolimonia* and *Orimarga*.

As indicated above, there is a dearth of knowledge about the larvae, and these could be searched for in the habitats listed above. Unknown larvae should be identified and recorded, together with habitat details. Where identification is possible and sufficient numbers are available, further investigations can be carried out, as described above. To better understand larval habitats emergence traps could be used, for example over moss-covered dead wood, and mossy boulders to compare species emerging. Saproxylic species would not emerge from moss-covered boulders. Moss-feeders may emerge from both biotopes.

Cranefly habitats that require special attention include the seepages, the stream margins, the wet woody debris, the drier rotting logs and the fungi. All of these should be swept using a hand-net and the samples stored separately. Studies on the algae and bryophytes in the ravine would provide useful information on food and habitat factors.

Acknowledgements

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First record of *Helina parcepilosa* (Stein) (Diptera, Muscidae) in northern France (Rég. Brittany) and a literature review of *H. parcepilosa*

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Summary
Helina parcepilosa (Stein, 1907) has been recorded for the first time in northern France. This article also reviews the distribution, flight period and habitat of *H. parcepilosa*. The biology of *H. parcepilosa* is unknown. However the larval habitats of other *Helina* species are summarised.

Introduction
Flora Conservation UK is a project funded and managed by EAH. Initially the aim of the project was to encourage gardeners to grow more wild flowers in their gardens for wildlife and pleasure. However, since the launch of the project in 2005 it has become increasingly evident that many speies of insect are in decline (e.g. Falk and Chandler 2005; Fox *et al*. 2010; Hayhow *et al*. 2016; Drake 2017; Falk and Pont 2017). Leather (2018) calls it an "**Ecological Armageddon**" with losses reverberating up the food chain (Vogel 2017). Furthermore Collen *et al*. (2012) state "from a moral and ethical perspective we must help ensure the future of the invertebrate creatures with which we share the world".

Consequently, Flora Conservation UK has started to review some of the Muscidae provisionally listed as Critically Endangered, Endangered, Vulnerable and Near Threatened in the United Kingdom (Falk and Pont 2017). One of these species is *Helina parcepilosa* (Stein, 1907); *H. parcepilosa* is designated as provisionally Near Threatened (Falk and Pont (*op. cit.*): "A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now but is close to qualifying for or is likely to qualify for a threatened category in the near future" (IUCN 2012); *H. parcepilosa* is also uncommon in Europe (Pont 2012).

This article presents some new information about *H. parcepilosa* and reviews the available literature.

Field observations
On 5 September 2018, a male of *H. parcepilosa* (Figs 1-3) was net collected by PYG on a cloudy day at c. 12.00 noon from a small sand dune at Palud Gourinet (Fig. 4), an exposed beach (co-ordinates N 47°56'48 942" W 4°24'34 106") in the Bay of Audierne, Pouldreuzic. Pouldreuzic is a coastal commune in the Finistère department of Brittany in north-western France. The small sand dune is bordered by a large pond, marshland with reed beds and a pebble beach.

The specimen (Figs 1-3) was determined using keys and species descriptions from Séguy (1923), Hennig (1955-64) and d'Assis-Fonseca (1968). Adrian Pont confirmed the species identity. Hennig (*op. cit.*) wrote in his species description of the male *H. parcepilosa* "f3 in der Apikalhälfte mit kräftigen av, in der Basalhälfte nur 1 kräftige av... t3 mit 2-3 av, 3-4 ad...". In the male specimen from Palud Gourinet the hind femora have 4 anteroventral setae on the apical half and 2 anteroventral setae on the basal half; the one closest to the base is the weakest. In addition, the hind tibiae have 5 anterodorsal setae.

Fig. 1. Dorsal view of the thorax of male *H. parcepilosa* (Stein) (photo PYG). Note the frons at the narrowest part is c. 3 times the width of the anterior ocellus.

Fig. 2. Side view of male *H. parcepilosa* (Stein) (photo PYG). Note the short prealar seta and 2+2 sternopleural setae.
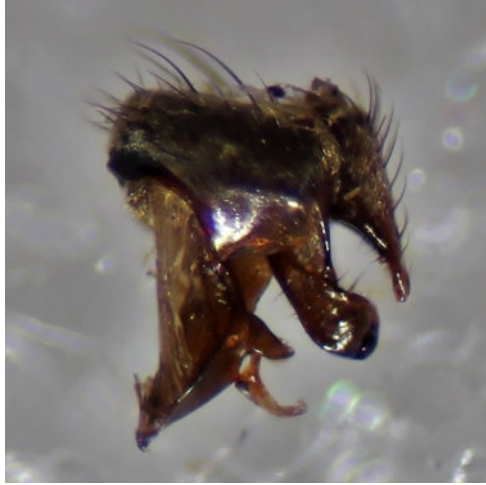
Fig. 3. Genitalia of male *H. parcepilosa* (Stein). Photo by PYG.

Fig. 4. Collection site (orange star) of male *H. parcepilosa* (Stein) at Palud Gourinet in the Bay of Audierne, Brittany, France. Photo by PYG.

The following Diptera were also recorded at Palud Gourinet on 5 September 2018: Anthomyiidae: *Delia platura* (Meigen, 1826). Diastatidae: *Diastata adusta* (Meigen, 1830). Dolichopodidae: *Dolichopus nubilus* (Meigen, 1824). Drosophilidae: *Scaptomyza* (*Parascaptomyza*) *pallida* (Zetterstedt, 1847). Hybotidae: *Platypalpus strigifrons* (Zetterstedt, 1849). Sarcophagidae: *Sarcophaga* (*Krameromyia*) *anaces* (Walker, 1849); *Senotainia albifrons* (Rondani, 1859). Scathophagidae: *Scathophaga furcata* (Say, 1823). Tachinidae: *Periscepsia carbonaria* (Panzer, 1798). Therevidae: *Thereva unica* (Harris, 1790). Trixoscelididae: *Trixoscelis obscurella* (Fallen, 1823). Ulidiidae: *Ceroxys urticae* (Linnaeus, 1758), *Melieria* (*Melieria*) *omissa* (Meigen, 1826) (Gloaguen *pers. obs.*).

Literature review of *H. parcepilosa*

Distribution. A review of the available literature has only found a single earlier record of *H. parcepilosa* in France. Séguy (1923) reported it from Cavalaire-sur-Mer, a commune in the Department of Var in the Provence-Alpes-Côte d'Azur region. There are no French specimens in the recently revised Muscidae collection at the Muséum National d'Histoire Naturelle, Paris (Delfosse *pers. comm.*). As a result, this is the first record of *H. parcepilosa* in northern France.

The type locality for *H. parcepilosa* is China "1♂ und 4♀♀ aus der Gaschun-Gobi im ostl. Chines. Turkestan: von der Oase Satschou (30.VII und 5.VIII.95) [Gansu Province] und aus Bugas bei Hami [Xinjiang Uyghur Autonomous Region] südlich von W.-Thian-Schan (4.VIII, 8.IX.95) (Roborowski)" (Stein 1907 as *Spilogaster parcepilosa* spec. nov.). Further records from China are in Wang *et al*. (2006); Wang *et al*. (2009 as *Helina calceataeformis*) (Schnabl 1911).

It has also been reported from Albania (Mihályi 1976), Algeria (Delfosse *pers. comm.*, 1♀), Armenia (Pont 2012; 2018), Austria (Stein in Becker 1908; Gregor *et al*. 2002; Schlüsslmayr *pers. comm.*), Belgium (Stein in Becker 1908), Bulgaria (Lavčiev 2003 in Hubenov 2018 as *H. calceataeformis*; Zielke 2018), Czech Republic (Gregor *et al*. 2002), England (Thornley 1935; d'Assis-Fonseca 1968; Falk and Pont 2017; Wyatt *pers. comm*), Denmark (Michelsen 1977), Estonia (Stein 1916), Germany (Stein in Becker 1908; Stein 1916; Kramer 1917; Karl 1931: Amrum; Karl 1937; Ringdahl 1952; Teschner 1958; Kühlhorn 1978 in Kühlhorn 1981; Kühlhorn 1981: Spiekeroog; Gregor *et al*. 2002), Greece (Hennig 1955-64: Pont 2004: Crete), Hungary (Hennig 1955-64; Gregor *et al*. 2002), Iran (Pont 2018; Delfosse *pers. comm.*, 1♂), Iraq (Kaddou 1967; Pont 1991), Republic of Ireland (Nash and Chandler 1978; Nash 1997), Israel (Kugler 1969; Pont 1991), Italy (Hennig 1955-64), Kyrgyz Republic (Pont *pers. comm.*), Lebanon (Pont 1991), Lithuania (Lutovinovas 2003). Morocco (Kettani *pers. comm.*), Poland (Schnabl and Dziedzicki 1911 as *Mydaea* (*Spilogaster*) *calceataeformis* spec. nov.; Karl 1937; Gregor *et al*. 2002; Draber-Monko 2001 in Makovetskaya and Vikhrev 2019), Portugal (Pont and Báez 2002), Romania (Ursu 1989), Russia (Sorokina 2008; Sorokina and Pont 2010; Sorokina *pers. comm.*), Slovakia (Gregor *et al*. 2002), Spain (Stein in Becker 1908; Lyneborg 1970; Báez 1983, 1988: Canary Islands; Pont and Báez 2002; Pont and Báez *op. cit.*: Balearic Islands; Pont and Báez *op. cit.*: Canary Islands), Sweden (Ringdahl 1913 as *Mydaea parcepilosa* Stein; Stein 1916; Ringdahl 1917, 1921, 1924, 1952, 1956), Switzerland (Gregor *et al*. 2002; Merz *et al*. 2007), Syria (Hennig 1955-64), Tajikistan (Hennig 1955-64), Turkmenistan (Hennig 1955-64), Tunisia (Hennig 1955-64), Turkey (Pont 1991; Pont 2018) and Wales (d'Assis-Fonseca and Cowley 1953; d'Assis-Fonseca 1968; Falk and Pont 2017; Wyatt *pers. comm.*).

Flight period. Males have been recorded in March (Lyneborg 1970), May (Schnabl and Dziedzicki 1911; d'Assis-Fonseca 1968; Ursu 1989; Wang *et al*. 2006; Wyatt *pers. comm.*), June (Ringdahl 1913; Mihályi 1976; d'Assis-Fonseca 1968; Wang *et al*. 2006; Pont 2012; Pont 2018; Sorokina *pers. comm.*; Wyatt *pers. comm.*), July (Wang *et al*. 2006; Pont 2018; Sorokina *pers. comm.*), August (Ringdahl 1913; d'Assis-Fonseca 1968; Wang *et al*. 2006; Sorokina *pers. comm.*) and September (Thornley 1935; d'Assis-Fonseca 1968). Females have been recorded in March (Lyneborg 1970), May (d'Assis-Fonseca 1968; Zielke 2018; Wyatt *pers. comm.*), June (d'Assis-Fonseca 1968; Pont 2012; Pont 2018; Zielke 2018; Sorokina *pers. comm.*; Wyatt *pers. comm.*), July (d'Assis-Fonseca and Cowley 1953; d'Assis-Fonseca 1968; Báez 1983; Pont 2018; Sorokina *pers. comm.*; Wyatt *pers. comm.*) and August (Thornley 1935; Sorokina *pers. comm.*).

Habitat. Kramer (1917) noted that *H. parcepilosa* was common on sand in July and August. Ringdahl (1921) also reported it on sand in August and September. Ringdahl (1917) stated "occurs in drier locations usually on the ground. On the aeolian sand areas in north-west Skåne

…and found among tufts of *Elymus*- and *Psamma* (*Ammophila*)". Ringdahl (1924) said that in Skåne it "is found in drier places, often on stones". Karl (1931) found it occasionally in the sand dunes between the dune grasses and willow (*Salix*) bushes. Mihályi (1976) collected a male from a meadow ("Wiese") at 900m. d'Assis-Fonseca and Cowley (1953) described the habitat at Llangennith as "dunes and dune slacks, marsh behind the dunes and mouth of stream onshore". Ringdahl (1956) wrote "Rather rare. Seems to be xerophilous, occurs in drier places, often on the ground or on stones". Teschner (1958) netted it on horse dung. Colonel Yerbury (Nash and Chandler 1978) collected it from a coastal sand dune area (now a golf course; Chandler *pers. comm.*). Kühlhorn found it at a rural garbage dump (Kühlhorn 1978 in Kühlhorn 1981) and on food, excrement and carrion (Kühlhorn 1981). Báez (1988) stated that it is a characteristic species of the laurel forests of Anaga and mixed pine forest on the island of Tenerife. Sorokina (2008) recorded *H. parcepilosa* from birch (*Betula*) stands with dense vegetation (Fig. 5) in birch (*Betula*)-aspen (*Populus*) forest on the Barabinskaya steppe. Sorokina has also swept males and females from dense vegetation on the bank of a saline lake (Sorokina *pers. comm.*). Pont collected males at Lake Sevan (Pont 2012) and a female at Lake Arpi (Pont 2018); both are freshwater lakes. Males have been found at an elevation of 2290m and females at 2400m (Pont 2018).

Fig. 5. Collection site of male *H. parcepilosa* (Stein) from birch (*Betula*) stands with dense vegetation in Russia (photo Vera Sorokina).

Biology. The biology of *H. parcepilosa* is unknown (Falk and Pont 2017). The female of *Helina protuberans* (Zetterstedt, 1845), another dune species at Palud Gourinet (Gloaguen *pers. obs.*), lays her eggs in the sand (Krogerus *et al*. 1932). The ovipositor of *H. protuberans* has 6-7 spines on each cercus (Krogerus *et al*. 1932). In the Asilidae, spines on the ovipositor are used for excavation in sand (*Lasiopogon*) or "sweeping" sand (*Philonicus*) (Melin 1923). However, these specialised spines are absent from the ovipositor of *H. parcepilosa* (Hennig 1955-64).

The larvae of other *Helina* species have been recorded from under bark (Horsfield *et al.* 2005), from under the bark of a decaying beech (*Fagus*) (Skidmore 1985), from the remains of a decayed elm (*Ulmus*) "les restes décomposés d'un pied d'Orme" (Keilin 1917), from dead wood, from a rot-hole, from inside a cavity in a cut stump, which was filled with wet humus and wood debris and from rotten wood in a moss-covered log (Horsfield *et al.* 2005), in moss (Smith 1958 in Skidmore 1985), under the moss *Mnium* and liverwort *Pellia epiphylla* on the woodland floor (Skidmore 1985), in moss on the bank of stream (d'Assis-Fonseca 1968), in turf in sparse woodland (Skidmore 1985), from dung (Cameron 1917; Nishijima and Iwasa 1979; Skidmore 1985; Iwasa and Watanabe 2007), from the nests of birds (Smith 1960; Skidmore 1985; Smith 1989; Pelham-Clinton in Horsfield *et al.* 2005) and in a mole hill (Skidmore 1985). *Helina pertusa* (Meigen, 1826) larvae are obligate monomorphic carnivores (Skidmore 1985).

Open conditions and the juxtaposition of a wide range of habitats are key to the importance of dune systems for invertebrates. In addition, bare substrates offer significantly warmer and drier conditions than surrounding areas of vegetation and are exploited by numerous thermophilic species (Howe *et al.* 2010). There are no records of adult *H. parcepilosa* visiting flowers.

A range of factors makes many invertebrate species susceptible to change. In coastal areas these include habitat loss through coastal tourism, urbanisation (Guilcher and Hallégouët 1991) and dune erosion (Falk and Pont 2017). However, in Brittany the adoption of effective management and conservation strategies has led to an increasing awareness by the local population of the need to protect and restore the sand dune ecosystem (Guilcher and Hallégouët 1991).

Acknowledgements

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Phytomyza penicilla Hendel (Diptera, Agromyzidae) new to Great Britain and Spain, with notes on the *robustella*-group

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Summary
Phytomyza penicilla Hendel, 1935 (Diptera, Agromyzidae) is reported as a species new to Britain, based upon a single male collected in Lincolnshire. A description of the adult, larval biology and circumstances of the discovery are provided. The species is also added to the Spanish Diptera list, based on historic data which are previously unpublished. The *Phytomyza robustella*-group is presented and discussed. *Arctium* is reported as a host genus of *P. continua* Hendel, 1920.

Introduction
During March 2019, BPW received several unidentified agromyzid specimens from Phil Porter. Within these, a large male *Phytomyza* stood out. Using Spencer (1976), the specimen runs to couplet 91 but no further progress was possible owing to the specimen possessing a yellow face and squamae, with the frons projecting above the eye in profile. Allowing for variation, the three possible species are *Phytomyza ciliata* Hendel, 1935, *P. spinaciae* Hendel, 1928 and *P. hirsuta* Spencer, 1976 but upon examination of the male genitalia, the aedeagus differed greatly from these three species.

Comparing the genitalia with illustrations in Spencer (1973, 1990) suggested *Phytomyza penicilla* Hendel, 1935. An image of the male phallus, along with morphological notes, were sent to Miloš Černý who confirmed that the specimen is *P. penicilla*, a species not previously recorded in Britain.

The specimen was collected from a hedgerow, chiefly comprising hawthorn and oak, adjacent to a small grassland, near Richmond Lakes, North Hykeham, South Lincolnshire (V.C. 53) by Richard Davidson on 15 May 2014. The area, a former sports ground, is a refuge amid housing and light industry, with small gravel pits nearby which contain an interesting flora, including one of the known host plants of this species, but unfortunately, since the specimen was collected, the site has been 'tidied', with much of the flora now removed (Davidson and Porter *pers. comm.*).

MvT examined specimens of *P. penicilla,* collected near Barcelona, Spain, which represent the first known record of this species in the country. Extensive morphological observations were noted and are described within this paper.

Identification
Phytomyza penicilla is a rather large species in the *robustella*-group. Dempewolf (2005) discussed aspects of the gall-inducing ability of the species belonging to this monophylum, with its species pupariating inside the galled or sclerotised mine and penetrating the plant epidermis with their anterior spiracles projecting ventrally. In his dissertation, Dempewolf (2001: 34, 40, 41, 153, 158, 181, 183-186, 188, 190, 193, 230, 231, 237, 238, 245) studied and figured the larval morphology of *P. continua* Hendel, 1920. Larvae were obtained from leaf stalks and stems of *Arctium minus* (a formerly unknown host) and selected as an example for the whole group. Griffiths (1964, 1972, 1974) proposed and defined the group, enlarged it and discussed interesting biological and morphological aspects.

Spencer (1971) described further species, placing them in the *robustella*-group. Spencer and Steyskal (1986) again accepted this group concept and listed additional species. MvT (unpublished) collected and studied eight undescribed species from Norway, Germany, Spain and Serbia which demonstrated the bionomical success of the evolved feeding mode in sclerenchymatic plant tissue, uncommon for other *Phytomyza* species.

In Table 1 we put together all species worldwide with their synonyms which, according to their typical male genitalia, without doubt belong to this monophylum, despite Winkler *et al.* (2009) splitting the group. Taxa with an asterisk are included in the group for the first time, based on the morphological similarity of their phalli.

Phytomyza penicilla has a wing length from 2.7mm in the male to 3.8mm in the female, the costa ending at vein R_{4+5} and the second costal section being x3.5 that of the fourth. There are usually 2 strong equal *ors* and 2 *ori*, the lower *ori* being much weaker. Orbital setulae are well-developed, proclinate, with the frons projecting above the eye in profile. Third antennal segment black with very long pubescence (Fig. 1), which separates it from the otherwise very similar *P. araciocecis* Hering, 1958, which possesses short, normal pubescence. [We include here for the first time another robust species in the *robustella*-group with comparable long pubescence, *P. formosae* Spencer, 1966, described from Taiwan (Spencer 1966). Griffiths (1972) described similar antennae for his *P. lugentis* Griffiths, 1972 from British Columbia]. Jowls are deep, up to ½ height of eye. Frons orange-yellow, mesonotum matt grey, with 3+1 *dc*, *acr* in two rows with one or two additional hairs in front. Pleura dark, only mesopleuron (= anepisternum) with narrow yellow upper margin. Femora black, with all knees bright yellow.

Fig. 1. *Phytomyza penicilla* Hendel: head detail, showing long pubescence on third antennal segment.

Specimens (2♂, 2♀) collected by Dr Oscar Alomar i Kurz at Canyamars, (41°37' N, 2°25' E), 30km NE of Barcelona, Spain, 24.vi.1980, were examined in detail by MvT, with the following observations noted: wing length of males 3.43mm and 3.53mm, females 3.38mm and 3.77mm; second costal section respectively 2.90, 2.70, 2.93 and 3.09 times that of fourth section; in all specimens, the length of the third antennal segment is longer than the depth, 1.18, 1.09, 1.28 and 1.23 times longer than deep.

In one male, in the middle between both *ors* and distinctly positioned inwards of them on both sides, there is an additional seta of two thirds the length of the *ors*. The *acr* end behind the 2nd *dc* (counted from behind). Vertical edges in front of the *vte* and inside the furrow between

both verticals yellow. Centre of face slightly brownish, palpi brown with a large distal sensory pit on their lower side. The hind edges of the dark tergites distinctly yellow; knees yellow, more than the width of the end of the femora. Squamal fringe relatively dark.

The phallus (Fig. 2A) closely resembles *P. araciocecis* and although in *P. penicilla* the base of the ejaculatory bulb (Fig. 2B) is not heavily sclerotised as in the *P. araciocecis* holotype, the differences in genitalia between the two species are inconsequential (Griffiths 1964).

Fig. 2. *Phytomyza penicilla* Hendel: (A) phallus in left lateral view, (B) ejaculatory apodeme (to scale).

Biology
The biology of this species was not known until Buhr (1955), twenty years after it was first described, discovered it to form gall-like swellings in the leaves of prickly lettuce (*Lactuca serriola*). Later, Buhr (1960) and Hering (1963) also found the larvae of this species, feeding gregariously, inside the upper stems of the same host. Deshusses and Deshusses (1929, 1933) recorded *P. penicilla* (as *P. continua*) in the leaves and upper part of the roots of chicory (*Cichorium*).

Both host genera belong to the latex-bearing subfamily of the Asteraceae, Liguliflorae, as does the third confirmed host, *Lapsana*. Hering (Spencer 1973) also recorded it from *Arctium majus*; however, this is based on a single puparium from Romania. The puparium differs only slightly from those of *P. penicilla* but, owing to this host belonging to a different sub-family (*Tubuliflorae*), its identification can only be confirmed when adults are successfully reared.

Spencer discussed *P. penicilla* as a species of economic importance for the damage it causes to cultivated chicory. However, this is based on a single mass outbreak on chicory in two regions within Switzerland; it caused serious damage [along with *Ophiomyia pinguis* (Fallén, 1820)] to the edible leaves. The larval characteristics are figured by de Meijere (1944).

Distribution
The species is known from Austria (Franz 1989), Czech Republic (Černý 2009), France (Buhr 1955), Germany (Hering 1963), Poland (Nowakowski 1991), ?Romania (see Biology), Russia

(Tanasijčuk and Zlobin 1981), Slovakia (Černý 2012), Slovenia (Coe 1962) and Switzerland (Spencer 1973, Černý and Merz 2007).

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Table 1. World list of valid and invalid names in the *Phytomyza robustella*-group.
An asterisk indicates species here included in the *robustella*-group for the first time, based on genital morphology; indented names are synonyms; Nea, Neo, Pal, Ori indicate occurrence in the Palaearctic, Nearctic, Neotropical and Oriental Regions; species with elongate pubescence on the third antennal segment are marked by the word long; references refer to the first classification of each species in the *robustella*-group.

	achilleaececis Süss, 1984	Pal	Süss 1984
	affinalis Frost, 1924	Nea	Winkler *et al.* 2009
	alamedensis Spencer, 1981	Nea	Spencer and Steyskal 1986
	analis Zetterstedt, 1848	Pal	syn. of *rufescens*
	araciocecis Hering, 1958	Pal	Griffiths 1964
	arnicivora Sehgal, 1971	Nea	Griffiths 1964
	aurata Griffiths, 1974	Nea	Griffiths 1974
	britannica Griffiths, 1956	Pal	syn. of *cecidonomia*

	buhriella Spencer, 1969	Pal	Griffiths 1972
	campestris Griffiths, 1974	Nea	Griffiths 1974
	cardui Hering, 1943	Pal	syn. of *continua*
	cecidonomia Hering, 1937	Pal	Griffiths 1964
	ciliata Hendel, 1935	Pal	long; Griffiths 1972
	cinerea Hendel, 1920	Pal	Winkler *et al.* 2009
	continua Hendel, 1920	Pal	long; Spencer 1972
	crepidis Spencer, 1981	Nea	Spencer and Steyskal 1986
	farfarae Hendel, 1935	Pal	Griffiths 1972
	ferina Spencer, 1971	Pal	Spencer 1971
	flavens Spencer, 1986	Nea	Spencer and Steyskal 1986
	flaviventris Zetterstedt, 1848	Pal	Spencer 1976
*	*formosae* Spencer, 1966	Ori	genitalia
	gilva Spencer, 1971	Pal	Spencer 1971
	hasegawai Sasakawa, 1981	Pal	Spencer 1990
	hedingi Rydén, 1953	Pal	long; Griffiths 1964
	hieracii Hendel, 1922	Pal	syn. of *rufescens*
	hyperborea Griffiths, 1972	Nea	Griffiths 1972
	hypophylla Griffiths, 1972	Nea	Griffiths 1972
	integerrimi Griffiths, 1974	Nea	Griffiths 1974
*	*jugalis* Hendel, 1935	Nea	after female only
	lugentis Griffiths, 1972	Nea	Griffiths 1972
	major Malloch, 1913	Nea	Winkler *et al.* 2009
	melanogaster Thomson, 1868	Neo	Griffiths 1964
*	*meridionalis* Spencer, 1972	Pal	genitalia
*	*montereyensis* Spencer, 1981	Nea	genitalia
*	*nagvakensis* Spencer, 1969	Nea	genitalia
	nigroclypea Hendel, 1935 [valid?]	Pal	syn. of *buhriella* ?
	notabilis Spencer, 1971	Pal	syn. of *buhriella*
*	*orbitella* (Spencer, 1981)	Nea	genitalia
	oreas Griffiths, 1974	Nea	Griffiths 1974
*	*paraciliata* (Godfray, 1985)	Pal	long; genitalia
	penicilla Hendel, 1935	Pal	long; Griffiths 1964
	picridocecis Hering, 1957	Pal	Griffiths 1964
	polyarthrocera Frey, 1946	Pal	syn. of *continua*
	rhabdophora Griffiths, 1964	Pal	Griffiths 1964
	robusta Hendel, 1935 preocc.	Pal	syn. of *robustella*
	robustella Hendel, 1936	Pal	Griffiths 1964
	rufescens von Roser, 1840	Pal	Winkler *et al.* 2009
	taraxacocecis Hering, 1949	Pal	syn. of *wahlgreni*
	wahlgreni Rydén, 1944	Pal Nea	Spencer and Steyskal 1986
	zetterstedti Rydén, 1951 preocc.	Pal	syn. of *continua*
	zetterstedtiana Rydén, 1953	Pal	syn. of *continua*

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