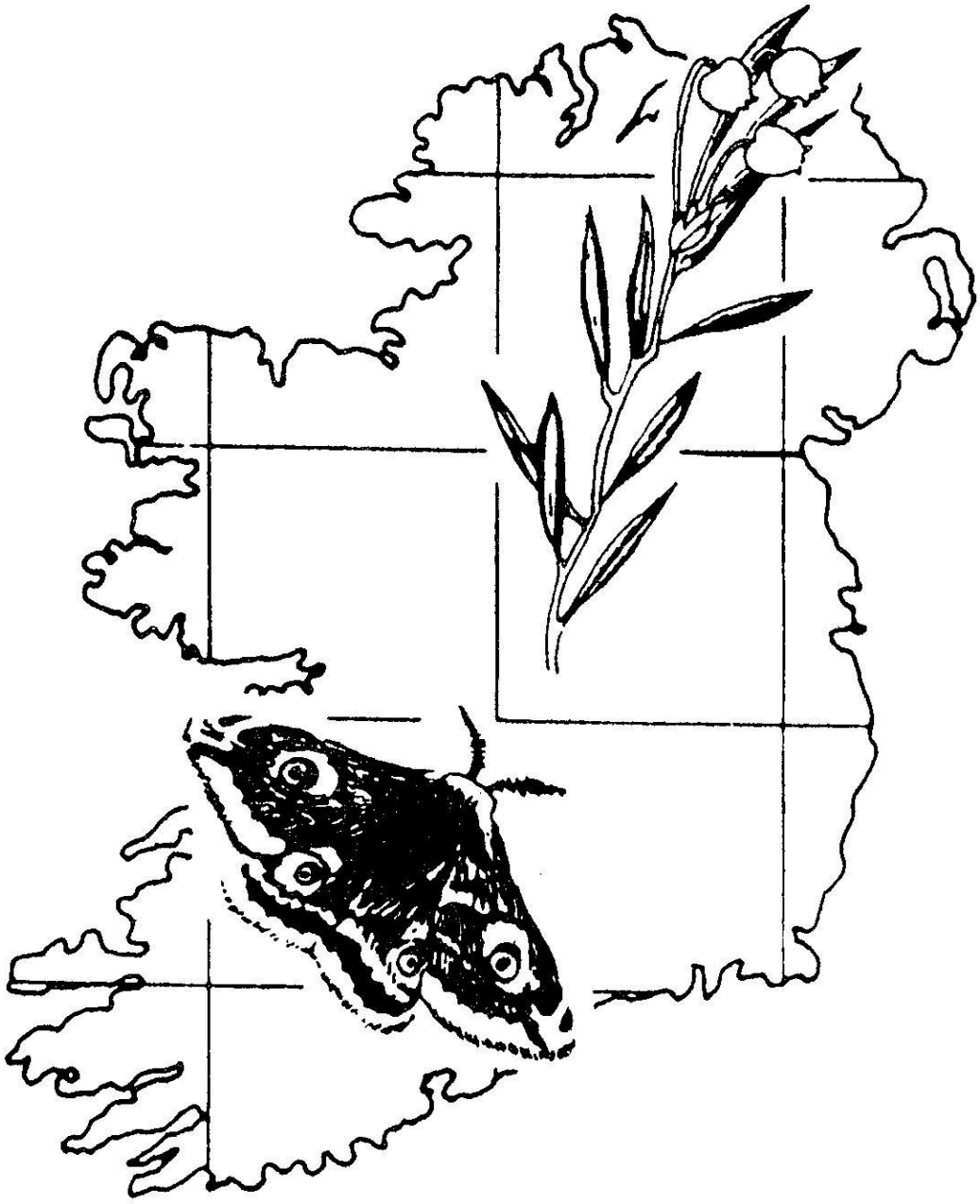
IRISH BIOGEOGRAPHICAL SOCIETY



Bulletin No. 42

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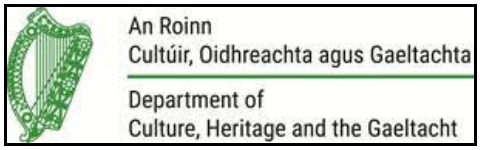

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BULLETIN OF THE IRISH BIOGEOGRAPHICAL SOCIETY
Number 42

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EDITORIAL

Our 12th Occasional Publication was published this year. Co-authored by Declan Murray, Patrick Ashe and the Editor, it is entitled *Chironomidae (Diptera) of Ireland – a review, checklist and their distribution in Europe*. This large volume, consisting of 416 pages, provides summary distribution data for the Irish species currently on record along with maps depicting their known Irish and European distributions. Previous studies on the Irish Chironomidae are also briefly reviewed. Further details will be found in this *Bulletin* along with other interesting research papers on the group.

This year, the *Bulletin* contains fourteen articles, representing a diverse range of topics. Three species of non-biting midges (Diptera: Chironomidae) new to science are described from France. They were found in pristine karstic streams or glacial springs and acid peat bogs, habitats under increasing threat of destruction or pollution throughout Europe. Another important taxonomic discovery is a new subfamily of Chironomidae based on fossil material.

The Calico Scallop and the Transverse Ark Clam are reported new to Ireland from inside the hull of a plastic toy boat stranded on Fanore Beach, County Clare. The distribution of both species within the Atlantic Ocean, and their potential invasiveness in Irish waters is reviewed.

The fascinating variation in the forceps of earwigs from Foynes Island, County Limerick is discussed. Males with long forceps have been shown to have greater mating success than males with short forceps and are thus subject to sexual selection. In another article, the extraordinary 'autocatcher' is described. Mounted on a vehicle and driven along roads to catch rove-beetles, its appearance must have caused surprise and some consternation among other road-users. Last year, the Cream-streaked ladybird was reported as new to Ireland in this journal. That author has now proved that the species is breeding at the site of its discovery.

There are several papers on the Irish caddisfly fauna. Notable records include the trapping of females of a brackish water species in County Waterford and the confirmation of the Window Winged Sedge as an Irish species. These are the first Irish adults of the former species since 1902 and its third Irish record. The latter species was observed by chance while Martin Gammell and Caitriona Carlin were trying to film and photograph Marsh Fritillary butterflies on a bog in County Galway. The Window Winged Sedge is threatened throughout Europe. Although one of its three Galway sites is within a Special Area of Conservation, all three are currently being affected by peat extraction and/or drainage and this has implications for its continued survival. Other new research on the distribution of Irish caddisflies is summarized in two papers and includes a species new to Northern Ireland.

On behalf of the Society, I would like to thank the authors and referees for such an excellent Bulletin, and our sponsors whose essential financial support is greatly appreciated.

J. P. O'Connor, Editor

24 October 2018

REVISED INSTRUCTIONS TO AUTHORS

1. Submitted manuscripts should follow the format of articles in *Bulletin* **Number 42** and other recent issues. The titles of journals should be given in full in the references. The references should be arranged alphabetically with, where relevant, Anon. appearing first.

2. Manuscripts may be submitted by e-mail to the Editor at <joconnor@museum.ie> or *via* our Treasurer Mr John Walsh at <ampersandwalsh@gmail.com>. Figures and photographs should be sent as jpegs. Complex tables should also be sent as jpegs and not in Excel. Remember that all figures and tables should be submitted in a type size which will remain legible after reduction to A5. Typed copy is still acceptable. It should be sent, on A4 paper, using double-spacing and 2.5cm (one inch) margins with the text and any figures on an accompanying compact disc or USB stick, to the Editor, Dr J. P. O'Connor, Emeritus Entomologist, National Museum of Ireland – Natural History, Merrion Street, Dublin D02 F627, Ireland.

3. Word is preferred and Times New Roman 13pt should be used.

4. Records: please ensure that, when possible, the following information is incorporated in each record included in a manuscript:-
(a) latin name of organism.
(b) statement of the reference work used as the source of nomenclature employed in the text. The describer's name should be also given when a zoological species is first mentioned in the text.
(c) locality details including at least a four figure Irish grid reference (e.g. N3946), county or vice-county and some ecological data about the collection site, plus date of capture.
(d) collector's name and determiner's name (where different from the collector's name), and
(e) altitude data should be included where relevant.

5. Each year, the closing date for submissions will be the 15 October for that year's *Bulletin*. Mss received after that date will be considered for the following year's *Bulletin*. All papers will be refereed and any major changes referred to the author(s) for consideration.

Bulletin of the Irish Biogeographical Society **Number 42** (2018)

THE BRACKISH WATER CADDISFLY *YLODES REUTERI* (MCLACHLAN, 1880) (TRICHOPTERA: LEPTOCERIDAE) DISCOVERED IN COUNTY WATERFORD, IRELAND

James P. O'Connor[1] and Anthony Bryant[2]
[1]*c/o National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland.*
e-mail: <joconnor@museum.ie>
[2]*Priest's Road, Tramore, Co. Waterford, Ireland.*
e-mail: <tony_bryant_tramore@yahoo.co.uk>

Abstract

Three adults of the brackish water caddisfly *Ylodes reuteri* (McLachlan, 1880) were light-trapped in June and July 2018 at Tramore, County Waterford, in south-east Ireland. These are the first Irish adults since 1902 and the third record of the species on the island.
Key words: Trichoptera, Leptoceridae, *Ylodes reuteri*, Ireland, Tramore, Waterford, brackish water, third record.

Introduction

Ylodes reuteri (McLachlan, 1880) is a brackish water species which previously has only been recorded twice in Ireland. It was first reported from the island by King and Halbert (1910) under the name *Triaenodes conspersa* (Rambur). However O'Connor (1979) showed that the voucher material (1♂2♀♀) of *T. conspersa* preserved in the National Museum of Ireland was misidentified and was actually *T. reuteri*. The species was subsequently placed in the genus *Ylodes*.

King collected his adults on the 14 July 1902 at Rosslare, County Wexford, in south-east Ireland. To-day, there are two localities in the area with Rosslare in their names *viz.* Rosslare Harbour and Rosslare Strand. However the former was only built in 1906 and King undoubtedly collected his material near Rosslare Strand which is still often referred to as Rosslare (O'Connor, 2015). Rosslare Strand is situated within a bay bounded by the headlands of Greenore Point to the south and Raven Point to the north. The latter and Rosslare Point form the entrance to Wexford Harbour. Between 1845 and 1855, approximately 2293 acres of the adjacent south slobs were reclaimed from what had been formerly mud-flats and sandy islands. The South Slobs are protected by dykes and there are still extensive salt marshes in the area (Hartnett and Nash, 2004) (Plates 1-2). Brindle (1966) found larvae of *Y. reuteri* in a dyke at Spurn, England, where the water salinity was 15% sea-water.

While no specimens of *Y. reuteri* have been taken in the Rosslare Strand area since King's

time, Healy (1997) found larvae at another site in County Wexford, some 12km distant. They were collected in low salinity at Bunargate Pool, Lady's Island Lake. However, when the senior author and his wife Mary attempted to visit the Pool in 2014 to look for larvae, they found that the site was now inaccessible due to a large metal gate which had closed off the private entry road.

The co-author has been light-trapping Lepidoptera since 1997 in the Tramore area of County Waterford. In recent years, he has picked out caddisflies and sent them to JPOC for identification. This material has provided many additions to the fauna of County Waterford and some notable extensions in the known Irish distributions (e.g. O'Connor and O'Connor, 2016, 2017). The latest batch of specimens contained three females of *Y. reuteri* which were identified by JPOC using Malicky (2004) and Barnard and Ross (2012). Barnard (1978) provides an excellent drawing of the female genitalia including the internal sclerotized parts of the vaginal wall which are very characteristic. The capture details are given below and the known Irish distribution is shown in Figure 1. A voucher specimen will be deposited in the National Museum of Ireland – Natural History. The remainder will be retained in the senior author's collection.

***Ylodes reuteri* (McLachlan, 1880) New to County Waterford (Fig. 1)**

WATERFORD: Tramore (S5701), 1♀ 7 June 2018, 1♀ 10 June 2018 & 1♀ 11 July 2018, 125w MV Robinson light-trap in a suburban garden, A. Bryant.

Light-trap captures of *Y. reuteri* can give an indication of its presence in an area, but the breeding site may be small and at a distance (Wallace, 2016). Barnard (1978) reported two females which have probably flown 4-5km from neighbouring saltmarsh areas on the River Thames. Tramore is a coastal town which is also situated in south-east Ireland, neighbouring County Wexford. The lands surrounding and within Tramore are of major ecological importance due to a range of good quality coastal habitats (Desmond, O'Hagan and Hees, 2008). The Back Strand for example has a well-developed and fairly extensive salt marsh area (Plate 3). This is lagoon saltmarsh which is the rarest type in Ireland. There are also other areas of brackish water which could provide suitable habitat including coastal pools, areas being reclaimed from the sea and even a sea-side artificial amusement lake near the town.

Y. reuteri can live in both still and slightly flowing brackish water. The larva is found, as for other members of the genus, amongst vegetation. The food of the larva is unknown and may be material grazed from plants rather than the plants themselves (Wallace, 2016). Barnard and Ross (2012) give the flight period as July. However, two of the Tramore specimens were trapped in early June.

Acknowledgements

The authors are indebted to Dr Peter Barnard for reviewing the ms and to Dr Liam Lysaght, Director of the National Biodiversity Data Centre, for permission to use the photographs in Plates 1-2. The distribution map was prepared using DMAP and the authors are grateful to Dr Alan Morton for supplying the relevant programme.

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PLATES 1-2. Left. The South Slobs, County Wexford. Rosslare Strand is situated on the right hand side. Right. Detail from Plate 1 showing some of the dykes in the South Slobs which may provide suitable habitat for *Ylodes reuteri*. Photographs © National Biodiversity Data Centre <https: // maps.biodiversityireland.ie/ Map/ Terrestrial/ Species/77680/ DatasetFilter/250>.

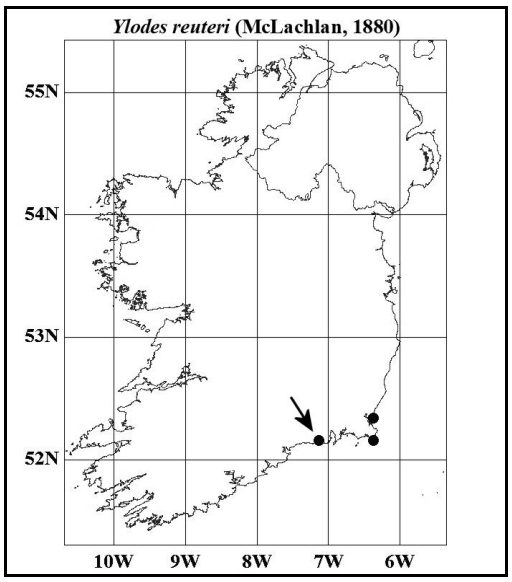

FIGURE 1. The known Irish distribution of *Ylodes reuteri*. The location of the Tramore record is indicated by an arrow.

PLATE 3. The Back Strand, Tramore, County Waterford. Tramore Town is situated on the left-hand side. The artificial lake is also on the left, beside the beach. From Desmond, O'Hagan and Hees (2008).

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FIRST RECORDS OF THE CALICO SCALLOP *ARGOPECTEN GIBBUS* (L.) AND THE TRANSVERSE ARK CLAM *ANADARA TRANSVERSA* (SAY, 1822) (MOLLUSCA: BIVALVIA) FROM IRISH WATERS

Declan T. G. Quigley[1], David Fenwick[2] and Liam MacNamara[3]
[1]*Dingle Oceanworld (Mara Beo Teo), The Wood, Dingle, Co. Kerry, Ireland.*
e-mail: <declanquigley@eircom.net>
[2]*Roscadghill Parc, Heamoor, Penzance, Cornwall TR18 3QY, U.K.*
[3]*Derreen, Craggagh, Fanore, Co. Clare, Ireland.*

Abstract

On 18 July 2016, eight Calico Scallops *Argopecten gibbus* (L.) and one Transverse Ark Clam *Anadara transversa* (Say, 1822) were found inside the hull of a plastic toy boat stranded on Fanore Beach, County Clare, on the west coast of Ireland. The *A. gibbus* specimens represent the first records from European and NE Atlantic waters, while the *A. transversa* specimen represents the first record from Irish waters and the most northerly European Atlantic record to date. The distribution of both species within the Atlantic Ocean, and their potential invasiveness in Irish waters is reviewed.

Key words: *Argopecten gibbus*, *Anadara transversa*, non-native species, first records, Ireland.

Introduction

Many species have undoubtedly been dispersing by rafting on natural flotsam (e.g. wood, algae, seeds, animal remains, ice and volcanic pumice) and stranding on foreign shores for millennia, long before the recent worldwide increase in anthropogenic rafting substrates (e.g. plastics and tar) discarded by humans (Thiel and Gutow, 2005a, b; Thiel and Haye, 2006; Kiessling *et al*., 2015). The increasing volume of plastic rafting substrates in the oceans are likely to contribute to propagule pressure, and combined with the effects of both natural and/or human induced climatic change, may facilitate the successful establishment of an increasing number of non-native species well beyond their current natural ranges (Barnes, 2002; Barnes and Milner, 2005; Gregory, 2009; Cozar *et al*., 2014; Rech *et al*., 2016, 2018a, b; Therriault *et al*., 2018). Although several species of non-native marine mollusca have been recorded on various anthropogenic rafting substrates in Irish and U.K. waters, none of them appear to have become established (Minchin *et al*., 2013; Holmes *et al*., 2015; Quigley and Hill, 2015a).

On 18 July 2016, LMN discovered a plastic toy boat (Plate 1) stranded on Fanore Beach (M0140080; 53.1049°N, 09.2955°W), County Clare, on the west coast of Ireland. Eight Calico Scallops *Argopecten gibbus* (L.) and one Transverse Ark Clam *Anadara transversa* (Say, 1822)

were found inside the hull of the vessel (Plate 2). Although all of the specimens were dead (Plate 3), the shells were intact (Plates 4-5), and each contained the remains of desiccated muscle tissue (Plates 6-7) which suggests that they were all probably still alive when stranded.

It is thought that the bivalves probably gained entry as pelagic larvae into the flooded hull of the boat *via circa* 1mm gaps around the superstructure retaining clips. The pelagic larvae of *A. gibbus* and *A. transversa* are known to settle at a shell length of 235-270µ (Costello *et al*., 1973) and 240-260µ (Loosanoff and Davis, 1963) respectively, a larval size range that could easily fit through the superstructure gaps.

The external surface of the deck superstructure was largely covered by a bryozoan colony (*Membranipora* sp.), whereas there was no epibiont growth on the external flat surface of the keel. This suggests that the boat had been drifting for a relatively long period in a capsized position. Indeed, when flooded with water, it is likely that the submerged external deck superstructure would have provided keel-like stability. The flooded internal structure of the deck superstructure compartments would also have provided further ballast-like stability and a more stable foothold for the subsequently entombed bivalves.

Various estimates have been made regarding the expected time interval for passive eastward long-range dispersal of drift objects from the south-eastern U.S.A. to Western Europe, ranging from 14-18 months (Quigley *et al*., 2014 and references therein), which is well within the estimated maximum 24-month life span of both *A. gibbus* (Costello *et al*., 1973) and *A. transversa* (EOL, 2018).

Details on shell morphometrics are summarized in Table 1. According to Broom (1976), *A. gibbus* attains a maximum shell length of 80mm, and reaches sexual maturity at four months of age, at a shell length of 19mm. The length range of the *A. gibbus* shells was 12-24mm (mean 17mm), which suggests that at least two specimens (>19mm) were probably mature. According to Walker and Power (2003), *A. transversa* attains a maximum shell length of 38mm, and reaches sexual maturity at a shell length of 10mm (Walker and Power, 2003). The shell length of the single *A. transversa* specimen was 8mm, which suggests that it was probably immature.

The current specimens were donated to the National Museum of Ireland – Natural History Division (NMINH). The *A. gibbus* specimens (NMINH: 2017.3.1) represent the first records from European and NE Atlantic waters, while the *A. transversa* specimen (NMINH: 2017.4.1) represents the first record from Irish waters and the most northerly European Atlantic record to date.

Calico Scallops *Argopecten gibbus* (L.) (Bivalvia: Pectinidae)

Argopecten gibbus is native to the western North Atlantic, ranging from Delaware Bay, U.S.A. (39^{o}N) southwards to the Gulf of Mexico (20^{o}N), where it commonly occurs at depths of

10-400m (Abbott, 1974; Hill, 2005; Turgeon *et al.*, 2009; Geiger *et al*., 2015). However, records on the Global Biodiversity Information Framework (GBIF, 2018) indicate that the species is not uncommon further southwards (to 5.1°N, 52.0°W), particularly in the Caribbean Sea (Cuba, Puerto Rico, Virgin Islands and Guadeloupe), and along the northern coast of South America (Columbia, Venezuela, Guyana, Suriname and French Guiana). Rios (2009) noted that *A. gibbus* has been recorded from Brazil, ranging from Amapá (in the north) to Bahia (in the northeast).

GBIF (2018) also list a number of dubious records of *A. gibbus* from locations well outside the species native range, including SW Brazil (Guarapari Reserve, Espirito Santo, 20.8°S, 40.1°W; GBIF 1435832524; UFRJ 15725), Western Australia (Gladstone, Queensland, 23.9°S, 151.3°E; GBIF 1272231399; WAM S28942), and NW Africa, including two preserved specimens from the Azores (38.6°N, 28.5°W; GBIF 1056175263; NHMUK: 1887.2.9.3261), which were taken during the Challenger Expedition (Station No. 75) at a depth of 823m on 2 July 1873, and one undated preserved specimen from Senegal (GBIF 1038160884; LMD: 262759). The Azorean and Senegalese specimens are listed as *Pecten gibbus* (L.) *sensu* Philippi, 1836 in the original NHMUK and LMD registers (Tom White and Stefan Curth pers. comm.). *P. gibbus* is a junior synonym of *Aequipecten commutatus* (Monterosato, 1875) which ranges from the Mediterranean Sea and adjacent region of the Atlantic (Portugal) southwards to Senegal, including the Azores, Selvagens, Madeira, Canaries, and Cape Verde Islands, usually at depths of 15-300m, but occasionally down to 2700m (Poppe and Goto, 2000; Dijkstra and Goud, 2002). Indeed, Wagner (1985, 1991) concluded that the genus *Argopecten* was not represented in Europe, and Adrovini and Cossignani (2004) did not include the genus in their list of West African Seashells. Goninon (pers. comm.) confirmed that *A. gibbus* is not established in Western Australia, and Dias Passos (pers. comm.) remarked that the species has not been recorded from either the southeastern or the southern coasts of Brazil.

In laboratory experiments, successful spawning was induced in *A. gibbus* at water temperatures of 20-25°C, and the pelagic larval stage persisted for 16 days prior to settlement (Costello *et al*., 1973), typically on hard substrata. In another experiment, the species did not survive 48-hour exposure to water temperatures of 10°C (Vernberg and Verenberg, 1970).

Transverse Ark Clam *Anadara transversa* (Say, 1822) (Bivalvia: Arcidae)

Anadara transversa is native to the western North Atlantic where it commonly occurs in coastal waters at depths ≤ 161m from Cape Cod, Massachusetts, U.S.A. (41.7°N, 70.3°W) southwards to the Yucatan, Mexico (*circa* 20.7°N, 89.1°W) (Abbott, 1974; Turgeon *et al.*, 2009; GBIF, 2018).

GBIF (2018) also list a number of dubious records of *A transversa* from various locations

well outside the species native range, including Canada (Bay of Fundy, *circa* 44.9°N, 65.4°W; GBIF 113843145; HMSC 9952157), Bahama Islands, Caribbean Sea (Puerto Rico and Antigua), Panama (*circa* 9.3°N, 79.9°W), Brazil (Praia das Charitas, Niteroi, *circa* 22.9°S, 43.1°S; GBIF 476902591; MCZ: 164885), Argentina (Puerto Madryn, Bahia Nuveva, Patagonia, *circa* 42.8°S, 65.1°W; GBIF 215644411; ANSP 170441), and Western Australia (Turkey Beach, Rodds Bay, S of Gladstone, Queensland, *circa* 24.1°S, 151.6°E; GBIF 899493190; UFIS 340148). Goodwin (pers. comm.) verified that the undated Canadian specimen (HMSC 9952157) was recorded in mud below low water at Sandy Point, St Croix River, in the vicinity of St Andrews, New Brunswick, and not in Nova Scotia as the GBIF co-ordinates indicate. Callomon (pers. comm.) confirmed that the Argentinian specimens (ANSP 170441) are not *A. transversa*. Zelaya (2016) did not include the species in his list of Argentinian marine bivalves, and confirmed that the species is not extant in Argentina (Zelaya pers. comm.). Dias Passos (pers. comm.) confirmed that there are no known records of *A. transversa* from Brazil and Goninon (pers. comm.) remarked that the species is not established in Western Australia.

In laboratory experiments, successful spawning was induced in *A. transversa* at water temperatures of 27-28°C and at 20°C the pelagic larval stage lasted 27-37 days (Loosanoff and Davis, 1963). *A. transversa* settles on rocky hard and muddy/sandy-muddy substrates and is particularly tolerant of polluted habitats (Fernandez-Rodriguez *et al*., 2016). Baker and Mann (1997) noted that post-larval *A. transversa* use a specialized drogue-like byssus to facilitate an extended period of planktonic drifting and thus increase their dispersal ability. Indeed, they suggested that post-larval drifting was probably an integral part of the species life cycle.

A. transversa was first recorded in European waters during 1972 from the Bay of Izmir (*circa* 38.4°N, 27.1°E), Turkey, Aegean Sea, NE Mediterranean. Since then, the species has become established throughout many parts of the Mediterranean (Nerlovic *et al*., 2012; Albano *et al*., 2018), and live specimens were recently discovered in the NE Atlantic as epibionts on intertidally cultivated Pacific Oysters *Magallana* (*Crassostrea*) *gigas* (Thunberg, 1793) in the Villaviciosa and Eo estuaries (*circa* 43.5°N), Cantabrian Sea, NW Spain (Fernandez-Rodriguez *et al*., 2016).

Albano *et al*. (2018) hypothesized that *A. transversa* was probably initially introduced into the Bay of Izmir *via* shipping, either in ballast water and/or as fouling epibionts. Its subsequent spread and establishment throughout the Mediterranean and its occurrence in NW Spain is thought to have been facilitated by the unintentional co-transport of larvae and/or juveniles with aquaculturally produced translocated bivalves (Fernandez-Rodriguez *et al*., 2016; Banon Diaz pers. comm.).

Discussion

Although the remains of desiccated muscle tissue in the *Argopecten gibbus* and *Anadara transversa* shells suggests that they were probably still alive when stranded, it is unlikely that either species could establish self-sustaining populations in Irish waters based on their relatively high sea water temperature requirements for spawning (>20°C). Although surface sea water temperatures (SST) around Ireland are about 7-8°C warmer than the global average at equivalent latitudes, primarily due to the North-Atlantic drift which transports warm water from the Gulf of Mexico to NW Europe (Anon, 2018a), they are still too low to support the survival of *A. gibbus* and *A. transversa*. The average SST on the west and south of Ireland ranges from 8-10°C in February-March and from 14-17°C in August, and is a couple of degrees colder on the north and east. The annual average SST at Fanore is 11.6 (range: 7.6-16.3°C) (Anon, 2018b). However, if current and predicted future increases in climatic warming continue (Hiscock *et al*., 2004; Boelens *et al*., 2005), it is possible that some passively rafting non-native warm-water species may eventually become established in Irish and other NW European waters.

A number of GBIF distributional records of *A. gibbus* and *A. transversa* were discovered to be erroneous. However, such errors are not surprising considering the historical and on-going difficulties concerning bivalve taxonomies (Bieler *et al*., 2010). Indeed, Maldonado *et al*. (2015) cautioned that all records on public biodiversity databases should be critically assessed and validated prior to being accepted as authentic.

Acknowledgements

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TABLE 1. Morphometrics of *Argopecten gibbus* and *Anadara transversa* shells.

Species	Length (mm)	Width (mm)	Depth (mm)
Argopecten gibbus	24	22	10
Argopecten gibbus	20	19	8
Argopecten gibbus	18	17	6
Argopecten gibbus	17	16	6
Argopecten gibbus	17	16	6
Argopecten gibbus	15	14	6
Argopecten gibbus	14	13	5
Argopecten gibbus	12	12	4
Mean	17	16	6
Range	12-24	12-22	4-10
Anadara transversa	8	5	4

PLATE 1. Plastic toy boat.

PLATE 2. *Argopecten gibbus* and *Anadara transversa* shells inside the hull of the plastic toy boat.

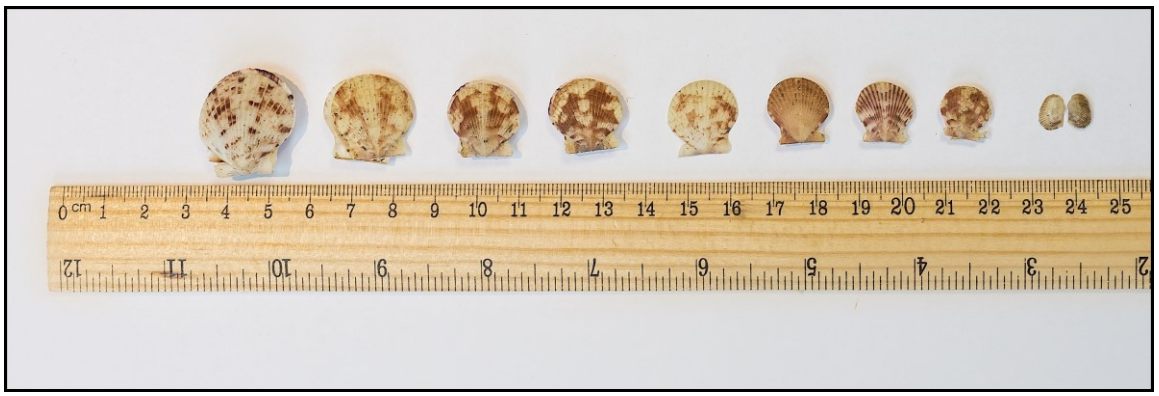

PLATE 3. *Argopecten gibbus* and *Anadara transversa* shells.

PLATE 4. *Argopecten gibbus* (external view of shells).

PLATE 5. *Anadara transversa* (external view of left and right valves).

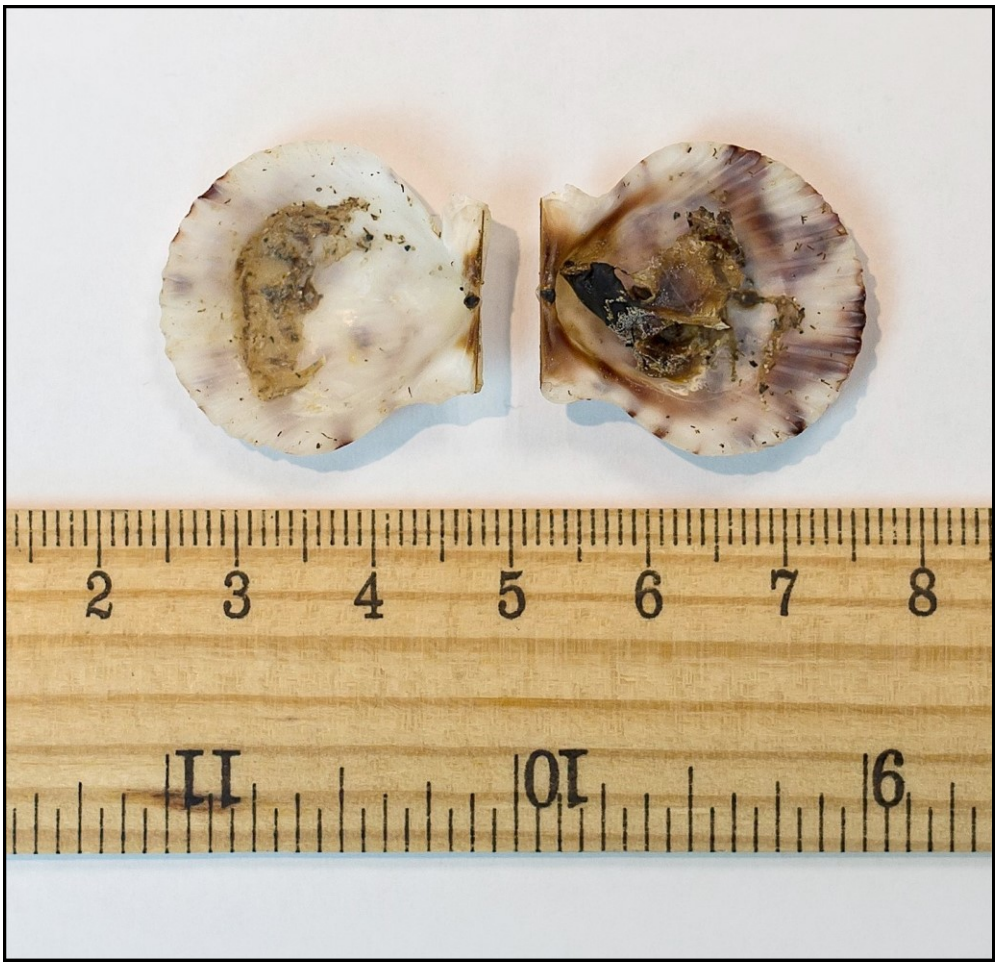

PLATE 6. *Argopecten gibbus* (showing tissue remains inside left and right valves).

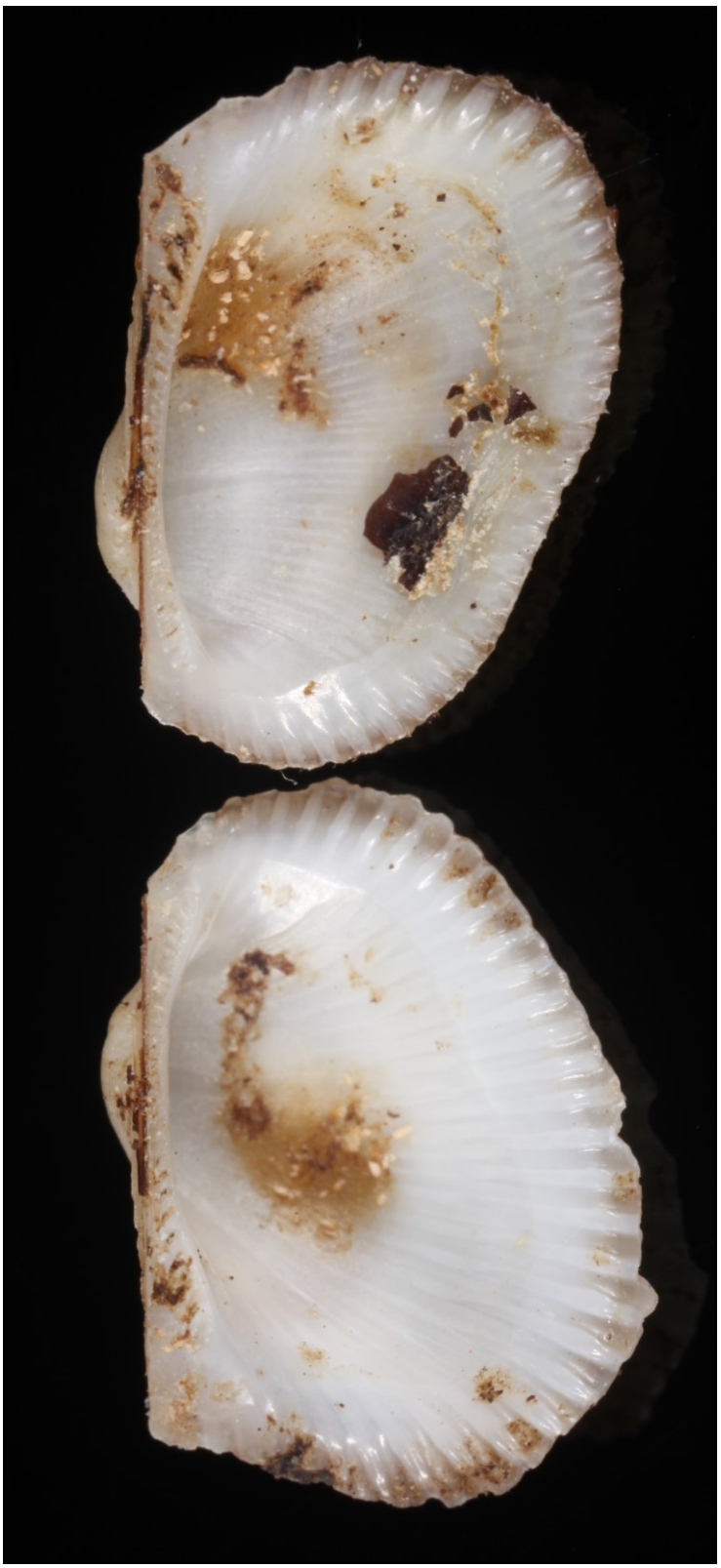

PLATE 7. *Anadara transversa* (showing tissue remains inside left and right valves).

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HOLOCENTROPUS DUBIUS (RAMBUR, 1842) NEW TO NORTHERN IRELAND WITH OTHER CADDISFLY (TRICHOPTERA) RECORDS FROM THE REGION

James P. O'Connor[1], M. A. O'Connor[1] and Cathal McNaughton[2]
[1]*c/o National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland.*
e-mail: <joconnor@museum.ie>
[2]*5 Middlepark Crescent, Cushendall, Co. Antrim BT44 0SD, Northern Ireland.*
e-mail: <cathalger@hotmail.co.uk>

Abstract

During recent field-work, *Holocentropus dubius* (Rambur, 1842) was discovered new to Northern Ireland. In addition, several new county records were found including *Apatania muliebris* McLachlan, 1866 which is new to County Antrim.

Key words: Trichoptera, caddisflies, *Holocentropus dubius*, *Apatania muliebris*, new Northern Ireland record, new county records.

Introduction

O'Connor, McNaughton and Langton (2017) provided a checklist of the caddisflies (Trichoptera) of Northern Ireland. Since then, *Hydroptila simulans* Mosely, 1920 and *Limnephilus borealis* (Zetterstedt, 1840) have been added to the fauna (O'Connor and McNaughton, 2017; O'Connor and Bond, 2018). This paper reports *Holocentropus dubius* (Rambur, 1842) as new to Northern Ireland, bringing the recorded total there to 112 species. Other interesting distributional records are also provided, including 11 new county records. The specimens were identified using Malicky (2004) and Barnard and Ross (2012). Distributional data are from O'Connor (2015). Voucher material of the rarer species has been retained in the O'Connor collection.

The new records

RHYACOPHILIDAE

***Rhyacophila dorsalis* (Curtis, 1834)**

ANTRIM: Craigagh Wood near Glendun River (D2232), 6♂♂ 28 September 2017; Dungonnell Dam near Cargan (the Ballysallagh Water exits this Dam) (D1917), 1♂ 13 June 2017; Glenariff River, tributary (D1821), 1♀ 15 July 2017, (D1819), 1♂ 5 July 2017; Glenariff River, upper reaches (D2020), 1♀ 6 July 2017; Glendun River, Clady Bridge (D2232), 1♀ 8 October 2017; Grenaghen Burn (D2321), 5♂♂1♀ 24 September 2017 and (D2322), 1♂1♀ 24 September 2017; Lough Garve (D2117), 1♀ 14 May 2018; Lough Natullig (D2421), 1♂ 24 September 2017; River Dall (D2327), 3♂♂ 23 September 2017; all C. McNaughton.

***Rhyacophila munda* McLachlan, 1862**

ANTRIM: River Braid, Ballymena, Grange Road (D1002), 3♂♂ 2 October 2017, C. McNaughton.

GLOSSOSOMATIDAE

***Agapetus fuscipes* Curtis, 1834 New to County Fermanagh (Fig. 1)**

FERMANAGH: River Erne, Bellanaleck Quay (H2339), 1♂ 5 June 2018, small stream nearby, J. P. O'Connor & M. A. O'Connor.

HYDROPTILIDAE

***Agraylea multipunctata* Curtis, 1834 New to County Antrim (Fig. 2)**

ANTRIM: Lough Garve (D2117), 1♀ 14 May 2018, gathered from vegetation, C. McNaughton; Lough na Trosk (D2719), 1♂ 17 May 2018, caught on the lake, C. McNaughton.

***Agraylea sexmaculata* Curtis, 1834 New to County Fermanagh (Fig. 3)**

FERMANAGH: Mill Lough (H2438), 1♂ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

***Hydroptila angulata* Mosely, 1922**

FERMANAGH: River Erne, Cloonatrig (H2637), 2♀♀ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

Previously known from the Lower Lough Erne.

***Hydroptila cornuta* Mosley, 1922 (Fig. 4)**

FERMANAGH: River Erne, Bellanaleck Quay (H2339), 2♂♂1♀ 5 June 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor.

Previously known from the Lower Lough Erne.

***Oxyethira flavicornis* (Pictet, 1834) New to County Antrim (Fig. 5)**

ANTRIM: Lough Garve (D2117), 1♂1♀ 9 June 2018; Lough na Bric (D2519), 1♀ 7 June 2018; Lough na Trosk (D2719), 1♂ 22 August 2018; all C. McNaughton.

PHILOPOTAMIDAE

***Philopotamus montanus* (Donovan, 1813)**

ANTRIM: stream near Aghalum (D2618), 1♂ 26 March 2018 and 1♂ 17 May 2018, C. McNaughton.

POLYCENTROPODIDAE

***Cyrnus flavidus* McLachlan, 1864 New to County Antrim (Fig. 6)**

ANTRIM: Lough Garve (D2117), 4♂♂ 1 June 2018, 1♂1♀ 4 June 2018 and 2♂♂ 9 June

2018, C. McNaughton.
FERMANAGH: River Erne, Cloonatrig (H2637), 2♂♂ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

***Holocentropus dubius* (Rambur, 1842) New to Northern Ireland (Fig. 7) (Plate 1)**
FERMANAGH: Mill Lough near Bellanaleck (H2438), 6♂♂1♀ 5 June 2018, swept from vegetation alongside a walkway over damp boggy ground, M. A. O'Connor, 1♂ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

***Holocentropus picicornis* (Stephens, 1836) New to County Antrim (Fig. 8)**
ANTRIM: Lough na Trosk (D2719), 1♂ 25 August 2018, C. McNaughton.

***Neureclipsis bimaculata* (Linnaeus, 1758)**
FERMANAGH: Mill Lough near Bellanaleck (H2438), 5♂♂12♀♀ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

***Plectrocnemia geniculata* McLachlan, 1871**
ANTRIM: Lough Garve (D2117), 1♂ 4 June 2018, C. McNaughton.

***Polycentropus flavomaculatus* (Pictet, 1834)**
ANTRIM: Ballycastle Marina (D1241), 1♀ 2 July 2018, probably from the nearby Glenshesk River, C. McNaughton.
FERMANAGH: River Erne, Cloonatrig (H2637), 3♂♂ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

***Polycentropus irroratus* (Curtis, 1835)**
FERMANAGH: Upper Lough Erne, Knockninny Marina (H2731), 1♂ 8 June 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor.

PSYCHOMYIIDAE

***Lype phaeopa* (Stephens, 1836)**
FERMANAGH: Lower Lough Erne, Castle Archdale (H1758), 1♂ 5 June 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor.

***Tinodes waeneri* (Linnaeus, 1758)**
ANTRIM: Lough na Bric (D2519), 1♂ 7 June 2018, C. McNaughton.

PHRYGANEIDAE

***Phryganea bipunctata* Retzius, 1783 New to County Antrim (Fig. 9)**
ANTRIM: Lough Fad (D2419), 1♂ 2 June 2018; Lough Garve (D2117), 3♂♂ 1 June 2018 and 1♂ 9 June 2018; Lough na Bric (D2519), 1♂ 23 June 2018; Lough na Trosk (D2719), 1♂ 3June 2018 and 1♀ 8 June 2018; all C. McNaughton.

***Phryganea grandis* Linnaeus, 1758 New to County Fermanagh (Fig. 10)**
FERMANAGH: Upper Lough Erne, Knockninny Marina (H2731), 1♂ 8 June 2018, freshly killed in a spider's web on a nearby building, J. P. O'Connor & M. A. O'Connor.

APATANIIDAE

***Apatania muliebris* McLachlan, 1866 New to County Antrim (Fig. 11) (Plate 2)**
ANTRIM: Garron Plateau (D2518), 1♀ 7 April 2018, a stream tributary of the Cranny Water, C. McNaughton.

This is the second record of this parthenogenetic glacial relict species from Northern Ireland. The specimen was high up on a path on the Garron Plateau between Lough na Trosk and the upper loughs (Fine, na Bric, Fad and Loughisland). Spring water flows on the path as it does on various places around those cliffs. *Apatania muliebris* was first taken in Northern Ireland in a Malaise trap situated in woodland west of Toomebridge and beside Lough Neagh, County Derry (Londonderry) (O'Connor, 2017).

LIMNEPHILIDAE

***Drusus annulatus* (Stephens, 1837)**
ANTRIM: Lough Garve (D2117), 1♀ 1 June 2018, C. McNaughton.
DERRY (LONDONDERRY): Coleraine Marina, River Bann (C8433), 2♀♀ 7 October 2017, swept and 2♂♂3♀♀ 9 October 2017, light-trap, C. McNaughton.
***Chaetopteryx villosa* (Fabricius, 1798)**
ANTRIM: River Dall, Cushendall (D2327), 1♂ 6 October 2017, C. McNaughton.
***Anabolia nervosa* (Curtis, 1834)**
ANTRIM: River Braid, Ballymena, Grange Road (D1002), 2♂♂ 2 October 2017, C. McNaughton.
***Limnephilus auricula* Curtis, 1834**
ANTRIM: Craigagh Wood, near Glendun River, Cushendun (D2232), 1♂ 28 September 2017, C. McNaughton.
***Limnephilus centralis* Curtis, 1834 New to County Fermanagh (Fig. 12)**
FERMANAGH: River Erne, Bellanaleck Quay (H2339), 1♂ 5 June 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor.
***Limnephilus elegans* Curtis, 1834**
ANTRIM: Lough na Trosk (D2719), 3♂♂ 22 May 2018, C. McNaughton.

This is the third record from Northern Ireland.

***Limnephilus flavicornis* (Fabricius, 1787)**
FERMANAGH: River Erne, Cloonatrig (H2637), 1♂ 5-6 June 2018, light-trap, J. P. O'Connor

& M. A. O'Connor.

***Limnephilus incisus* Curtis, 1834 (Fig. 13) (Plate 3)**

ANTRIM: Lough na Trosk (D2619), 1♀ 22 May 2018 & 1♀ 28 May 2018, gathered from vegetation, C. McNaughton.

This is the second record for County Antrim.

***Limnephilus lunatus* Curtis, 1834**

DERRY (LONDONDERRY): Coleraine Marina, River Bann (C8433), 1♀ 9 October 2017, light-trap, C. McNaughton.

***Halesus radiatus* (Curtis, 1834)**

DERRY (LONDONDERRY): Coleraine Marina, River Bann (C8433), 2♂♂ 9 October 2017, light-trap, C. McNaughton.

***Micropterna sequax* McLachlan, 1875**

ANTRIM: Craigagh Wood near Glendun River (D2232), 2♂♂ 28 September 2017, C. McNaughton.

***Potamophylax cingulatus* (Stephens, 1837)**

ANTRIM: Craigagh Wood near Glendun River (D2232), 2♂♂ 28 September 2017, C. McNaughton; tributary of the Cranny Water, Carnlough (D2718), 2♂♂ 18 September 2017, C. McNaughton.

***Potamophylax latipennis* (Curtis, 1834)**

ANTRIM: Craigagh Wood near Glendun River (D2232), 1♂♂ 28 September 2017, C. McNaughton.

SERICOSTOMATIDAE

***Sericostoma personatum* (Spence, 1826)**

ANTRIM: Lough Garve (D2117), 1♂1♀ 9 June 2018, C. McNaughton; Lough na Bric (D2519), 2♂♂3♀♀ 7 June 2018, C. McNaughton.

LEPTOCERIDAE

***Athripsodes aterrimus* (Stephens, 1836)**

ANTRIM: Lough Fine (D2520), 2♂♂ 7 June 2018, C. McNaughton.

The species is known from other lakes on the Garron Plateau.

***Oecetis furva* (Rambur, 1842) (Fig. 14)**

ANTRIM: Lough na Trosk (D2719), 1♂ 5 June 2018, C. McNaughton.

This is the second locality for the species in County Antrim.

***Oecetis ochracea* (Curtis, 1825) (Fig. 15)**

ANTRIM: Lough Garve (D2117), 4♂♂ 9 June 2018, two of the males occurred in the stomach

of a trout, C. McNaughton.

This is the second locality for the species in County Antrim.

Acknowledgement

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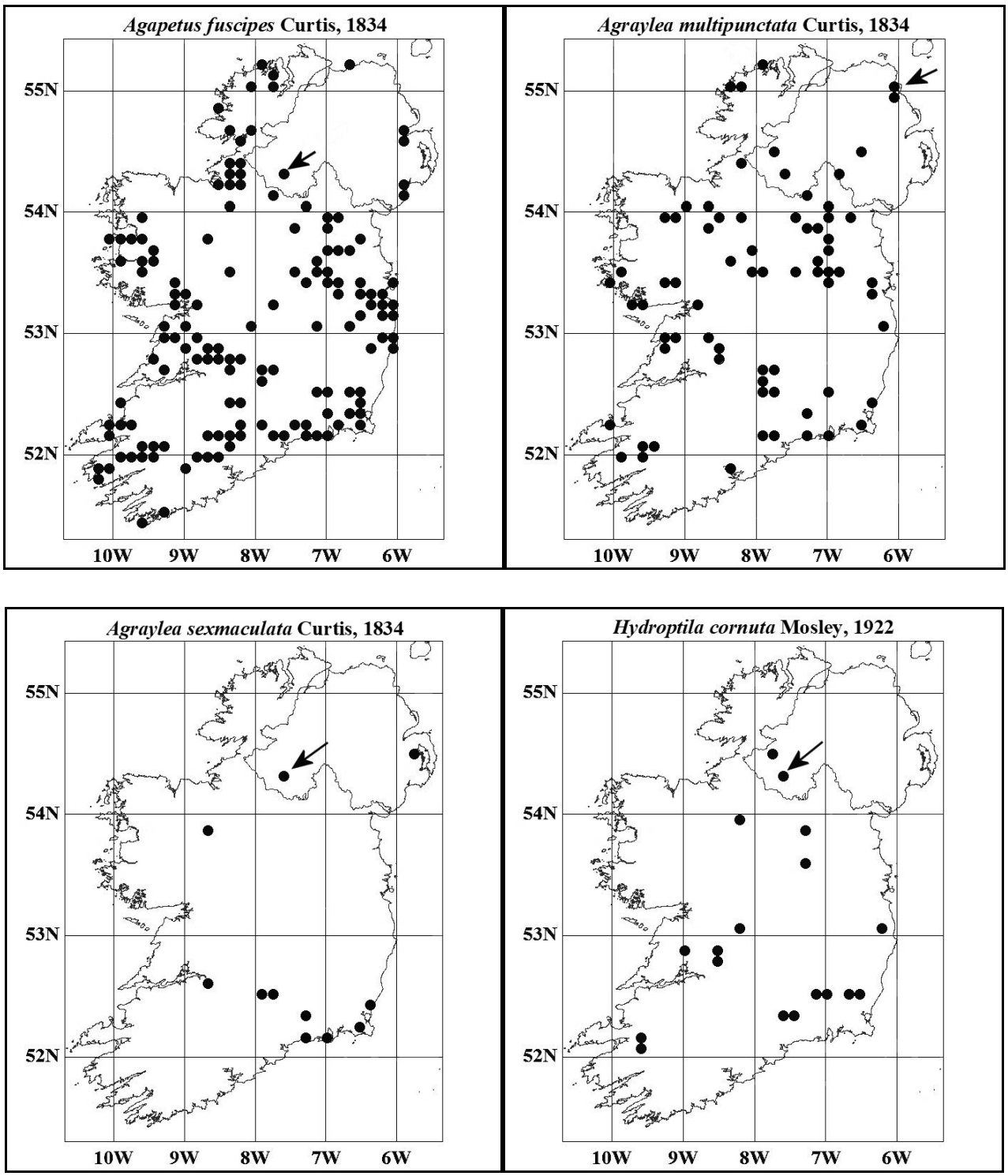
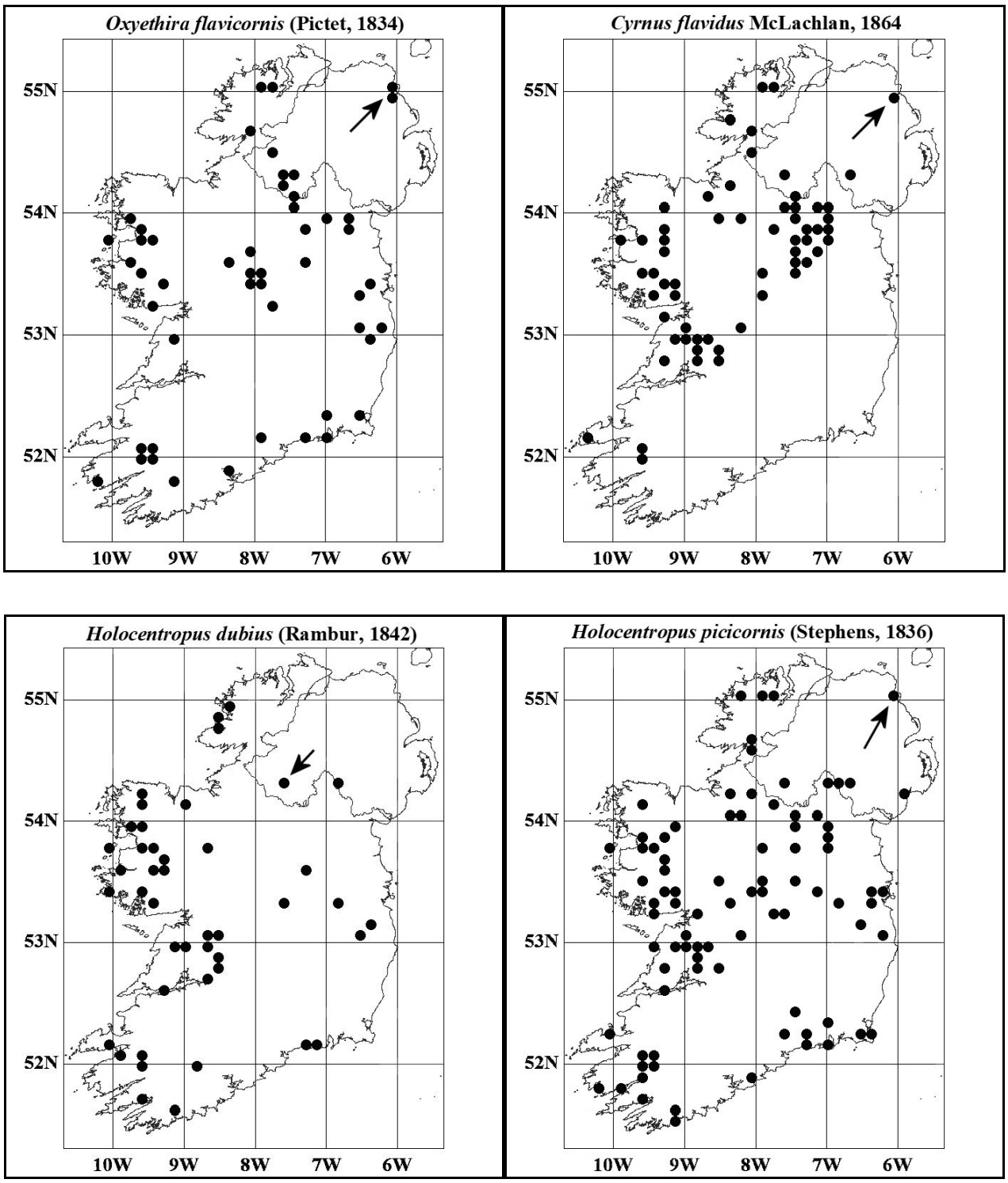
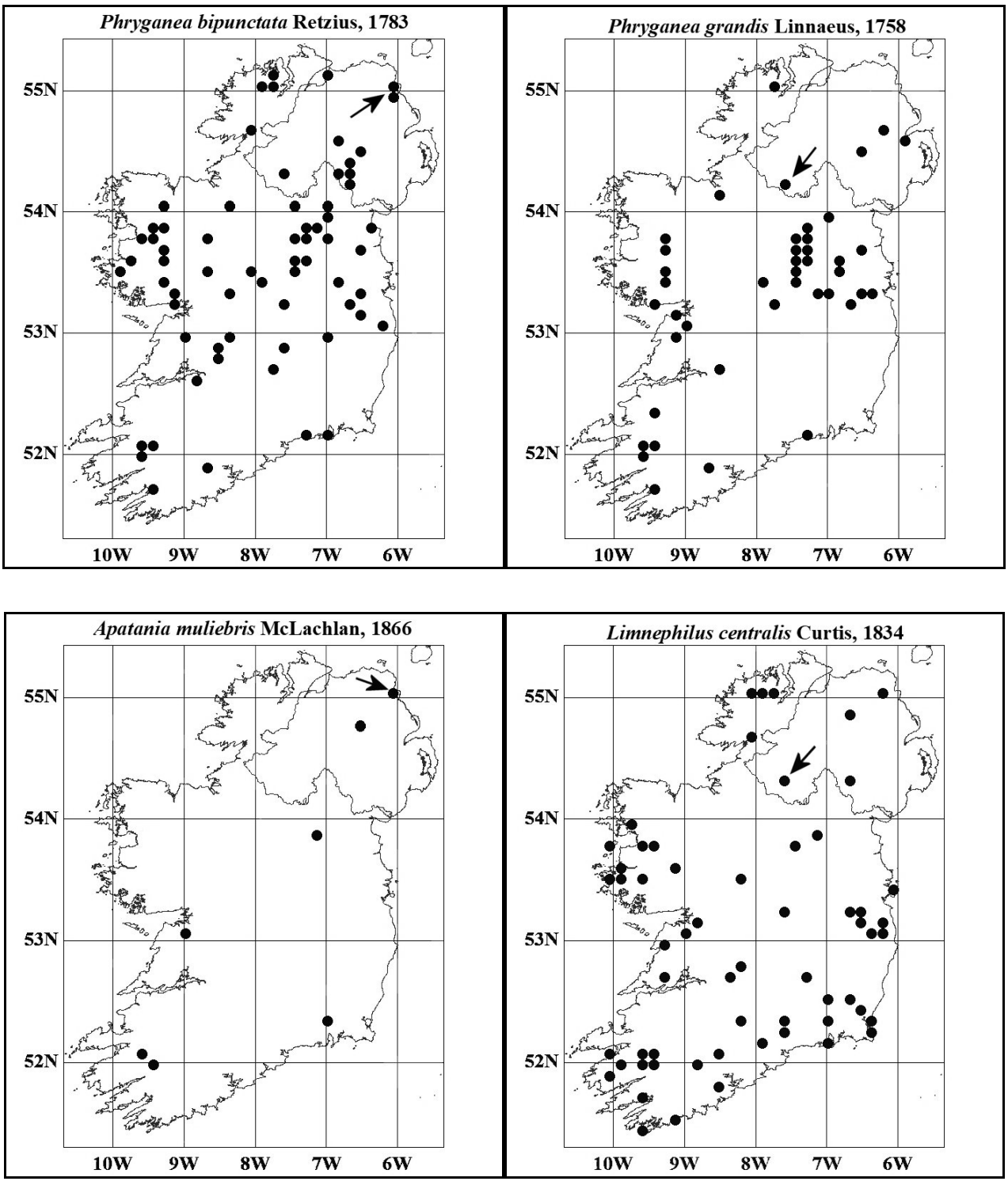


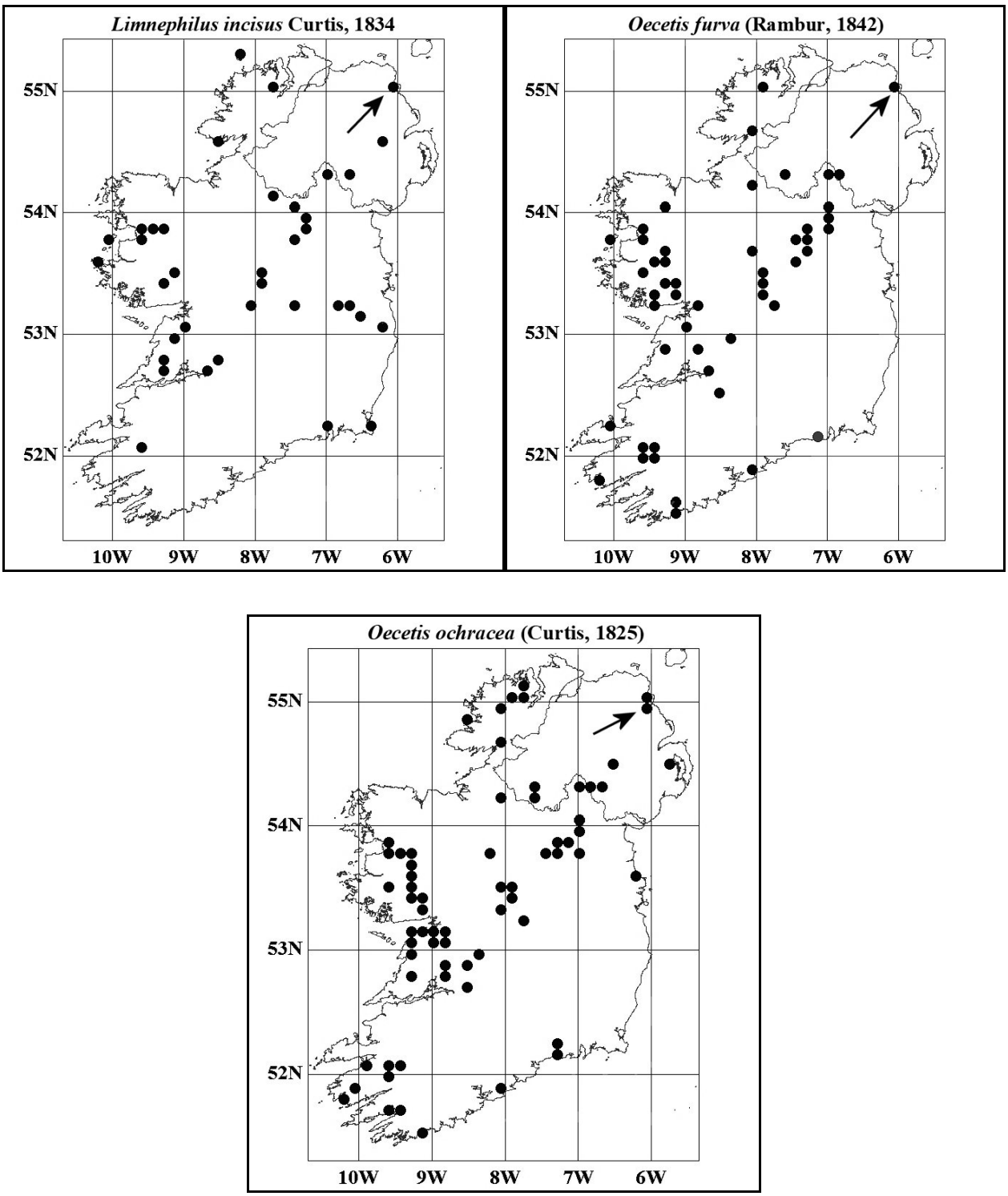
FIGURES 1-4. The known Irish distributions of *Agapetus fuscipes* Curtis, 1834, *Agraylea multipunctata* Curtis, 1834, *Agraylea sexmaculata* Curtis, 1834 and *Hydroptila cornuta* Mosley, 1922. The new records from Northern Ireland are indicated by arrows.



FIGURES 5-8. The known Irish distributions of *Oxyethira flavicornis* (Pictet, 1834), *Cyrnus flavidus* McLachlan, 1864, *Holocentropus dubius* (Rambur, 1842) and *Holocentropus picicornis* (Stephens, 1836). The new records from Northern Ireland are indicated by arrows.



FIGURES 9-12. The known Irish distributions of *Phryganea bipunctata* Retzius, 1783, *Phryganea grandis* Linnaeus, 1758, *Apatania muliebris* McLachlan, 1866 and *Limnephilus centralis* Curtis, 1834. The new records from Northern Ireland are indicated by arrows.



FIGURES 13-15. The known Irish distributions of *Limnephilus incisus* Curtis, 1834, *Oecetis furva* (Rambur, 1842) and *Oecetis ochracea* (Curtis, 1825). The new records from Northern Ireland are indicated by arrows.

PLATE 1. Mill Lough, County Fermanagh, where *Holocentropus dubius* was collected. Photograph © J. P. O'Connor.

PLATE 2. ♀ *Apatania muliebris*, 7 April 2018, from a stream tributary of the Cranny Water, County Antrim. Photograph © C. McNaughton.

PLATE 3. ♀ *Limnephilus incisus*, 28 May 2018, Lough na Trosk, County Antrim. Photograph © C. McNaughton.

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DISTRIBUTION RECORDS OF CHIRONOMIDAE (INSECTA: DIPTERA) IN IRELAND FROM RECENT COLLECTIONS

D. A. Murray[1] and J. P. O'Connor[2]
[1]*Emeritus Associate Professor, Freshwater Biodiversity, Ecology and Fisheries Research Group, School of Biology and Environmental Science, University College Dublin, Belfield, Dublin 4, Ireland.*
e-mail: <declan.murray@ucd.ie>
(address for correspondence: *Meadesbrook, Ashbourne, County Meath, A84 K727, Ireland.*)
[2]*Emeritus Entomologist, National Museum of Ireland - Natural History, Merrion Street, Dublin 2, Ireland.*

Abstract

Distribution data for 37 species of Chironomidae in Ireland are given from collections made in October 2017 and during 2018. Records are given from Counties Donegal, Dublin, Fermanagh, Laois, Meath, Roscommon and Wexford in Hydrometric Areas 7, 8, 9, 12, 14, 26 and 36.

Key words: Chironomidae, Diptera, Ireland, records, distribution.

Introduction

Continuing studies on the Irish Chironomidae have yielded additional records since publication of the extensive distribution data in Murray *et al*. (2013, 2014, 2015) and later in Murray (2016a, b, c; 2017a, b) and Murray and Ashe (2017). This paper reports species records from recent collections. Adult Chironomidae obtained in light trap collections by J. P. O'Connor & M. A. O'Connor in October 2017 and during 2018 from their ongoing review of Irish Trichoptera, were passed to the senior author for identification. Collections of adult chironomid males and pupal exuviae by the senior author provide additional data for 2018 that, together with the light trap collections by JPOC & MAOC and specimens provided by Paolo Viscardi, National Museum of Ireland - Natural History, gave records for Counties Donegal, Dublin, Fermanagh, Laois, Meath, Roscommon and Wexford among which are some new records for Counties Dublin, Laois, Roscommon and Wexford. The sites of these records lie in Hydrometric Areas 7, 8, 9, 12, 14, 26 and 36 and some records in Hydrometric Areas 9, 12, 14 and 37 are noted as first records for these Areas.

Abbreviations used

DAM - D. A. Murray; HA(s) - Hydrometric Area(s); JPOC - J. P. O'Connor; leg. - collected by; MAOC - M. A. O'Connor; Pe - pupal exuviae; ♂ - adult male.

Methods

Adult male chironomids were collected by light trap and aerial net sweeps. Pupal exuviae were collected by skimming surface waters with a fine mesh net. Samples were preserved in the field in 70% Alcohol. All determinations were made by the senior author. Adult males were identified from Langton and Pinder (2007) with further reference to Sæther (1990) for *Limnophyes* and Stur and Ekrem (2006) for species of *Micropsectra.* Pupal exuviae were identified from Langton and Visser (2003). Unless otherwise stated records are compiled from pupal exuviae, some identifiable without mounting but, where necessary, others were slide mounted as temporary mounts in glycerine or as permanent mounts in Euparol. Following the protocol in Murray *et al*. (2013) records are given by county and hydrometric area (see <www.epa.ie>) along with collection site information, Irish Grid Reference and date of collection.

Results and comments on species records

Records of 34 species are reported from seven counties (Donegal, Dublin, Fermanagh, Laois, Meath, Roscommon and Wexford) in nine hydrometric areas (HAs 7, 9, 10, 12, 14, 26, 36, 37 and 38). The data includes five species in the Subfamily Tanypodinae, ten in the Orthocladiinae and nineteen in the Chironominae (Chironomini, 12; Pseudochironomini, 1; Tanytarsini, 6).

Subfamily TANYPODINAE

[Unless stated otherwise references to previous records of Tanypodinae in Ireland are from Murray *et al.* (2013)].

***Ablabesmyia* (*Ablabesmyia*) *monilis* (Linnaeus, 1758)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

Ablabesmyia (*A.*) *monilis* is one of the most commonly found species of Tanypodinae in Ireland with over 280 distribution records. There are 15 previous records in HA 26, nine of which are in County Roscommon, but this is the first documented record of the species from Lough Ree.

***Ablabesmyia* (*Ablabesmyia*) *phatta* (Egger, 1864)**

MEATH: HA 7 - River Skane, Balgeeth, Kilmessan (N887594), 25 June 2018, ♂, leg. DAM.

Ablabesmyia (*A.*) *phatta* is known from over 90 locations in Ireland but until now was only on record from one location in County Meath, also in HA 7 on the River Boyne, into which the

River Skane feeds. The species is also on record from another three locations in HA 7 in County Cavan in the River Blackwater catchment, a tributary of the River Boyne.

***Apsectrotanypus trifascipennis* (Zetterstedt, 1838)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

There are ten previous records of this species in HA 26, four in County Roscommon of which one is also from Lough Ree on the east shore at Coosan in County Westmeath.

***Conchapelopia pallidula* (Meigen, 1818) New to County Roscommon**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

Although *Conchapelopia pallidula* is widespread in Ireland, this is the first record from County Roscommon and Lough Ree. A previous record is cited by Coe (1950) from nearby "Athlone", County Westmeath (HA 26).

***Procladius* (*Psilotanypus) rufovittatus* (van der Wulp, 1874) New to County Dublin and HA 9**

DUBLIN: HA 9 - artificial pond, University College Dublin, Belfield (O185300), 16 May 2018, ♂ and Pe, leg. DAM.

This is the first record of *Procladius rufovittatus* from County Dublin and HA 9 although it is known from the adjoining County Wicklow and HA 10. It has a widespread distribution in Ireland and is documented from 68 locations (Murray *et al.*, 2018).

Subfamily ORTHOCLADIINAE

[Unless stated otherwise references to previous records of Orthocladiinae in Ireland are from Murray *et al.* (2014)]

***Corynoneura carriana* Edwards, 1924**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

Murray *et al*. (2018) reported records of *Corynoneura carriana* from 13 locations in Ireland but none from County Roscommon. In addition to this record from Lough Ree, recent examination of collections undertaken in 1985, documented elsewhere in this volume (Murray, 2018), have yielded a record that pre-dates the finding at Hodson's Bay.

***Cricotopus* (*Isocladius*) *intersectus* (Staeger, 1839)**

DUBLIN: HA 9 - pond, University College Dublin (O186298), 16 May 2018, leg. DAM.

This is the second record of the species from County Dublin and HA 9. The earlier record was also reported from an artificial pond (Murray and Ashe, 2017).

***Cricotopus* (*Isocladius*) *sylvestris* (Fabricius, 1794)**

DUBLIN: HA 9 - pond, University College Dublin (O186298), 16 May 2018, leg. DAM.

Cricotopus (*Isocladius*) *sylvestris* is a very common species in Ireland and there are previous records from five other locations in HA 9, County Dublin including two from man-made

artificial ponds recently reported by Murray and Ashe (2017).

***Limnophyes minimus* (Meigen, 1818) New to County Wexford, HA 12 and the South Eastern River Basin District**

WEXFORD: HA 12 - tributary stream of the River Sow, Edenvale Estate, Castletown (T041272), 15 August 2018, ♂, leg. JPOC.

Adult specimens were found entangled in a pupal case of the trichopteran *Plectrocnemus geniculata* McLachlan. While there are records of *Limnophyes minimus* from 29 locations in Ireland, this is the first record of the species from County Wexford, Hydrometric Area 12 and the South Eastern River Basin District.

***Metriocnemus* (*Inermipupa*) *carmencitabertarum* Langton and Cobo, 1997 New to County Laois and HA 14**

LAOIS: HA 14 - Portarlington (N545121), 21 April 2018, ♂ at window, leg. P. Viscardi.

This species is considered a recent immigrant to Ireland that was first documented from HA 7 in County Meath (Murray, 2012). It is now known from 13 locations in the east of the country, in County Meath and the adjoining counties of Dublin, Kildare and Wicklow that encompass parts of HAs 7, 8, 9 and 10 all of which are constituent river catchments of the Eastern River Basin District. It is also documented from Northern Ireland (County Derry, HA 3). The new record from County Laois extends its known distribution southwards in Ireland to Hydrometric Area 14 in the South Eastern River Basin District.

***Metriocnemus* (*Metriocnemus*) *eurynotus* (Holmgren, 1883)**

MEATH: HA 7 - animal drinking trough, Ardsallagh, Navan (N896635), 18 June 2018, leg. DAM.

This species was first documented from Ireland in 1968 from County Meath (Murray, 1972). It is a commonly encountered species in Ireland whose larvae are frequently found in pools and ephemeral ponds but also in littoral regions of lakes and in small rivers and streams.

***Orthocladius* (*Orthocladius*) *oblidens* (Walker, 1856)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

This is one of the most common species of *Orthocladius* in Ireland with records from rivers and lakes throughout the country. There are over 20 records from HA 26, including two earlier records on Lough Ree at Yew Point, near Hodson's Bay, in September 2007.

***Psectrocladius* (*Allopsectrocladius*) *obvius* (Walker, 1856)**

DUBLIN: HA 9 - pond, O'Reilly Hall, University College Dublin (O185300), 16 May 2018, leg. DAM.

Psectrocladius obvius is commonly found in nutrient poor lakes ponds and pools (Murray *et al*., 2018). It was first documented on the campus of University College Dublin from a small temporary pool on 10 June 1966 (Murray, 1972).

***Psectrocladius* (*Psectrocladius*) *limbatellus* (Holmgren, 1869)**

MEATH: HA 7 - animal drinking trough, Ardsallagh, Navan (N896635), 18 June 2018, ♂ and Pe, leg. DAM.

This species was previously recorded from the same location in April 2000 and these are the only records to date from HA 7 although there are five records from similar artificial habitats in the adjoining HA 8 in County Meath.

***Psectrocladius* (*Psectrocladius*) *sordidellus* (Zetterstedt, 1838)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

This species is widely distributed in Ireland with records currently from 88 locations (Murray *et al.*, 2018). There are just two published records from County Roscommon (Murray *et al*., 2014; Murray and Ashe, 2017), however a further two records, from examination of samples in 1985 and 1986, are documented elsewhere in this volume in Murray (2018). The record at Hodson's Bay is the eighth record of the species for HA 26.

Subfamily CHIRONOMINAE

[Unless stated otherwise references to previous records of Chironominae in Ireland are from Murray *et al.* (2015)]

Tribe Chironomini

***Chironomus* (*Chironomus*) *alpestris* Goetghebuer, 1934 New to County Dublin and HA 8**

DUBLIN: HA 8 - Knock Pond (Wavin Lake), Balrothery (O192609), 12 October 2017, ♂, leg. JPOC & MAOC

Many earlier records of this species were given as *Chironomus dorsalis* auct. *sensu* Strenzke. This is the first record of the species in County Dublin and HA 8 although there are existing records from the adjoining County Meath in HAs 7 and 8.

***Chironomus* (*Chironomus*) *commutatus* Keyl, 1960 New to HA 37**

DONEGAL: HA 37 - Lough Eske (G973844), 7 June 2018, ♂, leg. JPOC & MAOC.

Several adult male imagines were collected by light trap at Lough Eske. While this is a new record for HA 37, the species was first recorded in County Donegal from the River Keenagh (HA 40) by B. P. Hayes in August 1982.

***Chironomus* (*Chironomus*) *plumosus* (Linnaeus, 1758) New to County Roscommon**

FERMANAGH: HA 36 - Mill Lough, Bellanaleck, Enniskillen (H240386), 6 June 2018, ♂, leg. JPOC & MAOC.

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

Chironomus (*C.*) *plumosus,* a characteristic species of organically enriched habitats, has a widespread distribution in Ireland. There are 15 records from HA 36, eight of which are in County Fermanagh. Surprisingly, the record from Lough Ree is the first documented account of

the species in County Roscommon although records exist from four other locations in HA 26 in Counties Cavan and Leitrim.

***Cryptochironomus redekei* (Kruseman, 1933) New to County Dublin and HA 9**

DUBLIN: HA 9 - pond, O'Reilly Hall, University College Dublin (O185300), 16 May 2018, leg. DAM.

This is the first record of *Cryptochironomus redekei* from the east of Ireland in County Dublin, HA 9 and the Eastern River Basin District. Previous records in Ireland are exclusively from four sites in County Galway (HAs 29, 30, 31, 32) and one site in County Leitrim (HA 26).

***Cryptochironomus supplicans* (Meigen, 1830)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

There are ten previous records of *Cryptochironomus supplicans* from HA 26, two of which are also from Lough Ree, one on the east shore at Coosan in County Westmeath and the second on the west shore at Yew Point on the promontory north of Hodson's Bay.

***Dicrotendipes tritomus* (Kieffer, 1916) New to HA 37**

DONEGAL: HA 37 - Lough Eske (G973844), 7 June 2018, ♂, leg JPOC & MAOC.

There are eleven prior records of this species from County Donegal in HAs 36, 38 and 39. The adult males obtained from light trap collections at Lough Eske provide the first records of the species from HA 37.

***Endochironomus albipennis* (Meigen, 1830)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

Endochironomus albipennis is a commonly encountered species. There are 25 previous records from HA 26, seven of which are from County Roscommon and one from the east shore of Lough Ree at Coosan, County Westmeath.

***Endochironomus tendens* (Fabricius, 1775) New to County Dublin and HA 8**

DUBLIN: HA 8 - Knock Pond (Wavin Lake), Balrothery (O192609), 12 October 2017, ♂, leg. JPOC & MAOC.

There are records of this species at 47 locations from ponds, pools and lakes in Ireland. It has a widespread distribution and is mostly known from northern, midland and south eastern counties. There are no previous records from County Dublin or HA 8 but it is on record from the Roundwood Reservoir in County Wicklow

***Glyptotendipes* (*Caulochironomus*) *scirpi* (Kieffer, 1915)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

This is the first record of the species from Lough Ree although there are five previous records documented in HA 26, three of which are in County Roscommon.

***Glyptotendipes* (*Glyptotendipes*) *pallens* (Meigen, 1804)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

There are five previous records of this species in HA 26, one from Lough Ree at Yew Point north of Hodson's Bay.

***Microtendipes pedellus* (De Geer, 1776)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

This species was first reported in HA 26 from collections made in 1968 near Cloone, County Leitrim (Murray, 1972). There are four published records from HA 26, one in County Roscommon. An additional record from Roscommon is reported from collections made in 1986 documented elsewhere in this volume (Murray, 2018). The record from Hodson's Bay is the first account of the species from Lough Ree, the third for County Roscommon and the sixth for HA 26.

***Nubensia nubens* (Edwards, 1929)**

FERMANAGH: HA 36 - Mill Lough, Bellanaleck, Enniskillen (H240386), 6 June 2018, ♂, leg. JPOC & MAOC.

This species is widely distributed throughout Ireland with early records documented as *Polypedilum* (*Pentapedilum*) *nubens*. There are eight previous records of this species from HA 36, six from County Fermanagh.

***Parachironomus gracilor* (Kieffer, 1918)**

DUBLIN: HA 9 - pond, O'Reilly Hall, University College Dublin (O185300), 16 May 2018, leg. DAM.

This is one of the more commonly encountered species of *Parachironomus* in Ireland with records from over 111 locations (Murray *et al*., 2018). This is the fourth record from HA 9 and County Dublin.

***Polypedilum* (*Pentapedilum*) *sordens* (van der Wulp, 1874)**

FERMANAGH: HA 36 - Mill Lough, Bellanaleck, Enniskillen (H240386), 6 June 2018, ♂, leg. JPOC & MAOC.

There are records of this species from 117 locations in Ireland, the majority of which are from lakes and ponds. There are 11 previous records in HA 36, eight of which are in County Fermanagh.

Tribe Pseudochironomini

***Pseudochironomus prasinatus* (Stæger, 1839)**

DONEGAL: HA 37 - Lough Eske (G973844), 7 June 2018, ♂, leg JPOC & MAOC.

Pseudochironomus prasinatus is widely distributed in Ireland with the majority of records from the western and north western regions where larvae are typical denizens of fine gravels in the littoral region of oligotrophic or mesotrophic lakes. There are 27 previous records from

County Donegal, mostly from HA 38. The two existing records from HA 37 are also from Lough Eske.

Tribe Tanytarsini

***Cladotanytarsus vanderwulpi* (Edwards, 1929)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

There are records of *Cladotanytarsus vanderwulpi* from 63 locations in Ireland (Murray *et al*., 2018). The majority of Irish records are from rivers with some from lake littoral regions. There are three existing records in HA 26, two from sites on the River Suck in County Roscommon.

***Micropsectra apposita* (Walker, 1856)**

MEATH: HA 7 - River Skane, Balgeeth, Kilmessan (N887594), 25 June 2018, ♂, leg. DAM.

There are four records of *Micropsectra apposita* in County Meath (Murray, 2016a) and this record of adult males from the River Skane constitutes a third location in HA 7.

***Micropsectra lindrothi* Goetghebuer, 1931**

MEATH: HA 7 - animal drinking trough, Ardsallagh, Navan (N896635), 18 June 2018, leg. DAM.

This species was previously reported from the same location in June 2000. There are now 12 records of *Micropsectra lindrothi* from County Meath, seven in HA 7 and five in the adjoining HA 8.

***Micropsectra pallidula* (Meigen, 1830))**

MEATH: HA 7 - River Skane, Balgeeth, Kilmessan (N887594), 25 June 2018, ♂, leg. DAM.

This is a common species in flowing waters that occasionally is found in ditches and water barrels. There are already 12 records of *Micropsectra pallidula* from County Meath, seven from 5 locations in HA 7 and five from two locations in HA 8 (Murray, 2016a).

***Paratanytarsus dissimilis* (Johannsen, 1905) New to HA 8**

DUBLIN: HA 8 - Knock Pond (Wavin Lake), Balrothery (O192609), 12 October 2017, ♂, leg. JPOC & MAOC.

MEATH: HA 7 - River Skane, Balgeeth, Kilmessan (N887594), 25 June 2018, ♂, leg. DAM.

There are records of this species from 55 sites in Ireland including two locations in HA 7 in County Meath one of which is on the River Skane at Dalgan, 4km downstream of the site of the present record. It was recently reported from County Dublin in HA 9 by Murray and Ashe (2017) but this is the first documented record of the species in HA 8.

***Paratanytarsus inopertus* (Walker, 1856)**

ROSCOMMON: HA 26 - Lough Ree, Hodson's Bay (N008464), 28 August 2018, leg. DAM.

Paratanytarsus inopertus is the most commonly encountered species of the genus in Ireland (Murray *et al.*, 2018). There are 35 records of the species in HA 26, 16 in County Roscommon including two from Lough Ree at Yew Point on the promontory north of Hodson's Bay. There is a further record of the species on L. Ree at Coosan on the opposite shoreline of the lake in County Westmeath.

***Tanytarsus usmaensis* Pagast, 1931 New to County Dublin and HA 8**

DUBLIN: HA 8 - Knock Pond (Wavin Lake), Balrothery (O192609), 12 October 2017, ♂, leg. JPOC & MAOC.

There are no previous records of this species in County Dublin or HA 8 although it is documented in HA 9 from the pond at the rere of Lyons House, County Kildare.

Summary

Records from light trap, aerial net and pupal exuviae collections in October 2017 and during 2018 are documented for 37 species in the data presented here. Nine species are noted as first county records: five in County Dublin, two in County Roscommon and one each in Counties Laois and Wexford. Nine species are also documented as first Hydrometric Area records: three in HA 8, two in HA 9, one each in HAs 12 and 14 and two in HA 37.

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Bulletin of the Irish Biogeographical Society **Number 42** (2018)

THE WINDOW WINGED SEDGE *HAGENELLA CLATHRATA* (KOLENATI, 1848) (TRICHOPTERA: PHRYGANEIDAE) CONFIRMED AS AN IRISH SPECIES

Martin P. Gammell[1], Caitriona M. Carlin[2], James P. O'Connor[3], Mary A. O'Connor[3] and John T. Brophy[4]

[1]*Marine and Freshwater Research Centre, Department of Natural Sciences, Galway-Mayo Institute of Technology, Dublin Road, Galway, H91 T8NW, Ireland.*
e-mail: <martin.gammell@gmit.ie>

[2]*Applied Ecology Unit, School of Natural Sciences, NUI Galway, Galway, H91 TK33 Ireland.*
email: <caitriona.carlin@nuigalway.ie>

[3]*c/o National Museum of Ireland – Natural History, Merrion Street, Dublin 2, D02 F627, Ireland.*
e-mail: <joconnor@museum.ie>

[4]*Botanical, Environmental & Conservation Consultants, 43 Herbert Lane, Dublin 2, D02TE86, Ireland.*
e-mail: <brophyjt@yahoo.com>

Abstract

The Window winged sedge *Hagenella clathrata* (Kolenati, 1848) was recently discovered at three sites in the west of Ireland, confirming its presence in Ireland. The Irish records are reviewed. Recommendations are provided for its conservation at the known Irish localities for the species in the west (County Galway) and midlands (County Laois).

Key words: Trichoptera, Phryganeidae, *Hagenella clathrata*, Window winged sedge, caddisfly, Ireland, presence confirmed, conservation.

Introduction

On 27 June 2017, the senior author informed JPOC that a photograph of a putative Irish specimen of the Window winged sedge *Hagenella clathrata* (Kolenati, 1848) (Trichoptera: Phryganeidae) had appeared on Facebook (in the Insects/Invertebrates of Ireland Group) with a request for its identification. The adult was photographed by Tina Claffey on 22 May 2016 in wet woodland beside Abbeyleix Bog, County Laois (Claffey personal communication, 2017; Claffey, 2017a, b) (Plate 1). Despite the photograph showing that the Abbeyleix specimen had testaceous legs (Plate 2), very characteristic of *H. clathrata*, the slim possibility existed that the individual could also be the widely distributed European species *Oligostomis reticulata* (Linnaeus, 1761) although that species is reported to have pitchy-black legs (McLachlan, 1874-1884). Both species are very similar in their general appearance and wing markings. If leg

colouration was a reliable means of identifying photographed specimens, then there were clearly misdetermined specimens of *H. clathrata* under the name *O. reticulata* on Google images (O'Connor and O'Connor, 2017). Consequently, it became necessary to collect a specimen for confirmation as the examination of the genitalia would resolve its identity, enabling the relevant species to be formally admitted to the Irish list. Both species have similar Continental European distributions, but only *H. clathrata* occurs in Great Britain (Figs 1-2).

Abbeyleix Bog and the original discovery

A native of Birr, County Offaly, Tina Claffey studied art and graduated in 1994 with a degree in Photography and Printmaking. Subsequently, she spent several years in Botswana, southern Africa before permanently returning to Ireland. In 2011, she joined an Eco Walk on Killaun Bog, County Offaly, a small raised bog near Birr and returned the next day with her camera. Thus, began her photographic studies of the plants and animals of Irish bogs, many of which are reproduced in her book *Tapestry of Light* (Claffey, 2017b) and in which she recorded *Hagenella clathrata* as new to Ireland. Having already photographed a caddis larva (probably *Limnephilus flavicornis or L. marmoratus*) at Killaun Bog for her planned book, she wanted to include a photograph of an adult. As a result, she visited Abbeyleix Bog, County Laois, where she happened to come across and photograph the adult of *H. clathrata* (Plate 2).

The Abbeyleix Bog Project (ABP) conserves and protects the Bog as an open access amenity, developed by volunteers to benefit all. The Project local action group known as AREA (Abbeyleix Residents for Environment Action) was established in 2000 to conserve and protect the Bog which was threatened with harvesting for peat moss. Following negotiations with Bord Na Móna (the Irish Peat Board), a lease was signed in 2010 which handed the Bog over to the local community to manage for a period of 50 years with a primary focus on conservation. The Bog is situated on the southern periphery of Abbeyleix town and encompasses an area of almost 500 acres of diverse habitats including degraded (but recovering) raised bog, lagg, cutaway, wet carr woodland and meadows (Anon, 2018a).

In order to confirm the identity of *H. clathrata*, the authors worked as two separate teams (MPG, CMC & JTB; JPOC & MAOC) on the Bog and made several visits there to collect a specimen of *H. clathrata* but with no success. Field-work included net-sweeping and light-trapping. However, a difficulty with locating adults of *H. clathrata* is that, although they may be found from May to July, their flight can last locally for only about two weeks (Wallace, 2011; Salokanel and Mattila, 2018). Nevertheless as a result of the field-work, several other trichopteran species were discovered new to County Laois or/and Abbeyleix Bog.

The Galway discovery

On 1 June 2018, while MPG and CMC were trying to film/photograph Marsh Fritillary butterflies (*Euphydryas aurinia* (Rottemburg, 1775)) (Lepidoptera) on bogland at Ower, County Galway, the senior author noticed a dark caddisfly flying around and realised that it could be *Hagenella clathrata* (Plate 3). It was darker than he was expecting, but he saw some yellow markings through his binoculars. The specimen was hand collected and identified as a male of *H. clathrata* by the senior author using Malicky (2004) before being sent to JPOC for confirmation. A few other active individuals were seen at the site and also on subsequent visits to the general area. All the specimens seen at the first site at Ower were dark, but adults with normal colouration (Plate 4) were subsequently observed by MPG and CMC at two other sites, some 1.5km distant (Fig 3). A dark form of *H. clathrata* (*melanoptera*) also occurs in Finland (Salokanel and Mattila, 2018). Although Ian and Brenda Wallace have seen many adults of *H. clathrata*, they have never come across a dark form (Ian Wallace, pers. comm.) so its discovery in Ireland is unexpected.

The first site in Galway where *H. clathrata* was discovered lies in the Lough Corrib Special Area of Conservation (SAC), but its other localities are unprotected. This large SAC contains four discrete raised bog areas and was selected for the habitats of *inter alia* active raised bog, degraded raised bog and bog woodland. The active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. The degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration (Anon., 2018b).

The Irish records of *Hagenella clathrata* (Kolenati, 1848)

GALWAY: Ower (M2237), 1♂ 1 June 2018, field observation and collection by hand, M. P. Gammell and C. M. Carlin, conf. J. P. O'Connor (This male has been deposited in the National Museum of Ireland); same site 2+ adults 3 June 2018, field observation/photograph, M. P. Gammell and C. M. Carlin; Ower (M2138), adult 3 June 2018, field observation/photograph, M. P. Gammell and C. M. Carlin; Callownamuck (M2139), adult 6 June 2018, field observation/photograph, M. P. Gammell and C. M. Carlin.

The site at Ower, within the Lough Corrib SAC, was visited again on 9 June 2018 and 22 June 2018, but there were no further sightings of *H. clathrata* on those dates.

LAOIS: photographed in wet woodland beside Abbeyleix Bog (S4383), adult 22 May 2016, T. Claffey, det. M. P. Gammell (Claffey, 2017b).

The location of the sites in County Galway is shown along with its known Irish and European distributions (Figs 1, 3-5). *H. clathrata* is presently recorded from two 10km squares in Ireland.

Discussion

As the Window winged sedge (*Hagenella clathrata*) is a priority species within the UK Biodiversity Action Plan, Wallace (2011) wrote an excellent species dossier and that document along with the detailed account in Wallace (2016) should be consulted for additional ecological and other information not mentioned here. *H. clathrata* is a scheduled species in Holland under an EC directive, being classed as vulnerable. From various websites, it is listed as threatened with extinction in the German states of Nordrhein-Westfalen, Bayern, Berlin, and Mecklenburg-Verpommen, critically endangered in Norway, endangered in the German state of Baden-Wurtemburg and Switzerland, seriously threatened in Poland, Ukraine and Belarus, threatened in the Czech Republic, vulnerable in Denmark, Sweden, Hungary and the Ardenne in France, on the Red List for Carinthia in Austria, the Leningrad region of Russia, and Estonia. Only in Finland, does it seem to be still widespread. Czachorowski (2004) provides a good summary of the predicament of this species as vanishing almost everywhere in Europe as bogs are exploited with the need for bogs to be protected and peat workings restored. In view of the decline of *H. clathrata* in Europe, its discovery at four Irish sites is a significant event for its conservation.

In Britain, the species uses three types of site *viz.* the edge of lowland raised bogs, the edge of schwingmoors (quaking bogs), and wet heaths. At all these sites, it is associated with areas with well-developed tussocks, principally of purple moor grass (*Molinia caerulea*) (Wallace, 2011).

The larva lives mainly in small pools, sometimes only inches across, between large tussocks of the *Molinia*. The pools are usually roofed over by fallen dead leaves of the grass so that very little open water is apparent. A characteristic of *Hagenella* sites is that there are usually no obvious water bodies. The pools usually dry out during summer. The eggs are laid in June and July, and in captivity did not appear to be particularly resistant to drying, unlike those of many limnephilids that use temporary water bodies. It may be that they leave the egg-mass soon after hatching and then burrow into the saturated peat and do not start to develop until the water level rises in autumn; this behaviour has been noted for the trichopteran *Limnephilus luridus* Curtis. Dead birch (*Betula* spp.) tree leaves appear to be used for case construction and food. However, other phryganeids are known to be carnivorous, which may also be the case for this species (Wallace, 2016).

Conservation

Wallace (2016) states that maintenance of a suitable water regime at a site is presumably critical. Drying out, but also damming of drains and ponding are both detrimental. It is possible that slight water-flow through the peat body is necessary. Digging pools within the habitat, for example to encourage dragonflies is undesirable as they act as sumps and drain surrounding marsh. The adults are not found away from breeding sites suggesting that it is not a mobile species and would not move very far to colonise new areas prepared for it, assuming the habitat could be re-created.

The unexpected discovery of *Hagenella clathrata* in Ireland brings the Irish list to 152 known species. With further research, the Window winged sedge may be shown to be widely distributed on the island, for in the past, little attention was paid to the trichopteran fauna of the Irish bogs - a situation which has improved due to better public access, including the provision of board walks. The increasing number of naturalists photographing insects on the bogs should also provide additional records and new sites. However, the experience across most of its range is that it is not found in all suitable habitat (Ian Wallace, pers. comm.) so the existing sites must be protected. It is important that the known Irish sites are maintained in their existing natural condition and safeguarded from fast man-made changes. Ian Wallace (pers. comm.) also advises that as a first step, leave well alone may seem good advice, but this is a species of the margins of habitats and will disappear as sites dry up naturally, i.e. are left alone. An example would be Chartley Moss in England, where it is found in a zone between a schwingmoor and tall carr; the pool is shrinking and will eventually go, and so will the margins and *Hagenella clathrata*. At Whixall Moss, also in England, it needed very careful birch removal to stop the drying out of one patch. Unfortunately, it appears that all of the known Galway sites are currently being affected by peat extraction and/or drainage, including the site within the Lough Corrib SAC (Plate 5). This has implications for the continued survival of *H. clathrata* at these sites. Studies are needed to check that the habitat that is being used by *H. clathrata* is likely to continue to be present.

Acknowledgements

The authors are indebted to Dr Ian Wallace for reading a draft of the ms and for his helpful and constructive comments. He also provided invaluable advice on the conservation of *Hagenella clathrata* in Ireland. We also wish to thank Tina Claffey for the photograph of the Laois *H. clathrata* and for information on her discovery; Dr Liam Lysaght for permission to reproduce the photograph in Plate 1; Dr Alan Morton for supplying the relevant software programme used for preparing the Irish distribution map with DMAP; Dr Peter Neu for

permission to include the distribution maps from the *Distribution Atlas of European Trichoptera* and for kindly supplying jpegs of those maps.

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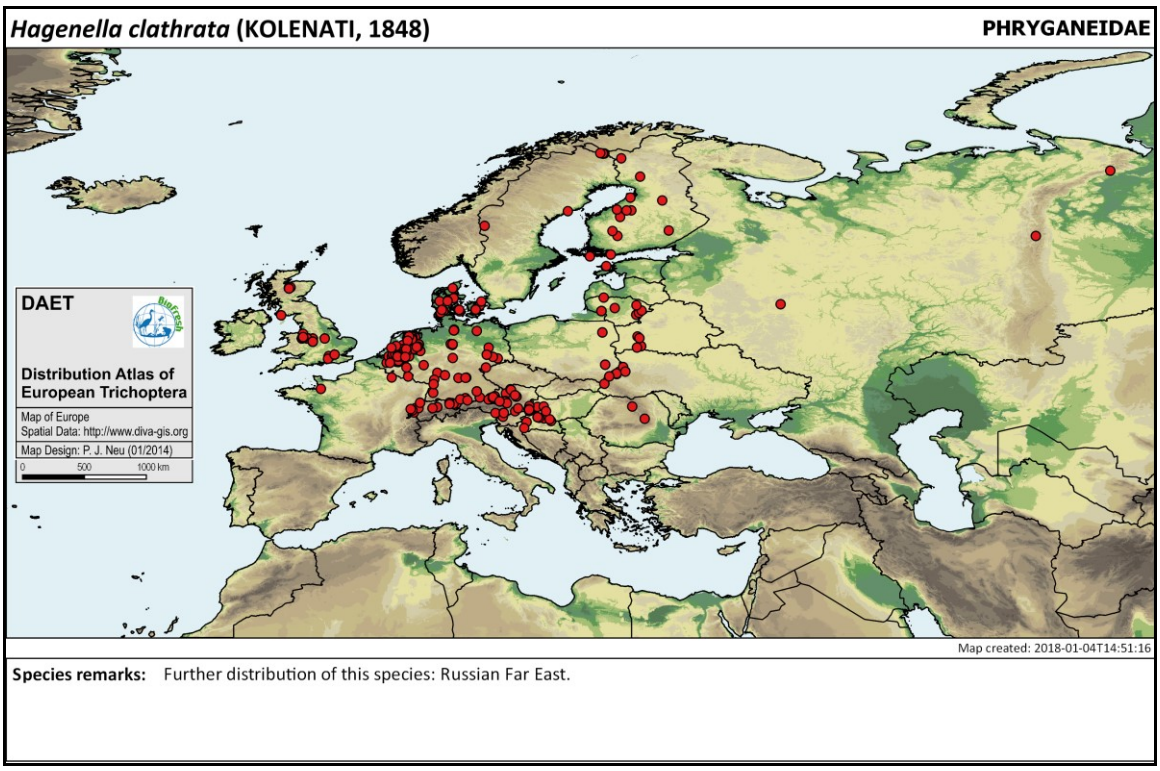
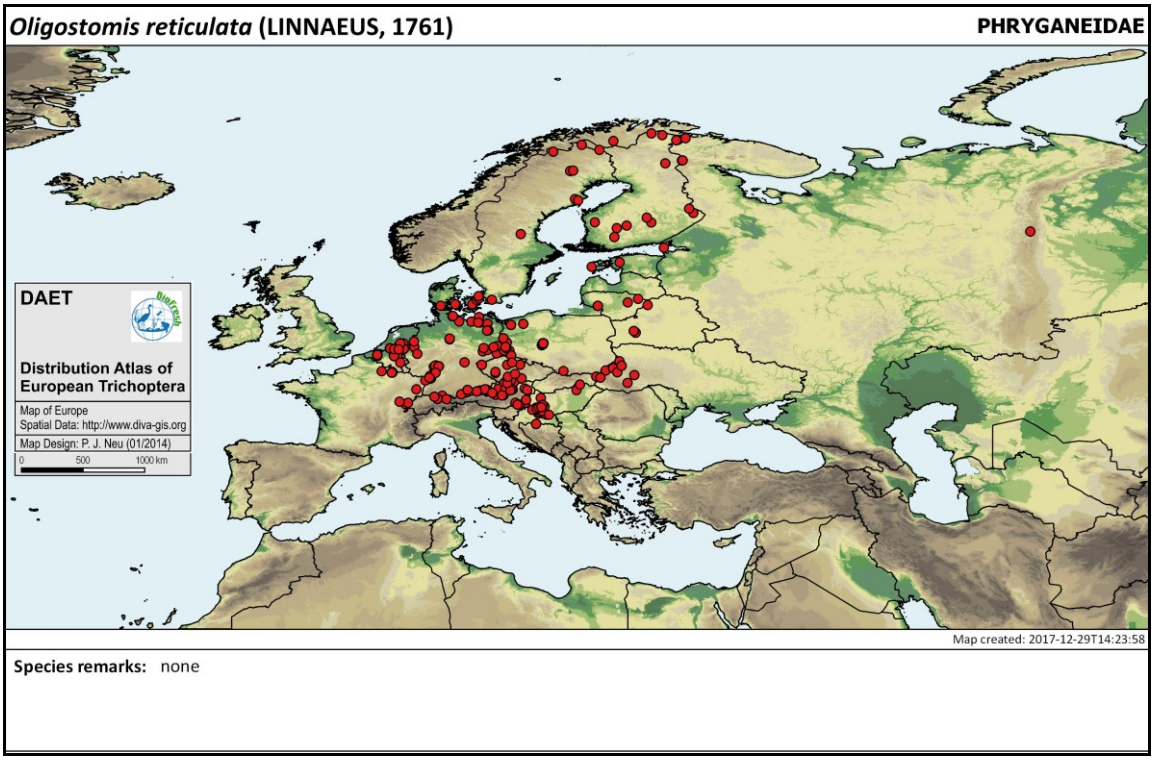




FIGURES 1-2. The European distributions of *Hagenella clathrata* and *Oligostomis reticulata* (from Neu *et al*., 2018).

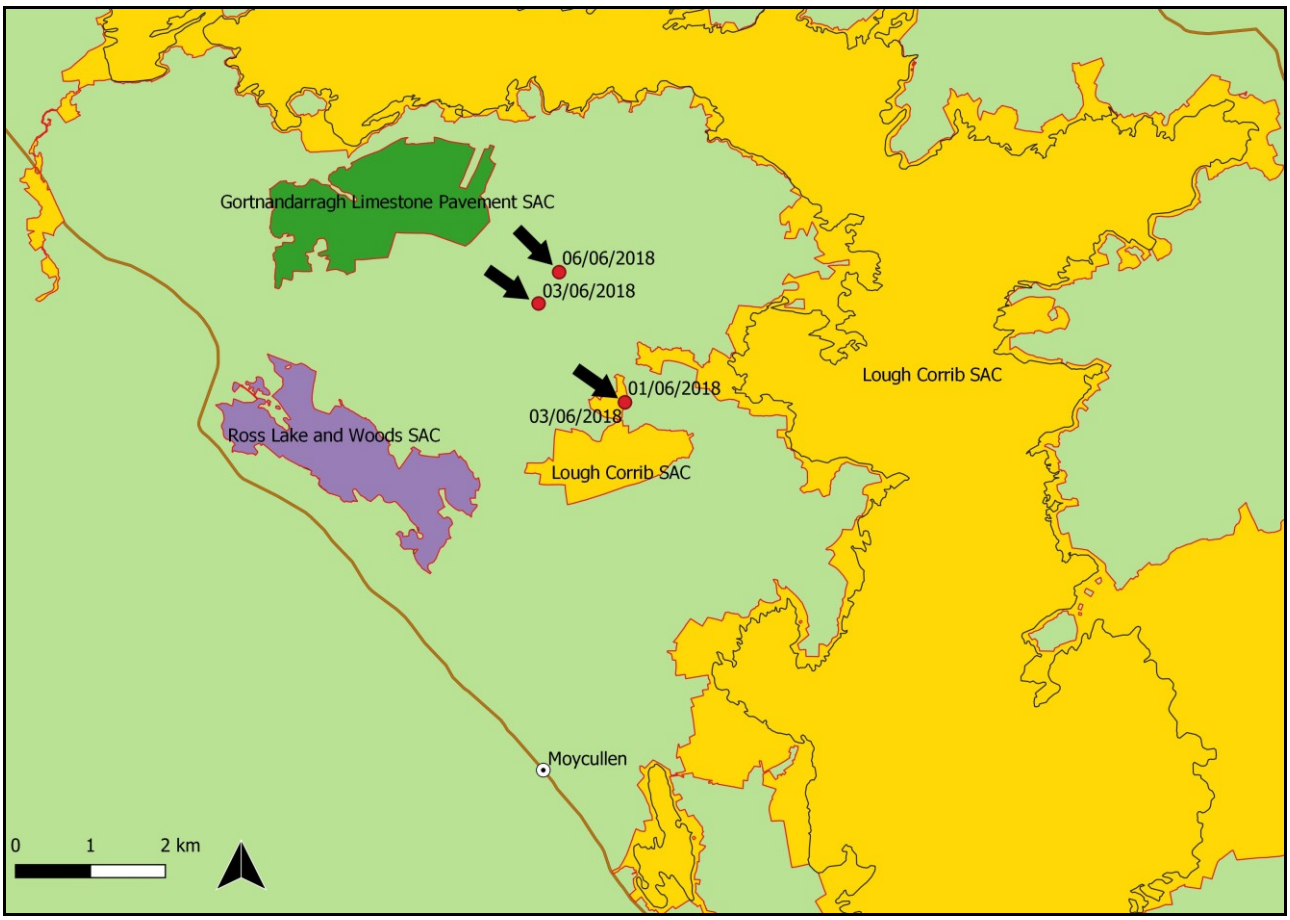
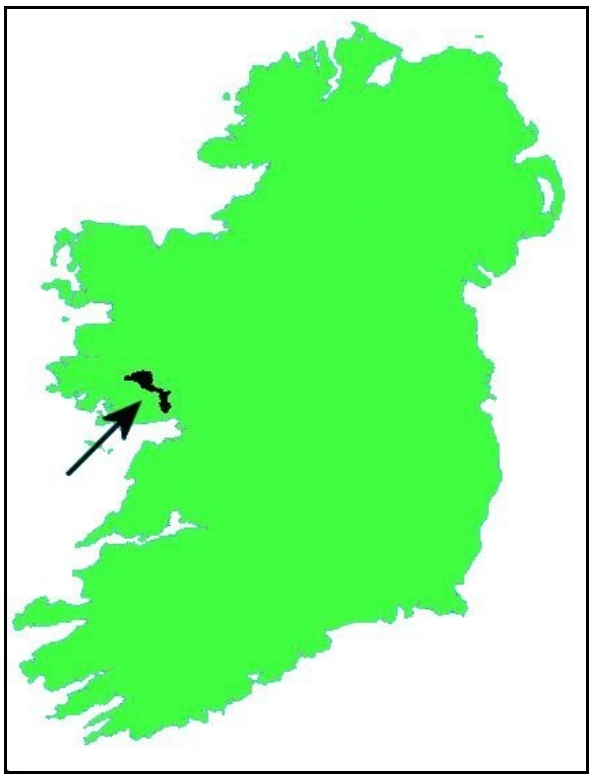
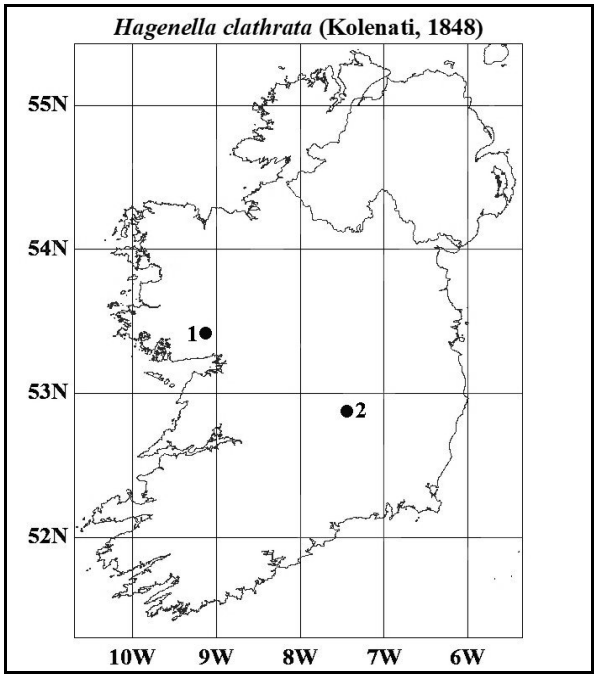


FIGURE 3. Map of the area west of Lough Corrib and north of Moycullen in County Galway where the Window winged sedge *Hagenella clathrata* was found between 1 June 2018 and 6 June 2018. The red dots and arrows mark the locations of the *H. clathrata* sightings (dates of sightings are included). Lough Corrib is indicated by the black outline within the Lough Corrib Corrib SAC (yellow). The area in light green is unprotected.





FIGURES 4-5. The known Irish distribution of *Hagenella clathrata.*
Fig. 4: Lough Corrib is shown in black and the area with the *Hagenella* sites indicated by an arrow. Fig. 5: the Irish distribution. 1 = Galway sites; 2 = Laois site.

PLATE 1. A section of Abbeyleix Bog, County Laois. The area of wet woodland where the specimen of *Hagenella clathrata* was photographed by Tina Claffey is indicated by a red arrow. Photograph © National Biodiversity Data Centre.

PLATE 2. The live adult of *Hagenella clathrata* at Abbeyleix Bog, County Laois. Photograph © Tina Claffey.

PLATE 3. *Hagenella clathrata*. A live dark coloured adult from Ower, County Galway. Photograph © Caitriona Carlin.

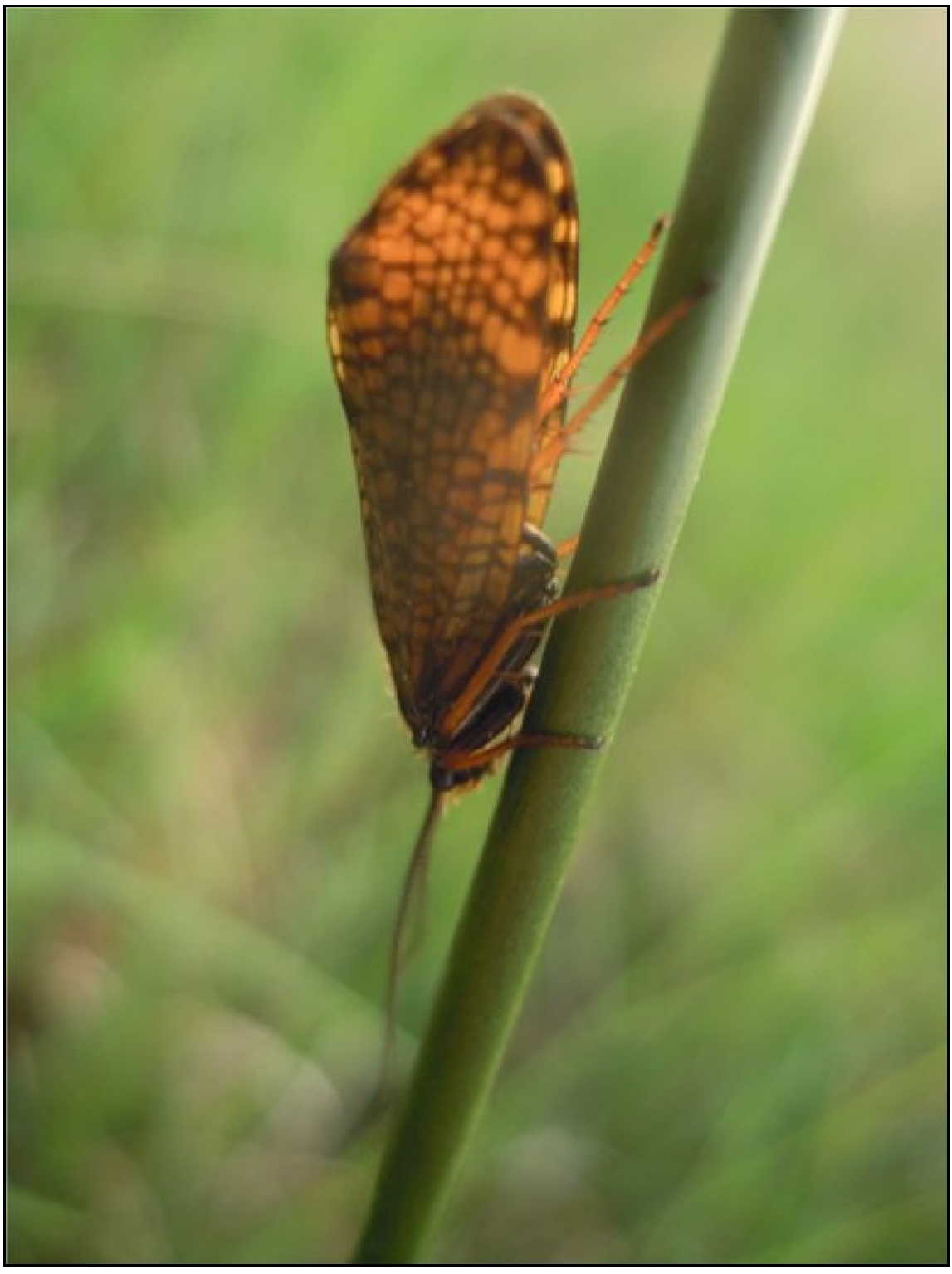


PLATE 4. *Hagenella clathrata*. A live normally coloured adult from Callownamuck, County Galway. Photograph © Martin Gammell.

PLATE 5. The site at Ower, County Galway, within the Lough Corrib SAC, showing land 'improvement' and drainage at the boundary of the SAC, presumably affecting the water regime within the SAC. Photograph © Caitriona Carlin.

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FURTHER DISTRIBUTION RECORDS OF CHIRONOMIDAE (INSECTA: DIPTERA) IN IRELAND FROM PAST COLLECTIONS

D. A. Murray
Emeritus Associate Professor, Freshwater Biodiversity, Ecology and Fisheries Research Group, School of Biology and Environmental Science, University College Dublin, Belfield, Dublin 4, Ireland.
e-mail: <declan.murray@ucd.ie>
(address for correspondence: *Meadesbrook, Ashbourne, Co. Meath, A84 K727, Ireland*.)

Abstract

Distribution data for 113 records of 69 species of Chironomidae in Ireland is given from examination of pupal exuviae in preserved samples collected in the 1980s. New records of 26 species are given for seven Counties: Dublin, Donegal, Galway, Offaly, Roscommon, Sligo and Wicklow as well as new records of 34 species in nine Hydrometric Areas: 9, 10, 25, 26, 27, 29, 32, 35 and 38. *Bryophaenocladius muscicola* Kieffer is documented as new to County Galway and Hydrometric Area 32 from a slide preparation previously mistakenly identified and reported as *B. subvernalis* (Edwards).

Key words: Chironomidae, Diptera, records, distribution, Ireland.

Introduction

Murray and Ashe (2017) reported species records of Chironomidae in remnants of bulk samples of formalin-preserved collections, taken in the littoral areas of small lakes and ponds between 1984 and 1986 by Catherine Duigan as part of her Ph.D. research on Irish *Cladocera* (Duigan, 1989, 1992). The samples, from which *Cladocera* had been removed, remained in the author's custody pending examination. The opportunity arose in 2016 to commence that examination. Results from examination of part of those samples were reported in Murray and Ashe (2017). The remaining samples have now been analysed and the resulting species records from identification of pupal exuviae in those samples are documented here - as well as updated distribution data on two species of Orthocladiinae: *Bryophaenocladius muscicola* Kieffer and *Corynoneura edwardsi* Brundin.

Abbreviations used

HA(s) - Hydrometric Area(s); leg. – collected by.

Methods

Apart from two records, those of *Bryophaenocladius muscicola* and *Corynoneura edwardsi*, all of the records reported here are based on the identification of pupal exuviae extracted from the formalin-preserved samples that were collected by Duigan (1989) between 1984 and 1986 for her studies on the Irish Cladocera. Aliquots of the formalin-preserved samples were examined under 10x or 25x microscopy and chironomid pupal exuviae present were removed. Exuviae were identified mostly from Langton and Visser (2003). Some exuviae were identifiable without mounting but, where necessary, others were slide mounted as temporary mounts in glycerine or as permanent mounts in Euparol. Following the protocol adopted in Murray *et al*. (2013), records are given by county and hydrometric area (see <www.epa.ie> for details of hydrometric areas in Ireland), collection site information, Irish Grid Reference and date of collection. Unless otherwise stated, the records from lakes, ponds and turloughs from the 1980s are based on the collections made by Catherine Duigan (Duigan, 1989).

Results

Records for 70 species level taxa of Chironomidae - 68 species and two pupal morphotypes - are reported from ten counties (Cavan, Clare, Donegal, Dublin, Galway, Offaly, Roscommon, Sligo, Tipperary and Wicklow) in twelve hydrometric areas (HAs 9, 10, 25, 26, 27, 28, 29, 31, 32, 35, 37 and 38). Distribution data in Counties and HAs is given for nine species in the Subfamily Tanypodinae, one each in the Subfamilies Diamesinae and Prodiamesinae; thirty five (including one pupal morphotype) in the Subfamily Orthocladiinae and twenty four in the Subfamily Chironominae (Chironomini, 14; Pseudochironomini, 1; Tanytarsini 9 (including a pupal morphotype)).

Subfamily TANYPODINAE

[References to previous records of Tanypodinae, Diamesinae and Prodiamesinae in Ireland are from Murray *et al.* (2013) unless stated otherwise.]

***Ablabesmyia* (*Ablabesmyia*) *monilis* (Linnaeus, 1758)**

DONEGAL: HA 38 - Lough Anillanowennamarve, Doocharry (B839071), 25 October 1985. **GALWAY: HA 29 -** Turlough na Néan, Gort (R430989), 1 November 1985. **ROSCOMMON: HA 26 -** Coolagarry Lough, Brideswell (M900475), 1 June 1985.

Ablabesmyia monilis is widely distributed in Ireland and records already exist from the three counties and HAs cited here.

***Ablabesmyia* (*Ablabesmyia*) *phatta* (Egger, 1864)**

GALWAY: HA 29 - Turlough na Néan, Gort (R430989), 13 October 1985.

There are 19 known records of this species in County Galway in HAs 30 and 31 and this

record in 1985 from the turlough at Gort predates the only other known published record for HA 29 - from Lough Rea in May 2003.

***Anatopynia plumipes* (Fries, 1823) New to County Dublin**

DUBLIN: HA 9 - pond, Phoenix Park (O103364), 23 March 1984.

There are relatively few records of *Anatopynia plumipes* as it has as been previously recorded from only ten locations in Ireland, mostly in the northern two-thirds of the country. There is one existing record in HA 9 in County Kildare but this is the first record of the species from County Dublin.

***Macropelopia nebulosa* (Meigen, 1804)**

DONEGAL: HA 38 - Lough Nasnahida, Doocharry (B851075), 25 October 1985.

Macropelopia nebulosa is a commonly found species in Ireland. There are 11 records of the species in County Donegal - two in HA 36, one in HA 37 and eight in HA 38, the earliest of which was from collections by the author at Killybegs in HA 38 in August 1984.

***Monopelopia* (*Monopelopia*) *tenuicalcar* (Kieffer, 1918) New to County Roscommon and HA 26**

DONEGAL: HA 38 - Sphagnum bog pool near Lough Fadda, Rinnafarset (B798201), 26 October 1985. **ROSCOMMON: HA 26 -** Lough Croan (Turlough), Lismoyle (M880497), 24 April 1984.

Records of *Monopelopia tenuicalcar* are sparse in Ireland. Where present, larvae of this species are commonly found among growths of *Sphagnum* in acidic bog pools. It is known from ten Irish locations, including one on Clare Island. There are two existing records from HA 38 in County Donegal based on specimens collected in 1988 in the Glenveagh National Park. The record from Lough Croan constitutes the first record of the species in HA 26 and County Roscommon.

***Procladius* (*Holotanypus*) *choreus* (Zetterstedt, 1850)**

GALWAY: HA 29 - Lough Cutra, Gort (R485986), 12 October 1985. **ROSCOMMON: HA 26 -** Coolgarry Lough, Brideswell (M900475), 1 June 1985. **WICKLOW: HA 10 -** Lough Dan, Roundwood (O157035), 3 October 1984.

Procladius choreus is a widespread species throughout Ireland. Eight records are already documented from HA 29 in Galway, including a record by P. H. Langton in 2003 from Lough Cutra (Murray *et al*., 2013). There are twenty records from HA 26, ten of which are in County Roscommon while there are seven in HA 10, County Wicklow, including a record from Lough Dan in 2009.

***Zavrelimyia* (*Paramerina*) *cingulata* (Walker, 1856) New to HA 25**

CLARE: HA 25 - Lough Atorick, Woodford (R637964), 12 October 1985.

There are records from 107 locations of *Zavrelimyia* (*P.*) *cingulata* in Ireland, eight from County Clare, two in HA 27, five in HA 28 and one in HA 29. The collections from Lough Atorick in 1985, containing exuviae of this species, provide not only the first account of the species from HA 25 but also the earliest account of the species from County Clare since existing documented records from County Clare date from 2009.

***Zavrelimyia* (*Zavrelimyia*) *hirtimanus* (Kieffer, 1918) New to HA 29**

GALWAY: HA 29 - Turlough NaNéan, Gort (R430989). 1 November 1985.

Zavrelimyia hirtimanus is less frequently found in Ireland compared to *Z. cingulata* with previous records from only ten locations (Murray *et al.*, 2018). There is one documented record of the species in HA 30 in County Galway from 2007 and thus the record from 1985 is the first record from HA 29 and the earliest of the species in County Galway.

***Zavrelimyia* (*Zavrelimyia*) *nubila* (Meigen, 1830) New to County Wicklow and HA 10**

WICKLOW: HA 10 - Powerscourt Main Pond, Enniskerry (O213160), 15 October 1984.

Larvae of *Zavrelimyia nubila* are typically found in stagnant waters, small pools and man-made habitats, such as garden ponds. This species is previously only known from two locations in County Meath in HAs 7 and 8 (Murray, 2015a). The record from the man-made pond in the Powerscourt Demense is in keeping with its known larval ecology and is the first record of the species in County Wicklow and HA 10.

Subfamily DIAMESINAE

***Protanypus morio* (Zetterstedt, 1838)**

SLIGO: HA 35 - Lough Gill, Agahamore (G715321), 29 October 1985. **WICKLOW: HA 10 -** Lough Bray Upper, Glencree (O140150), 22 October 1985; Lough Dan, Roundwood (O157035), 3 October 1984.

Larvae of *Protanypus morio* are commonly found in oligotrophic to mesotrophic lakes and most records in Ireland are from lakes in the south-west, west and north of the country. There are over 80 records in Ireland, four in County Sligo, two each in HAs 34 and 35, including one from Lough Gill in 2008, and ten in HA 10 and County Wicklow. The records from samples collected at Lough Dan in 1984 and Lough Gill in 1985 predate other records from these counties and HAs.

Subfamily PRODIAMESINAE

***Prodiamesa olivacea* (Meigen, 1818)**

DUBLIN: HA 9 - Upper Reservoir (O095219) and Lower Reservoir (O090227), Bohernabreena, 3 October 1984.

Prodiamesa olivacea is a common and widespread species in Ireland with more than 170

records from lakes, ponds and backwaters of slow-flowing rivers, streams and ditches. There are six previous records in HA 9, the earliest of which was from March 1949 by C. F. Humphries from the River Dodder at Clonskeagh.

Subfamily ORTHOCLADIINAE

[Unless stated otherwise references to previous records of Orthocladiinae in Ireland are from Murray *et al.* (2014).]

***Acricotopus lucens* (Zetterstedt, 1850) New to HA 38**

DONEGAL: HA 38 - pond on Rosapenna golf course, Carrigart (C111380), 27 October 1985.

There is just one previous record of *Acricotopus lucens* from County Donegal, in HA 39 from the River Crana in 1982 that was reported by Hayes (1991). The record at Rosapenna from 1985 is the first record of the species in HA 38.

***Bryophaenocladius muscicola* (Kieffer, 1906) New to County Galway and HA 32**

GALWAY: HA 32 - River Owenglin, Clifden (L677506), 18 August 1981, leg B. P. Hayes.

Recent re-examination of slide preparations by B. P. Hayes (Hayes, 1991), in the author's collection, revealed that a slide mount from the River Owenglin had been previously mistakenly determined as *Bryophaenocladius subvernalis* and was reported as such in Murray *et al.* (2014, p. 70). There are only two existing records of *B. muscicola*, one from Northern Ireland in HA 3, County Derry and one from County Wicklow in HA 10, the latter from specimens that had not been examined at the time of compilation of data for inclusion in Murray *et al*. (2014). That record has since been noted in Murray *et al.* (2018). The record from the River Owenglin in 1981 is the earliest known record of the species in Ireland and the first for Galway, HA 32 and the Western River Basin District.

***Bryophaenocladius nitidicollis* (Goetghebuer, 1913) New to County Donegal and HA 38**

DONEGAL: HA 38 - Lough McHugh, Glenties (B810032), 26 October 1985.

Bryophaenocladius nitidicollis is previously documented from bog pools at just two locations in Ireland, from collections in 1974 in the blanket bog of Featherbed Mountain, County Dublin and in Glenamoy, County Mayo reported by Dowling and Murray (1981). The samples collected from Lough McHugh were taken from a "*sphagnum* dominated pool at the west end of the lake" (Duigan, 1989) and the record documented from that sample is the first account of the species in County Donegal and HA 38 in the North Western River Basin District.

***Bryophaenocladius subvernalis* (Edwards, 1929) New to Counties Offaly, Wicklow, and HA 25**

OFFALY: HA 25 - Raheen Lough, Geashill (N464185), 5 November 1984. **WICKLOW: HA 9 -** pool near Poulaphuca Reservoir, Blessington (N982130), 14 November 1984.

There are documented records of *Bryophaenocladius subvernalis* from 24 locations in

Ireland but the record from Raheen Lough is the first record from County Offaly and HA 25. There is one documented record from HA 9 in County Dublin from collections in 1950 by C. F. Humphries.

***Chaetocladius* (*Chaetocladius*) *perennis* (Meigen, 1830)**

DONEGAL: HA 38 - Lough Shannagh, Magheradrumman, Fanad Penninsula (C216450), 27 October 1985.

There are 23 previous records of this species in Ireland including one record from County Donegal, also in HA 38 in bogland around Lough Inshagh, at Glenveagh.

***Corynoneura arctica* Kieffer, 1923**

GALWAY: HA 27 - Turlough Na Néan, Gort (R430989), 1 November 1985; **HA 32 -** Lough Fee, Garraun (L800610), 3 November 1985.

There are two previous records of *Corynoneura arctica* from locations in County Galway in HA 27 and also from HA 29. The record at Lough Fee is the first from part of HA 32 in County Galway but it is already documented from HA 32 in County Mayo from collections in 2002.

***Corynoneura carriana* Edwards, 1924 New to Counties Donegal, Roscommon and HA 38**

CLARE: HA 26 - Lough Atedaun, Corrofin (R297884), 16 November 1985. **DONEGAL: HA 38 –** no name lake, Meendooish Hill (R297884), 28 October 1985; Lough Creaghy, Dungloe (B790120), 28 October 1985. **GALWAY: HA 27 -** Turlough at Termon House (R406993), 17 November 1985. **OFFALY: HA 25 -** Raheen Lough, Geashill (N464185). **ROSCOMMON: HA 26 -** Coolgarry Lough, Brideswell (M900475). **WICKLOW: HA 10 -** Lough Bray Upper, Glencree (O140150), 3 October 1984.

The distribution data for *Corynoneura carriana* in Murray *et al.* (2018, p. 81) gave summary information based on these previously unpublished records from HA 38 in County Donegal and from Coolgarry Lough, County Roscommon, that are given here.

***Corynoneura celeripes* Winnertz, 1852 New to County Donegal and HA 38**

DONEGAL: HA 38 - Lough Namanlagh, Glenties (G759974), 28 October 1985.

There are seven existing records of this species in Ireland. This record from 1985 is the most northerly in Ireland and is new for County Donegal and HA 38 in the North Western River Basin District.

***Corynoneura edwardsi* Brundin, 1949**

DONEGAL: HA 37 - Carn Lough, Blue Stack Mountain, (G871886), 10 May 2005, leg J-R Baars; **HA 38 -** Lough Drumlesk, Falcarragh (B985339), 26 October 1985; Lough Magheradrumman, Fanad (C205450), 27 October 1985; Lough Shannagh, Fanad (C216450), 27 October 1985.

There is just one published record of *Corynoneura edwardsi* for Donegal, from Lough Golagh in HA 36 (Murray *et al.*, 2014). However, based on unpublished information from

previously undetermined slide preparations that were examined in 2017, records from HA 37 and HA 38 were cited by Murray *et al.* (2018). Details of those records, from specimens collected by J.-R. Baars (Baars *et al*., 2014) in HA 37 and by Duigan (1989) from HA 38, are given above.

***Corynoneura gratias* Schlee, 1968 New to County Wicklow, HA 10 and HA 38**

DONEGAL: HA 38 - Lough Drumlesk, Falcarragh (B985339), 26 October 1985. **WICKLOW: HA 10** - Lough Dan, Roundwood (O157035), 3 October 1984.

There are records of this species from only ten Irish locations, predominantly in the northern half of the country (Murray *et al*., 2018). While the species is known from HA 8 in County Meath, there are no previous records from County Wicklow and HA 10. The first published records in Ireland were given by Langton (2002) that included a record from collections in July 2000 on the River Deele (HA 1) at Raphoe, County Donegal. The record from Lough Drumlesk is the first documentation of the species in HA 38. The records here from Counties Donegal and Wicklow predate previous published records of the species for Ireland.

***Corynoneura lacustris* Edwards, 1924**

WICKLOW, HA 10: Upper Lough Bray, Glencree (O140150), 3 October 1984.

Corynoneura lacustris is a common species in streams and in the littoral regions of lakes in Ireland. The earliest Irish record was from Lough Owel, County Westmeath, reported in Murray and Ashe (1983). There are records of this species from the nearby Lower Lough Bray in June 1986, October 1996 and June 2009.

***Corynoneura* "Pe2a" sensu Langton 1991**

DONEGAL: HA 38 - Lough Waskel, The Rosses (B729165), 26 October 1985.

This pupal morphotype is known from 12 locations in Ireland (Murray *et al*., 2018) including three sites in County Donegal. The first documented records in Ireland were those of Langton (2002) from HAs 38 and 39 in County Donegal. It is also on record from in HA 37 from Carn Lough.

***Corynoneurella paludosa* Brundin, 1949 New to County Wicklow and HA 10**

WICKLOW: HA 10 - Lough Bray Upper, Glencree (O140150), 3 October 1984.

There are only two records of this species in Ireland, one from Clare Island, County Mayo (Murray and Murray, 2003) and one from County Donegal (Langton, 2002) that had been erroneously assigned to Northern Ireland in Fauna Europaea as highlighted by Murray *et al*. (2016). Its occurrence in samples collected by Duigan in 1984 from Upper Lough Bray, County Wicklow, constitutes the earliest record of the species in Ireland and extends its known distribution range eastwards in the Eastern River Basin District.

***Cricotopus* (*Cricotopus*) *annulator* Goetghebuer, 1927**

DONEGAL: HA 38 - Lough Creeslough, Creeslough (C058296), 27 October 1985.

This is a widespread species in Ireland. There are 15 documented records in County Donegal, eight in HA 38.

***Cricotopus* (*Cricotopus*) *pallidipes* Edwards, 1929 New to County Wicklow and HA 10**

WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

Cricotopus pallidipes is a less frequently recorded species of *Cricotopus* in Ireland with records from 17 locations in the country (Murray *et al*., 2018). The record from Lough Dan is the first record of the species in County Wicklow, HA 10 and the Eastern River Basin District.

***Cricotopus* (*Cricotopus*) *pilosellus* Brundin, 1956 New to HA 38**

DONEGAL: HA 38 - pond on Rosapenna golf course, Carrigart (C111380), 27 October 1985.

The first published records of this species in Ireland were given by Langton (2002) from collections in Northern Ireland in HA 36 in County Fermanagh. The species was later collected in County Donegal in 2009 from Lough Eske in HA 37. The record from the pond on Rosapenna golf course in 1985 extends its known distribution to HA 38 and represents the earliest documented record of the species in Ireland.

***Cricotopus* (*Cricotopus*) *tibialis* (Meigen, 1804) New to County Wicklow and HA 9**

WICKLOW: HA 9 - Poulaphuca Reservoir, Blessington (N982130), 14 November 1984.

This species is known from 16 locations in Ireland but the most northerly record is from Lough Ramor, County Cavan. The earliest documented records in Ireland are those of Grimshaw (1912) from Clare Island, County Mayo.

***Cricotopus* (*Isocladius*) *sylvestris* (Fabricius, 1794) New to HA 10**

CAVAN: HA 36 - Lough Gowna, Derrnafest Bridge (N285920), 28 October 1984.
WICKLOW: HA 10 - Main Pond, Powerscourt Estate (O213160), 15 October 1984.

Cricotopus sylvestris is a very common species in Ireland and there are eight previous records from six locations in HA 36, County Cavan. The species is already known from County Wicklow but the record from Powerscourt in 1984 is the first from HA 10.

***Eukiefferiella claripennis* (Lundbeck, 1898)**

WICKLOW: HA 10 - Lough Bray Lower, Glencree (O140163), 3 October 1984.

Eukiefferiella claripennis has a widespread distribution in Ireland. There are six previous records from County Wicklow in HA 10, including one from the Lower Lough Bray from April 2009. The earliest record of the species in County Wicklow is from 1929 by Humphries and Frost (1937) from the upper reaches of the River Liffey in the adjoining HA 9.

***Eukiefferiella coerulescens* (Kieffer, 1926)**

WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

Until now, there were seven documented records of *Eukiefferiella coerulescens* from HA 10 in County Wicklow, the earliest of which was in 1987 from the River Glencullen at Knocksink. The species has a widespread distribution in Ireland with records from 85 locations in the

country (Murray *et al*., 2018).

***Eukiefferiella dittmari* Lehmann, 1972 New to County Wicklow and HA 10**

WICKLOW: HA 10 - Lough Tay, Luggala, (O163008), 3 October 1984.

Although *Eukiefferiella dittmari* is on record from over 40 locations in Ireland, the record from the remote Lough Tay in the Wicklow Mountains is the first record of the species from County Wicklow and HA 10.

***Heterotanytarsus apicalis* (Kieffer, 1921)**

DONEGAL: HA 38 - Lough Dungloe, Dungloe (B782119), 28 October 1985. **GALWAY: HA 31 -** no name lake, Glenturkeen (L827440) and **HA 32** - Lough Fee (L800610), both 3 November 1985. **SLIGO: HA 35 -** Lough Gill, Aghamore (G715321), 29 October 1985. **WICKLOW: HA 10 -** Lough Bray Lower, Glencree (O140163), 3 October 1984; Lough Bray Upper (O140150), 22 October 1985; Lough Dan, Roundwood (O157035), 22 October 1985.

Heterotanytarsus apicalis is widely distributed in Ireland and records exist from locations in all the above Counties and Hydrometric Areas. There are more recent documented records from Lough Gill and Lough Bray Lower from collections made in 2008 and 2009 respectively. There are no previous records from Lough Dan.

***Heterotrissocladius grimshawi* (Edwards, 1929)**

WICKLOW: HA 10 - Lough Bray Upper, Glencree (O140150), 3 October 1984; Lough Dan, Roundwood (O157035), 3 October 1984.

There are records of this species from 65 locations in Ireland. There are six documented records at four locations in HA 10 in County Wicklow, including a record from Lough Dan in September 2009. The species has not previously been reported from Upper Lough Bray.

***Limnophyes pumilio* (Holmgren, 1869)**

DUBLIN: HA 9 - Quarry Pond, Phoenix Park (O103364), 23 March 1984.

This record form 1984 predates the recently published first record of this species from County Dublin and HA 9 in Murray and Ashe (2017) that was included in Murray *et al*. (2018).

***Metriocnemus* (*Metriocnemus*) *eurynotus* (Holmgren, 1883) New to HA 27**

GALWAY: HA 27 - Lough Fiddaun, Gort (R419966), 16 November 1985.

The only documented record of this species in County Galway is from specimens collected in 2003 by P. H. Langton (in Murray *et al*., 2014) from Lough Cutra, near Gort, in HA 29. The record from Lough Fiddaun is the first for the species in HA 27 that also predates the existing record in HA 29 in County Galway by 27 years.

***Metriocnemus* (*Metriocnemus*) *inopinatus* Strenzke, 1950 New to County Galway and HA 27**

GALWAY: HA 27 - Lough Fiddaun, Gort (R419966), 16 November 1985.

This species has a restricted distribution in Ireland and Europe (Murray *et al*., 2018). Until

now there are only two records of *Metriocnemus* (*M.*) *inopinatus* in Ireland, one in October 2016 by Peter Langton from the River Bann (HA 3) in County Derry, Northern Ireland (Murray *et al*., 2018) and one from September 2008 from Lough Allen (HA 26) by Murray (2010). The specimens collected at Lough Fiddaun constitute the earliest record of the species in Ireland.

***Orthocladius* (*Orthocladius*) *glabripennis* (Goetghebuer, 1921) New to County Sligo and HA 35**

SLIGO: HA 35 - Lough Gill, Aghamore (G715321), 29 October 1985.

There are records of this species from 14 locations on lakes and rivers in Ireland. This is the first record from County Sligo and HA 35.

***Orthocladius* (*Orthocladius*) *oblidens* (Walker, 1856)**

SLIGO: HA 35 - Lough Gill, Aghamore (G715321), 29 October 1985. **TIPPERARY: HA 25** - Lough Derg, Terryglass (M861008), 12 October 1985.

This is a commonly encountered species in Ireland with records from 137 locations (Murray *et al*., 2018). There are documented records from eight locations in Sligo, four in HA 35, including Lough Gill in collections in April, June and September 2008. There is one existing record in County Tipperary from the same location at Terryglass, Lough Derg, in April 2009.

***Orthocladius* (*Pogonocladius*) *consobrinus* (Holmgren, 1869)**

SLIGO: HA 35 - Lough Gill, Aghamore (G715321), 29 October 1985.

This species is known from over 100 locations in Ireland, including Lough Gill. The record from 1985 predates the later record from June 2008 by 23 years.

***Paraphaenocladius impensus impensus* (Walker, 1856) New to County Offaly and HA 25**

OFFALY: HA 25 - bog pool, Ballycommon, Daingean (N422273), 29 September 1984.

Records already exist from 23 locations in Ireland. This is the first record of the species from County Offaly and HA 25.

***Psectrocladius* (*Allopsectrocladius*) *obvius* (Walker, 1856) New to HA 29**

GALWAY: HA 29 - Turlough Na Néan, Gort (R430989), 1 November 1985.

Although already on record from County Galway in Hydrometric Areas 30, 31 and 32, this is the first record of the species from HA 29.

***Psectrocladius* (*Allopsectrocladius*) *platypus* (Edwards, 1929)**

DONEGAL: HA 38 - Lough McHugh, Glenties (B810032), 26 October 1985.

This species is commonly found in standing waters in ponds, bog pools and in nutrient-poor lakes. There are four documented records of the species from two locations in County Donegal, one each in HA 37 and HA 38.

***Psectrocladius* (*Psectrocladius*) *limbatellus* (Holmgren, 1869)**

DUBLIN: HA 9 - Lower Reservoir, Bohernabreena (O090227), 3 October 1984.

There are four previous records of this species in HA 9 in County Dublin, the earliest of

which was in 1981.

***Psectrocladius* (*Psectrocladius*) *psilopterus* (Kieffer, 1906)**

WICKLOW: HA 10 - Lough Bray, Lower, Glencree (O140163), Lough Bray Upper, Glencree (O140150) and Lough Dan, Roundwood (O157035), all three records from 3 October 1984.

This is a widespread species in Ireland. There are five documented records from HA 10 in County Wicklow. The records from 1984 are the first records of the species from these three locations.

***Psectrocladius* (*Psectrocladius*) *sordidellus* (Zetterstedt, 1838)**

GALWAY: HA 29 - Turlough Na Néan, Gort (R430989), 13 October and 1 November 1985. **ROSCOMMON: HA 26** - Mullygullan Turlough, Carronskeagh, Castleplunket (M798794) and Corkip Lough, Keoghville, Brideswell (M928435), both 25 April 1986. **WICKLOW: HA 10 -** Main Pond, Powerscourt Estate (O213160), 15 October 1984.

Psectrocladius (*P.*) *sordidellus* is already on record in County Galway and there is a record from HA 29 in County Leitrim but the records from Turlough Na Néan are the first records of the species the section of HA 29 in County Galway. Murray *et al.* (2014) documented just one record of the species in HA 26 in County Roscommon but, since compilation of that work, records were given by Murray and Ashe (2017) also from the Duigan (1989) material, and from collections in 2018 in Lough Ree (Murray and O'Connor, 2018). There are two published records from County Wicklow, in HA 10, from July 1996 and June 2009.

Subfamily CHIRONOMINAE

[Unless stated otherwise references to previous records of Chironominae in Ireland are from Murray *et al.* (2015).]

Tribe Chironomini

***Chironomus* (*Chironomus*) *anthracinus* Zetterstedt, 1860**

DONEGAL: HA 38 - Lough Creeslough, Creeslough (C058296), 27 October 1985.

There are records of *Chironomus* (*C.*) *anthracinus* from over 50 locations in Ireland, nine in County Donegal, three of which are in HA 38, the earliest being from 1981 in Lough Shannagh on the Fanad Peninsula (Hayes, 1991).

***Chironomus* (*Chironomus*) *commutatus* Keyl, 1960 New to County Roscommon and HA 26**

ROSCOMMON: HA 26 - Mollygollan Turlough, Carronskeagh, Castleplunket (M798794), 25 April 1986.

There are published records of this species from 11 locations in Ireland including one from collections by Duigan (1989) in County Cork documented by Murray and Ashe (2017). There are no records from Roscommon or HA 26.

***Chironomus* (*Chironomus*) *nuditarsis* Keyl, 1961 New to County Wicklow and HA 10**

WICKLOW: HA 10: Main Pond, Powerscourt Estate (O213160), 15 October, 1984.

This species is documented from over 20 locations in Ireland, 12 of which lie in Northern Ireland. It was recently reported from HA 9 in County Dublin (Murray and Ashe, 2017) and the record from the pond at Powerscourt is the first of the species in County Wicklow and HA 10.

***Chironomus* (*Chironomus*) *piger* Strenzke, 1956 New to County Roscommon and HA 26**

ROSCOMMON: HA 26 - Mullygullan Turlough, Carronskeagh, Castleplunket (M798794) and Lough Croan Turlough, Lismoyle (M880497), both 25 April 1986.

Records of *Chironomus* (*C.*) *piger* were documented in Murray *et al*. (2015) from 26 locations in Ireland, but an additional location for the species was given by Murray and Ashe (2017) for HA 9 in County Dublin. Records from the two locations in County Roscommon given above are first records for the County and HA 26.

***Chironomus* (*Chironomus*) *riparius* Meigen, 1804 New to HA 38**

DONEGAL: HA 38 - Burtonport Lough, Burtonport (B725152), 26 October 1985.

This species is already on record from 19 locations in Ireland, including one in HA 39 in County Donegal but the record from Burtonport in 1985 is the first record of this species from HA 38 in County Donegal.

***Cladopelma viridulum* (Linnaeus, 1767)**

CLARE: HA 28 - Lough Doo, Miltown Malbay (R123721), 12 July 1986.

Cladopelma viridulum is a common species in Ireland with records from 83 locations. It is already known from three locations in County Clare, including Lough Doo where it was collected in July 2009.

***Cryptochironomus albofasciatus* (Stæger, 1839) New to County Wicklow and HA 10**

WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

There are 17 locations in Ireland from which records of *Cryptochironomus albofasciatus* are documented. The majority of records are from the southwest, west and north of the country with just one record from the east in County Cavan from HA 7. The record from Lough Dan is the first from County Wicklow and HA 10.

***Demeijerea rufipes* (Linnaeus, 1761) New to HA 38**

DONEGAL: HA 38 - Lough Nageeragh, Dungloe (B761100), 26 October 1986.

Larvae of *Demeijerea rufipes* are frequently found mining in bryozoans and *Sparganium* spp. The earliest record of this species in Ireland is by Grimshaw (1912) from Achill Island, County Mayo.

***Glyptotendipes* (*Heynotendipes*) *signatus* (Kieffer, 1909) New to County Donegal and HA 38**

DONEGAL: HA 38 - Lough Tawney, Rosnakill (C196390), 27 October 1985.

This species has been recorded in Ireland from records in July and September 2007 at only

one site, Lough Illauntrasna in County Galway in HA 31 (Murray, 2015b). The specimens from Lough Tawney in Donegal not only predate those records by 22 years but are also the earliest records of the species in Ireland and are new for County Donegal, HA 38 and the Northwestern River Basin District.

***Microtendipes chloris* (Meigen, 1818) New to Counties Offaly, Wicklow and HA 10**

OFFALY: HA 25 - bog pool, Ballycommon, Daingean (N422273), 29 September 1984; Raheen Lough, Geashill (N464185), 5 November 1984. **WICKLOW: HA 10 -** Main Pond, Powerscourt, Enniskerry (O213160), 15 October 1984.

This species was documented from 79 locations in Ireland in Murray *et al.* (2018). Until now there were no records from County Offaly, although there are two records from HA 25 in County Westmeath. The record at Powerscourt from 1984 is the only known record of the species in County Wicklow and HA 10.

***Microtendipes pedellus* (De Geer, 1776)**

ROSCOMMON: HA 26 - Corkip Lough, Keoghville, Brideswell (M928435), 25 April 1986.

There are four published records from HA 26, one in County Roscommon. An additional record from Roscommon is reported from collections made in 2018 documented elsewhere in this volume (Murray and O'Connor, 2018). The collections from Corkip Lough in 1986 provide the earliest record of the species in County Roscommon.

***Polypedilum* (*Pentapedilum*) *sordens* (van der Wulp, 1874)**

CLARE: HA 28 - Lough Doo, Miltown Malbay (R123721), 12 July 1986.

This is a commonly encountered species in Ireland with records from over 100 locations. There are records from 14 locations in County Clare, six in HA 28 that include Lough Doo from collections in 2009, 23 years after the collections by Duigan (1989).

***Stictochironomus sticticus* (Fabricius, 1781)**

WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

There are records from 25 locations in Ireland, including two in County Wicklow in HA 10, from July 2009 in the nearby Lough Tay and the Upper Glendalough Lake.

***Xenochironomus xenolabis* (Kieffer, 1916)**

WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

Records of *Xenochironomus xenolabis*, whose larvae are obligate miners in freshwater sponges, are known from over 70 locations in Ireland. There is one documented record of the species in County Wicklow, also from Lough Dan in HA 10, from collections made in September 2009, 25 years after the collections in 1984 by Duigan (1989).

Tribe Pseudochironomini

***Pseudochironomus prasinatus* (Stæger, 1839)**

DONEGAL: HA 38 - Lough Anillanowenamarve, Doocharry (B839071), 27 October 1985.
WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

There are documented records of this species from over 100 locations in Ireland including 17 from HA 38 in County Donegal and one in County Wicklow in 2009 from Lough Dan.

Tribe Tanytarsini

***Micropsectra lindebergi* Säwedal, 1976 / *insignilobis* Kieffer, 1924**

WICKLOW: HA 10 - Lough Bray Lower, Glencree (O140163), 3 October 1984.

Pupal exuviae of these two species are inseparable. There are records of the morphotype from five locations, including a record from Lough Bray Lower in 2009.

***Micropsectra lindrothi* Goetghebuer, 1931**

ROSCOMMON: HA 26 - Lough Croan (Turlough), Lismoyle (M880497), 24 April 1984.

There are records of *Micropsectra lindrothi* from over 60 locations in Ireland, four in HA 26 including one in County Roscommon that had been identified in collections by Duigan (1989) from Coolgarry Lough in May 1986 and reported in Murray *et al*. (2015).

***Micropsectra roseiventris* (Kieffer, 1909)**

DUBLIN: HA 9 - Quarry Pond, Phoenix Park (O103364), 23 March 1984. **ROSCOMMON: HA 26 -** Corkip Lough, Keoghville, Brideswell (M928435), 25 April 1986. **WICKLOW: HA 10** - Lough Bray Upper, Glencree (O140150), 3 October 1984.

This species is now known from 50 locations in Ireland. Records from 47 locations at the end of the year 2017 were noted in Murray (*et al.*, 2018). These included three in HA 9 in County Dublin, five in HA 26, two in County Roscommon reported in Murray and Ashe (2017) from the initial examination of Duigan's collections, and one in HA 10, County Wicklow from Lough Dan.

***Paratanytarsus bituberculatus* (Edwards, 1929)**

ROSCOMMON: HA 26 - Lough Croan (turlough), Lismoyle (M880497), 24 April 1984.

There are three documented records of this species from two locations in HA 26 in County Roscommon from collections made in the years 2007 and 2008. The record at Lismoyle predates those records by 24 years.

***Paratanytarsus penicillatus* (Goetghebuer, 1928)**

WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

There are published records of *Paratanytarsus penicillatus* from two locations in HA 10 in County Wicklow, including Lough Dan, in collections taken in March and September 2009.

***Tanytarsus eminulus* (Walker, 1856)**

WICKLOW: HA 10 - Lough Dan, Roundwood (O157035), 3 October 1984.

There are records from over 100 locations of *Tanytarsus eminulus* in Ireland, eight of which are documented in HA 10 in County Wicklow the earliest of which is from 1983. There are no previous records of the species from Lough Dan.

***Tanytarsus gregarius* Kieffer, 1909 New to County Dublin and HA 9**

DUBLIN: HA 9 - Lower Reservoir, Bohernabreena (O090227), 3 October 1984.

Records of *Tanytarsus gregarius* are documented from 74 locations in Ireland (Murray *et al*., 2018). There are no previous records from County Dublin and HA 9 but the species is known from the Vartry Reservoir, in the adjacent HA 10, County Wicklow since 1983.

***Tanytarsus mendax* Kieffer, 1925 New to County Dublin and HA 9**

DUBLIN: HA 9 - Lower Reservoir, Bohernabreena (O090227), 3 October 1984.

Tanytarsus mendax was first documented in Ireland from specimens collected by J. P. O'Connor from Lough Sillan, County Cavan in October 1972 under its synonym *Tanytarsus holochlorus* Edwards. It is now known from 21 diverse locations in Ireland but this record, from 1984, is the first from County Dublin and HA 9.

***Tanytarsus usmaensis* Pagast, 1931**

DONEGAL: HA 38 - Lough Creeslough, Creeslough (C058296), 27 October 1985.

There are published records from July 2000 and May 2005 at two locations in HA 38 in County Donegal for *Tanytarsus usmaensis,* predated by the record from Creeslough in 1984 that now constitutes the earliest record of the species in County Donegal.

Summary

Examination of littoral samples from collections made by Catherine Duigan (Duigan, 1989) between 1984 and 1986 during her studies on the Irish Cladocera, that by chance included chironomid pupal exuviae, has yielded a total of 112 records for 67 species and two pupal morphotypes that are documented from those collections. An additional record is provided for *Bryophaenocladius muscicola* Kieffer, from a previously misdetermined slide preparation of *Bryophaenocladius subvernalis* that had been collected in 1981 (Hayes, 1991). Twenty-six species are noted as first records in seven Counties: nine in County Wicklow, four each in Counties Donegal and Roscommon, three in Counties Dublin and Offaly, two in County Galway and one in County Sligo. Thirty four species are documented as first records for nine Hydrometric Areas: eleven in HA 38, eight in HA 10, three each in HAs 9, 25 and 26, two each in HAs 27 and 29 and one each in HAs 32 and 35. Examination of these collections from over 30 years ago has provided worthwhile new species distribution data.

Acknowledgements

The author wishes to acknowledge the contribution of Catherine Duigan who, during her studies in the 1980s on Irish *Cladocera,* collected samples from a variety of small water bodies that coincidentally contained the chironomid pupal exuviae that have now provided the meaningful species distribution data reported here. Thanks are also extended to Jan-Robert Baars, School of Biology and Environmental Science, University College Dublin, for providing material from Carn Lough and to my wife, W. A. Murray for constructive criticism of the text and proof reading.

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RECORDS OF IRISH CADDISFLIES (TRICHOPTERA) INCLUDING A COUNTY LIST

J. P. O'Connor and M. A. O'Connor
c/o National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland.
e-mail: <joconnor@museum.ie>

Abstract

The presence of *Hagenella clathrata* (Kolenati, 1848) in Ireland has been confirmed bringing the number of species reliably recorded to 152. The brackish water species *Ylodes reuteri* (McLachlan, 1880) was reported from County Waterford - the third Irish record. *Hydroptila simulans* Mosely, 1920 and *Holocentropus dubius* (Rambur, 1842) were recorded as new to Northern Ireland. New distributional data for other Irish Trichoptera are provided based on recently collected material and older specimens including historical ones. Updated distribution maps are included for most of the listed species. A county list is provided for the Irish species.
Key words: Trichoptera, caddisflies, Ireland, review, distribution, flight-periods, *Hydroptila simulans, Holocentropus dubius*, *Hagenella clathrata*, *Ylodes reuteri*, county list.

Introduction

The opportunity is taken here to provide new distributional data for the Irish Trichoptera based on recently collected material, older specimens including historical ones and papers published in the last twelve months. Four figure (1km) Irish grid references are given for each record and these can be easily located on the Discovery series of maps from the Ordnance Survey of Ireland. However as these maps are generally unavailable outside Ireland, the sites are also mapped as 10km squares on longitude and latitude maps using DMAP. Updated maps are included for most of the listed species with significant records indicated by arrows. Unless otherwise stated, specimens were identified by the senior author. The specimens were determined using Edington and Hildrew (1995), Wallace, Wallace and Philipson (2003), Malicky (2004), Barnard and Ross (2012), and Waringer and Graf (2011). Voucher material of the rarer species has been retained in the O'Connor collection.

The presence in Ireland of *Hagenella clathrata* (Kolenati, 1848) has been confirmed bringing the present number of Irish species that are reliably recorded to 152 (Gammell *et al*., 2018). However, another species is soon to be added to the Irish list which will bring the total to 153 species. The two other species added to the Irish list since O'Connor (2015) are *Trichostegia minor* and *Limnephilus borealis* (O'Connor and McNaughton, 2017a, b, 2018). *Hydroptila simulans* Mosely, 1920 and *Holocentropus dubius* (Rambur, 1842) were reported as new to Northern Ireland (O'Connor and Bond, 2018; O'Connor, O'Connor and McNaughton, 2018).

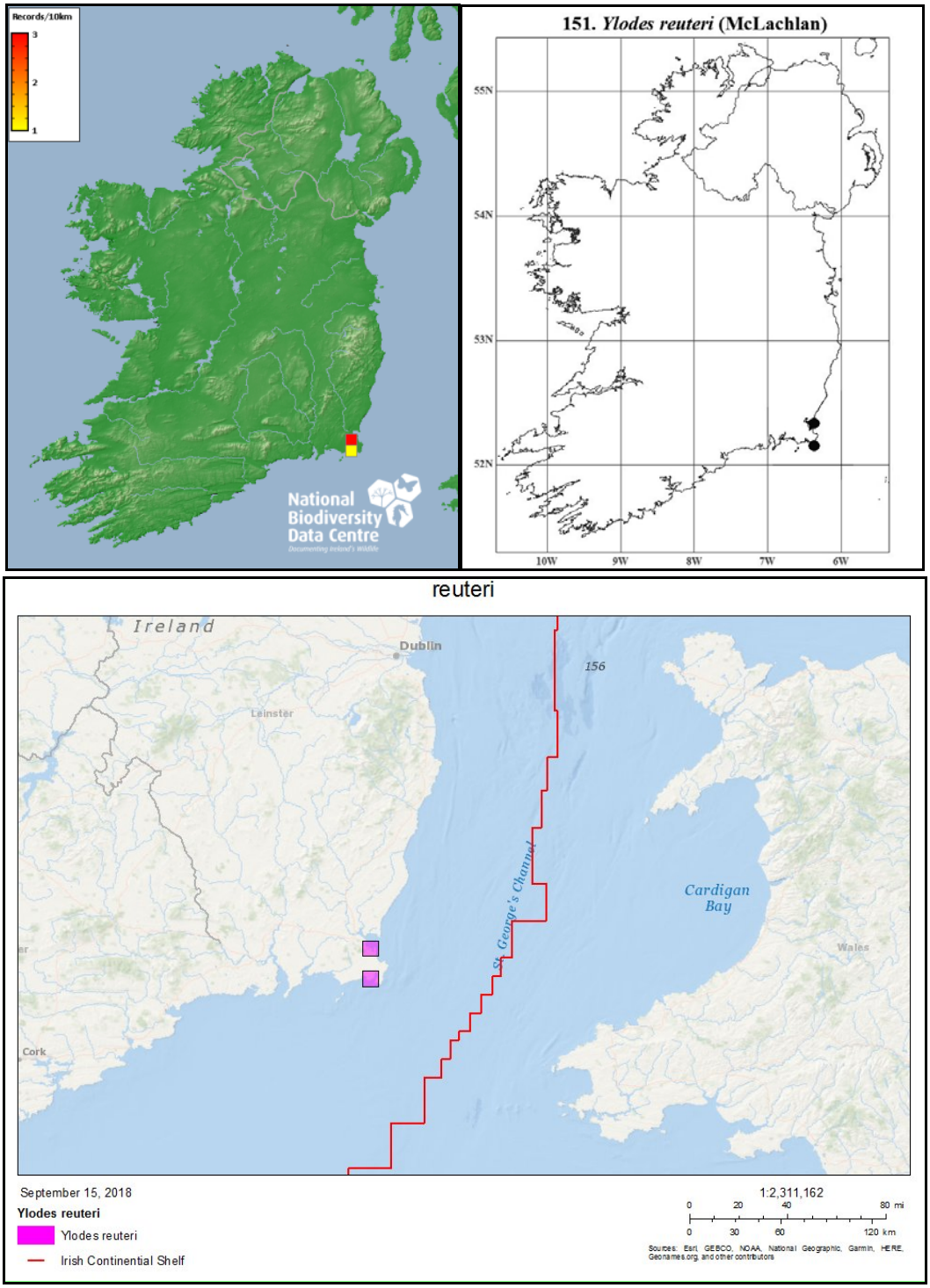
Biodiversity maps, National Biodiversity Data Centre

Records cited in this paper will be included in "Addendum 2" and forwarded in due course to the National Biodiversity Data Centre for incorporation into the data set "Caddisflies (Trichoptera) of Ireland" <https://maps.biodiversityireland.ie/ Dataset/250> (O'Connor, 2018). The set already includes the data from O'Connor (2015) and, recently, another 549 records were added as "Addendum 1". For each species on the site, the four figure grid references (1km) can be read either on the Irish grid option of the Terrestrial Map or on the longitude and latitude option of the Marine Map. By using the live map selection, you can zoom from 10km (Terrestrial Map) or 50km (Marine Map) to the appropriate 1km square. On the Marine maps, you can also view 10km squares on longitude and latitude similar to the DMAP maps in this paper. This feature is available for all data sets. Examples for *Ylodes reuteri* (McLachlan, 1880) are shown here (Fig. 1-3). Other features which can be shown on the system include counties, biological vice-counties and the Northern Ireland Border. The National Biodiversity Data Centre deserves great praise and recognition for their development of such a superb mapping system (Biodiversity Maps) which will be of inestimable value to anyone interested in Irish Trichoptera.

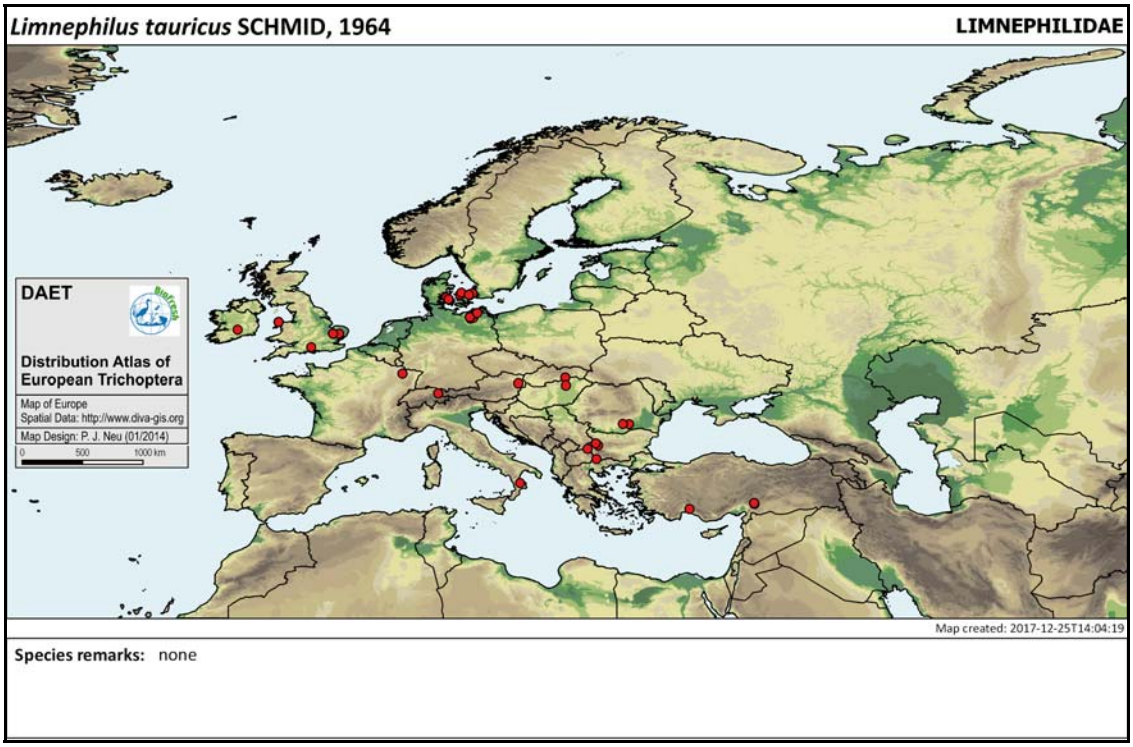
European distributions, DAET

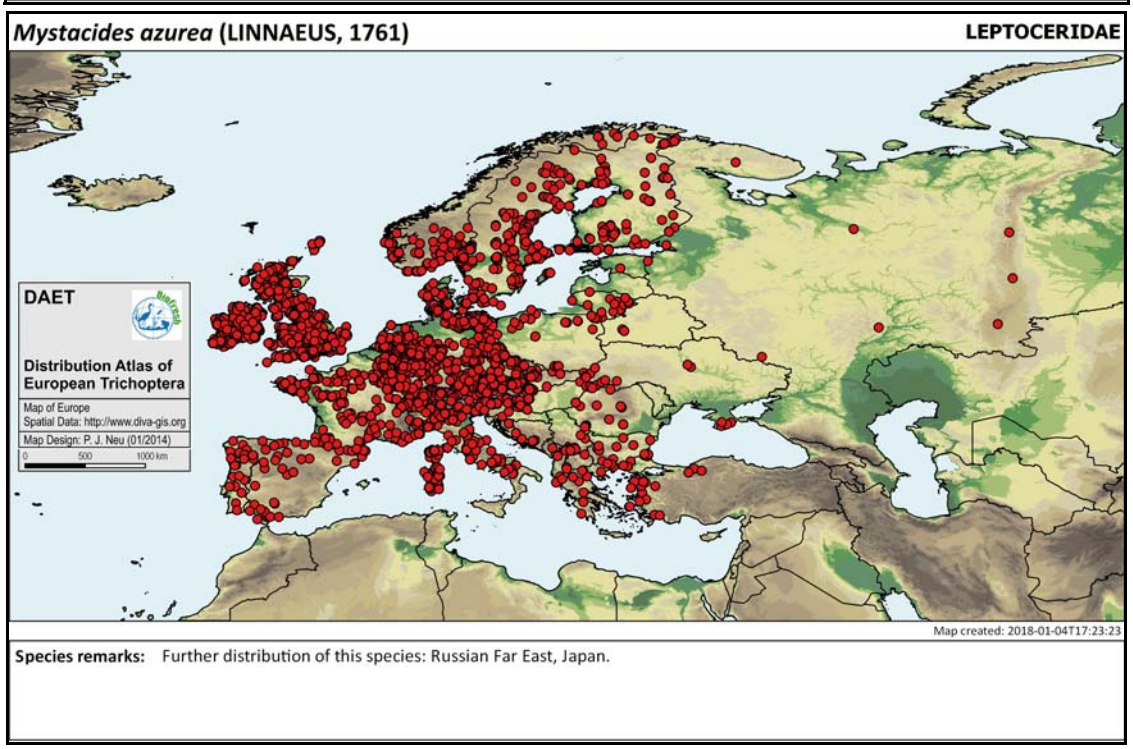
All the distribution data from O'Connor (2015) were incorporated into the *Distribution Atlas of European Trichoptera* (DAET) (Neu *et al.*, 2018). It was also possible to include some subsequent important Irish records before the closing date for the receipt of data. The foundation for the *Distribution Atlas of European Trichoptera* was laid within the BioFresh research project, funded by the EU from 2010 to 2014. Since 2011, more than 630,000 occurrence records (about 450,000 adult data) of European caddisflies contributed by 83 Trichoptera experts and the authors of the *Atlas* (DAET Consortium) have been compiled. The volume contains 1,583 distribution maps, a systematic list and a species index which is also a table of map contents. Point records of caddisflies, plotted on longitude and latitude, are illustrated on the maps in the *Atlas*. For the first time, a comprehensive overview of the distribution patterns of European Trichoptera families, species and sub-species is provided. The data were collected at more than 55,000 different sites in 50 countries covering the European continent. The temporal range is from 1793 to 2017. These maps will serve as a valuable base for future analyses, conservation and management priorities.

Because of this spendid volume, it is now possible to precisely place the Irish caddisfly fauna in a pan-European context. It can be easily ascertained from the relevant distribution map of a particular Irish species, whether that caddisfly is rare or common in the rest of Europe. Examples are shown in Figs 4-5.



FIGURES 1-3. The Irish distribution of *Ylodes reuteri* (10km). 1 (Top left): Terrestrial map (National Grid) from The National Biodiversity Data Centre; 2 (Top right): DMAP (longitude and latitude) from O'Connor (2015) and 3 (Bottom): Marine map (longitude and latitude) from The National Biodiversity Data Centre (which shows precise longitude and latitude coordinates when using the zoom facility). *Y. reuteri* has since been found in County Waterford.





FIGURES 4-5. The distributions of *Limnephilus tauricus* Schmid, 1964 and *Mystacides azurea* (Linnaeus, 1761) as shown in the *Distribution Atlas of European Trichoptera* (DAET) (Neu *et al*., 2018). The records are mapped using longitude and latitude coordinates.

The new records

RHYACOPHILIDAE

***Rhyacophila dorsalis* (Curtis, 1834) (Fig. 6)**

Recorded as adults from several localities in County Antrim (D1819, D1821, D1917, D2020, D2117, D2232, D2321, D2322, D2327, D2421) by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9683), 1♂ 6-7 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

DUBLIN: River Liffey, Lucan Demesne (O0235), 1♂ 10 May 2018, swept, J. P. O'Connor & M. A. O'Connor.

WEXFORD: J. F. Kennedy Park (S7219), 1 larva 6 August 2018, stream, H. O'Connor and D. de Rosa; Maudlins Stream, New Ross (S7328), 1♂1♀ 11-12 August 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

WICKLOW: Glenagvore Brook, Knocknadroose (O0101), 1 larva 27 March 1983, M. J. Costello.

Rhyacophila dorsalis is now known from 257 10km squares.

***Rhyacophila munda* McLachlan, 1862 First record for County Donegal (Fig. 7)**

Recorded from the River Braid, Ballymena, Grange Road (D1002), County Antrim by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Bredagh River, Moglass Bridge (C6038), 1 larva 1-2 June 2006 and 1km upstream of Moville (C6138), 3 larvae, 1-2 June 2006, collected and identified by Richard Nairn (EPA, 2013).

Rhyacophila munda is now known from 101 10km squares.

GLOSSOSOMATIDAE

***Agapetus fuscipes* Curtis, 1834 New to County Offaly (Fig. 8)**

Recorded as new to County Fermanagh from the River Erne at Bellanaleck Quay (H2339) by O'Connor, O'Connor and McNaughton (2018).

CORK: Lough Ine (Hyne) (W0929), 1 larva 27 January 1983, inlet stream, M. J. Costello.

DONEGAL: Lough Eske (G9683), 22♂♂11♀♀ 6 June 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor; Sessiagh Lough, Portnablagh (C0436), 2♂♂2♀♀ 6 May 2018, gathered in daylight on lakeside rocks, C. McNaughton.

OFFALY: canal supply stream near Killaranny (N2224), 2♂♂ 26 June 2018, swept from vegetation beside a regulatory lock-gate, M. A. O'Connor.

WATERFORD: Dunhill (S5304), 2♂♂1♀ 29 June 1988, stream, J. P. O'Connor; Tramore (S5701), 1♀ 3 July 2018, light-trap, T. Bryant.

WEXFORD: Maudlins Stream, New Ross (S7328), 1♂ 9 August 2018, swept from vegetation, 2♂♂ 11-12 August 2018 and 1♀ 16-17 August 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

Agapetus fuscipes is now known from 142 10km squares.

***Agapetus ochripes* Curtis, 1834 (Fig. 9)**

CORK: Fermoy [R. Blackwater] (W8198), 1♀ 2 June 1983, K. G. M. Bond.

TIPPERARY: River Suir, Kilsheelan (S2823), 57♂♂20♀♀ 16 August 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor.

Agapetus ochripes is now known from the 61 10km squares.

***Glossosoma boltoni* Curtis, 1834 (Fig. 10)**

Recorded as new to County Antrim by O'Connor and McNaughton (2017c) from the River Dall (D2327).

CORK: Castleblagh (W7058), 1♂ 19 February 2018, light-trap, stream nearby, K. G. M. Bond; Kilpatrick, River Bandon nearby (W5257), 1♂ 9 March 2017, light-trap, K. G. M. Bond.

The flight period of *Glossosoma boltoni* in O'Connor (2015) was given as "1 April - 26 October (unspecified date in March Kennedy)". The above records provide a definite date in March as well as the earlier date of 19 February.

DONEGAL: River Clady, near Lough Eske (G9684), ♀ 7 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WEXFORD: Maudlins Stream, New Ross (S7328), 1♀ 16-17 August 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

The species is now known from 106 10km squares.

***Glossosoma conformis* Neboiss, 1963 (Fig. 11)**

Although the record of *Glossosoma conformis* from the Owengarve River (F9101), County Mayo (Ryder *et al*., 2011) is given in the text of O'Connor (2015) but the 10km square is missing from the relevant maps. This record is indicated in Fig 11. The species is known from 18 10km squares.

HYDROPTILIDAE

***Agraylea multipunctata* Curtis, 1834 (Fig. 12)**

The species was reported as new to County Antrim by O'Connor, O'Connor and McNaughton (2018) from Lough Garve (D2117) and Lough na Trosk (D2719).

DONEGAL: Lough Eske (G9683), 1♀ 6 June 2018, swept, 1♂1♀ 6-7 June 2018, light-traps, & M. A. O'Connor; Sessiagh Lough, Portnablagh (C0436), 5♂♂ 6 May 2018, gathered in daylight on bankside rocks, C. McNaughton.

DUBLIN: River Liffey, Lucan Demesne (O0235), 1♂ 27 September 2018, M. A. O'Connor.

KERRY: Muckross Lake, Killarney (V9484), 1♂ 26 October 1994, J. P. O'Connor.

The previous latest record was 17 October. *Agraylea multipunctata* is now known from 73 10km squares.

***Agraylea sexmaculata* Curtis, 1834 (Fig. 13)**

Recorded as new to County Fermanagh from the Mill Lough (H2438) by O'Connor, O'Connor and McNaughton (2018). *Agraylea sexmaculata* is now known from 11 10km squares.

***Hydroptila angulata* Mosely, 1922 New to County Waterford (Fig. 14)**

O'Connor, O'Connor and McNaughton (2018) reported the species from the River Erne, Cloonatrig (H2637), County Fermanagh.

DONEGAL: Kilmacrennan [Leannan R.] (C1420), 1♀ 16 July 1891, J. J. F. X. King; Lough Eske (G9683), 2♂♂4♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

These are the second and third records from County Donegal.

WATERFORD: Tramore (S5701), 1♀ 10 June 2018 and 2♀♀ 28 June 2018, light-trap, T. Bryant.

Hydroptila angulata is now known from 30 10km squares.

***Hydroptila cornuta* Mosley, 1922 (Fig. 15)**

Reported from the River Erne, Bellanaleck Quay (H2339), County Fermanagh by O'Connor, O'Connor and McNaughton (2018).

TIPPERARY: River Suir, Kilsheelan (S2823), 4♀♀ 16 August 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor.

Previously taken on the River Suir at Carrick-on-Suir.

WEXFORD: Craywell, New Ross (S7228), 1♀ 6-7 August 2018, light-trap, in a suburban garden, J. P. O'Connor & M. A. O'Connor.

Hydroptila cornuta is now known from 18 10km squares.

***Hydroptila forcipata* (Eaton, 1873) (Fig. 16)**

CORK: Fermoy [River Blackwater] (W8198), 1♂ 2 June 1983, K. G. M. Bond.

DONEGAL: Kilmacrennan [Leannan River] (C1420), 1♂1♀ 9 July 1891, J. J. F. X. King; Lough Eske (G9683), 2♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

These are the second and third records from County Donegal.

DUBLIN: River Liffey, Lucan Demesne (O0235), 9♂♂3♀♀ 10 May 2018 and 1♂ 15 July 2018, swept, J. P. O'Connor & M. A. O'Connor; River Liffey, Strawberry Beds (O0735), 1♂ 25 August 2016, swept, J. P. O'Connor & M. A. O'Connor.

TIPPERARY: River Suir, Kilsheelan (S2823), 1♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Hydroptila forcipata is now known from 63 10km squares.

***Hydroptila martini* Marshall, 1977 New to County Donegal (Fig. 17)**

DONEGAL: Kilmacrennan [Leannan River] (C1420), 1♀ 27 July 1891, J. J. F. X. King.

WESTMEATH: Athlone [River Shannon] (N0243), ♂ 19 July 1888 and 1♂ 5 August 1888, J. J. F. X. King.

Hydroptila martini is now known from 12 10km squares.

***Hydroptila pulchricornis* Pictet, 1834 New to County Meath (Fig. 18)**

MEATH: Lough Brackan near Drumconrath (N8788), 1♂ 5 September 2018, swept, J. P. O'Connor & M. A. O'Connor.

*Hydroptila pulchricorn**is*** is now known from 11 10km squares.

***Hydroptila simulans* Mosely, 1920 (Fig. 19)**

O'Connor and Bond (2018) reported *Hydroptila simulans* new to Northern Ireland. A male was taken on the 14 April 2017 by Edward Rolston at Lisburn, County Antrim (J2565). The River Lagan is some 3km distant from the site.

DUBLIN: Lucan [River Liffey] (O0235) , 1♀ 29 August 1888, J. J. F. X. King.

TIPPERARY: River Suir, Kilsheelan (S2823), 6♂♂1♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Previously known from the River Suir at Carrick-on-Suir. *Hydroptila simulans* is now known from 15 10km squares.

***Hydroptila sparsa* Mosely, 1920 (Fig. 20)**

TIPPERARY River Suir, Carrick-on-Suir (S3921), 1♂3♀♀ 17 August 2017 and Kilsheelan (S2823), 30♂♂10♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Hydroptila sparsa is new to the River Suir.

WEXFORD: Craywell, New Ross (S7228), 1♀ 6-7 August 2018, light-trap in suburban garden, J. P. O'Connor & M. A. O'Connor.

Hydroptila sparsa is now known from 55 10km squares.

***Hydroptila tineoides* Dalman, 1819 (Fig. 21)**

DONEGAL: Lough Eske (G9683), 5♂♂4♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

Hydroptila tineoides is now known from 43 10km squares.

***Ithytrichia lamellaris* Eaton, 1873 New to County Donegal (Fig. 22)**

DONEGAL: Kilmacrennan [Leannan River] (C1420), 4♂♂8♀♀ 25 June-10 July 1891, J. J. F. X. King.

DUBLIN: River Liffey, Lucan Demesne (O0235), 1♂ 15 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

TIPPERARY: River Suir, Kilsheelan (S2823), 2♂♂1♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Ithytrichia lamellaris is now known from 33 10km squares.

***Orthotrichia angustella* (McLachlan, 1865) New to Counties Waterford and Westmeath (Fig. 23)**

WATERFORD: Tramore (S5701), 1♀ 10 June 2018, light-trap, T. Bryant.

WESTMEATH: Athlone [River Shannon] (N0341), 3♀♀ 10 August 1888, J. J. F. X. King.

Orthotrichia angustella is now known from nine 10km squares.

***Orthotrichia costalis* (Curtis, 1834) New to County Dublin (Fig. 24)**

DUBLIN: Glen Pond, Phoenix Park (O0935), 1♀ 22 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Carrickavrantry Reservoir (S5502), 1♂1♀ 13 July 2018, swept, T. Bryant.

Orthotrichia costalis is now known from five 10km squares.

***Oxyethira falcata* Morton, 1893 New to Counties Donegal and Kildare (Fig. 25)**

DONEGAL: Kilmacrennan [Leannan River] (C1420), 2♀♀ 23 June 1891, 1♀ 1 August 1891, J. J. F. X. King.

KILDARE: Louisa Bridge (N9936), 1♂ 22 August 1982, swept in a marshy area beside the River Camac, J. P. O'Connor & M. A. O'Connor.

MAYO: Mayo National Park (F8607), 1♀ 30 May-20 June 1997, Malaise trap on cutover blanket bog near the Owenduff River, M. C. D. Speight.

Oxyethira falcata is now known from 16 10km squares.

***Oxyethira flavicornis* (Pictet, 1834) New to Counties Meath and Offaly (Fig. 26)**

Reported new to County Antrim from Lough Garve (D2117), Lough na Bric (D2519) and Lough na Trosk (D2719) by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9683), 24♂♂58♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

MEATH: Lough Brackan near Drumconrath (N8788), 1♂ 5 September 2018, swept, J. P. O'Connor & M. A. O'Connor.

OFFALY: Lough Boora (N1818), 1♂ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Upper Finnamore Lake, Boora Discovery Park (N2120), 3♂♂1♀ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Belle Lake (S6604), 2♂♂ 28-29 July 2017, 1♀ 9-10 June 2018 and 1♂ 21 August 2018, A. Walshe; Ballyscanlan Lake (S5402), 1♂1♀ 15 May 2018, 1♂ 13 July 2018, swept, T. Bryant.

WEXFORD: Oaklands Lake, New Ross (S7125), 2♀♀ 14-15 August 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

Oxyethira flavicornis is now known from 50 10km squares.

***Oxyethira sagittifera* Ris, 1897 New to County Donegal (Fig. 27)**

DONEGAL: Kilmacrennan [Leannan River] (C1420), 1♀ 26 June 1891, J. J. F. X. King.

Oxyethira sagittifera is now known from five 10km squares.

PHILOPOTAMIDAE

***Philopotamus montanus* (Donovan, 1813) (Fig. 28)**

Recorded from a stream near Aghalum (D2618), County Antrim by O'Connor, O'Connor and McNaughton (2018).

CORK: Ardarou, River Bride (W7189), 1♀ 19 March 2017, K. G. M. Bond.

DONEGAL: River Clady, near Lough Eske (G9684), 4♂♂ & 1 larva 7 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WEXFORD: side stream/waterfall, River Sow, Edenvale (T0327), 2♂♂ 14 August 2018 and 1 larva 15 August 2018, J. P. O'Connor & M. A. O'Connor; Stoneyford stream (T1009), 1♂ 13 June 1986, J. P. O'Connor & M. A. O'Connor.

Philopotamus montanus is new to the Edenvale Nature Reserve and is now known from 99 10km squares.

***Wormaldia occipitalis* (Pictet, 1834) (Fig. 29)**

DONEGAL: River Clady, near Lough Eske (G9684), 2♂♂1♀ 7 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WICKLOW: Clonkeen Mine, Glenmalure (T0792), 2 larvae 12-13 August 2017, <20m from the surface in the mine around a 90 degree bend in the adit (first seen 9 August 2017), Edward Hick per Paolo Viscardi.

Wormaldia occipitalis is now known from 46 10km squares.

ECNOMIDAE

***Ecnomus tenellus* (Rambur, 1842) new to County Offaly (Fig. 30)**

OFFALY: Loch an Dochais, Lough Boora Discovery Park (N1819), 5♂♂ 26 June 2018, swept, J. P .O'Connor & M. A. O'Connor; Lough Boora (N1818), 1♀ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Upper Finnamore Lake, Lough Boora Discovery Park (N2120), 3♂♂2♀♀ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Belle Lake (S6604), 1♂ 21 August 2018, A. Walshe.

Previously, only a female had been collected at the lake. *Ecnomus tenellus* is now known from 59 10km squares.

POLYCENTROPODIDAE

***Cyrnus flavidus* McLachlan, 1864 (Fig. 31)**

Recorded from the River Erne, Cloonatrig (H2637), County Fermanagh and new to County Antrim from Lough Garve (D2117) by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9683), 13♂♂2♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

Cyrnus flavidus is now known from 60 10km squares.

***Cyrnus trimaculatus* (Curtis, 1834) New to County Offaly (Fig. 32)**

MEATH: Lough Brackan near Drumconrath (N8788), 3♂♂1♀ 5 September 2018, swept, J. P.O'Connor & M. A. O'Connor.

OFFALY: Lough Boora (N1818), 1♂ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

Cyrnus trimaculatus is now known from 143 10km squares.

***Holocentropus dubius* (Rambur, 1842) (Fig. 33)**

Reported as new to Northern Ireland by O'Connor, O'Connor and McNaughton (2018) from the Mill Lough near Bellanaleck (H2438), County Fermanagh.

Holocentropus dubius is now known from 44 10km squares.

***Holocentropus picicornis* (Stephens, 1836) (Fig. 34)**

Recorded as new to County Antrim from Lough na Trosk (D2719) by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9683), 1♂ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

Holocentropus picicornis is now known from 87 10km squares.

***Neureclipsis bimaculata* (Linnaeus, 1758) (Fig. 35)**

Recorded from Coleraine Marina (C8433), County Derry (Londonderry) (O'Connor and McNaughton, 2017c) and from the Mill Lough near Bellanaleck (H2438), County Fermanagh (O'Connor, O'Connor and McNaughton, 2018).

KERRY: Long Range (V9384), 1♂ 5 June 1983, light-trap, K. G. M. Bond.

Neureclipsis bimaculata is now known from 59 10km squares.

***Plectrocnemia conspersa* (Curtis, 1834) (Fig. 36)**

WATERFORD: Tramore (S5701), 1♀ 4 June 2018, light-trap, T. Bryant.

Plectrocnemia conspersa is now known from 158 10km squares.

***Plectrocnemia geniculata* McLachlan, 1871 (Fig. 37)**

Recorded from Lough Garve (D2117), County Antrim by O'Connor, O'Connor and McNaughton (2018).

WEXFORD: side stream, River Sow, Edenvale (T0427), 1♂ pupa with larval remains 15 August, 2018, J. P. O'Connor & M. A. O'Connor.

Plectrocnemia geniculata is new to the Edenvale Nature Reserve and is now known from 50 10km squares.

***Polycentropus flavomaculatus* (Pictet, 1834) (Fig. 38)**

Reported from the Ballycastle Marina (D1241), County Antrim and the River Erne, Cloonatrig (H2637), County Fermanagh by O'Connor, O'Connor and McNaughton (2018).

WATERFORD: Belle Lake (S6604), 2♂♂ 28-29 July 2017, 2♀♀ 15 May 2018, 2♀♀ 9-10 June 2018 and 2♂♂1♀ 21 August 2018 , A. Walshe; Tramore (S5701), 1♂ 18 June 2018, light-trap, T. Bryant.

WEXFORD: River Sow, Edenvale (T0427), 2♂♂ 14 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

First record at Edenvale since King and Halbert (1910). *Polycentropus flavomaculatus* is now known from 330 10km squares.

***Polycentropus irroratus* (Curtis, 1835) (Fig. 39)**

Reported from the Upper Lough Erne, Knockninny Marina (H2731), County Fermanagh by O'Connor, O'Connor and McNaughton (2018).

Polycentropus irroratus is now known from 61 10km squares.

PSYCHOMYIIDAE

***Lype phaeopa* (Stephens, 1836) (Fig. 40)**

Recorded from the Lower Lough Erne, Castle Archdale (H1758), County Fermanagh by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9684), 1♂1♀ 7 June 2018, swept where the River Clady enters the lake, J. P. O'Connor & M. A. O'Connor, (G9683), 1♂1♀ 6 June 2018, swept and 1♂2♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

Previously only known in County Donegal from larvae taken at Lough Anure.

DUBLIN: River Liffey, Lucan Demesne (O0235), 1♂ 10 May 2018, 2♀♀ 27 May 2018, ♂ 15 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Belle Lake (S6605), 1♂ 7 May 2017, (S6604), 1♂ 15 May 2018 and 2♂♂ 9-10 June 2018, all had landed on boats on the lake, A. Walshe.

WEXFORD: River Sow (T0427), Edenvale, 2♀♀ 14 August 2018, swept, J. P. O'Connor & M. A. O'Connor; side stream, River Sow, Edenvale (T0427), 1♀ 15 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Lype phaeopa is new to the Edenvale Nature Reserve. The species is now known from 51 10km squares.

***Lype reducta* (Hagen, 1868) New to County Donegal (Fig. 41)**

DONEGAL: River Clady, near Lough Eske (G9684), 1♂ 7 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WEXFORD: Maudlins Stream, New Ross (S7328), 1♂2♀♀ 9 August 2018, swept from small trickle stream entering the main stream, J. P. O'Connor & M. A. O'Connor.

Lype reducta is now known from 12 10km squares.

***Psychomyia pusilla* (Pictet, 1834) (Fig. 42)**

TIPPERARY: River Suir, Carrick-on-Suir (S3921), 11♂♂4♀♀ 17 August 2017 and Kilsheelan (S2823), 35♂♂45♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Psychomyia pusilla is now known from 108 10km squares.

***Tinodes waeneri* (Linnaeus, 1758) (Fig. 43)**

Recorded from Lough na Bric (D2519), County Antrim by O'Connor, O'Connor and McNaughton (2018).

ANTRIM: Lough Fadden (D1842), 2♂♂2♀♀ 21 September 2017, C. McNaughton.

KERRY: Muckross Lake, Killarney (V9484), 1♀ 26 October 1994, swept, J. P. O'Connor.

KILDARE: Royal Canal, Kilcock (N8839), 1♂1♀ 21 May 2018, swept, J. P. O'Connor & M. A. O'Connor.

MEATH: Lough Brackan near Drumconrath (N8788), 2♂♂2♀♀, 5 September 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Belle Lake (S6604), 1♂ 28-29 July 2017 and 3♂♂5♀♀ 20-21 August 2018, A. Walshe.

Tinodes waeneri is now known from 249 10km squares.

HYDROPSYCHIDAE

***Cheumatopsyche lepida* (Pictet, 1834) (Fig. 44)**

DUBLIN: River Liffey, Lucan Demesne (O0235), 7♂♂4♀♀ 15 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

TIPPERARY: River Suir, Carrick-on-Suir (S3921), 3♂♂3♀♀ 17 August 2017 and Kilsheelan (S2823), 4♂♂13♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Tramore (S5701), 1♂ 18 July 2017, light-trap, T. Bryant.

Cheumatopsyche lepida is now known from 52 10km squares.

***Diplectrona felix* McLachlan, 1878 (Fig. 45)**

TIPPERARY: Kilmastulla River tributary (R7269), 1 larva 14 June 1976, coll. & det. M. A. O'Connor.

WEXFORD: Maudlins Stream, New Ross (S7328), 1 larva 9 August 2018, in a trickle entering a stream, J. P. O'Connor & M. A. O'Connor.

Diplectrona felix is now known from 39 10km squares.

***Hydropsyche contubernalis* McLachlan, 1865 (Fig. 46)**

DUBLIN: River Liffey, Lucan Demesne (O0235), 1♀ 27 May 2018, swept, J. P. O'Connor & M. A. O'Connor.

Hydropsyche contubernalis was originally recorded (as *ornatula*) new to Ireland dowstream from the present site where it was extremely abundant (Beirne and Harris, 1946). In 1944, Poulaphouca Reservoir, located in the western foothills of the Wicklow Mountains, was created by damming of the River Liffey for the purpose of generating electricity from hydropower. Water is released frequently from the reservoir resulting in the volume of water in the river increasing significantly, with a consequent increase in the speed of the water flow. It is interesting that *H. contubernalis* has adapted to such conditions.

Hydropsyche contubernalis is known from 25 10km squares.

***Hydropsyche instabilis* (Curtis, 1834) New to Counties Donegal and Waterford (Fig. 47)**

DONEGAL: River Clady, near Lough Eske (G9684), 7 larvae 7 June 2018, J. P. O'Connor & M. A. O'Connor.

TIPPERARY: Nenagh River, Millbrook (R9173), 1 larva 1 December 1975, M. A. O'Connor.

WATERFORD: Tramore (S5701), 1♀ 10 July 2018, light-trap, T. Bryant.

Hydropsyche instabilis is known from 48 10km squares.

***Hydropsyche pellucidula* (Curtis, 1834) (Fig. 48)**

TIPPERARY: Nenagh River, Millbrook (R9173), 1 larva 9 November 1975, coll. & det. M. A. O'Connor.

Hydropsyche pellucidula is known from 142 10km squares.

***Hydropsyche siltalai* Döhler, 1963 (Fig. 49)**

DONEGAL: Kilmacrenan [Kilmacrenann] (C1420), 1♀ 25 June 1891, J. J. F. X. King.

DUBLIN: Lucan Demesne [River Liffey] (O0235), 2♂♂1♀ 15 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

TIPPERARY: River Suir, Kilsheelan (S2823), 2♂♂1♀ 16 August 2018, swept from vegetation, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Ballyscanlan Lake (S5402), 1♀ 7 June 2018 and 1♀ 12 June 2018, light-trap, T. Bryant; Dunhill stream (S5304), 1♂ 29 June 1988, swept, J. P. O'Connor; Tramore (S5701), 1 ♂ 17 July 2017, 1♂ 28 June 2018 and 1♀ 12 July 2018, light-trap, T. Bryant.

WEXFORD: Craywell, New Ross (S7228), 1♀ 4-5 August 2018, light-trap in suburban garden, J. P. O'Connor & M. A. O'Connor; Maudlins Stream, New Ross (S7328), 14♂♂18♀♀ 11-12 August 2018 and 27♂♂48♀♀ 16-17 August 2018, light-traps, J. P. O'Connor & M. A. O'Connor; Oaklands Lake, New Ross (S7125), 2♀♀ 14-15 August 2018, the light-trap was sited near several streams beside the lake, J. P. O'Connor & M. A. O'Connor.

Hydropsyche siltalai is known from 228 10km squares.

PHRYGANEIDAE

***Agrypnia obsoleta* (Hagen, 1864) New to County Tipperary (Fig. 50)**

MAYO: Carrigskeewaun (L7469), adult 26 July 2018, photographed at light-trap, K. G. M. Bond.

TIPPERARY: Cabragh Wetlands near Thurles (S1054), adult May 2010, reed-bed area, anon.

Identified from a photograph on <http://tipperarybiodiversity.blogspot.com /2010/10/this-was-photographed-in-reedbed-area.html> (accessed 13 July 2018).

Agrypnia obsoleta is now known from 56 10km squares.

***Agrypnia pagetana* Curtis, 1835 (Fig. 51)**

ROSCOMMON: Lough Ree, Rinnagan (M9956), 1♂1♀ 6 May 2018, J. T. Brophy, confirmed J. P. O'Connor.

This is the second record from County Roscommon. The species was previously known from Lough O'Flynn (M5878). *Agrypnia pagetana* is now known from 28 10km squares.

***Agrypnia varia* (Fabricius, 1793) New to County Laois (Fig. 52)**

DONEGAL: Lough Eske (G9683), 1♂ 6-7 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

LAOIS: Abbeyleix Bog (S4383), adult 1 July 2018, photographed on the boardwalk over the bog, L. Stenson (identified from photographs on twitter <https://twitter.com/irishflyfisher> (accessed 2 July 2018)).

MAYO: Gortnahurra Lower (G0720), adult 1 July 2018, from photograph at Skinner trap, K. G. M. Bond.

WATERFORD: Ballyscanlan Lough (S5402), 1♂1♀ 23 August 2017, 3♂♂ 26 August 2017, light-trap, T. Bryant; Tramore (S5701), 1♀ 9 September 2017, light-trap, T. Bryant.

Agrypnia varia is now known from 79 10km squares.

***Hagenella clathrata* (Kolenati, 1848) confirmed as an Irish species (Fig. 53) (Plates 1-2)**

O'Connor and O'Connor (2017) discussed the possible occurrence of *Hagenella clathrata* in Ireland based on Tina Claffey's photograph from Abbeyleix Bog, County Laois (S4383) (Plate 1). The slim possibility existed that it could have been a specimen of *Oligostomis reticulata* (Linnaeus, 1761) which has a similar distribution on mainland Europe (Neu *et al*., 2018). The Irish presence of the species has now been confirmed in County Galway by Martin Gammell and Caitriona Carlin at Ower (M2237), (M2138) and Callownamuck (M2139) (Gammell *et al*., 2018). *H. clathrata* is known from two 10km squares.

***Phryganea bipunctata* Retzius, 1783 (Fig. 54)**

Recorded as new to County Antrim from Lough Fad (D2419), Lough Garve (D2117), Lough na Bric (D2519) and Lough na Trosk (D2719) by O'Connor, O'Connor and McNaughton (2018).

CAVAN: Lough Ramor (N5987), 1♂ 11 May 2005, swept in lakeside woods, J. P. O'Connor.

DONEGAL: Lough Eske (G9683), 1♂1♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Ballyscanlan Lake (S5402), 1♀ 7 June 2018, light-trap, T. Bryant; Belle Lake (S6604), 5♂♂1♀ 15 May 2018, A. Walshe.

Phryganea bipunctata is now known from 66 10km squares.

***Phryganea grandis* Linnaeus, 1758 (Fig. 55)**

Recorded as new to County Fermanagh from the Upper Lough Erne, Knockninny Marina (H2731), by O'Connor, O'Connor and McNaughton (2018).

OFFALY: Upper Finnamore Lake, Lough Boora Discovery Park (N2120), 2♀♀ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

Phryganea grandis is now known from 42 10km squares.

GOERIDAE

***Goera pilosa* (Fabricius, 1775) (Fig. 56)**

WATERFORD: Ballyscanlan Lough (S5402), 1♀ 17 July 2017, light-trap, T. Bryant; Belle Lake (S6604), 1♂1♀ 28-29 July 2017 and 1♀ 20 August 2018, A. Walshe; Mahon River, Bunmahon (X4398), ♀ 13 June 2018, swept, A. Walshe.

Goera pilosa is now known from 110 10km squares.

***Silo nigricornis* (Pictet, 1834) (Fig. 57)**

WICKLOW: River Vartry near Ashford (T2797), 2♂♂ 22 May 1973, swept, J. P. O'Connor.

Silo nigricornis is now known from 54 10km squares.

***Silo pallipes* (Fabricius, 1781) New to County Carlow (Fig. 58)**

CARLOW: St Mullins (S7238), 1♂ 10 August 2018, swept from vegetation beside a stream, J. P. O'Connor & M. A. O'Connor.

Silo pallipes is now known from 128 10km squares.

LEPIDOSTOMATIDAE

***Cruenocia irrorata* (Curtis, 1834) (Fig. 59)**

Recorded from the Craigagh Wood, near the Glendun River, Cushendun (D2232), County Antrim by O'Connor and McNaughton (2017c).

WATERFORD: Tramore (S5701), 2♂♂ 10 June 2018 and ♀ 28 June 2018, light-trap, T. Bryant.

WEXFORD: J. F. Kennedy Park (S7219), 1♀ 25 August 2011, stream, J. P. O'Connor.

Cruenocia irrorata is now known from 41 10km squares.

***Lepidostoma hirtum* (Fabricius, 1775) (Fig. 60)**

DONEGAL: Lough Eske (G9683), 11♂♂42♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

DUBLIN: Castleknock, suburban house (O0837), 1♂ 3 August 2018, on outside of lighted window, J. P. O'Connor; Lucan Demesne [River Liffey] (O0235), 7♂♂5♀♀ 15 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

TIPPERARY: River Suir, Carrick-on-Suir (S3921), 1♂3♀♀ 17 August 2017 and Kilsheelan (S2823), 5♂♂10♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Tramore (S5701), ♀ 18 June 2018, light-trap, T. Bryant.

WEXFORD: Maudlins Stream, New Ross (S7328), 4♀♀ 16-17 August 2018, light-trap, J. P. O'Connor & M. A. O'Connor; Oaklands Lake, New Ross (S7125), 1♀ 14-15 August 2018, swept, J. P. O'Connor.

Lepidostoma hirtum is now known from 239 10km squares.

APATANIIDAE

***Apatania muliebris* McLachlan, 1866 (Fig. 61)**

A female new to County Antrim was taken on a stream tributary of the Cranny Water on the Garron Plateau (D2518), County Antrim (O'Connor, O'Connor and McNaughton, 2018). This is the second record for Northern Ireland.

Apatania muliebris is now known from seven 10km squares.

***Apatania wallengreni* McLachlan, 1871 (Fig. 62)**

DONEGAL: Sessiagh Lough, Portnablagh (C0436), 17♀♀ 4 May 2018, light-trap, C. McNaughton.

Apatania wallengreni is now known from 12 10km squares.

LIMNEPHILIDAE

***Drusus annulatus* (Stephens, 1837) (Fig. 63)**

Adults were also taken at the Coleraine Marina, River Bann (C8433), County Derry (Londonderry) and Lough Garve (D2117), County Antrim (O'Connor, O'Connor and McNaughton, 2018).

WICKLOW: Glenagvore Brook, Knocknadroose (O0101), 2 larvae 27 March 1983, M. J. Costello.

Drusus annulatus is now known from 72 10km squares.

***Ecclisopteryx dalecarlica* Kolenati, 1848**

WICKLOW: Glenagvore Brook, Knocknadroose (O0101), 1 larva 27 March 1983, M. J. Costello.

Ecclisopteryx dalecarlica is still only known from the 16 10km squares shown in O'Connor (2015).

***Chaetopteryx villosa* (Fabricius, 1798) (Fig. 64)**

Recorded from the Craigagh Wood, near the Glendun River, Cushendun (D2232), Lough Fadden (D1842), the River Braid (D1103) and the River Dall, Cushendall (D2327), County Antrim (O'Connor and McNaughton, 2017c; O'Connor, O'Connor and McNaughton, 2018).

Chaetopteryx villosa is now known from 37 10km squares.

***Anabolia nervosa* (Curtis, 1834) New to County Donegal (Fig. 65)**

Recorded from Lough Garve (D2117), Lough na Trosk (D2719), Lough na Tullig (D2420) and the River Braid, Ballymena, Grange Road (D1002), County Antrim (O'Connor and McNaughton, 2017c; O'Connor, O'Connor and McNaughton, 2018).

DONEGAL: Lough Eske (G9683), 2 larvae 6 June 2018, collected in a sheltered small inlet of the lake, J. P. O'Connor & M. A. O'Connor.

DUBLIN: Wavin Lake (Knock Pond) (O1960), 1♂ 11 October 2017, swept, J. P. O'Connor & M. A. O'Connor.

Anabolia nervosa is now known from 101 10km squares.

***Glyphotaelius pellucidus* (Retzius, 1783) (Fig. 66)**

LOUTH: Rathescar Lake (O0286), 2♀♀ 31 May 2018, swept, J. P. O'Connor & M. A. O'Connor.

This is the second record for County Louth.

WATERFORD: Ballyscanlan Lough (S5402), 1♀ 22 May 2017, 1♂ 5 June 2018 and 1♀ 11 June 2018, light-trap, T. Bryant, (S5302), 1♀ 7 June 2018 and 1♀ 21 June 2018, swept, T. Bryant; Tramore (S5701), 1♀ 27 May 2018 and 1♂ 2 June 2018, light-trap, T. Bryant.

WEXFORD: J. F. Kennedy Park (S7218), 1♂ 6 August 2018, swept near a pond and stream, J. P. O'Connor & M. A. O'Connor; Maudlins Stream, New Ross (S7328), 2♂♂1♀ 11-12 August 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

WICKLOW: "Tinode", The Lamb near Manor Kilbride (O0120), 1 ♂ 9 September 2018, dead in a spider's web, J. P. O'Connor & K. Killeen.

Glyphotaelius pellucidus is now known from 64 10km squares.

***Grammotaulius nigropunctatus* (Retzius, 1783) New to County Waterford (Fig. 67)**

WATERFORD: Tramore (S5701), 1♂ 14 September 2017, light-trap. T. Bryant.

This is the first record for south-east Ireland.

WICKLOW: Russelltown Park (N9610), Blessington Reservoir, ♀ 16 August 1981, swept, J. P. O'Connor & M. A. O'Connor.

Previously only known from a larval record at Russelltown Park, *Grammotaulius nigropunctatus* is now known from 30 10km squares.

***Limnephilus affinis* Curtis, 1834 New to Counties Louth and Meath (Fig. 68)**

LOUTH: Rathescar Lake (O0286), 2♀♀ 31 May 2018, swept from ivy *Hedera* overhanging a small stream bordered by an arable field, J. P. O'Connor & M. A. O'Connor.

The small stream was one of a network, some of which had been heavily contaminated by deposits of pig slurry after spraying on adjacent land.

MEATH: Corstown Lough near Drumconrath (N8991), 1♂ 5 September 2018, remains in a spider's web, J. P. O'Connor & M. A. O'Connor; Lough Brackan near Drumconrath (N8788), 1♂ 5 September 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: River Mahon, Bunmahon (X4398), 1♀ 23 April 2018, A. Walshe.

WEXFORD: Education Centre, Wexford Wildlife Reserve, North Slobs (T0723), 1♂1♀ 13 August 2018, remains in spiders' webs, J. P. O'Connor & M. A. O'Connor.

Limnephilus affinis is now known from 78 10km squares.

***Limnephilus auricula* Curtis, 1834 (Fig. 69)**

Recorded from Craigagh Wood, near Glendun River, Cushendun (D2232), County Antrim by O'Connor, O'Connor and McNaughton (2018).

KERRY: Muckross House Gardens (V9686), 1♂ 10 September 1981, found hiding inside a garden plant, J. P. O'Connor & M. A. O'Connor; Muckross Lake, Killarney (V9484), 1♀ 26 October 1994, swept, J. P. O'Connor.

The previous latest date was the 12 October. *Limnephilus auricula* is now known from 109 10km squares.

***Limnephilus binotatus* Curtis, 1834 (Fig. 70)**

CAVAN: Lough Sheelin, Mullaghboy (N4285), 2♀♀ 24 May 2018, light-trap, C. McNaughton.

This is the second record for County Cavan. *Limnephilus binotatus* is now known from 19 10km squares.

***Limnephilus borealis* (Zetterstedt, 1840) (Fig. 71)**

Adults of *Limnephilus borealis* were discovered new to Ireland at Lough Garve (D2117) on the Garron Plateau in County Antrim (O'Connor and McNaughton, 2017b). Subsequently, the species was collected at a second site *viz.* Lough Natullig (Loch na Tullig) (D2421), also in County Antrim (O'Connor and McNaughton, 2018).

Limnephilus borealis is now known from two 10km squares.

***Limnephilus centralis* Curtis, 1834 (Fig. 72)**

The species was recorded as new to County Fermanagh from the River Erne at Bellanaleck Quay (H2339) (O'Connor, O'Connor and McNaughton, 2018).

DONEGAL: River Clady, near Lough Eske (G9684), 3♂♂1♀ 7 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

Limnephilus centralis is now known from 59 10km squares.

***Limnephilus coenosus* Curtis, 1834 (Fig. 73)**

Recorded as new to County Antrim from Lough Garve (D2117) and Lough na Tullig (D2420) by O'Connor and McNaughton (2017c).

Limnephilus coenosus is now known from five 10km squares.

***Limnephilus decipiens* (Kolenati, 1848) New to Counties Meath, Offaly and Wexford (Fig. 74)**

CAVAN: Lough Sheelin, Mullaghboy (N4285), 1♀ 24 May 2018, light-trap, C. McNaughton.

This is the second record for County Cavan.

MEATH: Corstown Lough near Drumconrath (N8991), 1♀ 5 September 2018, swept, J. P. O'Connor & M. A. O'Connor.

OFFALY: Lough Boora (N1818), 5♂♂12♀♀ 10 October 2018, J. P.O'Connor & M. A. O'Connor.

WEXFORD: Oaklands Lake, New Ross (S7125), 2♀♀ 14-15 August 2018, light- trap, J. P. O'Connor & M. A. O'Connor.

Limnephilus decipiens is now known from 16 10km squares.

***Limnephilus elegans* Curtis, 1834 (Fig. 75) (Plate 8)**

Recorded from the north-eastern extremity of Dungonnell reservoir (D2018), County Antrim by O'Connor and McNaughton (2017c) and Lough na Trosk (D2719), County Antrim by O'Connor, O'Connor and McNaughton (2018).

Limnephilus elegans is now known from ten 10km squares.

***Limnephilus flavicornis* (Fabricius, 1787) New to Counties Donegal, Louth and Meath (Fig. 76)**

The species was also recorded from the River Erne, Cloonatrig (H2637), County Fermanagh (O'Connor, O'Connor and McNaughton, 2018).

DONEGAL: Lough Eske (G9683), 1♂1♀ 6 June 2018, swept, 2♂♂2♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

DUBLIN: Lucan Demesne [River Liffey] (O0235), 1♂ 15 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

LAOIS: Abbeyleix Bog (S4383), 1 larva 30 April 2018, in a bog pool, J. P. O'Connor & M. A. O'Connor.

LOUTH: Rathescar Lake (O0286), 3♂♂1♀ 31 May 2018, swept, J. P. O'Connor & M. A. O'Connor.

MEATH: Corstown Lough near Drumconrath (N8991), 1♂2♀♀ 5 September 2018, swept from trees and bushes near the lake, J. P. O'Connor & M. A. O'Connor; Lough Brackan near Drumconrath (N8788), 3♀♀ 5 September 2018, J. P. O'Connor & M. A. O'Connor.

Limnephilus flavicornis is now known from 107 10km squares.

***Limnephilus hirsutus* (Pictet, 1834) New to County Wexford (Fig. 77)**

WEXFORD: Craywell, New Ross (S7228), 1♀ 18 August 2018, resting on the front door of a suburban house, M. A. O'Connor; Maudlins Stream, New Ross (S7328), 3♂♂3♀♀ 11-12 August 2018 and 1♂ 16-17 August 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

WICKLOW: "Tinode", The Lamb near Manor Kilbride (O0120), 1♀ 9 September 2018, dead in a spider's web on a window, J. P. O'Connor & K. Killeen and 1♀ 9 September 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

This site is only the second locality for the species in County Wicklow. *Limnephilus hirsutus* is now known from 32 10km squares.

***Limnephilus incisus* Curtis, 1834 (Fig. 78)**

Limnephilus incisus was recorded from beside Lough na Trosk (D2619), County Antrim by O'Connor, O'Connor and McNaughton (2018).

WESTMEATH: Coosan Lough (N0545), 1♀ 2 July 1980, swept, J. P. O'Connor.

Limnephilus incisus is now known from 37 10km squares.

***Limnephilus lunatus* Curtis, 1834 (Fig. 79)**

Recorded from Lough Fadden (D1842), Lough Garve (D2117) and Lough na Trosk (D2719), County Antrim by O'Connor and McNaughton (2017c) and Coleraine Marina, River Bann (C8433), County Derry (Londonderry) by O'Connor, O'Connor and McNaughton (2018).

CORK: Finnis (W4759), 1♀ 26 October 2017, K. G. M. Bond; Lough Hyne (Ine) (W0929), 2 larvae 27 January 1983, stream, M. J. Costello.

DERRY: Coleraine Marina, River Bann (C8433), ♀ 9 October 2017, light-trap, C. McNaughton.

DONEGAL: Lough Eske (G9683), 1♂ and 1 larva 6 June 2018, J. P. O'Connor & M. A. O'Connor.

DUBLIN: Wavin Lake (Knock Pond) (O1960), 1♀ 11-12 October 2017, light-trap, J. P. O'Connor & M. A. O'Connor.

KERRY: Muckross Lake, Killarney (V9484), 3♀♀ 26 October 1994, swept, J. P. O'Connor.

WATERFORD: Ballyscanlan Lough (S5402), 1♀ 23 August 2017, swept, T. Bryant.

Limnephilus lunatus is now known from 173 10km squares.

***Limnephilus luridus* Curtis, 1834 (Fig. 80)**

WATERFORD: Tramore (S5701), 1♀ 10 June 2018, light-trap, T. Bryant.

This is the second locality for *Limnephilus luridus* in County Waterford. The species is now known from 38 10km squares.

***Limnephilus marmoratus* Curtis, 1834 (Fig. 81)**

Recorded from Lough Fadden (D1842), County Antrim, by O'Connor and McNaughton (2017c).

CORK: Lough Allua (W2065), 1 larva 27 April 1985, M. J. Costello; Lough Hyne (Ine) (W0929), 1 larva 27 January 1983, stream, M. J. Costello.

DONEGAL: Lough Eske (G9683), 1♂ 6 June 2018, swept from vegetation, 2♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

DUBLIN: Castleknock (O0837), 1♂ 2-3 September 2018, light-trap in a suburban garden, J. P. O'Connor.

KERRY: Muckross Lake, Killarney (V9484), 3♀♀ 26 October 1994, J. P. O'Connor; Torc Stream, Killarney (V9684), 1♀ 10 September 1981, swept, J. P. O'Connor.

MEATH: Corstown Lough near Drumconrath (N8991), 3♀♀ 5 September 2018, swept from trees and bushes near the lake, J. P. O'Connor & M. A. O'Connor.

OFFALY: Lough Boora (N1818), 1♂2♀♀ 25 July 2018, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Carrickvrantry Reservoir (S5502), 1♂ 24 August 2017, T. Bryant.

Limnephilus marmoratus is now known from 172 10km squares.

***Limnephilus nigriceps* (Zetterstedt, 1840) (Fig. 82)**

Recorded from Evish Lough (D1918), Lough Garve (D2117) and Lough na Tullig (D2420), County Antrim by O'Connor and McNaughton (2017c).

Limnephilus nigriceps is now known from 29 10km squares.

***Limnephilus rhombicus* (Linnaeus, 1758) New to County Cork (Fig. 83)**

CORK: Lough Allua (W2065), 1 larva 27 April 1985, M. J. Costello.

WEXFORD: Maudlins Stream, New Ross (S7328), 1♂1♀ 11-12 August 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

Limnephilus rhombicus is now known from 36 10km squares.

***Limnephilus sparsus* Curtis, 1834 (Fig. 84)**

DONEGAL: Lough Eske (G9683), 2♀♀ 6 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

FERMANAGH: Lower Lough Erne, Castle Archdale (H1758), 2♀♀ 5 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Ballyscanlan Lake (S5302), 1♂ 21 June 2018, swept, T. Bryant.

WEXFORD: Craywell, New Ross (S7228), 1♂ 12-13 August 2018, light-trap in suburban garden, J. P .O'Connor & M. A. O'Connor; Maudlins Stream, New Ross (S7328), 2♀♀ 9 August 2018, swept from vegetation, 1♀ 16-17 August 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

WICKLOW: "Tinode", The Lamb near Manor Kilbride (O0120), 1♂2♀♀ 9 September 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

Limnephilus sparsus is now known from 116 10km squares.

***Limnephilus stigma* Curtis, 1834 (Fig. 85)**

Recorded from Evish Lough (D1918) and Lough Garve (D2117), County Antrim by O'Connor and McNaughton (2017c).

Limnephilus stigma is now known from 26 10km squares.

***Halesus digitatus* (Schrank, 1781) (Fig. 86)**

Recorded from Craigagh Wood (near Glendun River) (D2232) and Waterfoot (D2325), County Antrim by O'Connor and McNaughton (2017c).

CORK: Lough Hyne (Ine) (W0929), 1 larva 27 January 1983, stream, M. J. Costello.

Halesus digitatus is now known from 28 10km squares.

***Halesus radiatus* (Curtis, 1834) (Fig. 87)**

Recorded from the Cranny Water (D2718), Lough Fadden (D1842), Lough Garve (D2117), Lough na Tullig (D2420) and the River Braid (D1102), County Antrim by O'Connor and McNaughton (2017c) and Coleraine Marina, River Bann (C8433), County Derry (Londonderry) by O'Connor, O'Connor and McNaughton (2018).

CORK: Dunbegly Cliffs (W7250) [small lake nearby], 1♀ 28 October 2017, K. G. M. Bond; Lough Hyne (Ine) (W0929), 20 larvae 27 January 1983, stream, M. J. Costello.

WATERFORD: Ballyscanlan Lough (S5402), 1♀ 9 October 2017, light-trap, T. Bryant.

Halesus radiatus is now known from 123 10km squares.

***Micropterna lateralis* (Stephens, 1837) (Fig. 88)**

KERRY: River Cloghereen, Killarney (V9786) , 6 larvae 28 May 1995, J. P. O'Connor.

Micropterna lateralis is now known from 39 10km squares.

***Micropterna sequax* McLachlan, 1875 (Fig. 89)**

Recorded from Craigagh Wood near Glendun River (D2232), County Antrim by O'Connor, O'Connor and McNaughton (2018).

WATERFORD: Ballyscanlan Lake (S5402), 1♂ 28 May 2018, light-trap, T. Bryant; Tramore (S5701), 1♂ 9 September 2017 and 1♂ 30 September 2017, light-trap, T. Bryant.

Micropterna sequax is now known from 55 10km squares.

***Potamophylax cingulatus* (Stephens, 1837) New to County Carlow (Fig. 90)**

O'Connor, O'Connor and McNaughton (2018) record *Potamophylax cingulatus* from Craigagh Wood near Glendun River (D2232) and a tributary of the Cranny Water, Carnlough (D2718), both in County Antrim.

CARLOW: St Mullins (S7238), 1 larva 10 August 2018, stream, J. P. O'Connor & M. A. O'Connor.

WEXFORD: Maudlins Stream, New Ross (S7328), 1 larva 9 August 2018, in small trickle entering the stream, 2♂♂ 16-17 August 2018 and 1♂ 11-12 August 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

WICKLOW: "Tinode", The Lamb near Manor Kilbride (O0120), 1 ♂ 9 September 2018, dead in spider's web, J. P. O'Connor & K. Killeen.

Potamophylax cingulatus is now known from 46 10km squares.

***Potamophylax latipennis* (Curtis, 1834) (Fig. 91)**

Recorded from Craigagh Wood near the Glendun River (D2232), County Antrim by O'Connor, O'Connor and McNaughton (2018).

WATERFORD: Mahon River, Bunmahon (X4398), 1♂ 13 June 2018, A. Walshe.

Potamophylax latipennis is now known from 80 10km squares.

***Stenophylax permistus* McLachlan, 1895**

WATERFORD: Tramore (S5701), ♂ 3 April 2018, light-trap, T. Bryant.

This is the earliest record for an Irish specimen of *Stenophylax permistus*. The species is known from 53 10km squares.

SERICOSTOMATIDAE

***Sericostoma personatum* (Kirby & Spence, 1826) (Fig. 92)**

Recorded from Lough Garve (D2117) and Lough na Bric (D2519), County Antrim by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9683), 27♂♂20♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

KILDARE: Royal Canal, Kilcock (N8839), 1♀ 21 May 2018, swept, J. P. O'Connor & M. A. O'Connor.

MAYO: Lough Muck, near Foxford (G2002), 1♂ 9 June 2018, L. Stenson, det. J. Brophy, conf. J. P. O'Connor.

WEXFORD: Maudlins Stream, New Ross (S7328), 2♂♂ 11-12 August 2018 and 1♂ 16-17 August 2018 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

Sericostoma personatum is now known from 245 10km squares.

BERAEIDAE

***Beraea pullata* (Curtis, 1834) New to County Donegal (Fig. 93)**

DONEGAL: at a stream in a gully entering the River Clady (G9684), 10♂♂6♀♀ 7 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

Beraea pullata is now known from 35 10km squares.

ODONTOCERIDAE

***Odontocerum albicorne* (Scopoli, 1763) (Fig. 94)**

WEXFORD: Maudlins Stream, New Ross (S7328), 2♂♂ 9 August 2018, swept from vegetation, 2♂♂ 11-12 August 2018 and 1♂ 16-17 August 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

Odontocerum albicorne is now known from 84 10km squares.

MOLANNIDAE

***Molanna albicans* (Zetterstedt, 1840) (Fig. 95)**

FERMANAGH: Lower Lough Erne, Castle Archdale (H1758), 8♂♂2♀♀ 5 June 2018, swept, J. P. O'Connor & M. A. O'Connor; River Erne, Cloonatrig (H2637), 1♀ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.

Previously only known from Lower Lough Erne based on an adult taken in 1948. *Molanna albicans* is now known from 28 10km squares.

LEPTOCERIDAE

***Adicella reducta* (McLachlan, 1865) New to County Carlow (Fig. 96)**

CARLOW: St Mullins (S7238), 1♂ 10 August 2018, swept from vegetation beside a stream, J. P. O'Connor & M. A. O'Connor.

Adicella reducta is now known from 24 10km squares.

***Athripsodes albifrons* (Linnaeus, 1758) (Fig. 97)**

TIPPERARY: River Suir, Carrick-on-Suir (S3921), 17♂♂10♀♀ 17 August 2017 and Kilsheelan (S2823), 5♂♂10♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Athripsodes albifrons is now known from 96 10km squares.

***Athripsodes aterrimus* (Stephens, 1836) New to County Louth (Fig. 98)**

Recorded from Lough Fine (D2520), County Antrim by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9683), 5♂♂3♀♀ 6 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

FERMANAGH: River Erne, Cloonatrig (H2637), 3♂♂ 5-6 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.
LOUTH: Rathescar Lake (O0286), 7♂♂2♀♀ 31 May 2018, swept from the lakeside vegetation and from numerous swarms on the lake, J. P. O'Connor & M. A. O'Connor.
OFFALY: Grand Canal, Pollagh (N1925), 1♀ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Loch an Dochais, Lough Boora Discovery Park (N1819), 7♂♂4♀♀ 26 June 2018, 2♂♂♀ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Upper Finnamore Lake, Lough Boora Discovery Park (N2120), 1♀ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor.
WATERFORD: Ballyscanlan Lough (S5402), 1♂ 23 August 2017, T. Bryant; Belle Lake (S6604), 1♂ 14 June 2017, on a boat, 3♂♂ 9-10 June 2018, A. Walshe.

Athripsodes aterrimus is now known from 121 10km squares.

***Athripsodes bilineatus* (Linnaeus, 1758) (Fig. 99) New to County Kildare**

KILDARE: Louisa Bridge, beside River Camac (N9936), 1♀ 22 August 1982, swept in marshy area, J. P. O'Connor & M. A. O'Connor.

This is the first record of an Irish adult of this species since King and Halbert (1910). *Athripsodes bilineatus* is now known from 16 10km squares.

***Athripsodes cinereus* (Curtis, 1834) (Fig. 100)**

MEATH: River Boyne, Trim (N8056), 1 larva 5 September 1988, M. F. O'Grady.
OFFALY: Grand Canal, Pollagh (N1925), 2♀♀ 25 July 2018, J. P. O'Connor & M. A. O'Connor; Lough Boora (N1818), 3♂♂2♀♀ 25 July 2018, J. P. O'Connor & M. A. O'Connor; Upper Finnamore Lake, Lough Boora Discovery Park (N2120), 1♀ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor.
TIPPERARY: River Suir, Carrick-on-Suir (S3921), 15♂♂6♀♀ 17 August 2017 and Kilsheelan (S2823), 35♂♂28♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.
WATERFORD: Belle Lake (S6604), 1♂ 28-29 July 2017, A. Walshe; Tramore (S5701), ♂♀ 1 July 2018, light-trap, T. Bryant.

Athripsodes cinereus is now known from 187 10km squares.

***Ceraclea annulicornis* (Stephens, 1836)**

DONEGAL: Kilmacrenan [Kilmacrenann] (C1420), 2♂♂12♀♀ 3 July 1891 and 4♂♂4♀♀ 20 July 1891, J. J. F. X. King, confirmed J. P. O'Connor.

Although already recorded from the area [Lennan River], Irish adults are rarely taken. *Ceraclea annulicornis* is known from seven 10km squares.

***Ceraclea dissimilis* (Stephens, 1836) (Fig. 101)**

DONEGAL: Lough Eske (G9683), 1♂ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

TIPPERARY: River Suir, Kilsheelan (S2823), 1♂4♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Ceraclea dissimilis is now known from 60 10km squares.

***Ceraclea fulva* (Rambur, 1842) (Fig. 102)**

WATERFORD: Belle Lake (S6604), 1♂ 14 June 2017, on a boat, A. Walshe; Tramore (S5701), ♂ 2 July 2018, light-trap, T. Bryant.

Previously known from Belle Lake, Tramore is the second locality for both County Waterford and south-east Ireland. *Ceraclea fulva* is now known from 61 10km squares.

***Ceraclea nigronervosa* (Retzius, 1783) New to County Dublin (Fig. 103)**

DONEGAL: Lough Eske (G9683), 3♂♂2♀♀ 6-7 June 2018, light-traps and swept from vegetation, J. P. O'Connor & M. A. O'Connor.

DUBLIN: Lucan Demesne [River Liffey] (O0235), 1♂ 27 May 2018, swept, J. P. O'Connor & M. A. O'Connor.

FERMANAGH: Upper Lough Erne, Knockninny Marina (H27311), 1♂ 8 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

MEATH: River Boyne, Dunmoe Castle (N9070), 1 pupal case 5 September 1988, M. F. O'Grady.

Ceraclea nigronervosa is now known from 56 10km squares.

***Ceraclea senilis* (Burmeister, 1839) (Fig. 104)**

DUBLIN: Royal Canal, 12th lock (O0838), 1♀ 17 July 2018, alive resting on a window inside a hotel, J. P. O'Connor.

In 1976, 3♂♂ were taken in same area which remains the only known Dublin locality. *Ceraclea senilis* is now known from 43 10km squares.

***Leptocerus tineiformis* Curtis, 1834 New to County Waterford (Fig. 105)**

WATERFORD: Tramore (S5701), 1♀ 30 June 2018 and ♀ 9 July 2018, light-trap, T. Bryant.

This species appears to be expanding its range in Ireland. *Leptocerus tineiformis* is now known from six 10km squares.

***Mystacides azurea* (Linnaeus, 1761) (Fig. 106)**

DONEGAL: Lough Eske (G9683), 24♂♂7♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

DUBLIN: Castleknock (O0837), 1♀ 2-3 September 2018, light-trap in a suburban garden, J. P. O'Connor; River Dodder (O1529), 1♀ 12 September 2018, on a riverside walkway, coll. and det. M. Nolan, conf. J. P. O'Connor.

KERRY: Muckross Lake, Killarney (V9484), 1♂ 26 October 1994, J. P. O'Connor.

The 26 October is the latest flight date for Ireland.

MEATH: Corstown Lough near Drumconrath (N8991), 1♀ 5 September 2018, swept, J. P. O'Connor & M. A. O'Connor.
OFFALY: Grand Canal, Pollagh (N1925), 1♂ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Lough Boora (N1818), 3♂♂3♀♀ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor.
TIPPERARY: River Suir, Carrick-on-Suir (S3921), 5♂♂4♀♀ 17 August 2017 and Kilsheelan (S2823), 3♂♂2♀♀ 16 August 2018, swept, J. P. O'Connor & M. A. O'Connor.

Mystacides azurea is now known from 163 10km squares.

***Mystacides longicornis* (Linnaeus, 1758) (Fig. 107)**

DUBLIN: Glen Pond, Phoenix Park (O0935), 1♀ 22 July 2018, swept, J. P. O'Connor & M. A. O'Connor; River Liffey, Strawberry Beds (O0735), 1♀ 30 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

Although *Mystacides longicornis* is a widespread Irish species, these are the first records from the River Liffey in County Dublin and also the Phoenix Park. The species has been found in the Farmleigh Estate which adjoins the Park.
MEATH: Lough Brackan near Drumconrath (N8788), 6♂♂ 5 September 2018, swept, J. P. O'Connor & M. A. O'Connor.
OFFALY: Loch an Dochais, Boora Park (N1819), 1♂ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Lough Boora (N1818), 2♂♂5♀♀ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Upper Finnamore Lake, Lough Boora Discovery Park (N2120), ♂ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor.
WATERFORD: Ballyscanlan Lough (S5402), 1♀ 24 July 2017, T. Bryant; Belle Lake (S6604), 1♀ 9-10 June 2018, A. Walshe; Tramore (S5701), 1♀ 11 June 2018, light-trap, T. Bryant.

Mystacides longicornis is now known from 105 10km squares.

***Oecetis furva* (Rambur, 1842) New to CountyWaterford (Fig. 108)**

Recorded from Lough na Trosk (D2719), County Antrim by O'Connor, O'Connor and McNaughton (2018).
DONEGAL: Lough Eske (G9683), 1♂ 6-7 June 2018, light-trap, J. P. O'Connor & M. A. O'Connor.
OFFALY: Loch an Dochais, Boora Park (N1819), 1♂ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Lough Boora (N1818), 2♂♂1♀ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor.
WATERFORD: Carrickavrantry Reservoir (S5502), 1♂ 30 June 2018, swept, T. Bryant.

Oecetis furva is now known from 50 10km squares.

***Oecetis ochracea* (Curtis, 1825) New to County Offaly (Fig. 109)**

Recorded from Lough Garve (D2117), County Antrim by O'Connor, O'Connor and McNaughton (2018).

DONEGAL: Lough Eske (G9683), 1♂ 6 June 2018, swept, 5♂♂3♀♀ 6-7 June 2018, light-traps, J. P. O'Connor & M. A. O'Connor.

OFFALY: Lough Boora (N1818), 1♀ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Ballyscanlan Lake (S5402), 1♂ 4 June 2018, swept, T. Bryant.

Oecetis ochracea is now known from 67 10km squares.

***Triaenodes bicolor* (Curtis, 1834) (Fig. 110)**

CORK: Lough Allua (W2065), 1 larva 27 April 1985, M. J. Costello.

This is the second record from County Cork.

OFFALY: Loch an Dochais, Lough Boora Discovery Park (N1819), 1♂ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor; Lough Boora (N1818), 2♂♂ 25 July 2018, swept, J. P. O'Connor & M. A. O'Connor; Upper Finnamore Lake, Lough Boora Discovery Park (N2120), 1♂ 26 June 2018, swept, J. P. O'Connor & M. A. O'Connor.

WATERFORD: Carrickvrantry Reservoir (S5502), 1♂ 29 August 2017, T. Bryant.

Triaenodes bicolor is now known from 81 10km squares.

***Ylodes reuteri* (McLachlan, 1880) (Fig. 111)**

Tony Bryant light-trapped three females of *Ylodes reuteri* in Tramore, County Waterford (S5701) during June and July 2018 (O'Connor and Bryant, 2018). This is the third Irish record of this brackish water species. *Ylodes reuteri* is now known from three 10km squares.

Acknowledgements

We are very grateful to the following who have provided records and/or help with this paper:- Ken Bond, John Brophy, Tony Bryant, Caitriona Carlin, Mark Costello, Tina Claffey, Dan de Rosa, Martin Gammell, Edward Hick, Kevin Killeen, Cathal McNaughton, Myles Nolan, Helen O'Connor, the late Martin O'Grady, Ted (Edward) Rolston, Martin Speight, Liam Stenston, Paolo Viscardi and Alan Walshe. We also wish to thank the staff of the Lough Boora Discovery Park for permission to collect caddisflies there, Adrian Browne for permission to run light-traps at Oaklands Lake and Ciaran McDonald and the Committee of the Gormanston and District Anglers for enabling access to Wavin Lake; Dr Liam Lysaght and Dr Peter Neu kindly read the text on mapping and respectively gave permission to use the relevant figures from the National Biodiversity Data Centre and from the *Distribution Atlas of European Trichoptera*. The Irish distribution maps were prepared using DMAP and the authors are indebted to Dr Alan Morton for supplying the relevant programme.

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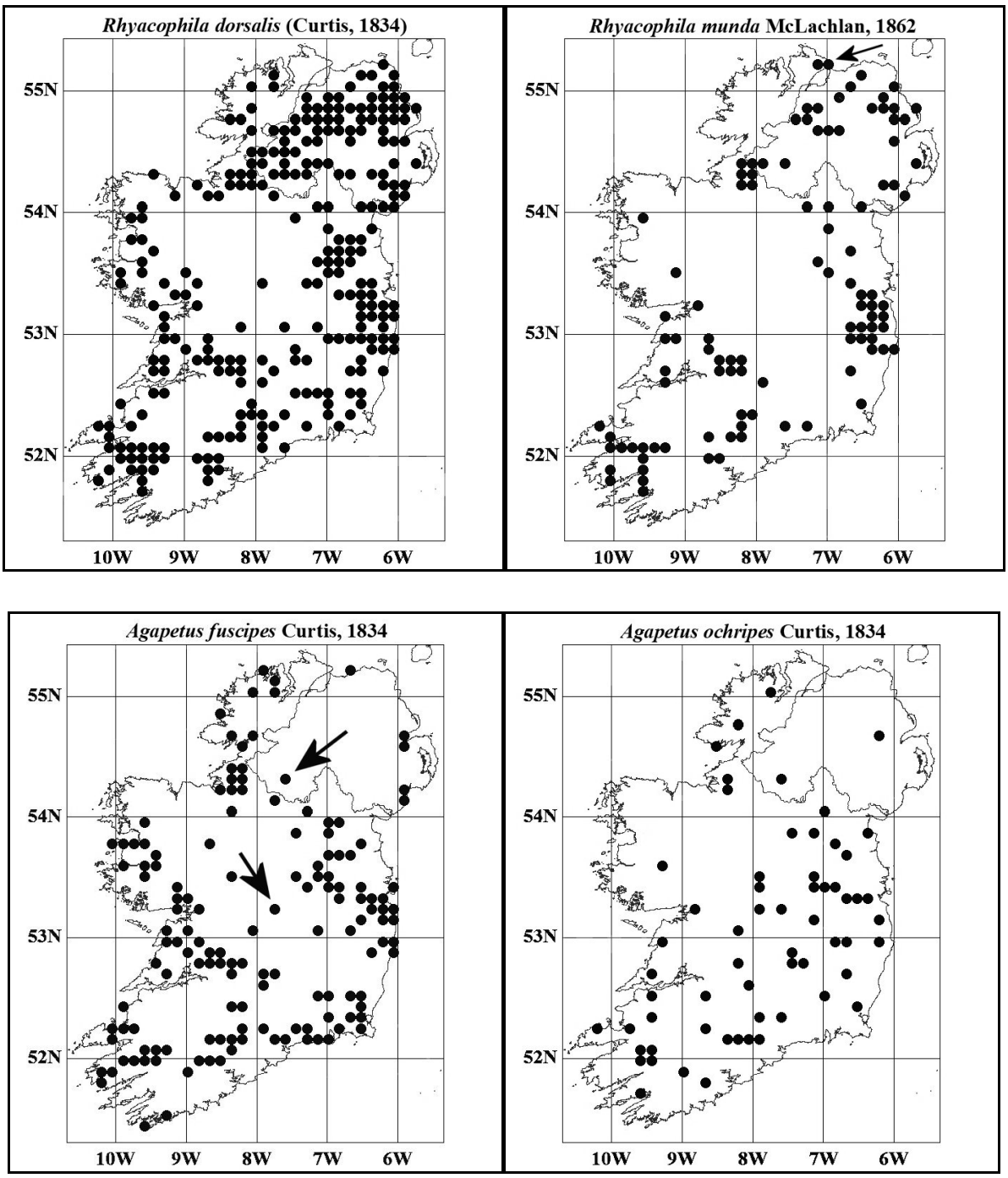
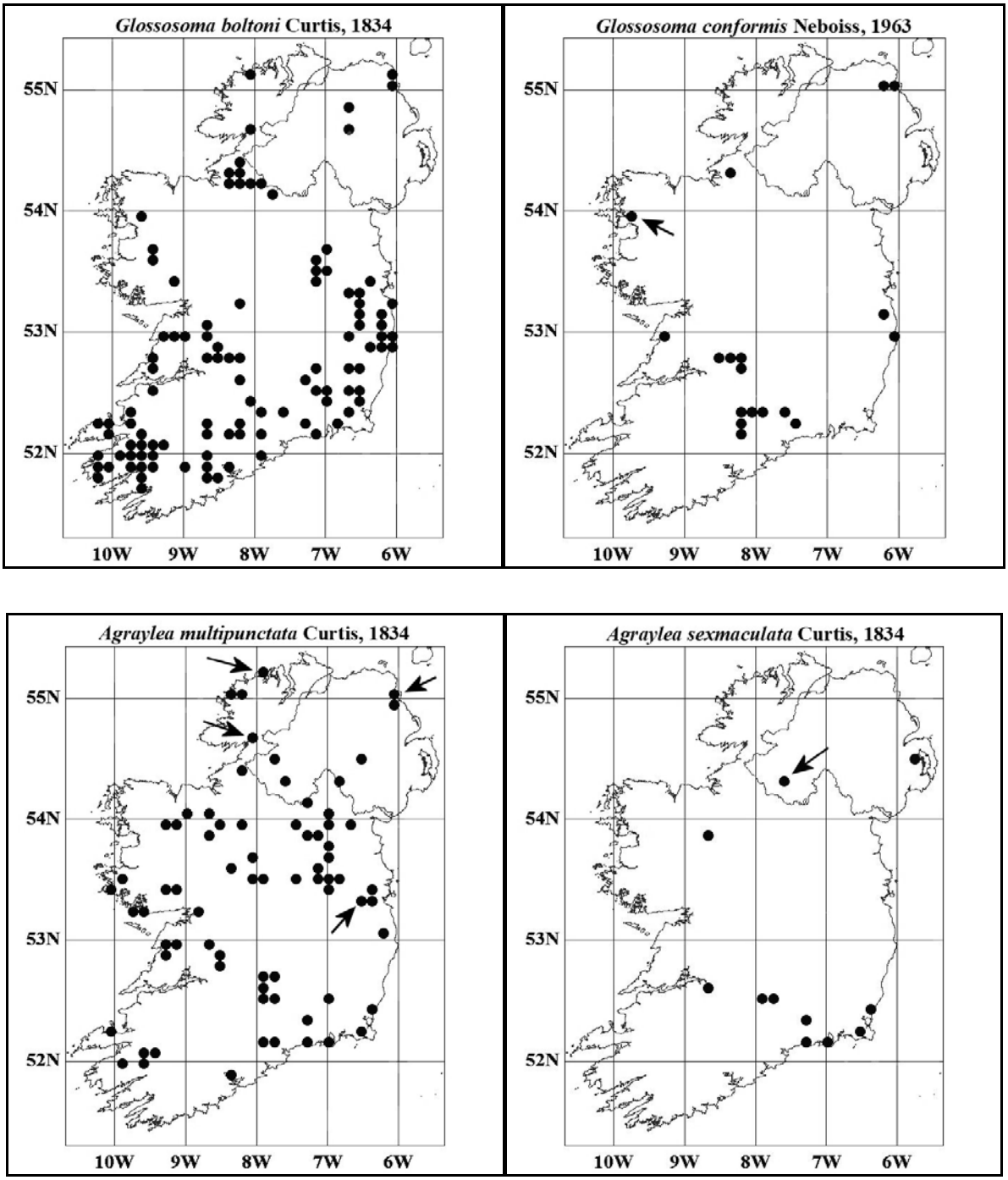
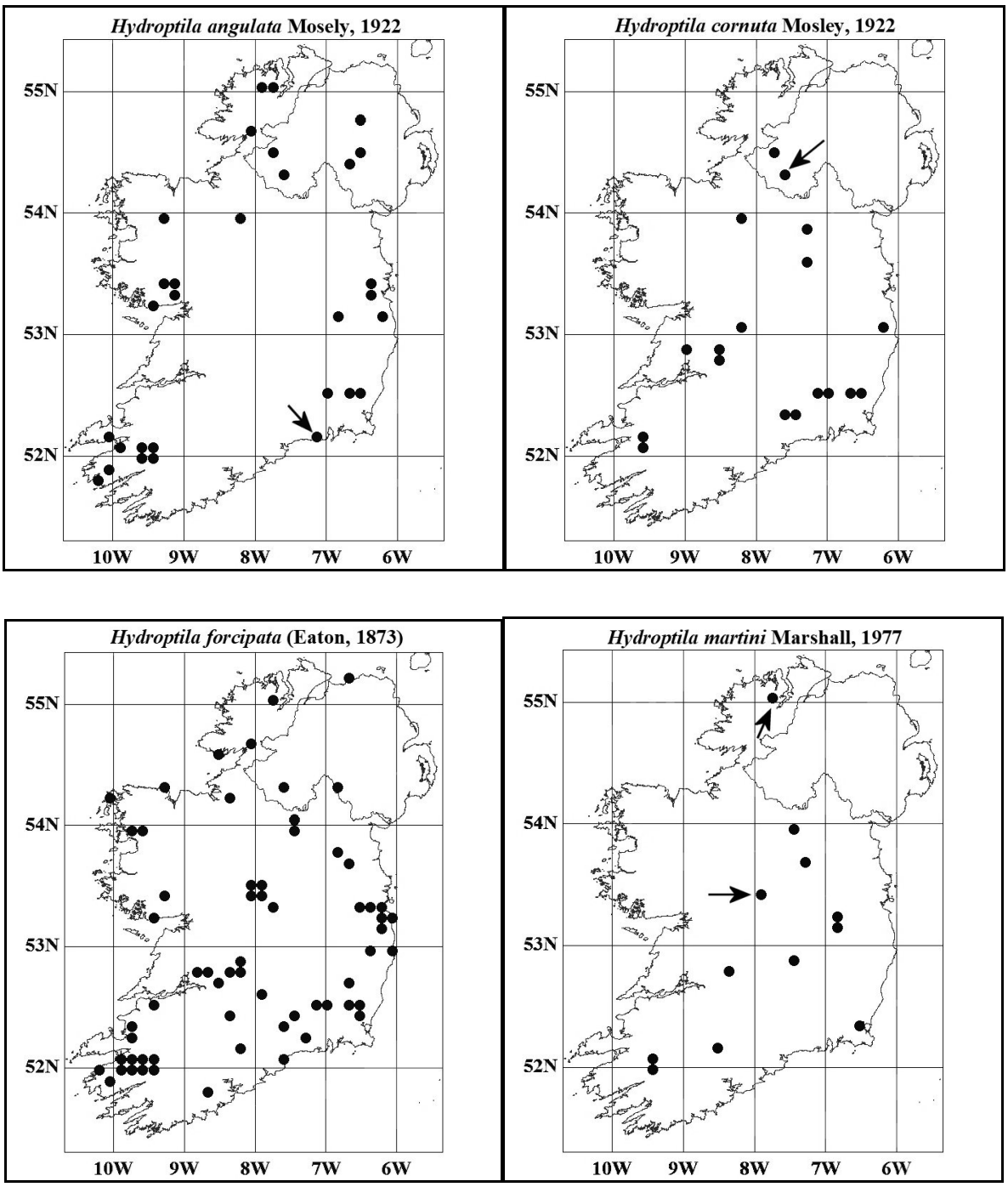


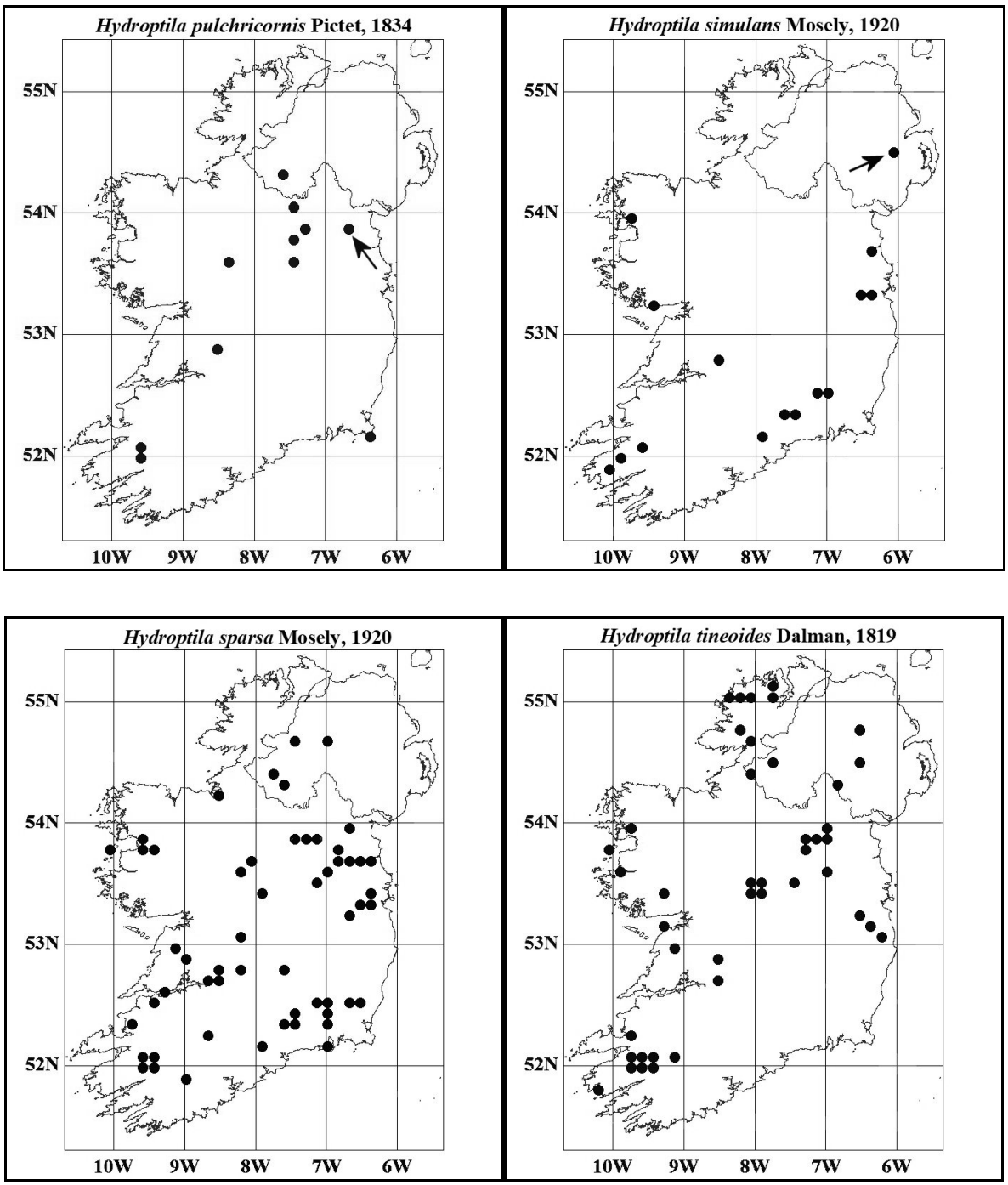
FIGURES 6-9. The known Irish distributions of *Rhyacophila dorsalis* (Curtis, 1834), *Rhyacophila munda* McLachlan, 1862, *Agapetus fuscipes* Curtis, 1834 and *Agapetus ochripes* Curtis, 1834. Significant records are indicated by arrows.



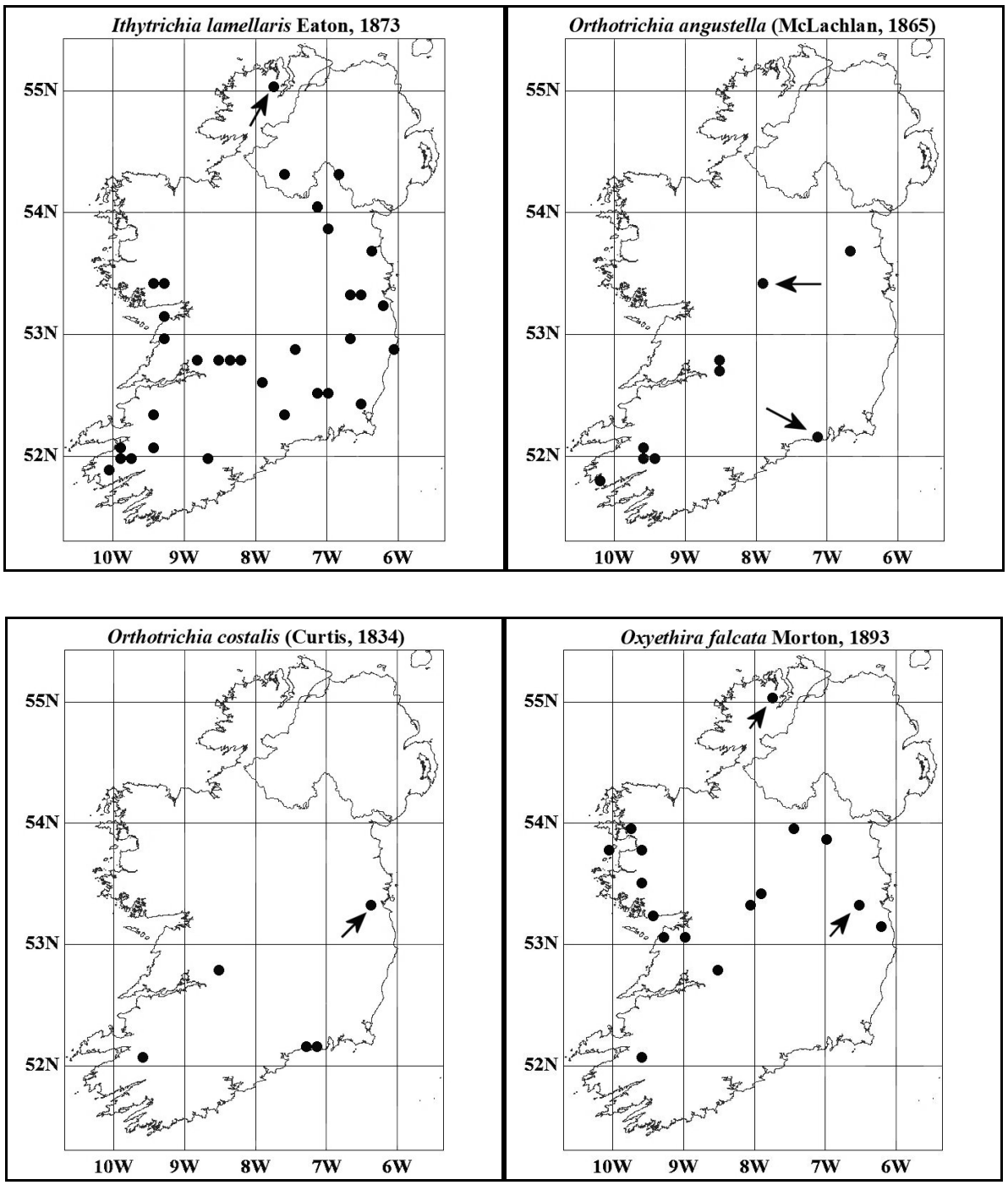
FIGURES 10-13. The known Irish distributions of *Glossosoma boltoni* Curtis, 1834, *Glossosoma conformis* Neboiss, 1963, *Agraylea multipunctata* Curtis, 1834 and *Agraylea sexmaculata* Curtis, 1834. Significant records are indicated by arrows.



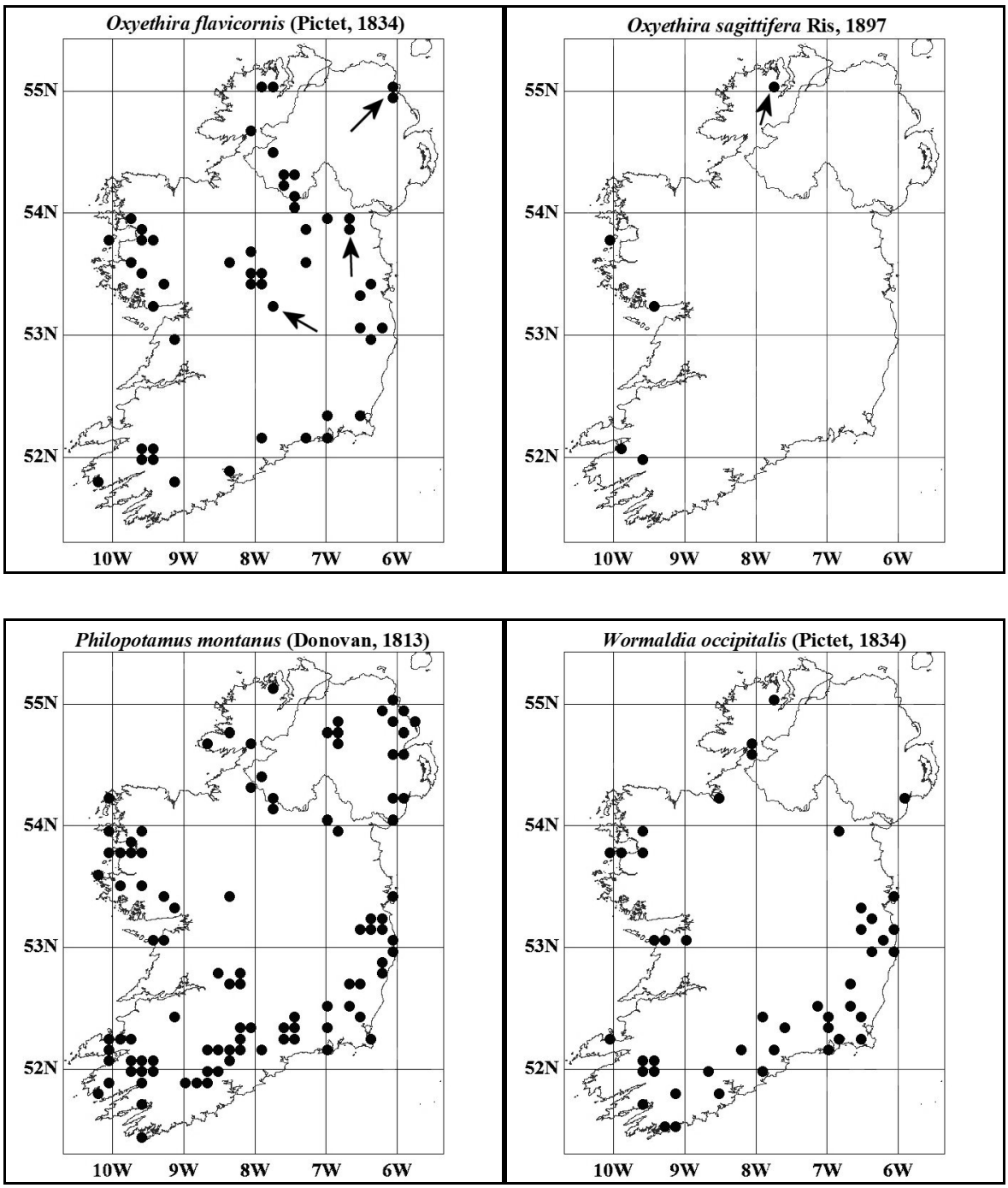
FIGURES 14-17. The known Irish distributions of *Hydroptila angulata* Mosely, 1922, *Hydroptila cornuta* Mosley, 1922, *Hydroptila forcipata* (Eaton, 1873) and *Hydroptila martini* Marshall, 1977. Significant records are indicated by arrows.



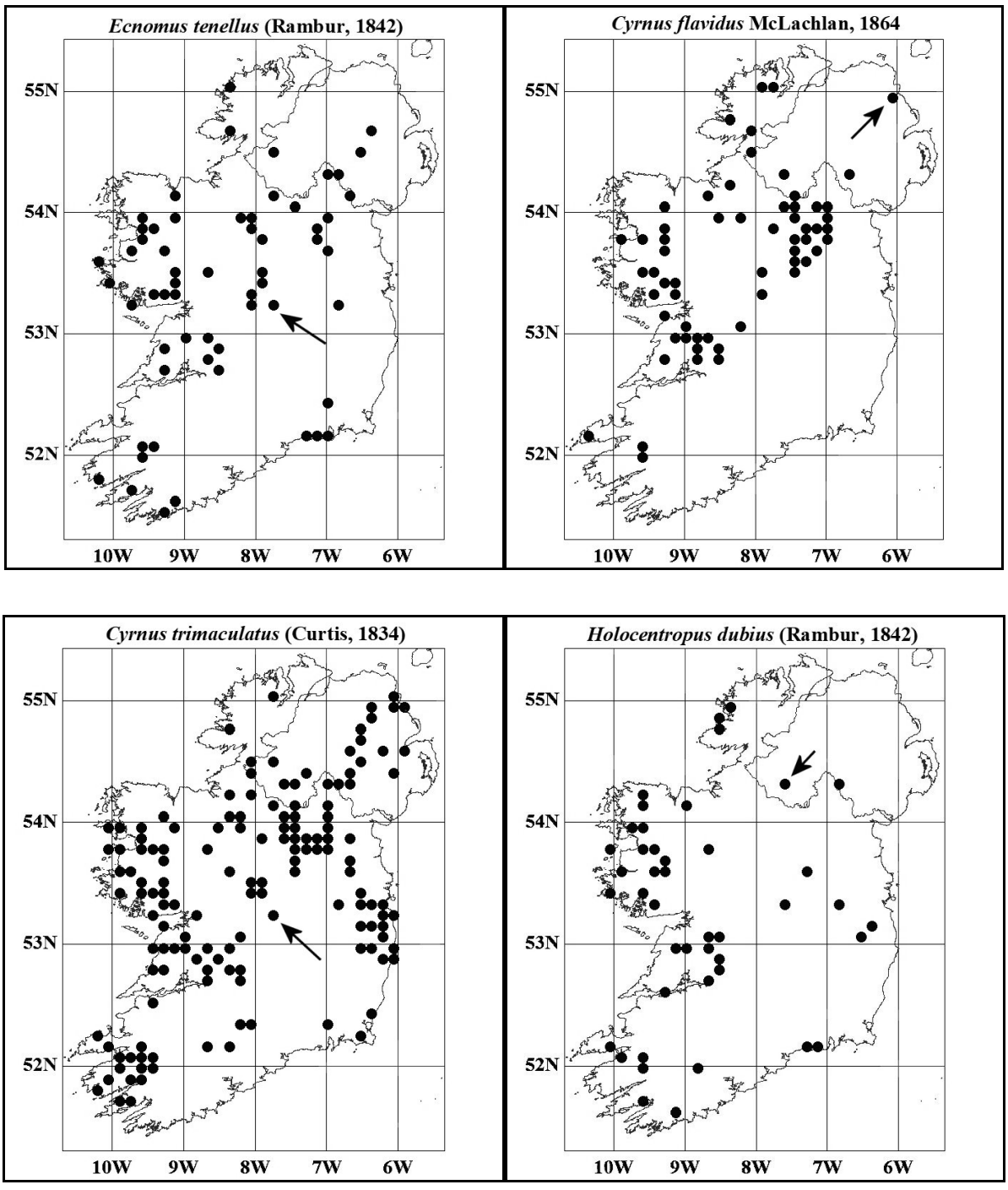
FIGURES 18-21. The known Irish distributions of *Hydroptila pulchricornis* Pictet, 1834, *Hydroptila simulans* Mosely, 1920, *Hydroptila sparsa* Mosely, 1920 and *Hydroptila tineoides* Dalman, 1819. Significant records are indicated by arrows.



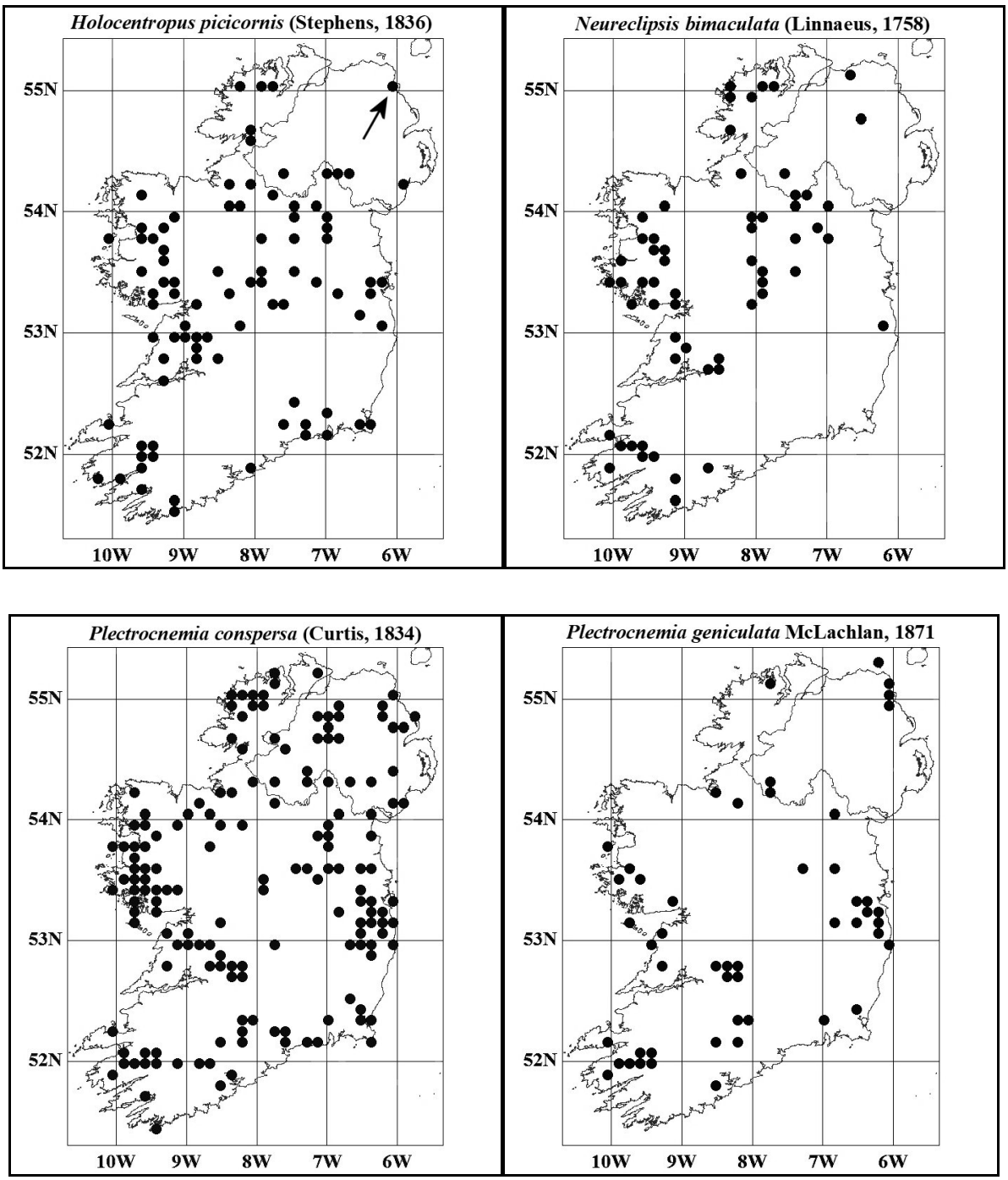
FIGURES 22-25. The known Irish distributions of *Ithytrichia lamellaris* Eaton, 1873, *Orthotrichia angustella* (McLachlan, 1865), *Orthotrichia costalis* (Curtis, 1834) and *Oxyethira falcata* Morton, 1893. Significant records are indicated by arrows.



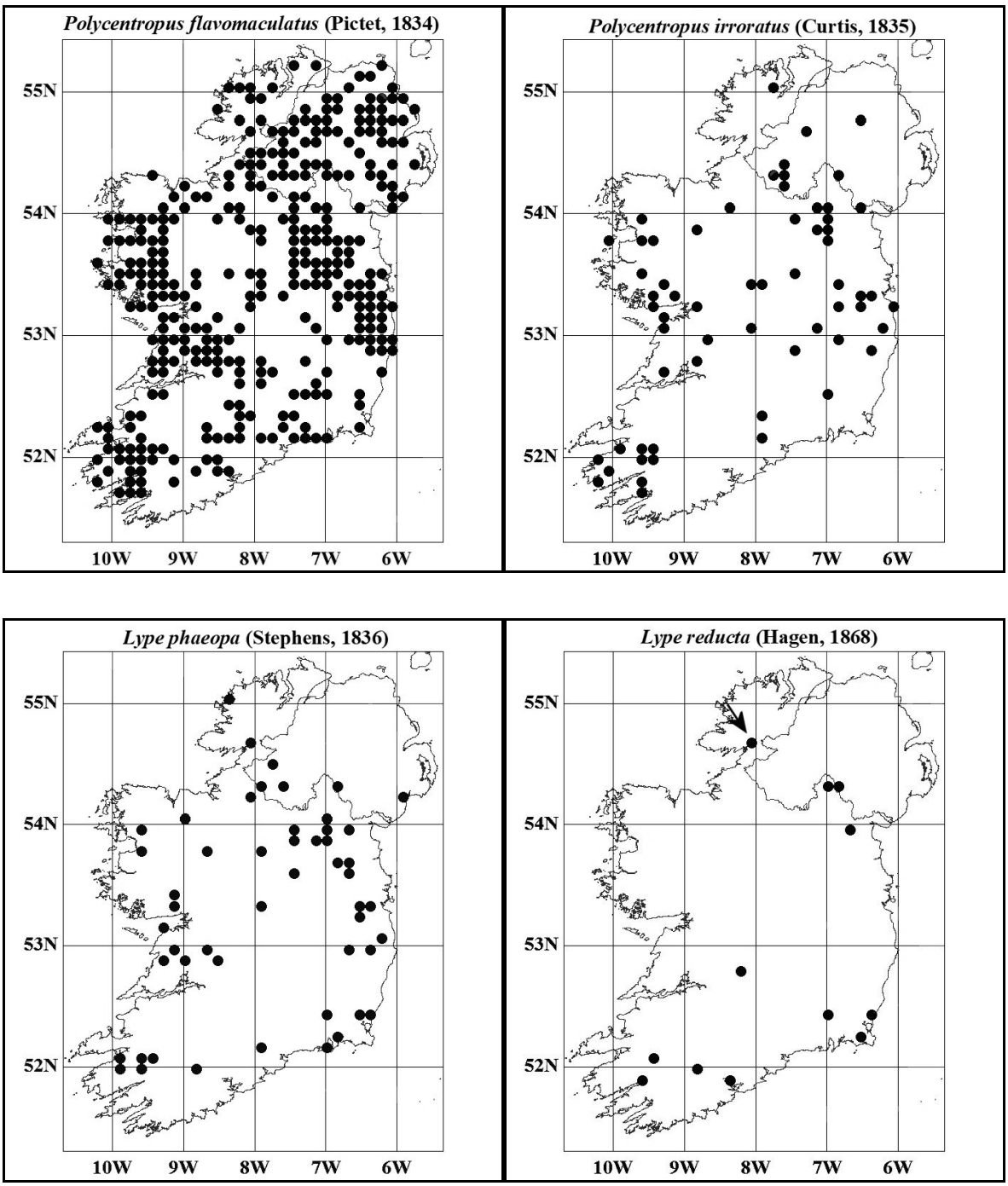
FIGURES 26-29. The known Irish distributions of *Oxyethira flavicornis* (Pictet, 1834), *Oxyethira sagittifera* Ris, 1897, *Philopotamus montanus* (Donovan, 1813) and *Wormaldia occipitalis* (Pictet, 1834). Significant records are indicated by arrows.



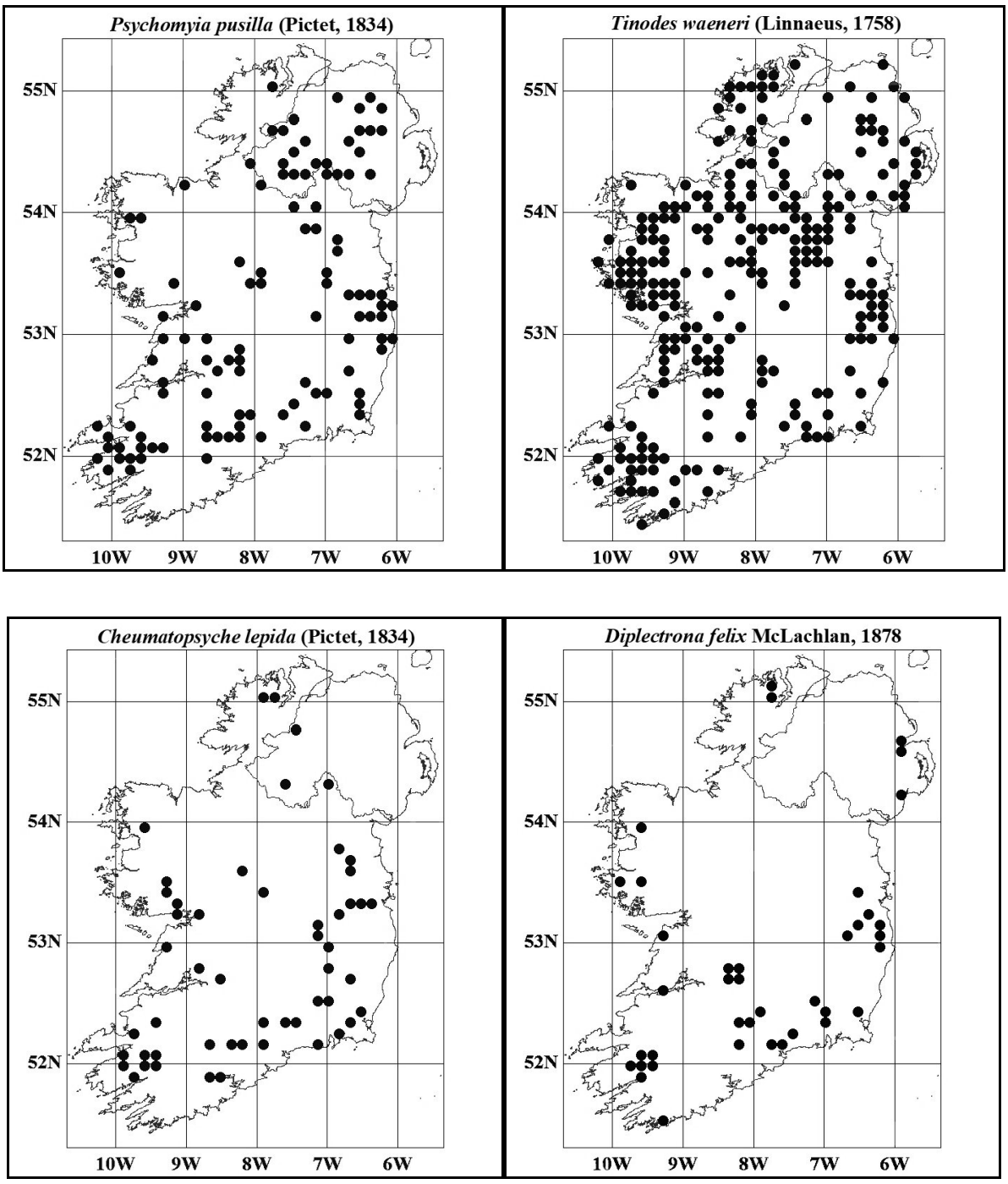
FIGURES 30-33. The known Irish distributions of *Ecnomus tenellus* (Rambur, 1842), *Cyrnus flavidus* McLachlan, 1864, *Cyrnus trimaculatus* (Curtis, 1834) and *Holocentropus dubius* (Rambur, 1842). Significant records are indicated by arrows.



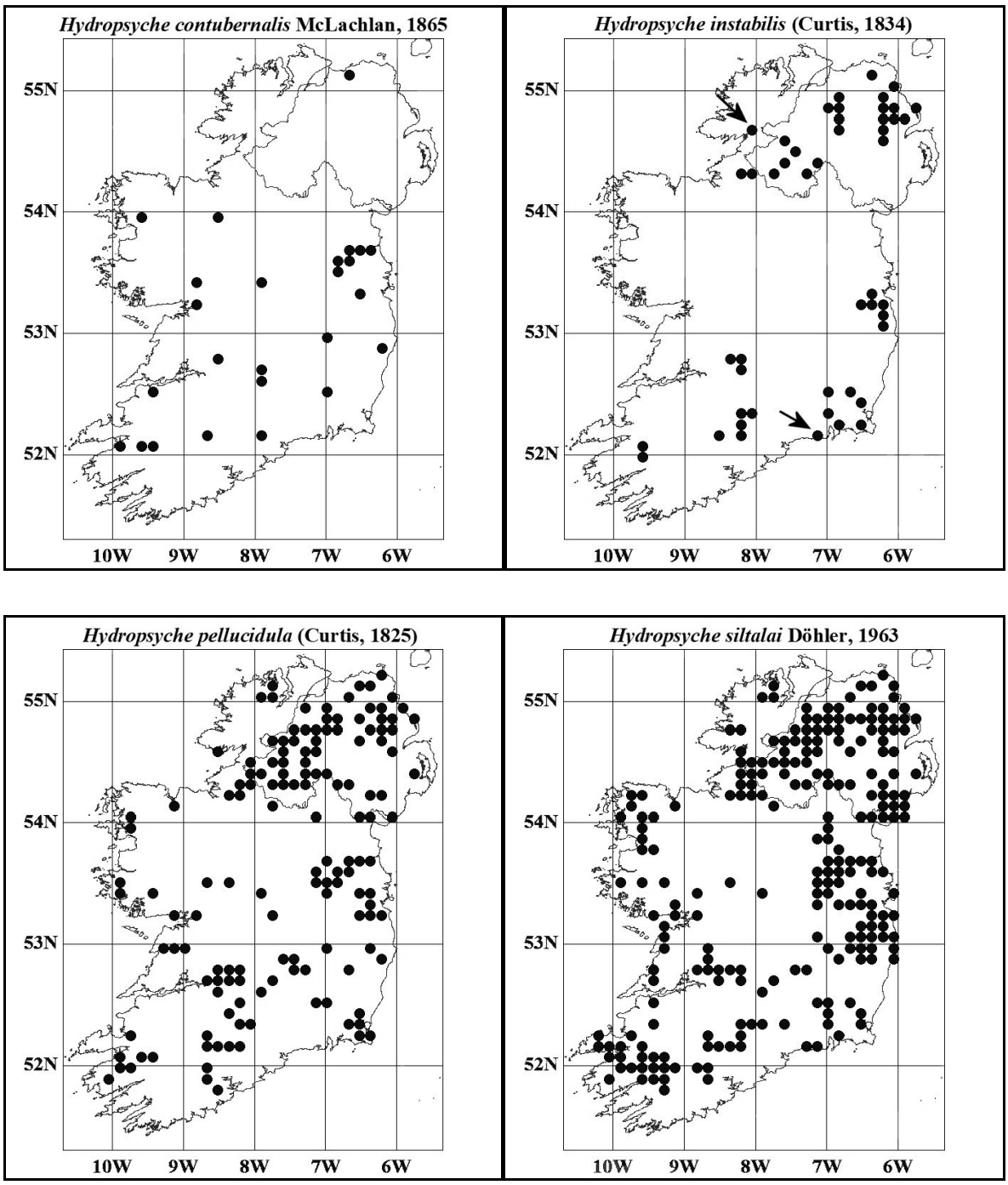
FIGURES 34-37. The known Irish distributions of *Holocentropus picicornis* (Stephens, 1836), *Neureclipsis bimaculata* (Linnaeus, 1758), *Plectrocnemia conspersa* (Curtis, 1834) and *Plectrocnemia geniculata* McLachlan, 1871. Significant records are indicated by arrows.



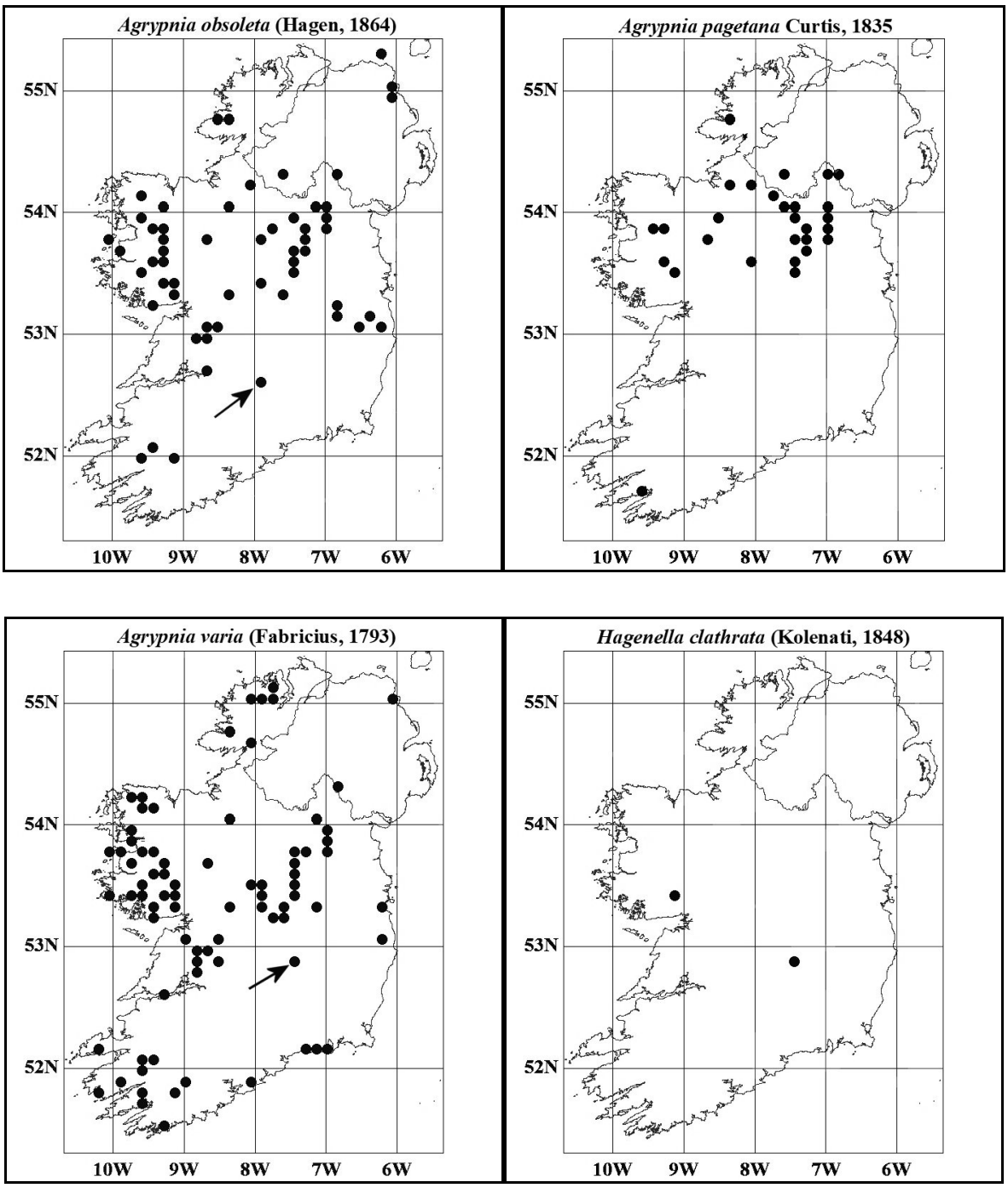
FIGURES 38-41. The known Irish distributions of *Polycentropus flavomaculatus* (Pictet, 1834), *Polycentropus irroratus* (Curtis, 1835), *Lype phaeopa* (Stephens, 1836) and *Lype reducta* (Hagen, 1868). Significant records are indicated by arrows.



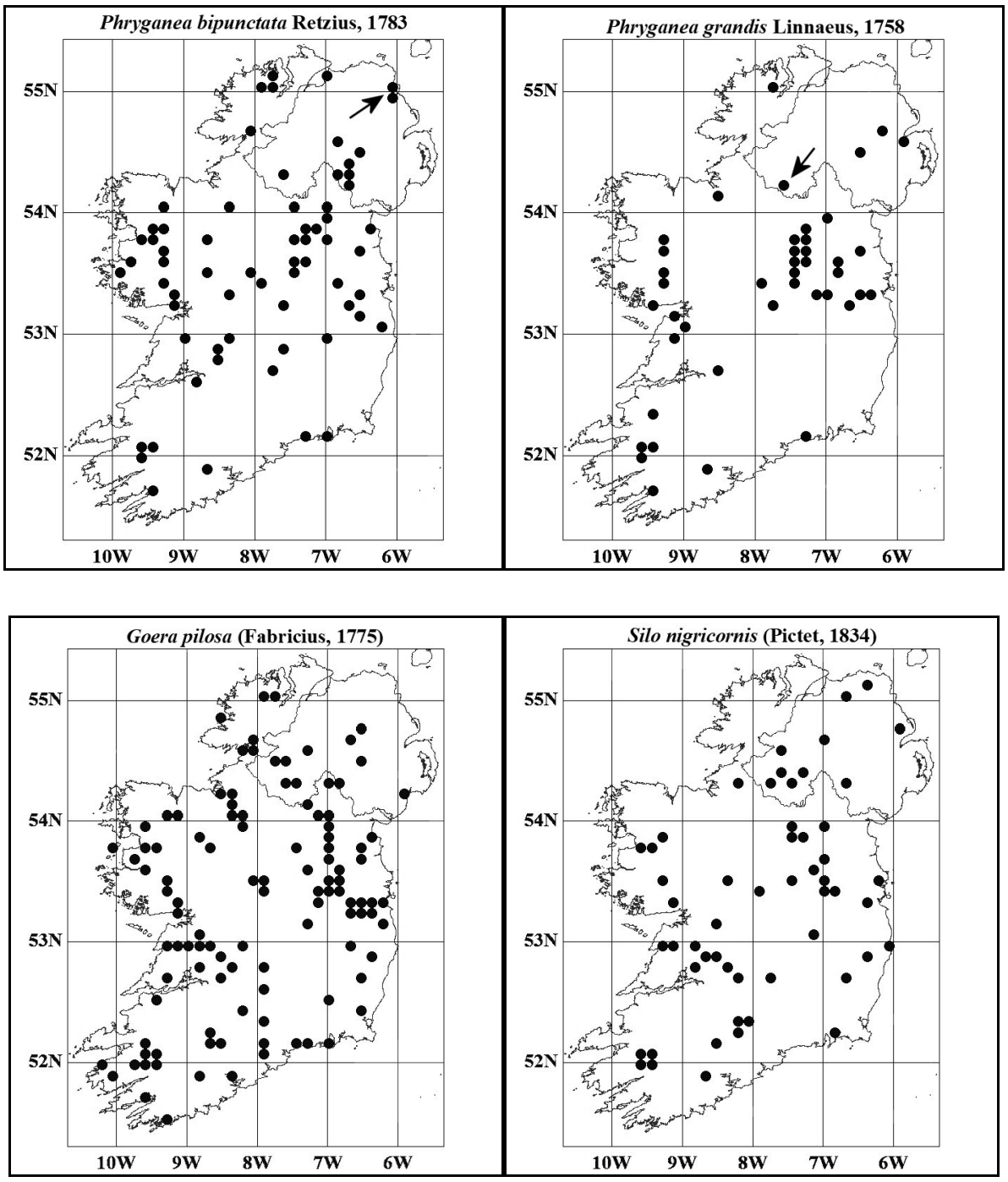
FIGURES 42-45. The known Irish distributions of *Psychomyia pusilla* (Pictet, 1834), *Tinodes waeneri* (Linnaeus, 1758), *Cheumatopsyche lepida* (Pictet, 1834) and *Diplectrona felix* McLachlan, 1878. Significant records are indicated by arrows.



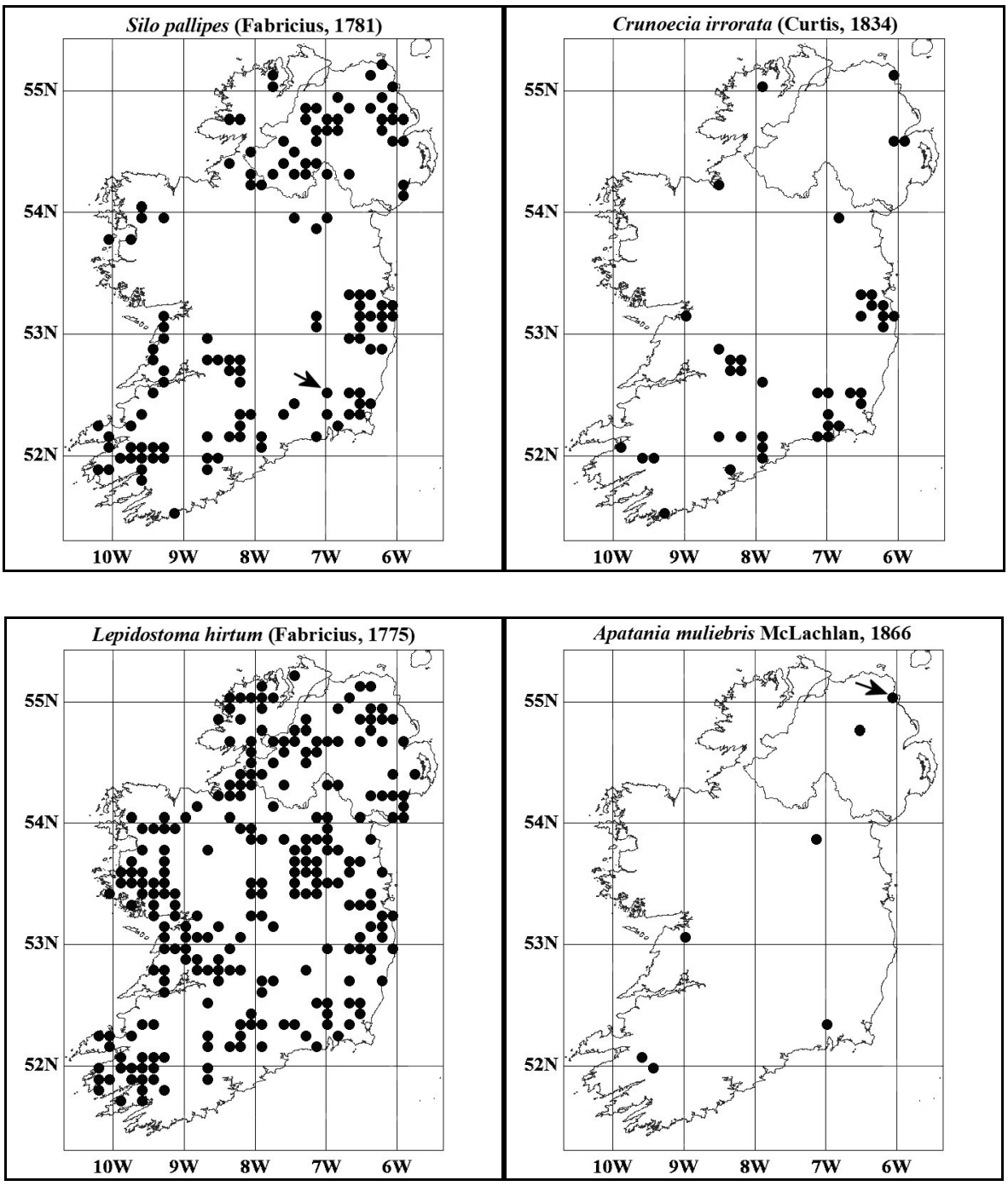
FIGURES 46-49. The known Irish distributions of *Hydropsyche contubernalis* McLachlan, 1865, *Hydropsyche instabilis* (Curtis, 1834), *Hydropsyche pellucidula* (Curtis, 1834) and *Hydropsyche siltalai* Döhler, 1963. Significant records are indicated by arrows.



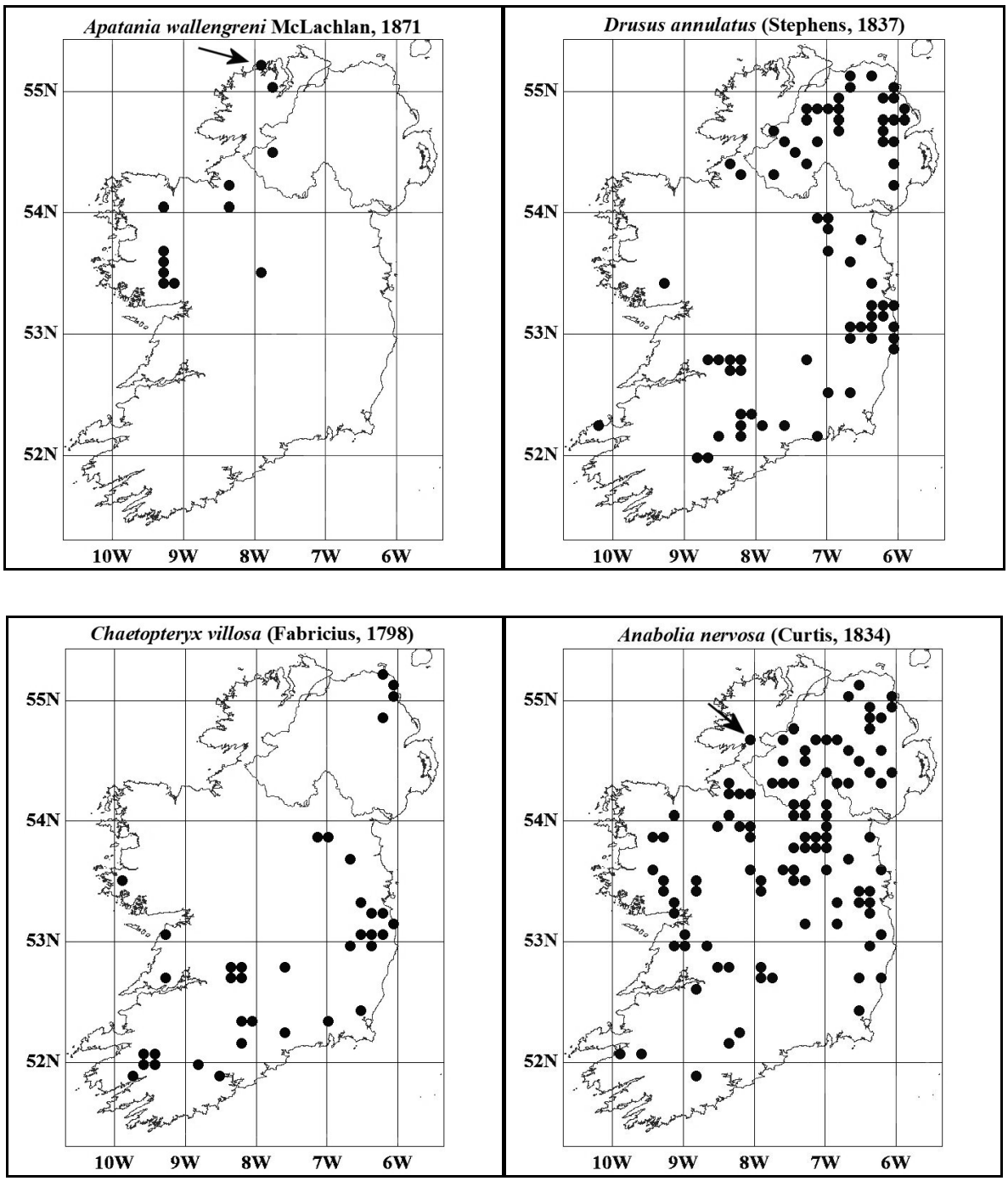
FIGURES 50-53. The known Irish distributions of *Agrypnia obsoleta* (Hagen, 1864), *Agrypnia pagetana* Curtis, 1835, *Agrypnia varia* (Fabricius, 1793) and *Hagenella clathrata* (Kolenati, 1848). Significant records are indicated by arrows.



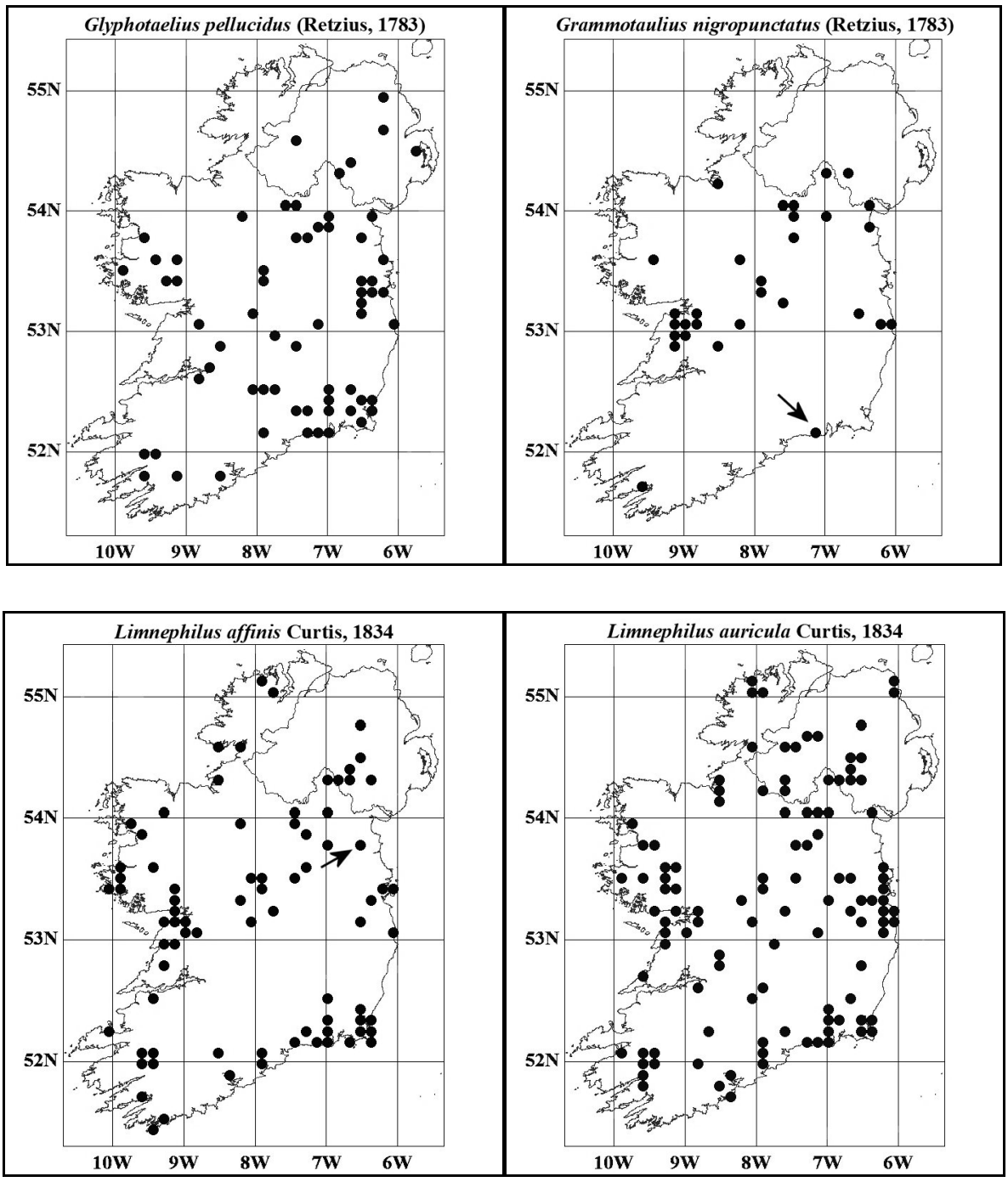
FIGURES 54-57. The known Irish distributions of *Phryganea bipunctata* Retzius, 1783, *Phryganea grandis* Linnaeus, 1758, *Goera pilosa* (Fabricius, 1775) and *Silo nigricornis* (Pictet, 1834). Significant records are indicated by arrows.



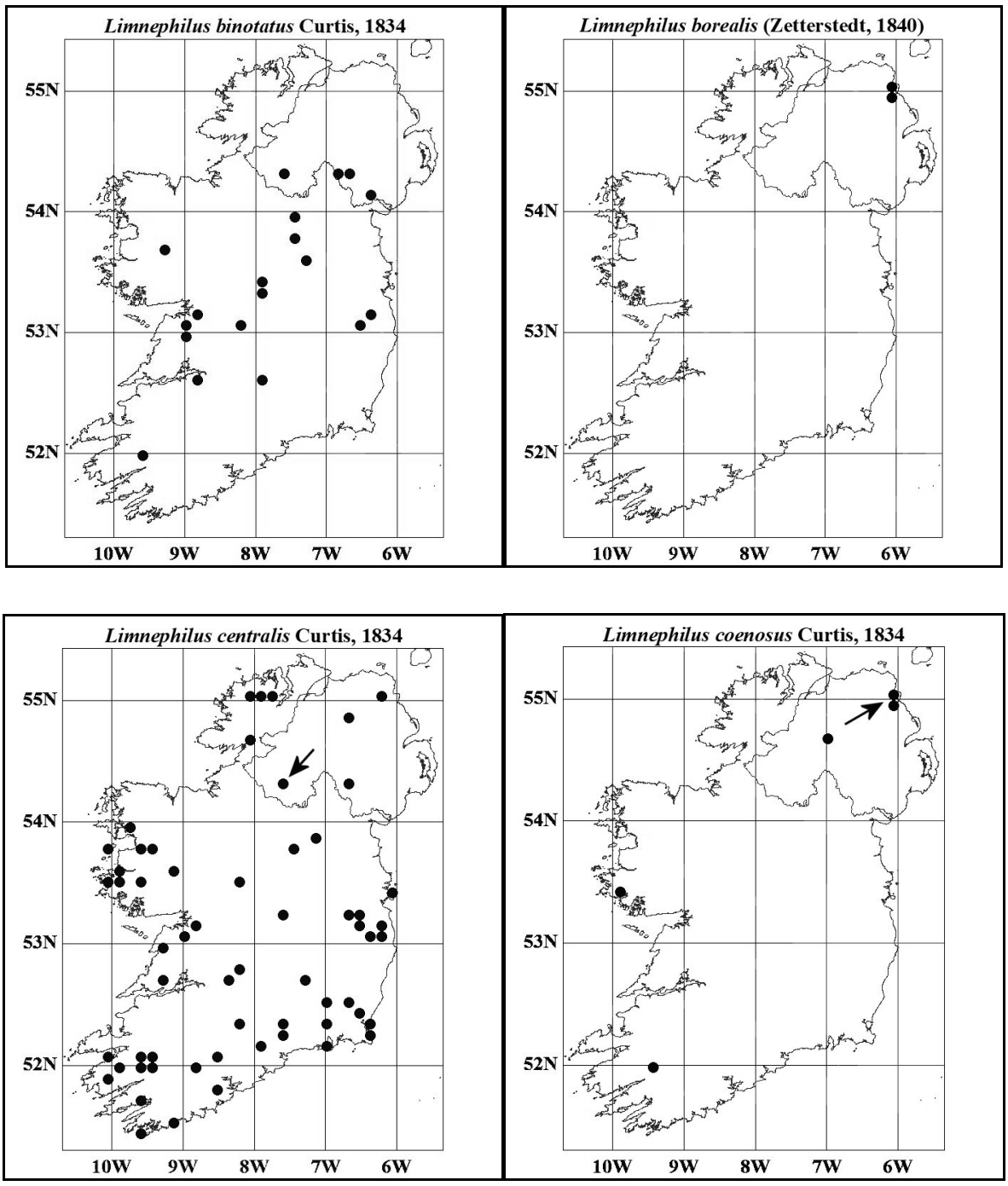
FIGURES 58-61. The known Irish distributions of *Silo pallipes* (Fabricius, 1781), *Cruenocia irrorata* (Curtis, 1834), *Lepidostoma hirtum* (Fabricius, 1775) and *Apatania muliebris* McLachlan, 1866. Significant records are indicated by arrows.



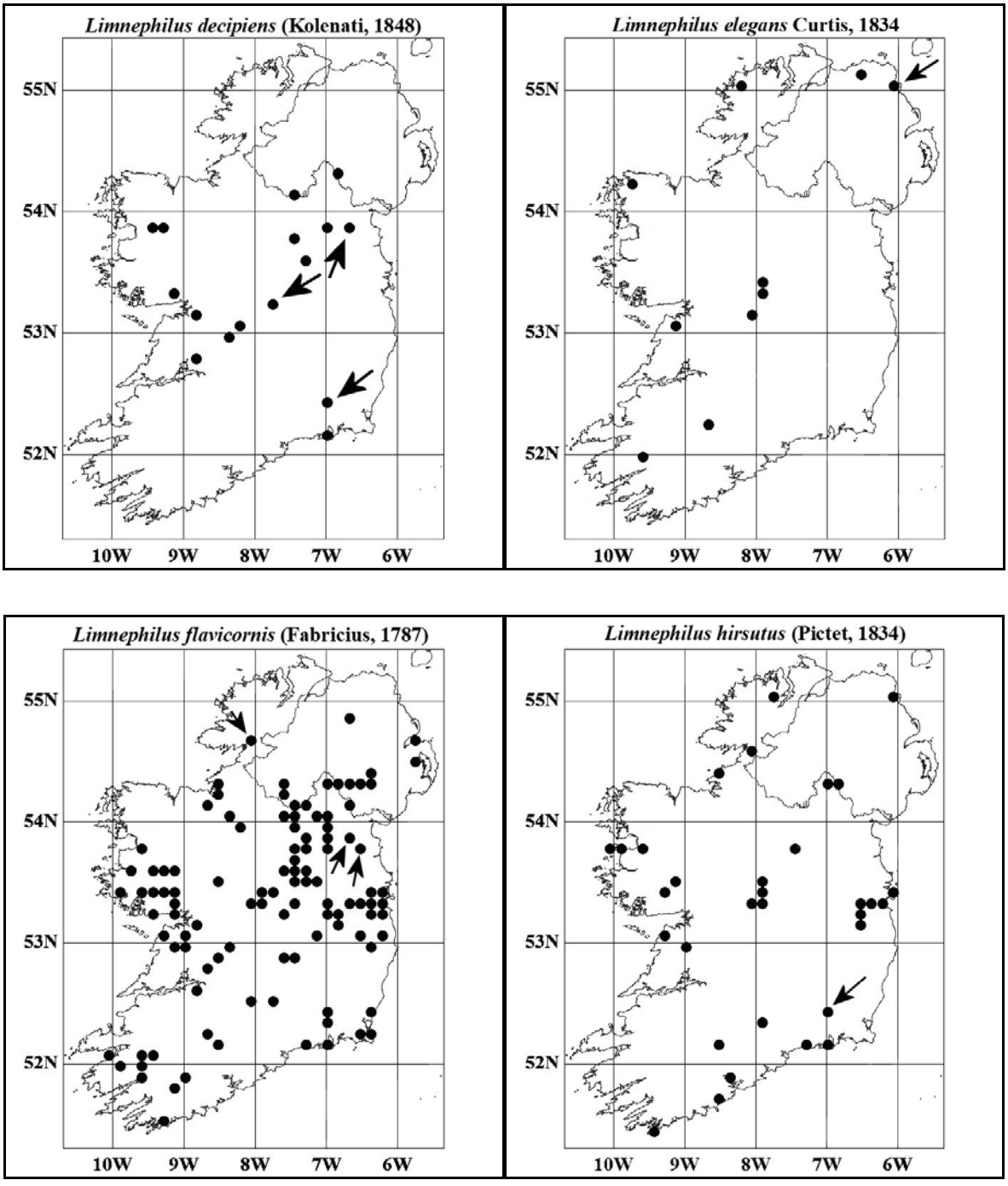
FIGURES 62-65. The known Irish distributions of *Apatania wallengreni* McLachlan, 1871, *Drusus annulatus* (Stephens, 1837), *Chaetopteryx villosa* (Fabricius, 1798) and *Anabolia nervosa* (Curtis, 1834). Significant records are indicated by arrows.



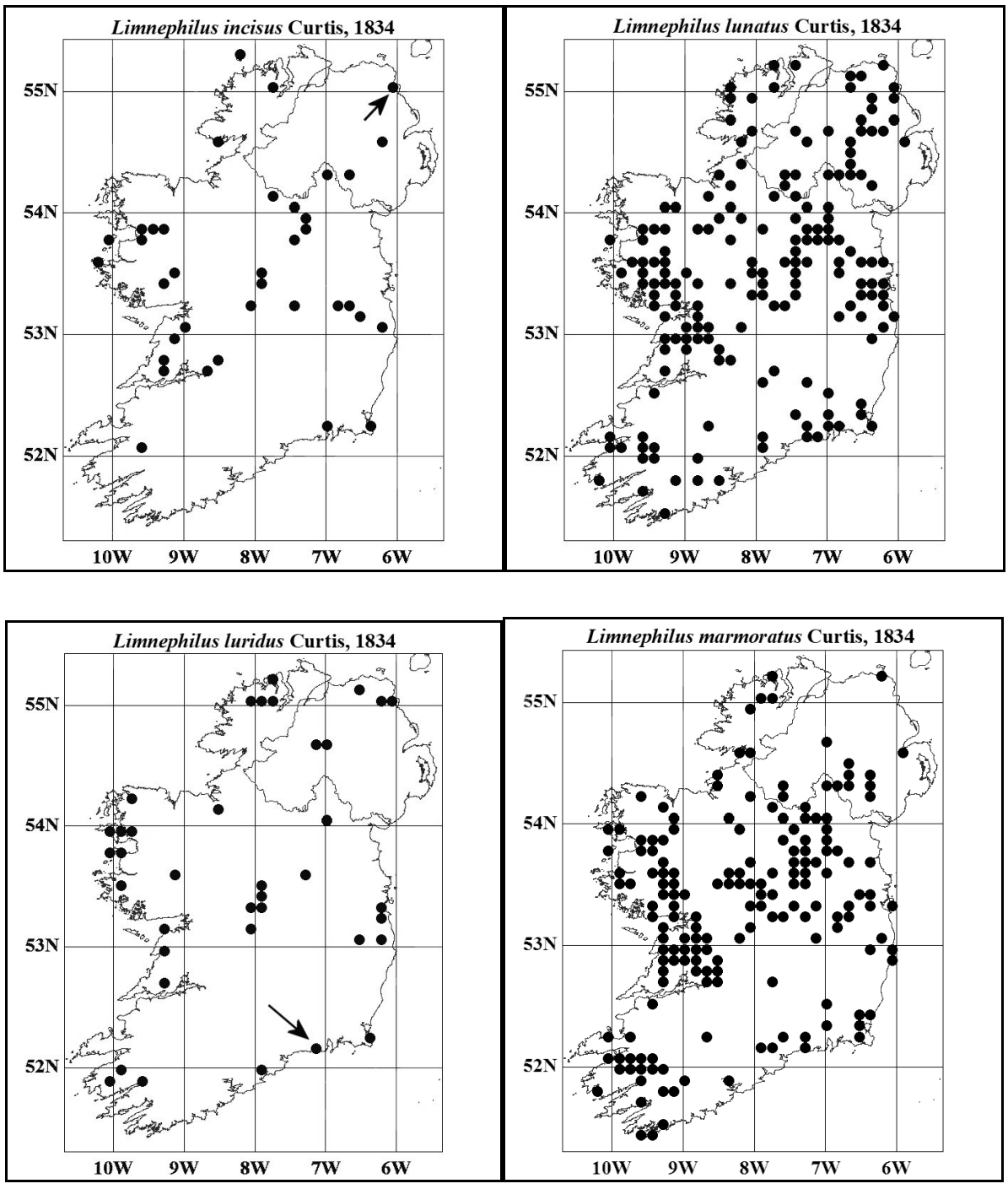
FIGURES 66-69. The known Irish distributions of *Glyphotaelius pellucidus* (Retzius, 1783), *Grammotaulius nigropunctatus* (Retzius, 1783), *Limnephilus affinis* Curtis, 1834 and *Limnephilus auricula* Curtis, 1834. Significant records are indicated by arrows.



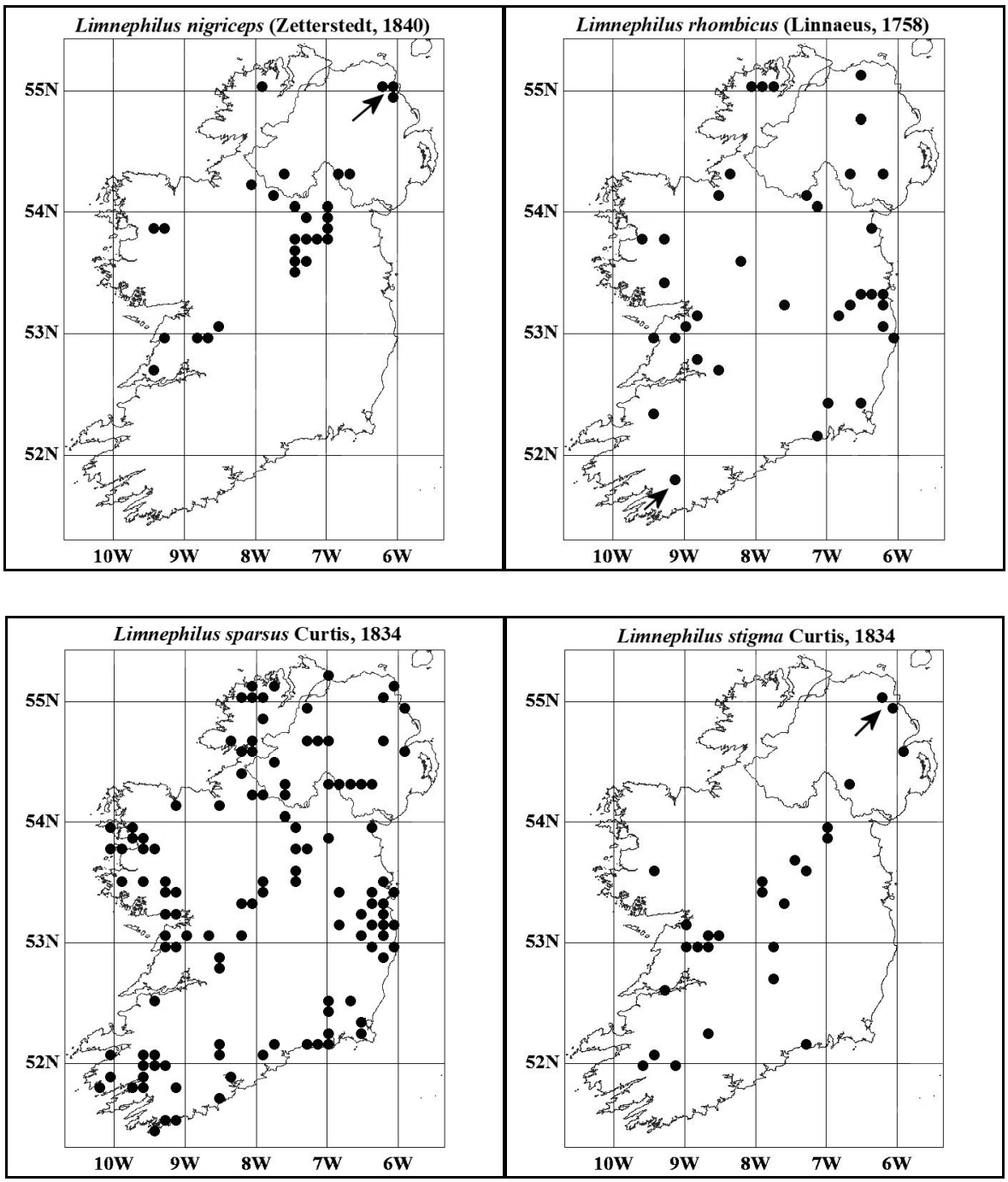
FIGURES 70-73. The known Irish distributions of *Limnephilus binotatus* Curtis, 1834, *Limnephilus borealis* (Zetterstedt, 1840), *Limnephilus centralis* Curtis, 1834 and *Limnephilus coenosus* Curtis, 1834. Significant records are indicated by arrows.



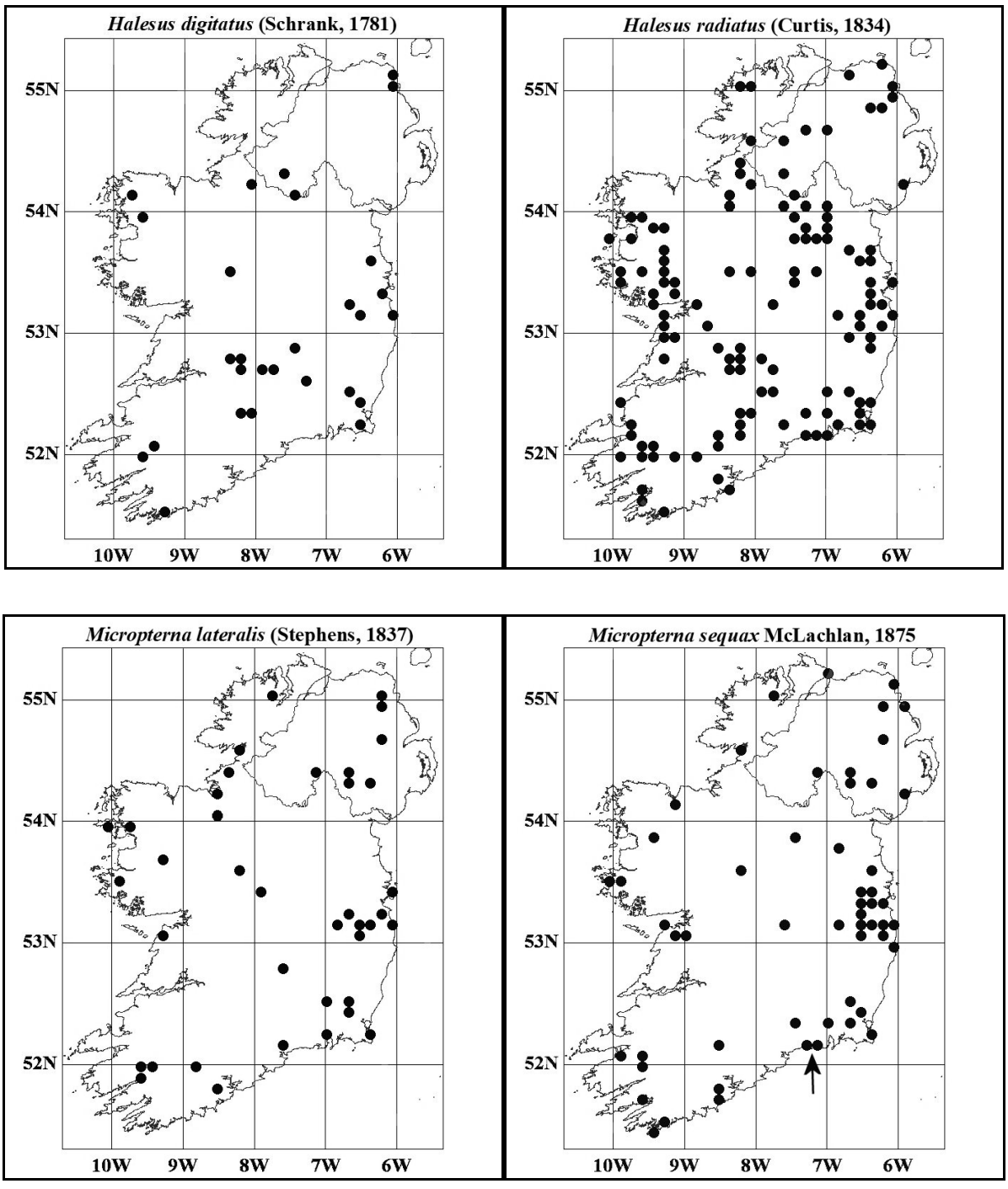
FIGURES 74-77. The known Irish distributions of *Limnephilus decipiens* (Kolenati, 1848), *Limnephilus elegans* Curtis, 1834, *Limnephilus flavicornis* (Fabricius, 1787) and *Limnephilus hirsutus* (Pictet, 1834). Significant records are indicated by arrows.



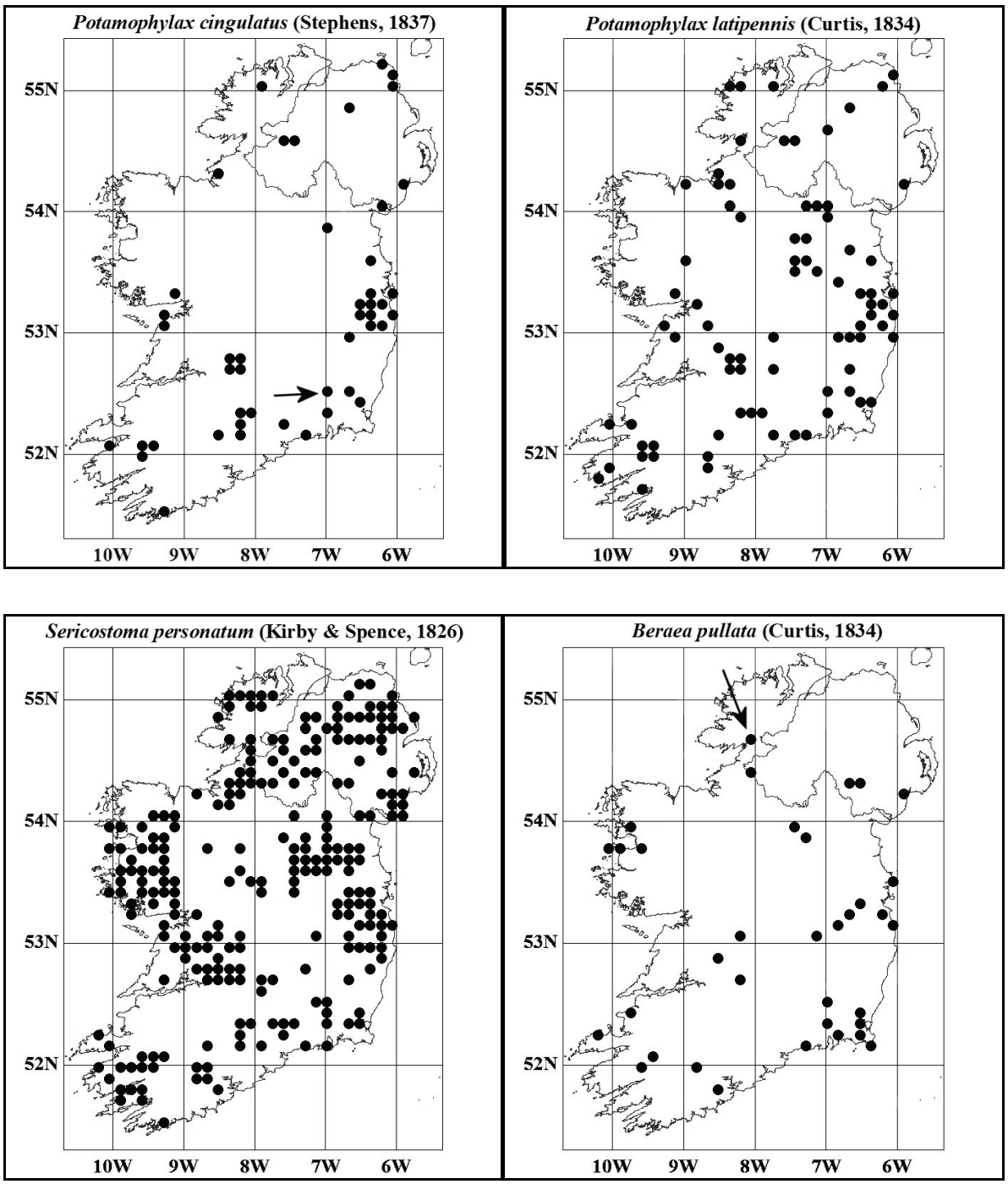
FIGURES 78-81. The known Irish distributions of *Limnephilus incisus* Curtis, 1834, *Limnephilus lunatus* Curtis, 1834, *Limnephilus luridus* Curtis, 1834 and *Limnephilus marmoratus* Curtis, 1834. Significant records are indicated by arrows.



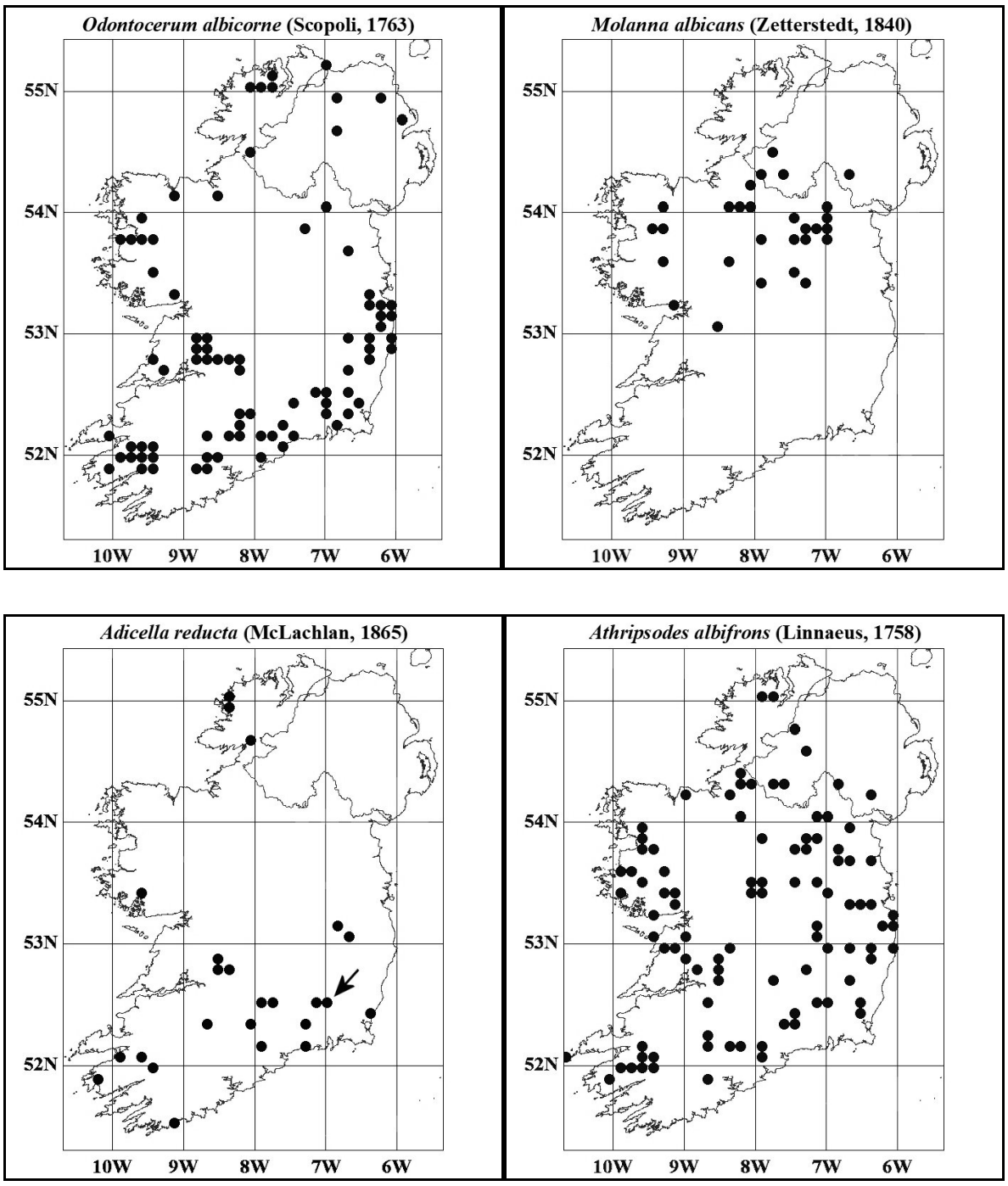
FIGURES 82-85. The known Irish distributions of *Limnephilus nigriceps* (Zetterstedt, 1840), *Limnephilus rhombicus* (Linnaeus, 1758), *Limnephilus sparsus* Curtis, 1834 and *Limnephilus stigma* Curtis, 1834. Significant records are indicated by arrows.



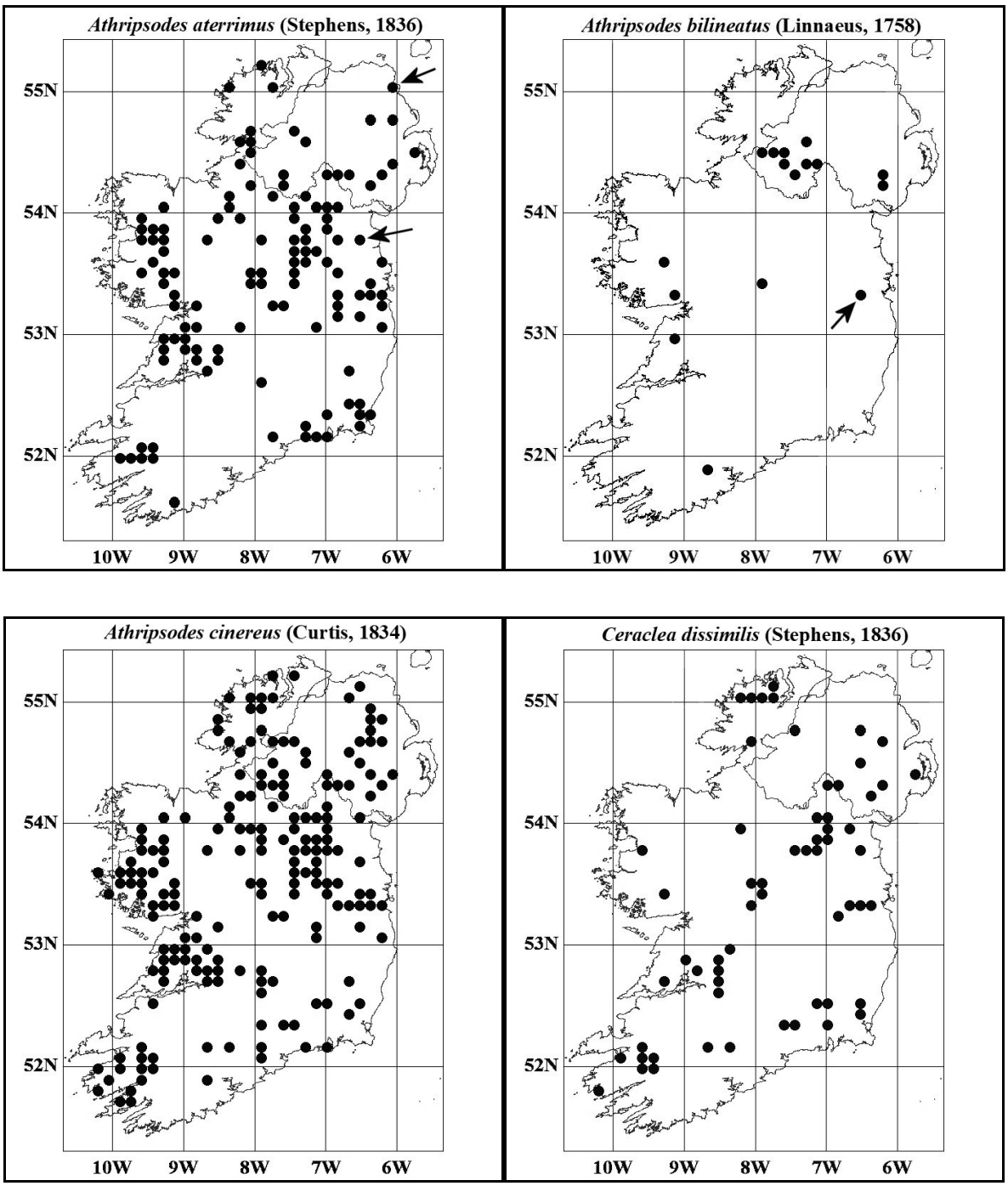
FIGURES 86-89. The known Irish distributions of *Halesus digitatus* (Schrank, 1781), *Halesus radiatus* (Curtis, 1834), *Micropterna lateralis* (Stephens, 1837) and *Micropterna sequax* McLachlan, 1875. Significant records are indicated by arrows.



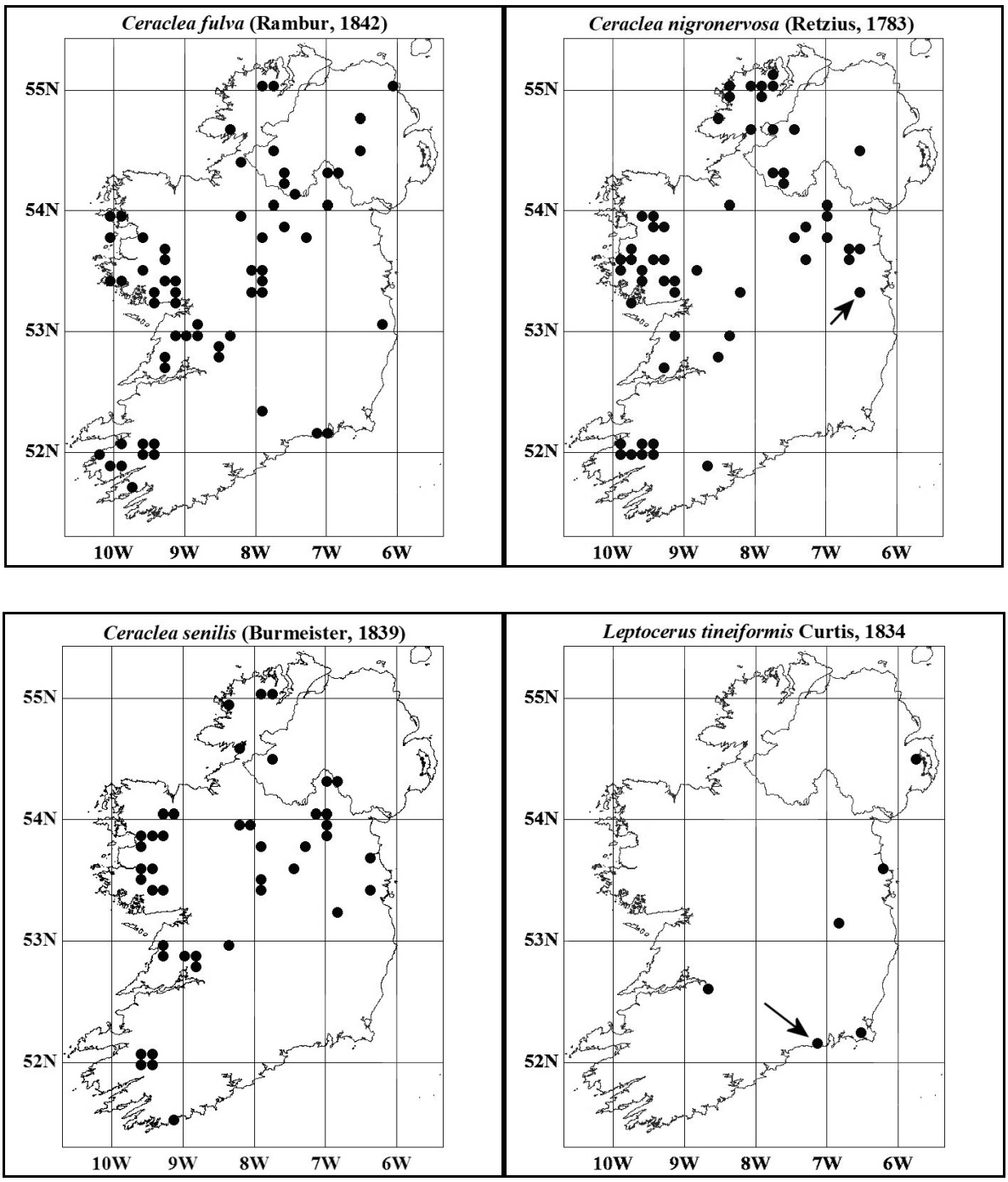
FIGURES 90-93. The known Irish distributions of *Potamophylax cingulatus* (Stephens, 1837), *Potamophylax latipennis* (Curtis, 1834), *Sericostoma personatum* (Kirby & Spence, 1826) and *Beraea pullata* (Curtis, 1834). Significant records are indicated by arrows.



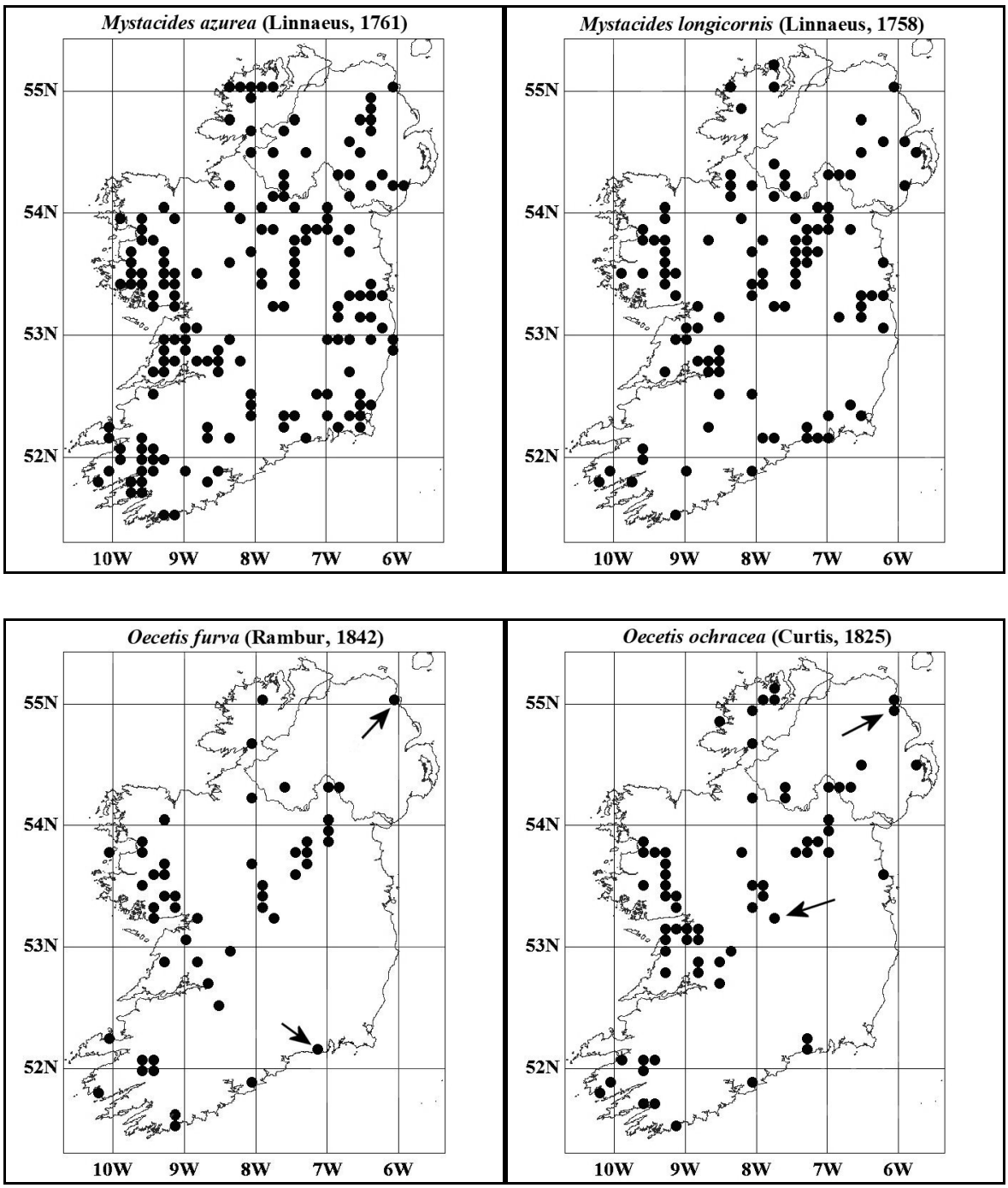
FIGURES 94-97. The known Irish distributions of *Odontocerum albicorne* (Scopoli, 1763), *Molanna albicans* (Zetterstedt, 1840), *Adicella reducta* (McLachlan, 1865) and *Athripsodes albifrons* (Linnaeus, 1758). Significant records are indicated by arrows.



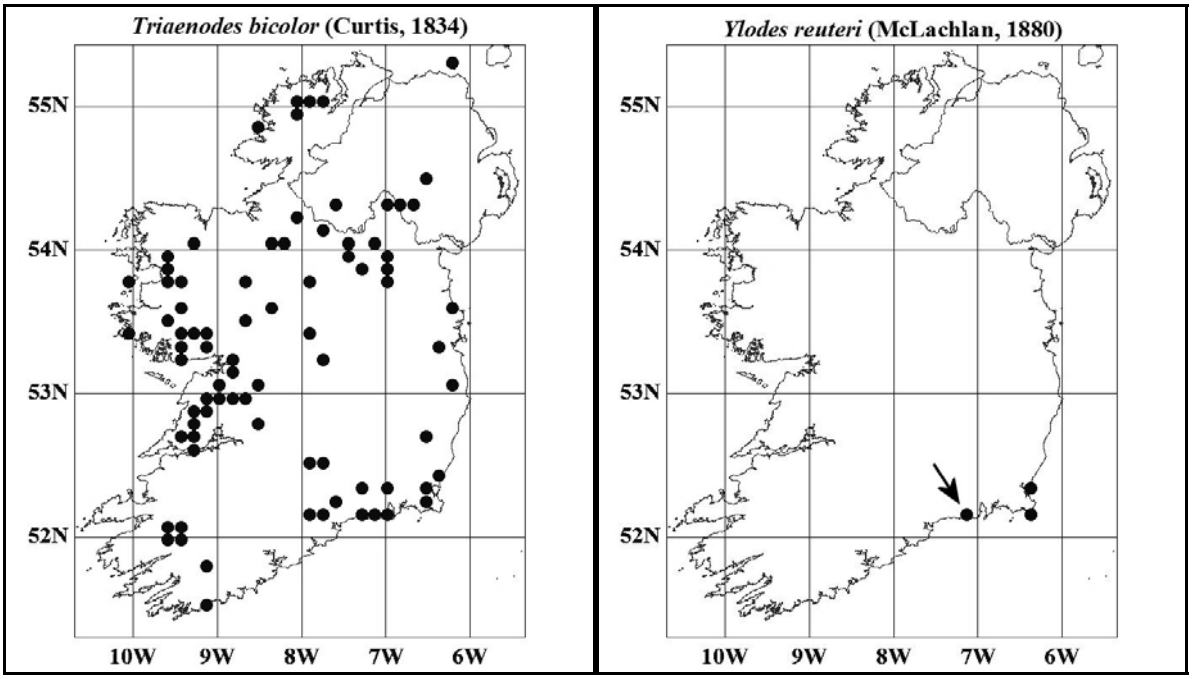
FIGURES 98-101. The known Irish distributions of *Athripsodes aterrimus* (Stephens, 1836), *Athripsodes bilineatus* (Linnaeus, 1758), *Athripsodes cinereus* (Curtis, 1834) and *Ceraclea dissimilis* (Stephens, 1836). Significant records are indicated by arrows.



FIGURES 102-105. The known Irish distributions of *Ceraclea fulva* (Rambur, 1842), *Ceraclea nigronervosa* (Retzius, 1783), *Ceraclea senilis* (Burmeister, 1839) and *Leptocerus tineiformis* Curtis, 1834. Significant records are indicated by arrows.



FIGURES 106-109. The known Irish distributions of *Mystacides azurea* (Linnaeus, 1761), *Mystacides longicornis* (Linnaeus, 1758), *Oecetis furva* (Rambur, 1842) and *Oecetis ochracea* (Curtis, 1825). Significant records are indicated by arrows.



FIGURES 110-111. The known Irish distributions of *Triaenodes bicolor* (Curtis, 1834) and *Ylodes reuteri* (McLachlan, 1880). Significant records are indicated by arrows.

PLATE 1. The live adult of *Hagenella clathrata* at Abbeyleix Bog, County Laois. Photograph © Tina Claffey.

PLATE 2. *Hagenella clathrata*. A live adult from Ower, County Galway. Photograph © Caitriona Carlin.

PLATES 3-4. Top: Corstown Lough, County Meath where *Limnephilus decipiens* was collected. Bottom: Lough Brackan, County Meath where *Hydroptila pulchricornis* was collected. Photographs © M. A. O'Connor.

PLATE 5. The Glen Pond, Phoenix Park, County Dublin where *Orthotrichia costalis* was collected. Photograph © J. P. O'Connor.

PLATE 6. Lough Boora, County Offaly where *Oecetis ochracea* was collected. Photograph © M. A. O'Connor. The lake is surrounded by bog-land.

PLATE 7. The Maudlins Stream, New Ross, County Wexford where *Limnephilus hirsutus* was light-trapped. This small stream has extensive marshland alongside its course. Photograph © M. A. O'Connor.

PLATE 8. *Limnephilus elegans*, ♂, 22 May 2018, Lough na Trosk (D2719), County Antrim. Photograph © Cathal McNaughton.

APPENDIX 1. A revised list of county records for the Irish caddisflies (Trichoptera). The counties are shown (Figure 112).

RHYACOPHILIDAE

***Rhyacophila dorsalis* (Curtis, 1834)**

Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Monaghan, Offaly, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (30/32).

***Rhyacophila munda* McLachlan, 1862**

Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Limerick, Mayo, Meath, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (24/32)

GLOSSOSOMATIDAE

***Agapetus delicatulus* McLachlan, 1884**

Clare, Cork, Donegal, Dublin, Kerry, Kildare, Kilkenny, Laois, Limerick, Meath, Roscommon, Tipperary, Waterford, Wexford, Wicklow (15/32).

***Agapetus fuscipes* Curtis, 1834**

Antrim, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (28/32).

***Agapetus ochripes* Curtis, 1834**

Antrim, Carlow, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Offaly, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (25/32).

***Glossosoma boltoni* Curtis, 1834**

Antrim, Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Galway, Kerry, Kildare, Kilkenny, Leitrim, Mayo, Meath, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wickow (22/32).

***Glossosoma conformis* Neboiss, 1963**

Antrim, Clare, Cork, Leitrim, Mayo, Tipperary, Waterford, Wicklow (8/32).

HYDROPTILIDAE

***Agraylea multipunctata* Curtis, 1834**

Antrim, Armagh, Carlow, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Longford, Mayo, Meath, Monaghan, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (24/32).

***Agraylea sexmaculata* Curtis, 1834**
Down, Fermanagh, Limerick, Roscommon, Tipperary, Waterford, Wexford (7/32).
***Allotrichia pallicornis* (Eaton, 1873)**
Antrim, Carlow, Derry, Dublin, Fermanagh, Galway, Kildare, Kilkenny, Leitrim, Limerick, Meath, Tipperary, Tyrone, Waterford, Westmeath, Wicklow (16/32).
***Hydroptila angulata* Mosely, 1922**
Armagh, Carlow, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Mayo, Roscommon, Waterford, Wexford, Wicklow (14/32).
***Hydroptila cornuta* Mosley, 1922**
Carlow, Cavan, Clare, Fermanagh, Kerry, Kilkenny, Roscommon, Tipperary, Westmeath, Wexford, Wicklow (11/32).
***Hydroptila forcipata* (Eaton, 1873)**
Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Leitrim, Limerick, Mayo, Meath, Monaghan, Offaly, Roscommon, Tipperary, Waterford, Westmeath, Wexford, Wicklow (24/32).
***Hydroptila martini* Marshall, 1977**
Cavan, Cork, Donegal, Kerry, Kildare, Laois, Tipperary, Westmeath, Wexford (9/32).
***Hydroptila occulta* (Eaton, 1873)**
Cavan, Kerry, Tipperary (3/32).
***Hydroptila pulchricornis* Pictet, 1834**
Cavan, Clare, Fermanagh, Galway, Kerry, Longford, Meath, Westmeath, Wexford (9/32).
***Hydroptila simulans* Mosely, 1920**
Antrim, Carlow, Dublin, Galway, Kerry, Kilkenny, Limerick, Mayo, Meath, Tipperary, Waterford (11/32).
***Hydroptila sparsa* Curtis, 1834**
Armagh, Carlow, Cavan, Clare, Cork, Dublin, Fermanagh, Kerry, Kildare, Kilkenny, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford (23/32).
***Hydroptila tigurina* Ris, 1894**
Kerry (1/32).
***Hydroptila tineoides* Dalman, 1819**
Armagh, Cavan, Clare, Cork, Derry, Donegal, Fermanagh, Galway, Kerry, Leitrim, Limerick, Mayo, Meath, Monaghan, Roscommon, Westmeath, Wicklow (17/32).
***Hydroptila valesiaca* Schmid, 1947**
Kerry, Kildare (2/32).

***Ithytrichia clavata* Morton, 1905**
Kerry (1/32).
***Ithytrichia lamellaris* Eaton, 1873**
Carlow, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Limerick, Meath, Monaghan, Tipperary, Wexford, Wicklow (18/32).
***Orthotrichia angustella* (McLachlan, 1865)**
Clare, Kerry, Limerick, Meath, Waterford, Westmeath (6/32).
***Orthotrichia costalis* (Curtis, 1834)**
Clare, Dublin, Kerry, Tipperary, Waterford (5/32).
***Oxyethira falcata* Morton, 1893**
Cavan, Clare, Donegal, Galway, Kerry, Kildare, Mayo, Offaly, Tipperary, Westmeath, Wicklow (11/32).
***Oxyethira flavicornis* (Pictet, 1834)**
Antrim, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Waterford, Westmeath, Wexford, Wicklow (19/32).
***Oxyethira frici* Klapálek, 1891**
Cavan, Clare, Donegal, Galway, Kerry, Mayo, Tipperary, Westmeath, Wicklow (9/32).
***Oxyethira sagittifera* Ris, 1897**
Donegal, Galway, Kerry, Mayo (4/32).
***Oxyethira simplex* Ris, 1897**
Galway, Kerry, Kildare, Leitrim, Westmeath, Wicklow (6/32).
***Oxyethira tristella* Klapálek, 1895**
Galway, Kerry (2/32).
***Tricholeiochiton fagesii* (Guinard, 1879)**
Galway, Kerry, Offaly, Westmeath (4/32).

PHILOPOTAMIDAE

***Chimarra marginata* (Linnaeus, 1761)**
Armagh, Carlow, Clare, Cork, Donegal, Dublin, Galway, Kerry, Kildare, Kilkenny, Limerick, Mayo, Meath, Sligo, Waterford, Wexford (16/32).
***Philopotamus montanus* (Donovan, 1813)**
Antrim, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kilkenny, Mayo, Monaghan, Tipperary, Tyrone, Waterford, Wexford, Wicklow (20/32).
***Wormaldia mediana* McLachlan, 1878**
Cork, Kerry, Wicklow (3/32).

***Wormaldia occipitalis* (Pictet, 1834)**
Carlow, Cavan, Clare, Cork, Donegal, Down, Dublin, Kerry, Kildare, Kilkenny, Mayo, Sligo, Tipperary, Waterford, Wexford, Wicklow (16/32).
***Wormaldia subnigra* McLachlan, 1865**
Cavan, Clare, Dublin, Galway, Kerry, Mayo, Waterford, Westmeath, Wexford, Wicklow (10/32).

ECNOMIDAE

***Ecnomus tenellus* (Rambur, 1842)**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Fermanagh, Galway, Kerry, Kildare, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Waterford, Westmeath, Wexford (21/32).

POLYCENTROPODIDAE

***Cyrnus flavidus* McLachlan, 1864**
Antrim, Armagh, Cavan, Clare, Donegal, Fermanagh, Galway, Kerry, Leitrim, Mayo, Meath, Offaly, Roscommon, Sligo, Tipperary, Westmeath (16/32).
***Cyrnus insolutus* McLachlan, 1878**
Clare, Waterford (2/32).
***Cyrnus trimaculatus* (Curtis, 1834)**
Antrim, Armagh, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Limerick, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Westmeath, Wexford, Wicklow (26/32).
***Holocentropus dubius* (Rambur, 1842)**
Clare, Cork, Donegal, Fermanagh, Galway, Kerry, Kildare, Limerick, Mayo, Monaghan, Offaly, Roscommon, Tipperary, Waterford, Westmeath, Wicklow (16/32).
***Holocentropus picicornis* (Stephens, 1836)**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Longford, Mayo, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (23/32).
***Neureclipsis bimaculata* (Linnaeus, 1758)**
Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Tipperary, Westmeath, Wicklow (20/32).

***Plectrocnemia conspersa* (Curtis, 1834)**
Antrim, Armagh, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Mayo, Meath, Monaghan, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (24/32).

***Plectrocnemia geniculata* McLachlan, 1871**
Antrim, Armagh, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Mayo, Meath, Monaghan, Sligo, Tipperary, Westmeath, Wexford, Wicklow (18/32).

***Polycentropus flavomaculatus* (Pictet, 1834)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Longford, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (32/32).

***Polycentropus irroratus* (Curtis, 1835)**
Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Mayo, Meath, Monaghan, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wicklow (23/32).

***Polycentropus kingi* McLachlan, 1881**
Antrim, Cavan, Clare, Cork, Donegal, Down, Dublin, Galway, Kerry, Laois, Mayo, Meath, Monaghan, Roscommon, Sligo, Westmeath, Wexford, Wicklow (18/32).

PSYCHOMYIIDAE

***Lype phaeopa* (Stephens, 1836)**
Cavan, Clare, Cork, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Leitrim, Longford, Mayo, Meath, Monaghan, Roscommon, Sligo, Waterford, Westmeath, Wexford, Wicklow (20/32).

***Lype reducta* (Hagen, 1868)**
Cork, Donegal, Kerry, Monaghan, Tipperary, Wexford (6/32).

***Psychomyia fragilis* (Pictet, 1834)**
Cavan, Clare, Cork, Galway, Kerry, Mayo, Meath, Roscommon, Sligo, Tyrone, Westmeath (11/32).

***Psychomyia pusilla* (Fabricius, 1781)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Mayo, Meath, Monaghan, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (29/32).

***Tinodes dives* (Pictet 1834)**
Sligo (1/32).

***Tinodes maclachlani* Kimmins, 1966**
Carlow, Cavan, Clare, Cork, Donegal, Down, Dublin, Galway, Kerry, Mayo, Monaghan, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (17/32).
***Tinodes maculicornis* (Pictet 1834)**
Carlow, Cavan, Clare, Galway, Kilkenny, Limerick, Mayo, Meath, Monaghan, Roscommon, Tipperary, Westmeath, Wexford (13/32).
***Tinodes unicolor* (Pictet 1834)**
Clare, Donegal, Wicklow (3/32).
***Tinodes waeneri* (Linnaeus, 1758)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (30/32).

HYDROPSYCHIDAE

***Cheumatopsyche lepida* (Pictet, 1834)**
Carlow, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Limerick, Mayo, Meath, Monaghan, Roscommon, Tipperary, Tyrone, Waterford, Westmeath, Wexford (21/32).
***Diplectrona felix* McLachlan, 1878**
Antrim, Clare, Cork, Donegal, Down, Dublin, Galway, Kerry, Kilkenny, Mayo, Meath, Tipperary, Waterford, Wexford, Wicklow (15/32).
***Hydropsyche angustipennis* (Curtis, 1834)**
Antrim, Armagh, Cavan, Cork, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Mayo, Meath, Offaly, Tipperary, Tyrone, Waterford, Westmeath, Wexford (19/32).
***Hydropsyche contubernalis* McLachlan, 1865**
Carlow, Clare, Cork, Derry, Dublin, Galway, Kerry, Kildare, Mayo, Meath, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wicklow (16/32).
***Hydropsyche instabilis* (Curtis, 1834)**
Antrim, Carlow, Cork, Derry, Donegal, Dublin, Fermanagh, Kerry, Leitrim, Tipperary, Tyrone, Waterford, Wexford, Wicklow (14/32).
***Hydropsyche pellucidula* (Curtis, 1834)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Offaly, Roscommon, Tipperary, Tyrone, Westmeath, Wexford, Wicklow (28/32).

***Hydropsyche siltalai* Döhler, 1963**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Monaghan, Offaly, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (29/32).

PHRYGANEIDAE

***Agrypnia obsoleta* (Hagen, 1864)**
Antrim, Cavan, Clare, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Westmeath, Wicklow (21/32).

***Agrypnia pagetana* Curtis, 1835**
Cavan, Cork, Donegal, Fermanagh, Galway, Leitrim, Mayo, Monaghan, Roscommon, Sligo, Westmeath (11/32).

***Agrypnia varia* (Fabricius, 1793)**
Antrim, Cavan, Clare, Cork, Donegal, Dublin, Galway, Kerry, Laois, Mayo, Monaghan, Offaly, Roscommon, Sligo, Waterford, Westmeath, Wicklow (17/32).

***Hagenella clathrata* (Kolenati, 1848)**
Galway, Laois (2/32).

***Oligotricha striata* (Linnaeus, 1758)**
Cavan, Roscommon, Westmeath (3/32).

***Phryganea bipunctata* Retzius, 1783**
Antrim, Armagh, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Limerick, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wicklow (26/32).

***Phryganea grandis* Linnaeus, 1758**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Limerick, Mayo, Meath, Offaly, Sligo, Tipperary, Waterford, Westmeath, Wicklow (20/32).

***Trichostegia minor* (Curtis, 1834)**
Cork and Westmeath (2/32).

GOERIDAE

***Goera pilosa* (Fabricius, 1775)**
Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (29/32).

***Silo nigricornis* (Pictet, 1834)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Dublin, Fermanagh, Galway, Kerry, Laois, Leitrim, Mayo, Meath, Tipperary, Tyrone, Westmeath, Wexford, Wicklow (20/32).
***Silo pallipes* (Fabricius, 1781)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Kerry, Kildare, Kilkenny, Laois, Mayo, Monaghan, Sligo, Tipperary, Tyrone, Waterford, Wexford, Wicklow (23/32).

LEPIDOSTOMATIDAE

***Crunoecia irrorata* (Curtis, 1834)**
Antrim, Carlow, Cavan, Clare, Cork, Donegal, Dublin, Galway, Kerry, Kildare, Kilkenny, Sligo, Tipperary, Waterford, Wexford, Wicklow (16/32).
***Lepidostoma basale* (Kolenati, 1848)**
Cavan, Donegal, Fermanagh, Galway, Kerry (5/32).
***Lepidostoma hirtum* (Fabricius, 1775)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Leitrim, Limerick, Longford, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (31/32).

APATANIIDAE

***Apatania auricula* (Forsslund, 1930)**
Clare, Kerry (2/32).
***Apatania muliebris* McLachlan, 1866**
Antrim, Cavan, Clare, Derry, Kerry, Wexford (6/32).
***Apatania wallengreni* McLachlan, 1871**
Donegal, Fermanagh, Galway, Mayo, Sligo, Westmeath (6/32).

LIMNEPHILIDAE

***Drusus annulatus* (Stephens, 1837)**
Antrim, Carlow, Cavan, Clare, Cork, Derry, Down, Dublin, Fermanagh, Galway, Kerry, Laois, Leitrim, Meath, Sligo, Tipperary, Tyrone, Waterford, Wexford, Wicklow (20/32).
***Ecclisopteryx dalecarlica* Kolenati, 1848**
Clare, Cork, Derry, Donegal, Leitrim, Tipperary, Tyrone, Wicklow (8/32).

***Chaetopteryx villosa* (Fabricius, 1798)**
Antrim, Cavan, Clare, Cork, Dublin, Galway, Kerry, Kildare, Kilkenny, Meath, Tipperary, Waterford, Wexford, Wicklow (14/32).
***Anabolia brevipennis* (Curtis, 1834)**
Cavan, Galway, Westmeath (3/32).
***Anabolia nervosa* (Curtis, 1834)**
Antrim, Armagh, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Leitrim, Limerick, Longford, Louth, Mayo, Meath, Monaghan, Roscommon, Sligo, Tipperary, Tyrone, Westmeath, Wexford, Wicklow (28/32).
***Glyphotaelius pellucidus* (Retzius, 1783)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Down, Dublin, Galway, Kerry, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Monaghan, Roscommon, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (24/32).
***Grammotaulius nigropunctatus* (Retzius, 1783)**
Armagh, Cavan, Clare, Cork, Galway, Leitrim, Louth, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wicklow (15/32).
***Limnephilus affinis* Curtis, 1834**
Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Galway, Kerry, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tyrone, Waterford, Westmeath, Wexford, Wicklow (22/32).
***Limnephilus auricula* Curtis, 1834**
Antrim, Armagh, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Leitrim, Limerick, Louth, Mayo, Meath, Monaghan, Offaly, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (27/32).
***Limnephilus binotatus* Curtis, 1834**
Armagh, Cavan, Clare, Fermanagh, Galway, Kerry, Limerick, Mayo, Monaghan, Offaly, Tipperary, Westmeath, Wicklow (13/32).
***Limnephilus borealis* (Zetterstedt, 1840)**
Antrim (1/32).
***Limnephilus centralis* Curtis, 1834**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Mayo, Offaly, Roscommon, Tipperary, Waterford, Wexford, Wicklow (21/32).
***Limnephilus coenosus* Curtis, 1834**
Antrim, Galway, Kerry, Tyrone (4/32).

***Limnephilus decipiens* (Kolenati, 1848)**
Cavan, Clare, Fermanagh, Galway, Mayo, Meath, Monaghan, Offaly, Tipperary, Waterford, Westmeath, Wexford (12/32).
***Limnephilus elegans* Curtis, 1834**
Antrim, Clare, Cork, Donegal, Kerry, Mayo, Offaly, Tipperary, Westmeath (9/32).
***Limnephilus flavicornis* (Fabricius, 1787)**
Armagh, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Leitrim, Longford, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (27/32).
***Limnephilus fuscinervis* (Zetterstedt, 1840)**
Cavan, Clare, Galway, Kildare, Mayo, Monaghan, Offaly, Roscommon, Westmeath (9/32).
***Limnephilus griseus* (Linnaeus, 1758)**
Clare, Cork, Donegal, Galway, Kerry, Mayo, Offaly, Sligo, Westmeath (9/32).
***Limnephilus hirsutus* (Pictet, 1834)**
Antrim, Cavan, Clare, Cork, Donegal, Dublin, Galway, Kildare, Mayo, Monaghan, Offaly, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (17/32).
***Limnephilus ignavus* Mclachlan, 1865**
Antrim, Cavan, Clare, Kildare, Mayo, Waterford, Westmeath, Wexford, Wicklow (9/32).
***Limnephilus incisus* Curtis, 1834**
Antrim, Armagh, Cavan, Clare, Donegal, Galway, Kerry, Kildare, Limerick, Mayo, Monaghan, Offaly, Waterford, Westmeath, Wexford, Wicklow (16/32).
***Limnephilus lunatus* Curtis, 1834**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Leitrim, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (29/32).
***Limnephilus luridus* Curtis, 1834**
Antrim, Clare, Cork, Donegal, Dublin, Galway, Kerry, Mayo, Monaghan, Offaly, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (17/32).
***Limnephilus marmoratus* Curtis, 1834**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (29/32).
***Limnephilus nigriceps* (Zetterstedt, 1840)**
Antrim, Armagh, Cavan, Clare, Donegal, Fermanagh, Galway, Mayo, Meath, Westmeath (10/32).
***Limnephilus pati* O'Connor, 1980**
Donegal, Mayo, Tipperary, Westmeath (4/32).

***Limnephilus rhombicus* (Linnaeus, 1758)**
Antrim, Armagh, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kildare, Leitrim, Limerick, Louth, Mayo, Offaly, Roscommon, Sligo, Tipperary, Waterford, Wexford, Wicklow (23/32).

***Limnephilus sparsus* Curtis, 1834**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Louth, Mayo, Meath, Monaghan, Offaly, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (26/32).

***Limnephilus stigma* Curtis, 1834**
Antrim, Armagh, Cavan, Clare, Cork, Galway, Kerry, Offaly, Tipperary, Waterford, Westmeath (11/32).

***Limnephilus tauricus* Schmid, 1964**
Tipperary (1/32).

***Limnephilus vittatus* (Fabricius, 1798)**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (23/32).

***Halesus digitatus* (Schrank, 1781)**
Antrim, Cavan, Cork, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Mayo, Meath, Tipperary, Wexford, Wicklow (15/32).

***Halesus radiatus* (Curtis, 1834)**
Antrim, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Louth, Mayo, Meath, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (26/32).

***Hydatophylax infumatus* (McLachlan, 1865)**
Cavan (1/32).

***Mesophylax impunctatus* McLachlan, 1884**
Clare, Galway, Kerry, Mayo, Sligo, Westmeath (6/32).

***Micropterna lateralis* (Stephens, 1837)**
Antrim, Armagh, Carlow, Clare, Cork, Donegal, Down, Dublin, Galway, Kerry, Kildare, Kilkenny, Mayo, Roscommon, Sligo, Tyrone, Waterford, Westmeath, Wexford, Wicklow (20/32).

***Micropterna sequax* McLachlan, 1875**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Down, Dublin, Galway, Kerry, Kildare, Mayo, Meath, Offaly, Roscommon, Tyrone, Waterford, Wexford, Wicklow (19/32).

***Potamophylax cingulatus* (Stephens, 1837)**
Antrim, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Kerry, Louth, Meath, Sligo, Tipperary, Tyrone, Waterford, Wexford, Wicklow (18/32).
***Potamophylax latipennis* (Curtis, 1834)**
Antrim, Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Galway, Kerry, Kildare, Mayo, Meath, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (22/32).
***Stenophylax permistus* McLachlan, 1895**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Limerick, Louth, Mayo, Meath, Roscommon, Sligo, Tyrone, Waterford, Westmeath, Wexford, Wicklow (22/32).

SERICOSTOMATIDAE

***Sericostoma personatum* (Spence, 1826)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Longford, Louth, Mayo, Meath, Monaghan, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (31/32).

BERAEIDAE

***Beraea maurus* (Curtis, 1834)**
Antrim, Cavan, Clare, Cork, Derry, Down, Dublin, Fermanagh, Kerry, Kildare, Kilkenny, Mayo, Sligo, Tipperary, Tyrone, Waterford, Wexford, Wicklow (18/32).
***Beraea pullata* (Curtis, 1834)**
Armagh, Carlow, Cavan, Clare, Cork, Donegal, Down, Dublin, Fermanagh, Kerry, Kildare, Laois, Mayo, Tipperary, Waterford, Wexford, Wicklow (17/32).
***Beraeodes minutus* (Linnaeus, 1761)**
Antrim, Cavan, Fermanagh, Kerry, Meath, Tipperary, Tyrone, Waterford (8/32).

ODONTOCERIDAE

***Odontocerum albicorne* (Scopoli, 1763)**
Antrim, Carlow, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Kerry, Kilkenny, Mayo, Meath, Sligo, Tipperary, Tyrone, Waterford, Wexford, Wicklow (19/32).

MOLANNIDAE

***Molanna albicans* (Zetterstedt, 1840)**

Armagh, Cavan, Fermanagh, Galway, Leitrim, Longford, Mayo, Monaghan, Roscommon, Sligo, Westmeath (11/32).

LEPTOCERIDAE

***Adicella reducta* (McLachlan, 1865)**

Carlow, Clare, Cork, Donegal, Galway, Kerry, Kildare, Kilkenny, Tipperary, Waterford, Wexford, Wicklow (12/32).

***Athripsodes albifrons* (Linnaeus, 1758)**

Carlow, Cavan, Clare, Cork, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (27/32).

***Athripsodes aterrimus* (Stephens, 1836)**

Antrim, Armagh, Cavan, Clare, Cork, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Laois, Leitrim, Longford, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (28/32).

***Athripsodes bilineatus* (Linnaeus, 1758)**

Clare, Cork, Down, Dublin, Fermanagh, Galway, Kildare, Mayo, Tyrone, Westmeath (10/32).

***Athripsodes cinereus* (Curtis, 1834)**

Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (31/32).

***Athripsodes commutatus* (Rostock, 1874)**

Cavan, Clare, Cork, Donegal, Dublin, Galway, Kerry, Leitrim, Limerick, Mayo, Meath, Monaghan, Sligo, Westmeath (14/32).

***Ceraclea albimacula* (Rambur, 1842)**

Antrim, Carlow, Cavan, Clare, Cork, Donegal, Galway, Kerry, Kildare, Kilkenny, Leitrim, Limerick, Mayo, Monaghan, Roscommon, Westmeath, Wexford, Wicklow (18/32).

***Ceraclea annulicornis* (Stephens, 1836)**

Clare, Donegal, Galway, Kerry, Roscommon, Westmeath (6/32).

***Ceraclea dissimilis* (Stephens, 1836)**

Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Galway, Kerry, Kildare, Kilkenny, Limerick, Mayo, Monaghan, Offaly, Roscommon, Tipperary, Tyrone, Westmeath, Wexford (23/32).

***Ceraclea fulva* (Rambur, 1842)**
Armagh, Cavan, Clare, Derry, Donegal, Fermanagh, Galway, Kerry, Leitrim, Limerick, Longford, Mayo, Monaghan, Roscommon, Tipperary, Waterford, Westmeath, Wicklow (18/32).
***Ceraclea nigronervosa* (Retzius, 1783)**
Armagh, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Mayo, Meath, Roscommon, Sligo, Tyrone, Westmeath (15/32).
***Ceraclea senilis* (Burmeister, 1839)**
Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Longford, Louth, Mayo, Monaghan, Roscommon, Westmeath (16/32).
***Erotesis baltica* McLachlan, 1877**
Westmeath (1/32).
***Leptocerus tineiformis* Curtis, 1834**
Down, Dublin, Kildare, Limerick, Waterford, Wexford (6/32).
***Mystacides azurea* (Linnaeus, 1761)**
Antrim, Armagh, Carlow, Cavan, Clare, Cork, Derry, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Tyrone, Waterford, Westmeath, Wexford, Wicklow (30/32).
***Mystacides longicornis* (Linnaeus, 1758)**
Antrim, Armagh, Cavan, Clare, Cork, Derry, Donegal, Dublin, Fermanagh, Galway, Kerry, Kildare, Leitrim, Limerick, Longford, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (26/32).
***Oecetis furva* (Rambur, 1834)**
Antrim, Cavan, Clare, Cork, Donegal, Fermanagh, Galway, Kerry, Limerick, Longford, Mayo, Monaghan, Offaly, Waterford, Westmeath (15/32).
***Oecetis lacustris* (Pictet, 1834)**
Antrim, Armagh, Cavan, Clare, Cork, Fermanagh, Galway, Kerry, Kildare, Leitrim, Longford, Mayo, Monaghan, Roscommon, Westmeath, Wexford, Wicklow (17/32).
***Oecetis notata* (Rambur, 1842)**
Dublin, Kerry, Kilkenny, Mayo, Tipperary, Waterford, Wexford (7/32).
***Oecetis ochracea* (Curtis, 1825)**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Down, Dublin, Fermanagh, Galway, Kerry, Limerick, Mayo, Monaghan, Offaly, Roscommon, Waterford, Westmeath (18/32).
***Oecetis testacea* Curtis, 1825**
Cavan, Clare, Cork, Donegal, Galway, Kerry, Limerick, Mayo, Westmeath, Wexford, Wicklow (11/32).

***Setodes argentipunctellus* McLachlan, 1877**
Kerry (1/32).
***Triaenodes bicolor* (Curtis, 1834)**
Antrim, Armagh, Cavan, Clare, Cork, Donegal, Dublin, Fermanagh, Galway, Kerry, Longford, Mayo, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow (21/32).
***Ylodes reuteri* (McLachlan, 1880)**
Waterford, Wexford (2/32).

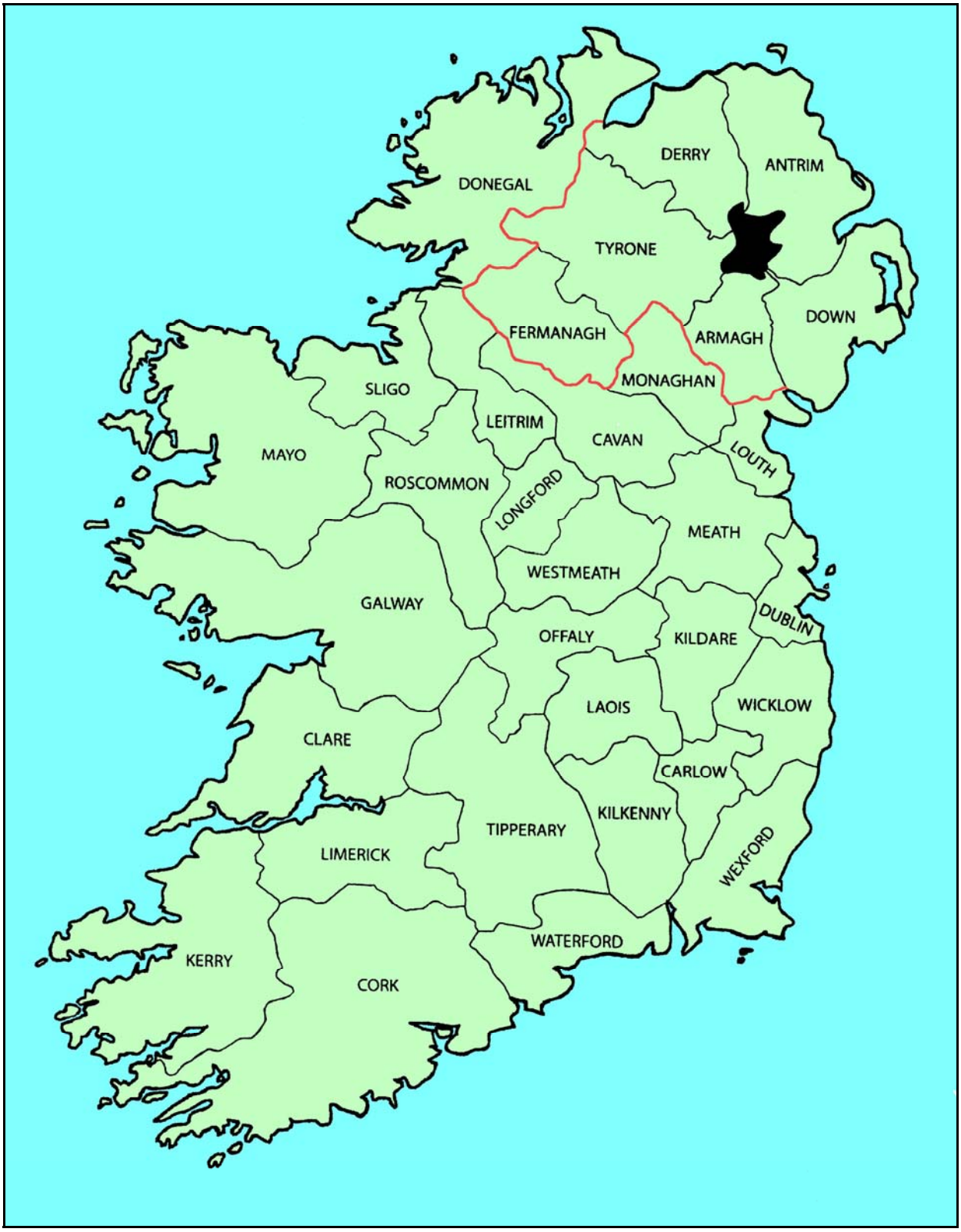


FIGURE 112. The counties of Ireland.

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DOUBT AND CERTAINTY IN RECORDS OF *MICROPSECTA RECURVATA* GOETGHEBUER (INSECTA: DIPTERA: CHIRONOMIDAE) IN IRELAND

D. A. Murray[1] and P. H. Langton[2]
[1]*Emeritus Associate Professor, Freshwater Biodiversity, Ecology and Fisheries Research Group, School of Biology and Environmental Science, University College Dublin, Belfield, Dublin 4, Ireland.*
e-mail:<declan.murray@ucd.ie>
(address for correspondence: *Meadesbrook, Ashbourne, Co. Meath, A84 K727, Ireland.*)
[2]*University Museum of Zoology, Cambridge, Downing Street, Cambridge, England.*
(address for correspondence: *16 Irish Society Court, Coleraine, Co. Derry, BT52 1GX, Northern Ireland*.)

Abstract

Micropsectra recurvata Goetghebuer, 1928 is confirmed for the faunal inventory of Chironomidae (Insecta: Diptera) of Ireland from collections in Northern Ireland.
Key words: *Micropsectra recurvata*, Chironomidae, Ireland, inventory, amendment.

Introduction

According to Courchamp *et al*. (2014), fundamental research is primarily undertaken to satisfy curiosity, acquire knowledge and achieve understanding. Faunistic studies for species inventory purposes may thus be aptly considered as fundamental research since such activity is exploratory and curiosity-driven in the endeavour to find out "what's there" - with reliable evidence of occurrence. Compilers of regional faunal inventories strive to include valid, up-to-date, species records for checklists of a defined region. Such undertakings are predisposed to constant amendment as new information becomes available, either from taxonomic review, from additional faunal collections or arising from past errors or misdeterminations. Cranston (1995) remarked "one of the most humble tasks of taxonomists is 'housekeeping' - the provision and maintenance of records of what we know about described species". Like "housekeeping", faunal inventories are seemingly never complete. In this paper the rationale is outlined for (a) the exclusion of records of *Micropsectra recurvata* Goetghebuer, 1928 (Tribe Tanytarsini, Subfamily Chironominae) from the recent checklist of Chironomidae in Ireland (Murray *et al*., 2018) and (b) its reinstatement, validated from a confirmed record in Northern Ireland from 2013 that had regrettably been overlooked.

Micropsectra recurvata Goetghebuer, 1928 restored to the Irish faunal checklist

The first records of *Micropsectra recurvata* in Ireland were given by Colette Dowling from two locations, the Glenamoy Blanket Bog, County Mayo and the blanket bog on Featherbed Mountain, County Dublin, during her unpublished Ph.D. studies (Dowling, 1975). Those records were not cited in Dowling and Murray (1981). The first published record of the species was given in the inventory for Ireland by Murray and Ashe (1983), based on Dowling (1975). The species was later cited in Ashe and Cranston (1990), Ashe *et al*. (1998) and Chandler (1998). It was noted by Murray (2005) in the unpublished catalogue that accompanied the *Heritage Council Collection of Irish Chironomidae* (now on deposit in the National Museum of Ireland - Natural History), but the record was considered uncertain since voucher specimens from Dowling (1975) could not be located. Based on the then available published information, *M. recurvata* was included in the listing for Ireland in Chandler *et al.* (2008) and in the Fauna Europaea database (Sæther and Spies, 2003).

In the absence of voucher specimens from Dowling's collections at Glenamoy and Featherbed Mountain, either in the senior author's reference collection or in the National Museum of Ireland, Murray *et al.* (2016) considered the record of *M. recurvata* as unconfirmed, removed it from the listing for Ireland and did not include it in the latest review (Murray *et al*., 2018). That removal from the Irish faunal checklist was also recognised in the recent updating of the Diptera Section of the Checklist of Insects of the British Isles (Chandler, 2018 p. 85).

However, it has now transpired that a record of the species in Ireland had been overlooked for over five years, since the second author had collected specimens in Northern Ireland on 12 April 2013 from the River Bann at Coleraine (Grid reference C854303), County Derry (Londonderry). Due to inadvertent miscommunication, that unpublished record was not available for inclusion in Murray *et al.* (2015) leading to its subsequent omission in the recent inventory by Murray *et al.* (2018). The species is now formally restored to the Irish checklist based on the confirmed record from Northern Ireland by PHL. In the light of this record, it is perhaps realistic to speculate that the records of *M. recurvata* by Dowling (1975) from Glenamoy Bog, County Mayo (F896345) in April 1973 and Featherbed Mountain, County Dublin (O120190) in May 1974, may be well-founded. However, in the continued absence of voucher specimens, its status remains uncertain for the Republic of Ireland.

M. recurvata is known from Great Britain and is widely distributed in the West Palaearctic - including Iceland and the Faroe Islands (Spies and Sæther, 2013).

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DOUBLE DIMORPHISM AND CYCLOLABIC MALE EARWIGS *FORFICULA AURICULARIA* (L.) (DERMAPTERA: FORFICULIDAE) FROM FOYNES ISLAND, IRELAND

Jervis A. Good[1] and Julian D. Reynolds[2]
[*Department of Zoology, Trinity College, Dublin 2, Ireland.*]
[1]Present address: *Glinny, Riverstick, Co. Cork, Ireland.*
e-mail: <Pygidicrana@gmail.com>
[2]Present address: *115 Wierview Drive, Stillorgan, Co. Dublin, Ireland*.

Abstract

Studies of sexual selection and forceps size variation in male earwigs, *Forficula auricularia* (L.), have usually examined forceps length, dividing macrolabic males (with long forceps) from microlabic males (with short forceps). However, male earwigs with different forceps shape, cyclolabic males, recognised by Fieber (1853), Paulian (1937) and Kuhl (1928), were identified in morphometric graphs of earwigs collected from Foynes Island, County Limerick, Ireland, as well as from published data. Above a threshold (or switch-point) in body size, cyclolabic males (with a short forceps with wide base) and macrolabic males (with a long forceps) can be distinguished, but below this threshold, the two types are generally indistinguishable as microlabic males which, due to their poor development, have not expressed what is possibly their genotypic dimorphic potential. Mating experiments could usefully take account of the difference between cyclolabic and microlabic males as they may have different behaviour or mating success.

Key words: Dermaptera, *Forficula auricularia*, earwigs, forceps, double dimorphism, cyclolabic males, Ireland.

Introduction

The massive pair of antlers of the extinct 'Irish elk' or giant deer (*Megalocerus giganteus* (Blumenbach)) is probably the best-known example of a "bizarre" secondary sexual structure from the Irish fauna (Gould, 1974). A less well-known example is the elongated terminal pair of forceps of some males of the common earwig (*Forficula auricularia* (L.)) (see Plate 1), particularly well-developed in some offshore island populations. Males with long forceps have been shown to have greater mating success than males with short forceps (Radesäter and Halldórsdóttir, 1993; Forslund, 2003; Tomkins and Simmons, 1998; Good, 2015). They are thus subject to sexual selection, as is the case with male scarabaeid beetles with large cephalic and thoracic horns (Emlen and Nijhout, 2000).

Male common earwig forceps were originally described as dimorphic in length (Bateson and

Brindley, 1892; Diakonov, 1925; Huxley, 1927), and were divided into a 'microlabious' or 'microlabic' morph (with short forceps; also known as 'brachylabic' or 'low' males), and a 'macrolabious' or 'macrolabic' morph (with long forceps; also known as the form *forcipata* (Stephens) or 'high' males) (see Plate 1).

A different nomenclature was introduced by Fieber (1853), who described two forms, *macrolabia* and *cyclolabia*. According to van Heerdt (1953), Fieber described these two male varieties as: "the first with a long forceps (5-8mm), the second with a short one (2.5-5mm)" (quoting from van Heerdt). However, Paulian (1937) pointed out that these terms were originally used to distinguish two *morphologically* different forms of male earwig. According to Paulian's description, the "forceps of the cyclolabic form are strongly curved, with a strong, multidentate base; the forceps of the macrolabic form are, on the contrary, thinner, nearly straight, with a relatively feeble and paucidentate base." Paulian (1937) found that these subjectively separated forms were allometrically distinct, when forceps length was plotted against elytron length (as a measure of body size) on a logarithmic scale.

Kuhl (1928) separated three forceps forms in the male: two short forms, one slender and the other broad (equivalent to the cyclolabic), and a long form (equivalent to the macrolabic). He was unable to separate the short forms by graphic techniques, but noted that the short broad type often produced similarly high values for forceps width as did long forceps. He also observed that the forceps tips rarely overlapped in this form (often being up to 12mm apart although also in some cases coming together), whereas in the short-slender and long forms, the tips overlapped.

Ollason (1972) further examined forceps shape differences in *F. auricularia*, and was again able to separate three male morphs (and two female morphs). Lamb (1976) identified four morphs in body weight and forceps length for Canadian *F. auricularia*, using a probability plot method.

Otte and Stayman (1979), noting the problem of why male forceps length is dimorphic in *F. auricularia* while body size is continuously variable, suggested that developmental switch-points could be responsible. More recent studies have shown that a conditional threshold or switch-point indeed explains the morphometric plots of body size against forceps length for *F. auricularia* (Tomkins, 1999; Tomkins and Simmons, 1996; Kotiaho and Tomkins, 2001; Tomkins and Brown, 2004; Tomkins *et al*., 2011). Emlen *et al*. (2012) experimentally established the role of insulin or insulin-like growth factor (IGF) in the disproportionate growth of male horns in the rhinoceros beetle *Trypoxylus dichotomus* (L.), and this conditional mechanism may also apply to earwig forceps.

Forceps metric data from a sample of earwigs from Foynes Island, in the Shannon Estuary (County Limerick, Ireland), originally presented in an unpublished thesis (Good, 1983), are reported here. Similar to Kuhl's (1928) findings, three morphs can be identified.

Methods

Forceps variation was analysed in a sample of 100 male *Forficula auricularia* from Foynes Island, County Limerick (R1450), collected by JDR and Kevin Bradley on 4 September 1980. Earwigs were collected under stones and jetsam above mean high tide level on the exposed western shore of the island. The area of the island is approximately 120ha, and it is separated from the mainland at Foynes by less than 250m of tidal estuary (Reynolds and Reynolds, 1992). Specimens were preserved in 70% ethanol, and subsequently dry-mounted, venter-up, for forceps measurement. Measurements were made in units of 0.025mm, using a binocular microscope with an eyepiece grid.

Brindley (1914) stated that measurement of forceps *in situ* is unsatisfactory, and that they should be dissected. However, it is likely that he was referring to the dorsal aspect, as the proximal end of the outer margin can be clearly seen if the specimens are examined ventrally. Measurements were made from this proximal point to the forceps tip, using the left-hand forceps as seen ventrally.

Pronotum width was used as proxy measurement of body size. In addition to untransformed data plots, data were also plotted on log-log scales to show deviation from simple allometry (Gould, 1966; Huxley, 1968; Tomkins *et al*., 2005).

Pronotal width, forceps length and forceps width thresholds were located by eye in Figs 4-6. They are, nevertheless, similar to the horizontal and vertical switch-point lines illustrated in Fig. 3 of Kotiaho and Tomkins (2001), which were derived from statistical models.

Results

Metrics from the sample of male *Forficula auricularia* collected at Foynes Island are plotted in Figs 1-5. Raw data are given in Appendix 1 (following Huxley's (1927) recommendation).

The untransformed plot of forceps length against pronotal width (Fig. 1) shows the conventional arrangement of the dependent variable (forceps length) on the y-axis. This shows that a threshold of body size (as indicated by pronotal width) has to be reached (looking from left to right in the graph) before distinct increases in forceps length occur. However, as it seems more natural to visualize a threshold as a horizontal line above which change occurs, the graph in Fig. 1 is re-plotted (in Fig. 2) with forceps length on the x-axis. In the log-log plot (Fig. 3), the data points can be separated into two parts, one with a steep regression line where forceps length only increases slightly with increasing body size, and another where forceps length increases rapidly with only a slight increase in body size.

The plots of forceps width against forceps length for both the Foynes sample (Fig. 4) and Kuhl's (1928) larger Helgoland data-set (Fig. 6) can be divided into different zones representing cyclolabic, macrolabic and what can be redefined here as microlabic (short and narrow forceps) forms. These are clearly distinct in the log-log plot also (Fig. 5).

Discussion

An environmental (or conditional) dimorphism explains the observations of Diakonov (1925), Kuhl (1928) and Tomkins (1999) that male earwigs with poor development will not develop long forceps. However, it does not explain why some male earwigs with large body size and broad forceps (cyclolabic males) do not develop long forceps.

The untransformed graph of forceps length versus pronotum width for the Foynes Island population (Fig. 1) shows a similar pattern to graphs published by Tomkins (1999) for two of the Farnes Islands off Northumberland, and by Tomkins and Brown (2004) for six islands in the Firth of Forth, Scotland. A common feature of all these populations is the occurrence of individuals which have well exceeded the apparent body-size threshold or switch-point (or *Umbiegungsstelle* of Kuhl (1928: 406)) for forceps length development but which have not developed long forceps, and which are close to the same allometric regression line as those with low body-size. This is particularly noticeable in the Foynes population (Figs 2 and 3), where two individuals which have the largest body size in the sample (as measured by pronotal width: 1.2mm) have not developed long-forceps despite their large body size. This pattern is not restricted to *Forficula auricularia*, and can also be seen in graphs in Tomkins and Simmons (1996) for the forficulid earwig *Timomenus aeris* (Shiraki), and the labiid earwig *Spongovostox assiniensis* (Bormans).

When forceps width is plotted against forceps length (Figs 4 and 5), the pattern is similar but more distinct, compared to the graphs of pronotal width and against forceps length (Figs 2 and 3). As found by Kuhl (1928) and Paulian (1937), males with short broad forceps may represent a different morphological type to those with long narrow forceps (see Plates 1 and 2 for an example of these two types from Foynes Island). This pattern is also evident in other studies, such as the graphs of forceps length against width for a Helgoland collection in 1924 (with 1053 male specimens (Kuhl (1928); replotted in Fig. 6).

Tomkins (1999) also noted the occurrence of individuals, in forceps length *versus* pronotal width graphs, which had developed large body size but did not possess macrolabic forceps (i.e. cyclolabic individuals). He suggested several hypotheses to explain this. These included a genetic polymorphism, either in morph type, or in the body size threshold at which the trait is expressed. However, the latter would need to be extreme to explain the two largest cyclolabic individuals in Fig. 3.

Kuhl (1928) explained the occurrence of cyclolabic males as being due to slight malformations as a result of moulting disorders where the forceps are incompletely extended. He argued that if the forceps trait was hereditary then malformations should be seen in macrolabic as well as cyclolabic forceps. However, this may be equally well explained by macrolabic forceps only occurring in individuals which have both genetic and physiological conditions suitable for their development. Illustrations of ‘macrolabic’ and ‘brachylabic’

morphs of the related Siberian *Forficula robusta* Semenov, in Bey-Bienko (1936: Fig. 40, drawn to scale), show a cyclolabic-type forceps in the 'brachylabic' form, although its pronotal width and body-size is clearly larger than the macrolabic form. The cyclolabic type (broad base, tips not meeting) is also apparent in *F. kombaitensis* Hincks, *F. sagitta* Semenov, *F. lucasi* Dohrn, *F. biplaga* Bey-Bienko, *F. tawangensis* Srivastava and *F. flavalis* Brindle (Steinmann, 1993), and perhaps at its most extreme in the Tibetan *F. macrobasis* (Bey-Bienko, 1936: Fig. 41; Emlen, 2008: Fig. 2(a)). It is very unlikely that all these specimens are due to moulting malformations, and more likely represent a genetically-determined cyclolabic shape.

If genetic, it is possible that macrolabic and cyclolabic forms represent two different sexual selection tactics, one to invest in a secondary sexual trait (macrolabic individuals), and another not to so invest (cyclolabic individuals) despite exceeding a body size threshold. Alternative reproductive tactics have been proposed to explain different levels of investment in beetle horns and mandibles; for instance, Thomaes and Camps (2016) suggested that the reduced investment in large mandibles in minor males of stag beetles (*Lucanus cervus* (Linnaeus)) is offset by greater flight and dispersal ability in finding females. However, it could also represent a balanced polymorphism, as described by Gadgil (1972), for individuals above the threshold body-size, with macrolabic individuals suffering greater *natural* selection against longer forceps due to predation, parasitism or some other factor.

Macrolabic males are easier to catch by their forceps and may suffer greater predation. Hibbert-Ware (1937) found, on occasion, large numbers of earwig forceps in the pellets of the little owl (*Athene noctua* (Scopoli)) in England. At three localities, almost all of the male forceps in pellets were macrolabic, possibly indicating greater predation of this male morph. Alternatively, there may be unknown costs. For instance, does the cost of forceps development render nymphs of macrolabic males more susceptible to fungal parasitism, for instance by the entomopathogenic fungus *Zoophthora* (= *Entomophthora*) *forficulae* (Giard) A. Batko? This was shown to be an important nymphal mortality factor in introduced common earwigs in North America by Crumb, Eide and Bonn (1941), and is known to occur in Great Britain (Petch, 1948) and probably occurs in Ireland too. In years when physiological development is generally good, it may be disadvantageous to place all genetic 'bets' on the macrolabic option.

It is also worth mentioning that there is no evidence that this dimorphism is related to chromosome variation, which has been long recognised in male *F. auricularia* (Payne, 1914; Morgan, 1928). Callan (1941) and Henderson (1970) did not find a correlation between forceps length dimorphism and chromosomal number in this species.

Good (1983, unpublished) originally concluded that *F. auricularia* males may have two genetic tactics, one for short broad (cyclolabic) forceps, and the other for long (macrolabic) forceps, although these forms are only expressed when body-size exceeds a threshold or switchpoint. In other words, there may be an overlapping double dimorphism, one

environmental (or conditional) and the other genetic, which is not represented by forceps length alone. This hypothesis may still be worth considering, especially as some mating experiments, such as that reported in Good (2015), did not distinguish between cyclolabic males and microlabic males (as defined here), and these types may have different behaviour or mating success.

Postscript

Just before this paper was submitted, we came across the recently published study by Matsumoto and Knell (2017) on mandible polymorphism in *Odontolabis* stag beetles. Interestingly, they also conclude that "the complex polymorphisms in these animals are probably maintained by a combination of a conditional strategy and a genetic polymorphism."

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PLATE 1. Macrolabic (left) and microlabic (right) forceps of *Forficula auricularia* males from Foynes Island, County Limerick. Vertical bar = 1mm.

PLATE 2. Microlabic (left) and cyclolabic (right) forceps of *Forficula auricularia* males from Foynes Island, County Limerick, showing differing shape despite similar length. Vertical bar = 1mm.

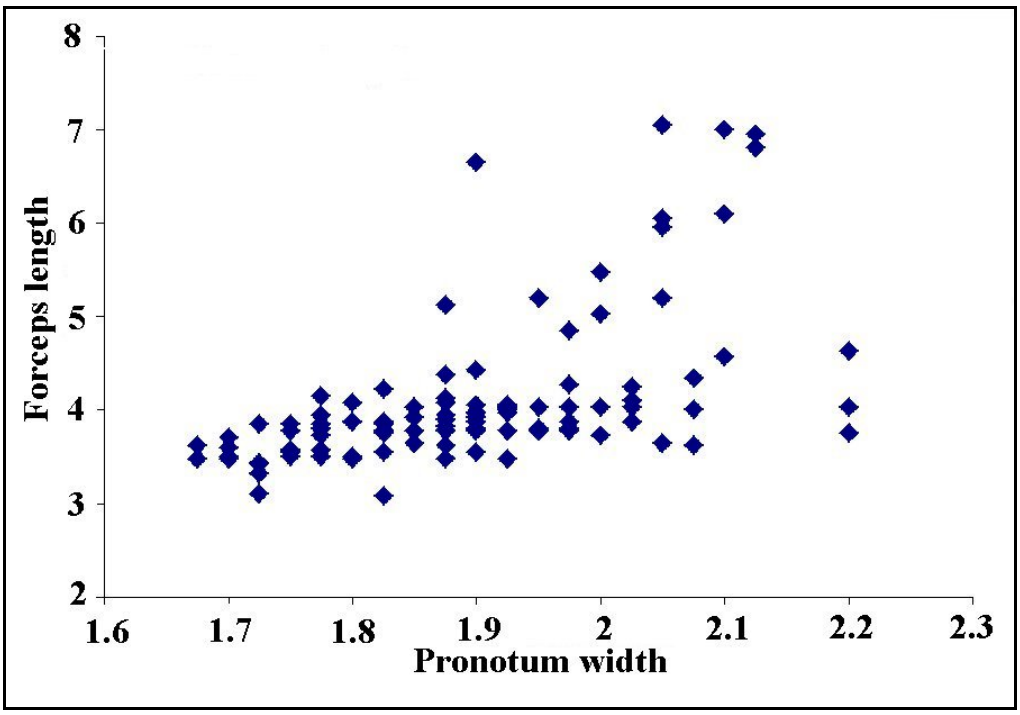

FIGURE 1. Scatter-plot of male *Forficula auricularia* pronotum width (mm) against forceps length (mm), from a sample (n=99) collected from Foynes Island (County Limerick).

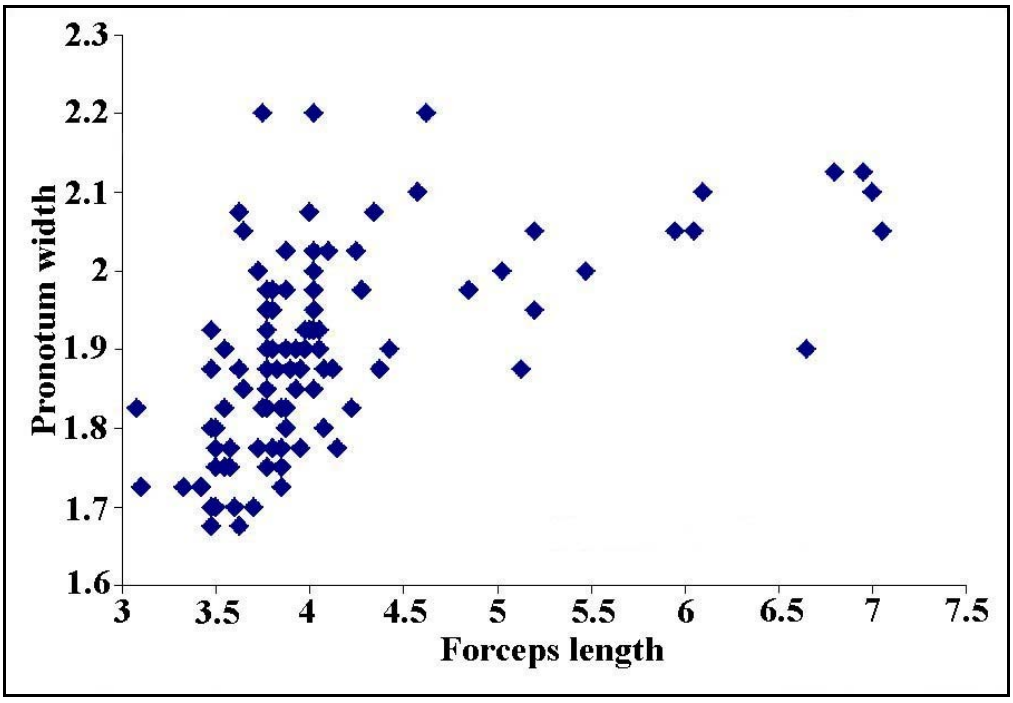

FIGURE 2. As Fig. 1, but with forceps length (mm) on x-axis and pronotum width (mm) on y-axis.

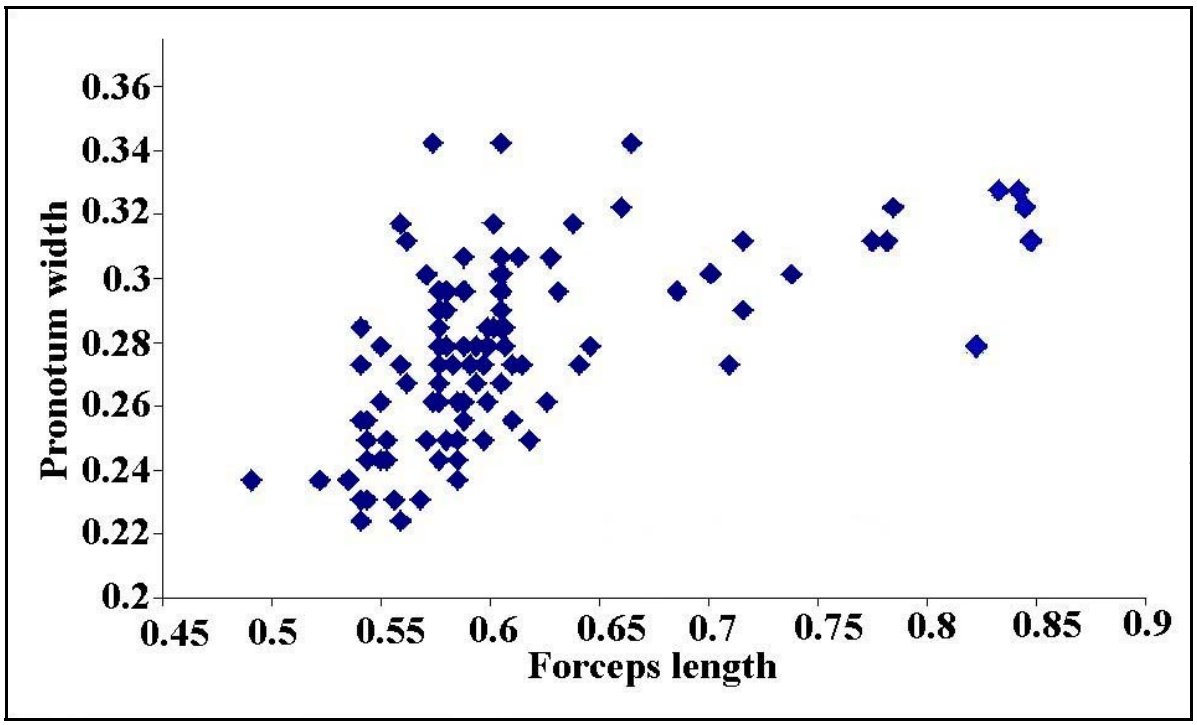

FIGURE 3. As Fig. 2, but on a log-log scale.

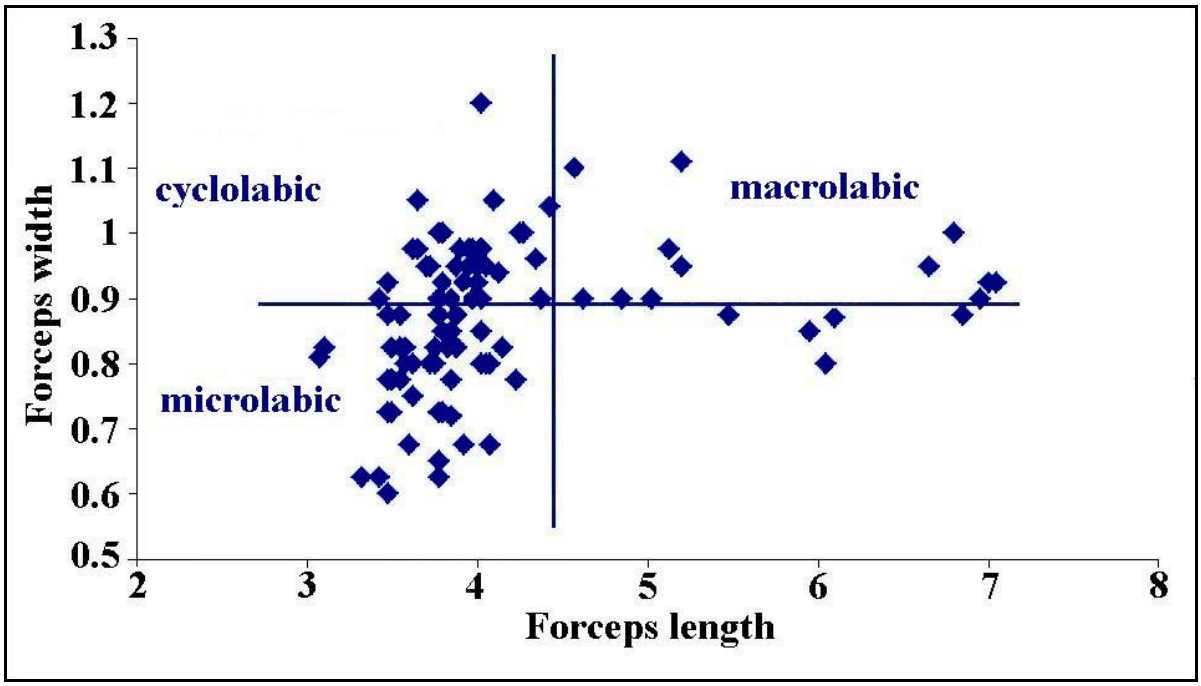

FIGURE 4. Scatter-plot of male *Forficula auricularia* forceps length (mm) against forceps width (mm), from a sample (n=100) collected from Foynes Island, County Limerick, showing microlabic, macrolabic and cyclolabic forms.

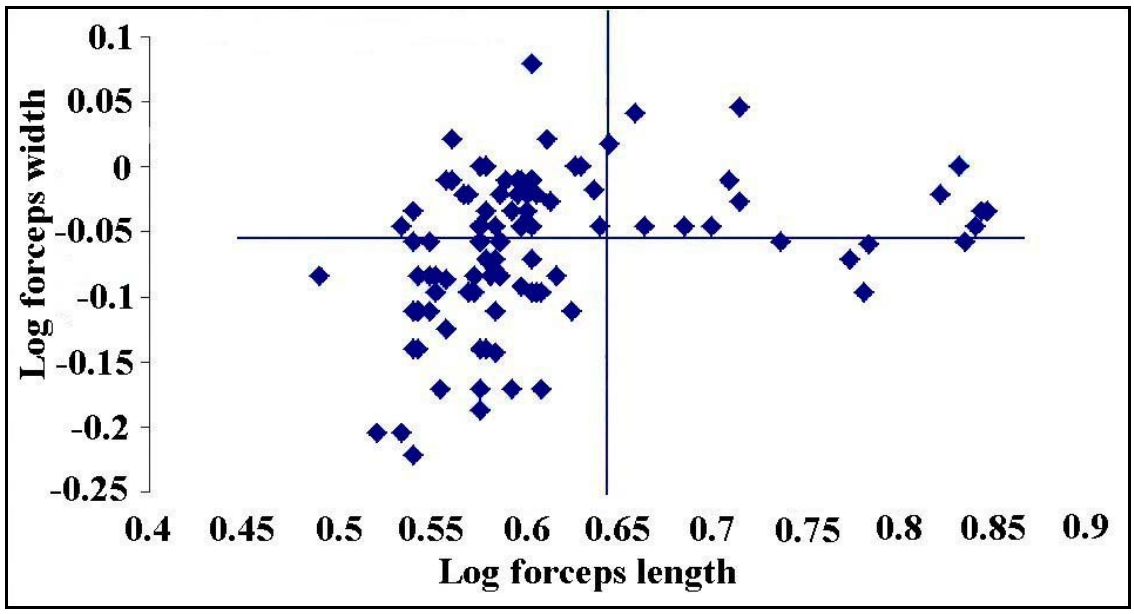

FIGURE 5. As Fig. 4, but on a log-log scale.

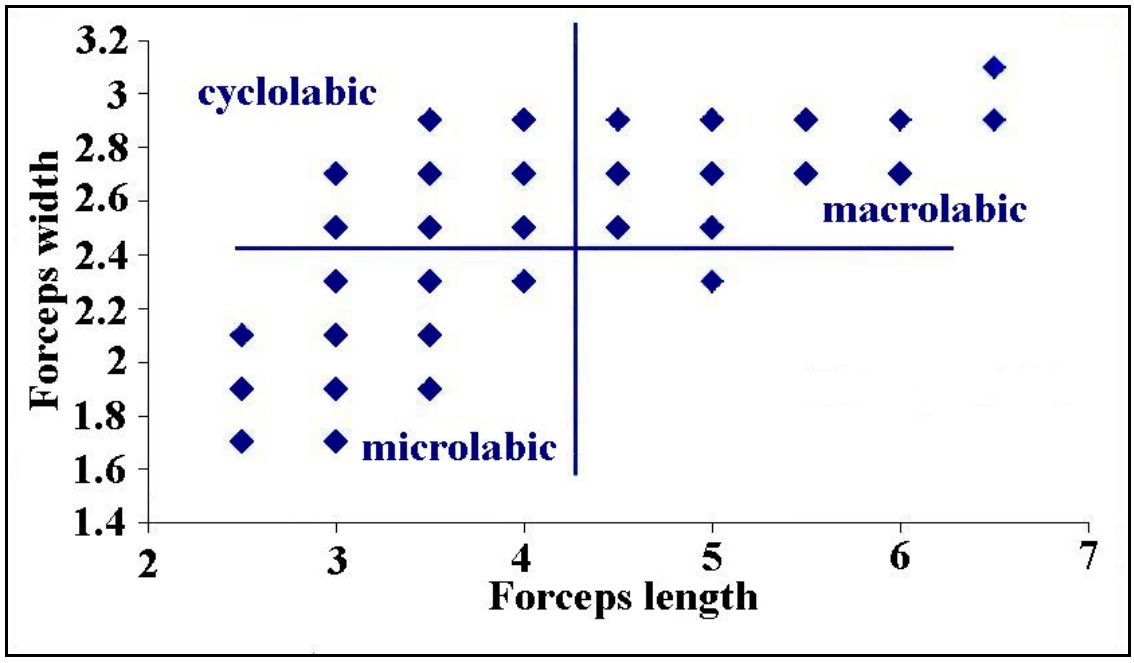

FIGURE 6. Scatter-plot of male *Forficula auricularia* forceps length (mm) against forceps width (mm, both forceps together), adapted from size-class data in Kuhl (1928) for a sample from Helgoland in 1924, showing microlabic, macrolabic and cyclolabic zones. (Each point represents more than one individual, with most points representing several tens of individuals (n=1053)).

APPENDIX 1. Measurement data (mm) for Figs. 3-7. 'Length' & 'width' refer to forceps.

No.	Length	Width	Pronotal width	No.	Length	Width	Pronotal width
01	7.00	0.925	2.10	41	4.35	0.96	2.075
02	4.025	0.80	1.95	42	3.85	0.72	1.725
03	4.375	0.90	1.875	43	6.10	0.87	2.10
04	3.975	0.975	1.90	44	3.975	0.81	1.825
05	4.025	0.975	1.975	45	4.125	0.94	1.875
06	4.00	0.95	1.925	46	5.95	0.85	2.05
07	4.025	1.20	2.025	47	3.65	0.975	1.85
08	3.475	0.725	1.70	48	4.05	0.95	1.9
09	3.625	0.0	1.875	49	3.75	0.8	1.825
10	3.50	0.75	1.775	50	3.1	0.825	1.725
11	3.775	0.875	1.975	51	3.775	0.9	1.875
12	3.875	0.95	1.825	52	3.875	0.825	1.8
13	6.05	0.80	2.05	53	6.8	1.0	2.125
14	4.025	0.85	2.00	54	4.025	0.975	1.85
15	3.775	0.65	1.95	55	3.475	0.925	1.875
16	5.475	0.875	2.00	56	3.625	0.975	2.075
17	4.25	1.00	2.025	57	3.9	0.975	1.875
18	5.125	0.975	1.875	58	3.725	0.8	1.775
19	3.70	0.95	1.70	59	3.55	0.875	1.9
20	3.475	0.775	1.925	60	3.775	0.675	1.825
21	4.275	1.00	1.975	61	3.475	0.875	1.8
22	6.95	0.90	2.125	62	3.425	0.9	1.725
23	6.85	0.875	[fore-body missing]	63	3.85	0.775	1.75
24	4.025	0.975	1.925	64	3.975	0.9	1.925
25	4.025	0.90	2.20	65	3.65	1.05	2.05
26	6.65	0.95	1.90	66	3.875	0.875	2.025
27	3.55	0.775	1.75	67	3.5	0.775	1.8
28	3.475	0.60	1.675	68	3.5	0.825	1.75
29	3.775	1.00	1.95	69	3.775	0.725	1.75
30	3.95	0.975	1.775	70	3.775	0.875	1.9
31	4.075	0.80	1.80	71	3.6	0.675	1.7
32	3.775	0.90	1.85	72	3.8	0.85	1.9
33	3.75	0.825	2.20	73	3.85	0.9	1.775
34	4.85	0.90	1.975	74	3.95	0.95	1.875
35	3.85	0.85	1.825	75	3.575	0.8	1.775
36	7.05	0.92	2.05	76	3.8	1.0	1.95
37	5.20	1.11	2.05	77	3.875	0.875	1.975
38	4.425	1.04	1.90	78	3.825	0.825	1.875
39	5.20	0.94	1.95	79	3.925	0.675	1.85
40	5.025	0.90	2.00	80	3.925	0.925	1.9

APPENDIX 1 (Continued). Measurement data (mm) for Figs. 3-7. 'Length' & 'width' refer to forceps.

No.	Length	Width	Pronotal width	No.	Length	Width	Pronotal width
81	4.625	0.9	2.2	91	3.775	0.9	1.925
82	4.075	0.675	1.875	92	3.725	0.95	2.0
83	3.425	0.625	1.725	93	3.875	0.825	1.9
84	4.05	0.8	1.925	94	4.575	1.1	2.1
85	3.5	0.725	1.7	95	4.1	1.05	2.025
86	3.625	0.75	1.675	96	3.8	0.925	1.97
87	4.225	0.775	1.825	97	3.575	0.825	1.75
88	3.325	0.625	1.725	98	4.15	0.825	1.775
89	3.975	0.9	1.9	99	3.55	0.825	1.825
90	4.0	0.925	2.075	100	3.8	0.725	1.775

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ROVE BEETLES (COLEOPTERA: STAPHYLINIDAE) COLLECTED BY AN 'AUTOCATCHER' NEAR CLONMACNOISE (COUNTY OFFALY) AND KILLARNEY (COUNTY KERRY), IRELAND

Jervis A. Good
Glinny, Riverstick, Co. Cork, Ireland.
e-mail: <*Pygidicrana@gmail.com*>

Abstract

An autocatcher (car-mounted insect sampling net) was trialled during two afternoons in August 1986. In total, 53 species of staphylinid or rove beetle (Coleoptera) were captured in two 20 minute samples at locations near Clonmacnoise (County Offaly), and 15 species during a 20 minute sampling at an oak woodland site in Killarney National Park, County Kerry. From these three samples, eight species were captured which are rarely recorded in Ireland, and a further two species have only one previous Irish record. A further 20-minute autocatcher sample had a similar number of species to a window trap running for 3 weeks, in an old pasture during October. The autocatcher is an efficient method for collecting rove beetles, including in late summer and autumn.

Key words: Autokescher, autocatcher, Coleoptera, Staphylinidae, rove beetles, sampling techniques, Ireland, Clonmacnoise esker, Tomies Wood.

Introduction

Field entomologists must accept that the observing public will sincerely question their sanity on occasion. 'Did you catch any fish?' was the question I was asked after a local man had been entertained watching me drive slowly back and forth on an esker road in County Offaly, with a plankton net mounted on the roof of the car to catch rove beetles (Staphylinidae). This technique was originally developed in Germany and Norway for catching beetles in flight, where it was called an 'Autokätscher' (Strand, 1961; Freude, Harde and Lohse, 1965).

The English word 'autokatcher' (derived from 'Autokätscher') was used in the 1970s (Williams, 1973), but it has been spelt more recently as 'autocatcher' (Hermann, 2001; Chandler, 2004; Cooter and Barclay, 2006). The German spelling has also changed; 'Autokescher' is now used in the recent German literature (e.g. Köhler, 1994; Renner, 2002; Kölkebeck and Wagner, 2007). However, in the recent non-British English language literature (European, North American and Japanese), the term 'car net' is most frequently used (e.g. Rutanen and Muona, 1982; Peck and Cook, 1992; Tóthová *et al*., 2005; Assing, 2007; Assing and Wunderle, 2008; Nishikawa *et al*., 2011; Zanetti, 2015). This might be the term of choice,

were it not for 'car net' having now developed a meaning as an abbreviation of 'car internet' (Volkswagen, 2018), so the word 'autocatcher' is used here because of its specific use for this entomological technique.

The above-mentioned autocatcher used in County Offaly was based on a design used by Kronblad and Lundberg (1978), which has a wider intake than the design originally illustrated by Freude *et al*. (1965) (see Plate 1). Results from a trial of this technique at two localities, carried out in August 1986, on roads near Clonmacnoise (County Offaly) and in a forest track in Tomies Wood, Killarney National Park (County Kerry), are reported here. In addition, a once-off comparison, in October 1985, between the autocatcher and a window trap is also reported from an old pasture field in south Cork. These appear to be the first reported results from an autocatcher in Ireland.

Also, the opportunity is taken to correct identification errors in an unpublished thesis (Good, 1987), where four species, previously unrecorded in Ireland, were incorrectly listed from the same Clonmacnoise samples as reported below. These misidentified species were not included in the recent revised check-list of Irish Staphylinidae (Good and Anderson, 2017).

Methods

The autocatcher structure used here was constructed of steel, following the design in Kronblad and Lundberg (1978), and mounted on a roof rack (Plate 1). The net, made of muslin was tapered to a 2l plastic jar (Plate 2). During sampling, the car was driven at a steady 30-35 km/hr for four runs between start and finish (except on occasion on public roads when the car had to be pulled in to allow faster traffic to pass); beetles were removed from the net after each run.

The following sites were sampled (grid references are given for start and end locations of the route travelled).

(1). Clonascra, near Clonmacnoise, County Offaly (N033313 to N041314). 12 August 1986, *circa* 15:30 GMT. Public road, near esker pastures, hedgerows, limestone scrub and raised bog.

(2). Clorhane, near Clonmacnoise, County Offaly (M996287 to M995279). 12 August 1986, *circa* 16:00 GMT. Public road, near esker pastures, hedgerows, limestone scrub and conifer plantation.

(3). Tomies Wood, near Killarney, County Kerry (V914885 to V909890). 24 August 1986, *circa* 16:00 GMT. Forest lane, oak woodland, with mature *Quercus* x *rosacea* and *Ilex aquifolium*.

(4). Glinny, near Riverstick, County Cork (W668590). 21 October 1985, *circa* 15:00 GMT. 1.3ha field, sheep pasture with hedge-banks in an agricultural landscape.

The window (flight interception) trap was a $1m^2$ perspex sheet in a metal frame, supported

vertically on greased poles, with a sample tray with ethylene glycol underneath. The trap was placed in the field (at (4) above), *circa* 3m from the hedge-bank, between 10 October and 1 November 1985.

The autocatcher samples reported here were originally identified in 1986-7, and most voucher specimens were re-determined in 2018. Voucher specimens for the originally indeterminate species listed in Tables 1 and 3 below could not be relocated, so these are listed simply as '[Genus] sp.'

Data on species status in Ireland is taken from Anderson (1997) and more recent publications, as well as data kindly provided by Dr Roy Anderson in 2004.

Nomenclature follows Löbl and Smetana (2014), but due to a difference between the British and Palaearctic checklists, where subgenera of *Atheta* in the latter are raised to generic status in the former, the unusual step is taken of listing British genera in square brackets after the genus *Atheta* in Tables 1-3, other than British *Atheta* itself.

Results

In total, 70 species of rove-beetle were captured in the autocatcher, during a combined sampling period of one hour and twenty minutes, at four sites (Clonascra and Clorhane (near Clonmacnoise, County Offaly), Tomies Wood (Killarney National Park, County Kerry) and Glinny (near Riverstick, County Cork).

Clorhane (Clonmacnoise), County Offaly

The 20-minute autocatcher run in Clorhane near Clonmacnoise produced 33 species (Table 1), of which four species are rarely recorded in Ireland (*Acrotona parvula*, *Atheta* [*Datomicra*] *sordidula*, *Atheta* [*Dimetrota*] *cinnamoptera* and *Atheta* [*Badura*] *macrocera*). A further species captured from Clorhane, *Carpelimus erichsoni*, has only recently been recognised as separate from *C. bilineatus*.

Carpelimus erichsoni, originally determined as *C. bilineatus* Stephens, was represented by a single male from Clorhane (Table 1). Lott (2009) predicted that Irish records of *C. bilineatus* could refer to this species, and, although *C. bilineatus* has been recorded subsequently from Ireland (Anderson, 2011), this prediction has proved to be the case here.

Clonascra (Clonmacnoise), County Offaly

Also near Clonmacnoise, at Clonascra, 40 species were captured during another 20-minute run (Table 1), of which five species are rarely recorded in Ireland (*Arrhenopeplus* (= *Micropeplus*) *tesserula*, *Atheta* [*Dimetrota*] *cinnamoptera*, *Atheta divisa*, *Atheta* [*Badura*] *macrocera* and *Pella limbata*).

Tomies Wood (Killarney), County Kerry

The autocatcher run in Tomies Wood in Killarney National Park produced 15 species (Table 2), of which six species (all athetines) are rarely recorded in Ireland. Three of these (*Atheta brunneipennis*, *Atheta* [*Dimetrota*] *cadaverina*, *Atheta* [*Dimetrota*] *laevana*), have been previously recorded from near Killarney in the early twentieth century by E. F. Bullock (Anderson, 1997), and with *Atheta* [*Bessobia*] *monticola*, are known from only a few locations elsewhere in Ireland. Two further species, detailed below, are only known from one other locality each in Northern Ireland.

Atheta [*Microdota*] *boreella* was recorded in abundance in Tomies Wood (Table 2). It was added to the Irish list by Anderson (2012) from Northern Ireland, so this Killarney record appears to represent the second Irish record. Rutanen and Muona (1982) concluded that autocatchers are useful for determining the times and sites of species swarming, and *A. boreella* appears to have been swarming in August in oak woodland in Killarney National Park. In Central Europe, Koch (1989) described this species as a stenotopic hygrophilous species occurring in leaf litter and plant detritus in cattle pastures, bogs and wet deciduous woodland. This species has also been captured elsewhere in Europe in autocatchers (Rutanen and Muona, 1982; Zanetti, 2015).

A single female of *Atheta* [*Alaobia*] *subglabra* was recorded from Tomies Wood (Table 2). At the time of sampling it had not been recorded in Ireland, but was subsequently added to the Irish list by Bryan and Anderson (2013) based on a female from County Armagh. It was determined using the spermathecal illustration in Strand and Vik (1964), and the key in Benick and Lohse (1974). The species appears to preferentially occur in deciduous woodland (Palm, 1970; Koch, 1989; Alexander, 2002; Bryan and Anderson, 2013), and with *A. boreella*, may indicate the conservation value of Tomies oak-wood, despite its felling and replanting in the early nineteenth century (Weld, 1812).

Glinny (Riverstick), County Cork

The window trap catch had fewer species (8) compared to the autocatcher (10) (Table 3). This single comparison indicates that the autocatcher can at least be as productive as a window trap operating for three weeks in autumn. One rarely-recorded species, provisionally determined as *Quedius nigriceps*, was recorded from both the window trap and autocatcher (Table 3), and is discussed below.

Quedius nigriceps is considered to particularly favour litter in dry, often south-facing, soil under pine or *Calluna* heath (Horion, 1965; Anderson, 1997; Solodovnikov, 2012). There were two, widely separated, tree-lines of mature Scots pine (*Pinus sylvestris* Linnaeus) within 1km of the sampled field, and dry heath within 2km, which might correlate with this type of habitat,

although the annual rainfall for this area is approximately 1100mm. Anderson (1997) recorded a single individual of *Q. nigriceps* from the margin of an upland lake in West Cork, also not in its cited preferred habitat, so it may disperse widely. However, Horion (1965) also mentions *Q. nigriceps* records from wet habitats in woods and *Sphagnum* in bog areas, although it is not clear if these individuals were recorded during dispersal.

The reference specimen for the window trap record, a male, keyed out on external characters in Lott and Anderson (2011) as *Q. umbrinus* Erichson, due to its darkened tibiae. However, its aedeagus clearly corresponded to *Q. nigriceps*, not *Q. umbrinus*, and it keyed out as *Q. nigriceps* using the key in Solodovnikov (2012) which does not use tibial coloration as a diagnostic character. I have not seen any reference to *Q. nigriceps* with darkened legs, so this identification must be provisional at present.

Discussion

Autocatchers can be efficient when conditions are suitable for dispersing beetles; 40 staphylinid species were collected in just 20 minutes at Clonascra (Clonmacnoise), County Offaly. Using a similar but smaller autocatcher to that used here, 109 species of Staphylinidae (excluding *Atheta* and *Oxypoda* species) were collected in one June evening (over 3 hours) in northern Germany (Köhler, 2002). A total of 100 species of Staphylinidae (including pselaphines and scydmaenines) were collected in a total period of 3.5h during June/early July over five evenings also in northern Germany (Kölkebeck and Wagner, 2007). The main samples collected here, taken during the afternoon in August, were similarly productive, although even greater numbers of species might be expected in May or June, and especially during the period before sunset (Rutanen and Muona, 1982). Air temperature was not recorded, but Rutanen and Muona (1982) recommended sampling at >15^{o}C.

The autocatcher method was found to be particularly useful for capturing rove-beetles which are not frequently collected by other methods (Rutanen and Muona, 1982; Grundmann, Erbeling and Wolf, 1992; Köhler, 1994). Rarely recorded species occurred in all four samples, even (*Quedius* cf. *nigiceps*) in an October sample from farmland in south Cork. This is particularly true for aleocharines; in other parts of Europe most records of species like *Alevonota egregia* (Rye) and *Thecturota marchii* (Dodero), for instance, have come from autocatchers (Assing and Wunderle, 2008; Renner, 2002). It appears that the regularly-used sampling techniques are missing the microhabitats of these species.

The autocatcher is relatively easy to set up and operate, and was found to be as efficient as a flight interception (window) trap. A particular advantage is that it can also be used to sample dispersing beetles from habitats were access to land is difficult. Furthermore, it is particularly useful for obtaining data on dispersal phenology, as is shown here for *Atheta* [*Microdota*] *boreella* (near Killarney) and *Carpelimus pusillus* (near Clonmacnoise).

The particular design used here could be easily improved upon, for instance by replacing the steel structure with a lighter material such as aluminium or carbon-fibre, by the use of a clip-on conical net at the apex of the main net such as illustrated by Zentsch *et al*. (2017), and a reduction in the height of the trap as in the autocatcher used by Köhler (2002). Further tips on autocatcher use are given by Hermann (2001). Overall, the autocatcher is a valuable addition to methods for sampling rove beetles, including in late summer and autumn, and is probably essential in some circumstances where a full species inventory is required.

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TABLE 1. Staphylinidae collected by an autocatcher at Clonascra and Clorhane, near Clonmacnoise, County Offaly on 12 August 1986. Nomenclature follows Löbl and Smetana (2014), with athetine genera sensu Lott (2008) and Duff (2012) cited in square brackets. The taxon *Atheta* (*Mocyta*) *fungi* sensu lato (s.l.) includes *A. amplicollis* (Mulsant & Rey) and *A. fungi* (Gravenhorst).

	Clorhane	Clonascra
Acrotona parvula (Mannerheim)	2	-
Aleochara bipustulata (Linnaeus)	3	1
Aleochara lanuginosa (Gravenhorst)	2	2
Aleochara sp.	-	1
Aloconota gregaria (Erichson)	3	1
Amischa analis (Gravenhorst)	1	-
Anotylus sculpturatus (Gravenhorst)	-	2
Anotylus tetracarinatus (Block)	2	9
Arrhenopeplus tesserula (Curtis)	-	3
Atheta [*Microdota*] *amicula* (Stephens)	3	-
Atheta [*Dimetrota*] *atramentaria* (Gyllenhal)	13	-
Atheta [*Datomicra*] *celata* (Erichson)	1	1
Atheta [*Dimetrota*] *cinnamoptera* (Thomson)	1	1
Atheta [*Dalotia*] *coriaria* (Kraatz)	-	1
Atheta divisa (Märkel)	-	1
Atheta [*Philhygra*] *elongatula* (Gravenhorst)	-	5
Atheta [*Mocyta*] *fungi* (Gravenhorst) s.l.	-	3
Atheta [*Chaetida*] *longicornis* (Gravenhorst)	2	2
Atheta [*Badura*] *macrocera* (Thomson)	1	1
Atheta [*Datomicra*] *nigra* (Kraatz)	7	15
Atheta [*Dimetrota*] *nigripes* (Thomson)	1	1
Atheta [*Datomicra*] *sordidula* (Erichson)	2	-
Atheta sp.	-	3
Autalia impressa (Olivier)	-	1
Bisnius cephalotes (Gravenhorst)	-	1
Bisnius fimetarius (Gravenhorst)	-	1
Carpelimus erichsoni Sharp	1	-
Carpelimus corticinus (Gravenhorst)	1	-
Carpelimus pusillus (Gravenhorst)	22	17
Encephalus complicans Stephens	1	-
Lordithon thoracicus (Fabricius)	-	1

TABLE 1 (continued).

	Clorhane	Clonascra
Megarthrus prosseni Schatzmayr	1	1
Micropeplus porcatus (Paykull)	1	1
Nehemitropia lividipennis (Mannerheim)	2	-
Oligota inflata (Mannerheim)	-	7
Ontholestes murinus (Linnaeus)	-	1
Oxypoda exoleta Erichson	3	7
Oxypoda haemorrhoa (Mannerheim)	1	-
Oxypoda brevicornis (Stephens) (= *umbrata* (sensu auct.))	5	5
Pella limbata (Paykull)	-	1
Philonthus laminatus (Creutzer)	-	1
Philonthus longicornis Stephens	2	4
Philonthus marginatus (Müller)	-	3
Philonthus splendens (Fabricius)	-	1
Philonthus carbonarius (Gravenhorst)	-	2
Platystethus arenarius (Geoffroy)	65	21
Stenus nanus Stephens	2	-
Stenus picipes Stephens	-	1
Stenus similis (Herbst)	1	-
Tachinus laticollis Gravenhorst	1	-
Tachinus signatus Gravenhorst	3	3
Tachyporus nitidulus (Fabricius)	-	2
Tinotus morion (Gravenhorst)	3	1
Xantholinus glabratus (Gravenhorst)	1	-

TABLE 2. Staphylinidae collected by an autocatcher at Tomies Wood, Killarney National Park, County Kerry, on 24 August 1986. Nomenclature follows Löbl and Smetana (2014), with athetine genera sensu Lott (2008) and Duff (2012) cited in square brackets. Sexes are given for selected species.

Acrotona aterrima (Gravenhorst)	1 ♂
Anotylus tetracarinatus (Block)	3
Atheta brunneipennis (Thomson)	1 ♀
Atheta [*Microdota*] *boreella* Brundin	44 ♀♀♂♂
Atheta [*Dimetrota*] *cadaverina* (Brisout de Barneville)	7 ♀♀♂♂
Atheta [*Dimetrota*] *laevana* (Mulsant & Rey)	3 ♀♀♂
Atheta [*Chaetida*] *longicornis* (Gravenhorst)	1 ♀
Atheta [*Bessobia*] *monticola* (Thomson)	1 ♀
Atheta [*Oreostiba*] *subglabra* (Sharp)	1 ♀
Atheta [*Alaobia*] *trinotata* (Kraatz)	2 ♀♀
Gyrophaena affinis Mannerheim	1 ♂
Megarthrus prosseni Schatzmayr	10
Oxypoda brevicornis (Stephens) (= *umbrata* sensu auct.)	4
Oxytelus laqueatus (Marsham)	2 ♂
Proteinus brachypterus (Fabricius)	1 ♀

TABLE 3. Staphylinidae collected from an autocatcher in an old sheep pasture at Glinny, near Riverstick, County Cork, on 21 October 1985, compared to catches in a window trap operating in the same field from 10 October - 1 November 1985. Nomenclature follows Löbl and Smetana (2014), with athetine genera sensu Lott (2008) and Duff (2012) cited in square brackets. The taxon *Atheta* [*Mocyta*] *fungi* sensu lato (s.l.) includes *A. amplicollis* and *A. fungi*.

	autocatcher	window trap
Atheta [*Mocyta*] *fungi* (Gravenhorst) s.l.	8	2
Atheta triangulum (Kraatz)	1	-
Atheta sp.	1	-
Gabrius breviventer Sperk (= *pennatus* Sharp)	1	-
Oxypoda alternans (Gravenhorst)	-	1
Philonthus cognatus Stephens	-	2
Philonthus laminatus (Creutzer)	2	-
Philonthus marginatus (Ström)	-	10
Philonthus sp.	-	1
Platystethus arenarius (Fourcroy)	-	3
Proteinus sp.	1	-
Quedius cf. *nigriceps* Kraatz	1	1
Quedius schatzmayri Gridelli	-	1
Tachyporus hypnorum (Fabricius)	7	-
Tachyporus pusillus Gravenhorst	2	-
Tinotus morion (Gravenhorst)	1	-
Total no. individuals	25	21
Total no. species	10	8

PLATE 1. The autocatcher used in this trial (1985).

PLATE 2. Side view of the autocatcher.

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EVIDENCE THAT THE CREAM-STREAKED LADYBIRD *HARMONIA QUADRIPUNCTATA* (PONTOPPIDAN, 1763) (COLEOPTERA: COCCINELLIDAE) IS BREEDING IN IRELAND

Myles Nolan
48 Rathmines Road Upper, Rathmines, Dublin D06 P657, Ireland.
e-mail: <mylesnolan@hotmail.com>

Abstract

The first records of the Cream-streaked ladybird *Harmonia quadripunctata* (Pontoppidan, 1763) from Ireland were found and noted in 2017 (Nolan, 2017). Larvae, pupae and adults of the species were found on three collecting trips to the same location through 2018 and demonstrate that the species is breeding in Ireland. Three additional ladybird species were recorded, two of which have a preference for *Pinus*, and there are few Irish records of one of these *Myrrha octodecimguttata* (L.).

Key words: Coleoptera, Coccinellidae, *Harmonia quadripunctata*, Cream-streaked ladybird, Ireland, breeding, larvae, pupae, *Myrrha octodecimguttata*, 18-spot ladybird.

Introduction

In 2017, the author found the Cream-streaked ladybird *Harmonia quadripunctata* (Pontoppidan, 1763) new to Ireland (Nolan, 2017). The species was discovered in Dublin City at the Irishtown Park and Nature Reserve, Sandymount. Altogether, three adults were collected on two separate occasions. In 2018, the author returned to the site to ascertain if the ladybird was breeding there. Adults, pupae and larvae were taken, evidence that *H. quadripunctata* is indeed breeding in Ireland. The results are given below.

The records

Harmonia quadripunctata (Pontoppidan, 1763) Cream-streaked ladybird

DUBLIN: All specimens were collected from the lower branches (to 2m) of young *Pinus* trees in Irishtown Nature Reserve (O203332), Sandymount, Dublin: two adults 28 April 2018 beaten from branches into a canvas net; two larvae 21 June 2018 collected by parting needles and inspecting young shoots by hand/eye; one larva, three adults and two pupae 21 July 2018 collected by parting needles and inspecting twigs by hand/eye.

Other ladybirds recorded

Collected from the lower branches (to 2m) of young *Pinus* trees in Irishtown Nature Reserve (O203332), Sandymount, Dublin: *Myrrha octodecimguttata* (L.) - 18-spot ladybird, three adults 28 April 2018 beaten from branches into a canvas net; *Calvia quattuordecimguttata* (L.) -

Cream-spot ladybird, one adult 28 April 2018 beaten from branches into a canvas net; *Anatis ocellata* (L.) - Eyed ladybird, one pupa 21 July 2018 collected by hand/eye on *Pinus* twig, adult emerged within five days.

All specimens remain with the author.

Adults, larvae and pupae of the Cream-streaked ladybird

All specimens were identified using Roy *et al.* (2013). The two adults collected in April were of a rather darkish russet colour with two spots on the lateral margins of the elytra. The three adults collected in July had eight clear black spots in a 1-3-3-1 formation on each elytron but little cream-streaking, however they died after a few days and additional markings might have developed over time. An adult emerged from one of the pupae within three or four days and over a two-week period the elytra remained a pale pinkish/red colour with only the barest hint of a single marginal black spot appearing. This seems to be a little unusual as the species' name derives from the presence of the four marginal spots in all variant forms. All adult specimens had the typical and diagnostic pronotal pattern of *circa* eleven black/dark spots on a white/pale background: five relatively large dark spots centrally and two to four smaller spots to each side. Specimens were 5-6mm in length.

The larvae are essentially very dark in colour and are quite similar to those of the Harlequin ladybird *Harmonia axyridis* (Pallas). *H. quadripunctata* differs by having the median spines on abdominal segments 1-4 (1-5 in *H. axyridis*) and the inner spine on segment 4 (1, 4 and 5 in *H. axyridis*) coloured yellow/orange (this colour fades on preservation) (Roy *et al.*, 2013). The smaller of the two larvae collected in June moulted within a day of capture. On basis of the presence of distinct spines and size (*circa* 4-5mm), these larvae were probably at third instar. They were kept together and soon after the smaller one moulted it was predated by the other and consumed almost entirely. The single larva collected in July was considerably larger (*circa* 9mm) and thus was probably at fourth instar.

Of the two pupae collected in July one was set on a pine needle closer to its base than its tip and the other on a twig between needles. They displayed pupal alarm behaviour if touched, rising up into an erect position (pictured in Roy *et al.*, 2013). It has been noted that an adult emerged from one of the pupae within a few days. Microscope examination of the second pupa around that time revealed some maggots moving around within. These emerged within a couple of days but did not themselves pupate and soon died. Given that a number of larvae emerged a fly from the Phoridae (Diptera) may be the likely culprit (Roy *et al.*, 2013).

Discussion

These records demonstrate that the Cream-streaked ladybird is breeding in Ireland. Given that adults of *Harmonia quadripunctata* emerged in July it seems likely the ladybird could

produce a second generation with new adults appearing in later summer. It is known that in Britain, the Harlequin ladybird can produce two generations and even occasionally three during the breeding season (Roy *et al.*, 2013). So the specimens of *H. quadripunctata* collected in 2017 may have been from a second generation. No further collecting trips were made to the site after the July specimens were gathered so this has not been verified. The duration of egg, larval and pupal stages can shorten with an increase in temperature (Belyakova *et al*., 2016) so it is possible that because the summer of 2018 was for Ireland exceptionally warm over an unusually long period the adults might have appeared earlier than usual. However, the ladybird breeds very successfully at a temperature of 17°C and may thus be able to produce two generations even in cooler summers (Belyakova *et al*., 2016).

There are few Irish records of the 18-spot ladybird *Myrrha octodecimguttata*. Ladybirds of Ireland (2018) has it from only ten hectads and Ladybird Atlas 2025 (2018) shows records from only three. There are more records of the Eyed ladybird *Anatis ocellata* with fifteen hectads mapped in Ladybirds of Ireland (2018) and nearly thirty in Ladybird Atlas 2025 (2018). Both of these species are widespread in Britain, *A. ocellata* being common and *M. octodecimguttata* locally so. Both species are probably significantly under-recorded in Ireland. Both also have a strong preference for coniferous trees/woodland and *M. octodecimguttata* in particular for mature Scots pine (Roy *et al*., 2013). The pine trees in Irishtown Park and Nature Reserve thus play host to a noteworthy ladybird fauna.

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MICROPSECTRA OKSANAE SP. N., A NEW CRENOPHILOUS SPECIES INHABITING KARSTIC SPRINGS AND STREAMS IN SOUTH-EASTERN FRANCE (DIPTERA: CHIRONOMIDAE, TANYTARSINI)

J. Moubayed-Breil[1] and P. Ashe[2]
[1]*Consultant in Freshwater & Marine Biology, 10 rue des Fenouils, F-34070 Montpellier, France.*
e-mail: <joelmb34@free.fr>
[2]*33 Shelton Drive, Terenure, Dublin 12, D12 PK68, Ireland.*
[1]Corresponding author.

Abstract

Micropsectra oksanae sp. n. is described as male adult and pupal exuviae, based on associated pharate material collected in May 2005 from two pristine karstic streams (Verne and Valescure, altitude 300-400m) in south-eastern France. Its geographical distribution is currently restricted to the northern area of the Var Department (France). Remarks on the taxonomic position and ecology of the new species are given.

Key words: Diptera, Chironomidae, *Micropsectra oksane* sp. n., karstic springs and streams, south-eastern France, conservation.

Introduction

Data on the taxonomy, geographical distribution and ecology of the genus *Micropsectra* Kieffer, 1909 from the Palaearctic Region (Shilova, 1976; Reiss, 1969a, 1969b, 1971, 1982, 1983; Cranston *et al.*, 1989; Stur and Ekrem, 2006; Ekrem *et al.*, 2010; Giłka, 2009, 2011; Giłka and Jazdzewska, 2010; Sæther and Spies, 2013) show that about 45 species are currently known from Europe and neighbouring areas. In continental France, the genus *Micropsectra* is represented by 23 known valid species and 6-7 undescribed new taxa: *M. andalusiaca* Marcuzzi, 1950; *M. appendica* Stur and Ekrem, 2006; *M. apposita* (Walker, 1856); *M.* cf. *aristata* Pinder, 1976; *M. atrofasciata* (Kieffer, 1911); *M. attenuata* Reiss, 1969; *M. auvergnensis* Reiss, 1969; *M. chionophila* (Edwards, 1933); *M. junci* (Meigen, 1818); *M. lacustris* Säwedal, 1975; *M. lindrothi* Goeghebuer, 1931; *M. mendli* (Reiss, 1983); *M. nohedensis* (Moubayed and Langton, 1996); *M. notescens* (Walker, 1856); *M. oksanae* sp. n.; *M. pallidula* (Meigen, 1830); *M. radialis* Goetghebuer, 1939; *M. recurvata* Goetghebuer, 1928; *M. roseiventris* (Kieffer, 1909); *M. shrankelae* Stur and Ekrem, 2006; *M. sofiae* Stur and Ekrem, 2006; *M. styriaca* Reiss, 1969 and *M. uliginosa* (Reiss, 1969).

In this paper, *Micropsectra oksanae* sp. n. (= *M.* sp. 6 in Moubayed-Breil and Ashe, 2016) is described as male adult and pupal exuviae based on associated material collected in May 2005

from two pristine karstic springs and streams in south-eastern France (upper basin of both Verne and Valescure streams, Var Department, altitude 300-400m). A total of **768** species of Chironomidae, recently reported from continental France in Moubayed-Breil (2017), was updated to **780** valid species based on Moubayed-Breil and Ashe (2018) and Moubayed-Breil *et al.* (2018). Consequently, the description of *M. oksanae* sp. n. increases the total number to **820** taxa including **781** valid known species from this country. Remarks and discussion on the closest related *Micropsectra* species and comments on the ecology and geographical distribution of the new species are given.

Materials and methods

Morphological terminology and measurements follow Sæther (1980), Pinder and Reiss (1986) and Spies (1998) for the imagines; Sæther (1980), Anderson *et al.* (2013) and Langton (1991, 1994) for the pupal exuviae. For the male hypopygium feature "*Micropsectra*-seta" see Giłka and Jazdzewska (2010, Figs 8, 10).

Type material was preserved in 80-85% alcohol, and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid then washed in about 60% ethanol before mounting on slides. Part of the abdomen and the halter of the male adult are preserved in 85% ethanol for an eventual DNA analysis.

Description

Micropsectra oksanae Moubayed-Breil and Ashe, sp. n.

(= *M.* sp. 6 in Moubayed-Breil and Ashe, 2016)

Material examined

Holotype. **France**, karstic spring, upper basin of Verne stream, Var Department, altitude 400m, 24 May 2005, 1 male pharate adult, leg. J. Moubayed-Breil. Environmental data of spring: calcareous water, conductivity about 430µS/cm; temperature 8-12°C.

Paratypes (all leg. J. Moubayed-Breil). 1 male adult + 1 male pupal exuviae, same locality and data as for holotype; 2 pupal exuviae (1 male + 1 female), Valescure karstic springs and rivulets, upper basin of the Réal Collobrier River, Var Department, south-eastern France; 43° 26' 0" North, 6° 47' 0" East.

The Holotype (on 1 slide) is deposited in the collections of the National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland. Remaining paratypes are deposited in the senior author's collection.

Diagnostic characters

The most closely related *Micropsectra* species to *M. oksanae* sp. n. belong to the *atrofasciata*-group but also to the *attenuata*-group based on various characters of both the male adult and pupal exuviae including: the shape of tergite IX and anal point (dorsal and lateral view); absence of a digitus; the distribution pattern of armament on tergites III-V of the pupa. However, the new species can be separated from other members of the genus *Micropsectra* primarily by the following characters of the male adult and pupal exuviae.

Male adult. Anal lobe of wing weakly projecting, squamal area densely covered with dark proclinate microtrichia (directed forwards). Tergite IX sub-rectangular with a nearly straight posterior margin, the presence of a distinct projecting hump located medially (clearly visible in lateral view), anal tergite bands posteriorly separated and abruptly terminated well before base of anal point. Anal point drop-like with bifid apex. Superior volsella triangular, longitudinally projecting, wide at base and gradually tapered distally to a pointed apex, setiger area with 7-8 setae located laterally close to the outer margin, inner margin bare, median area markedly wrinkled, digitus absent. Stem of median volsella uniformly linear, reaching distal third of inferior volsella, with both normal and lanceolate setae apically. Inferior volsella reaching beyond half-length of gonostylus, with a distinct transverse protrusion medially and a well developed setiferous ventral lobe bearing 5 long setae.

Pupal exuviae. Frontal apotome weakly wrinkled, frontal tubercles well developed and typically cylindrical. Thoracic horn distinctly swollen in its proximal half. Thorax with two granulose areas located anteriorly and posteriorly close to the thoracic suture; thoracic mound well developed, consisting of a broad sub-triangular expansion projecting laterally at a right angle. All pleurae bare. Tergite II almost entirely covered with chagrin and short spines except for one postero-median oval patch, Pedes spurii B present, hook row ¾ as long as segment width. Tergite III with a pair of inwardly curved spine patches becoming gradually longer posteriorly and separated by a bare oval median area. Armament of tergites IV-V quite similar but less conspicuous on V, consisting of two fused pairs of bands located on anterio- and postero-median areas, anterior one sub-oval to sub-triangular and extended transversally, wider laterally, composed of short inwardly bent spines becoming gradually longer laterally, second band a reverse L-shape on the left side, composed of long and dense spines anteriorly becoming shorter posteriorly. Lateral setae present on segments I-IV (2, 2, 2, 1); lateral taeniae present on segments II-VIII (1, 1, 2, 3, 4, 4, 5). Comb of segment VIII weakly paddle-like in shape, composed of 4-5 strong teeth including one much larger located medially. Anal lobe with 2 dorsal taeniae placed posteriorly, fringe with 22-24 taeniae.

Etymology

The new species is named '*oksanae*' after our colleague Dr Oksana V. Orel (Institute of Biology and Soil Sciences; Vladivostok, Russia) who is actively contributing to our knowledge of the subfamily Chironominae in the Russian Far East.

Male adult

(n = 2; Figs 1-2, 5, 7-11)

A large sized *Micropsectra* species. Total length 4.95-5.00mm. Wing length 3.25mm. TL/WL 1.54. Colouration brown to dark brown with contrasting light brown to dark brown scutal thoracic strips. Head, legs and abdominal segments brownish, anal segment contrasting brown to dark brown.

Head. Eyes bare; hairs densely present on the inner margin of eyes (proximal, median and distal parts); frontal margin slightly gaping medially; coronal triangle distinct; frontal tubercles absent. Temporal setae 12 including 9 inner and 3 outer verticals. Clypeus sub-rectangular with about 35-37 setae in 8 rows. Palp 5-segmented (segments 4 and 5 lost); length (in µm) of segments 1 to 3: 85, 85, 105; palpomere 3 with 5-6 sensilla clavata and several sensilla coeloconica (about 5). Antenna 13-segmented, 1490µm long, ultimate flagellomere 970µm long, weakly clubbed (nearly linear) and bearing 1 distinct apical seta; antennal groove reaching segment 3; AR 1.87.

Thorax. Lobes of antepronotum widely separated; antepronotals with 4-5 lateral antepronotals, median antepronotals absent; acrostichals 8-9 in 1 row; dorsocentrals 14-15 in 1-2 rows; prealars 4-5. Scutellum with about 22 setae located in 2 rows. *Wing*. Brachiolum with 2 setae; all veins and cells well covered with setae; anal lobe weakly projecting, squamal area (Figs 1-2) densely covered with spine-like blackish proclinate microtrichia (directed forwards); squama bare. *Legs*. Tarsomere ta_1 of PI slightly longer than tibia. Length (in µm) of tibial spurs: PI, 20; PII, 30 and 20; PIII, 45 and 25. Tibial combs of PII and PIII well developed with about 17 smooth and sub-equal teeth (20-25µm long). Length (µm) and proportions of legs PI-PIII as in Table 1.

TABLE I. *Micropsectra oksanae* sp. n. Length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs.

P	fe	Ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
PI	1450	1160	1320	835	660	420	225	1.14	1.84	1.98	3.00
PII	1785	1745	725	570	425	290	215	0.41	3.71	4.87	2.70
PIII	1740	1310	715	530	425	330	185	0.55	2.56	4.27	2.30

Hypopygium (Figs 7-8) as illustrated in dorsal (Fig. 7) and ventral view (Fig. 8, without anal point and tergite IX). Tergite IX 270µm maximum width at base (between the lateral teeth), sub-rectangular, broad in both basal and distal parts with a nearly straight posterior margin; anal tergite bands (ATB) widely open basally, converging posteriorly but separated and abruptly terminated well before base of anal point, not reaching crests of anal point; projecting elevated hump (tubercle) present on median area (clearly visible in lateral view, Fig. 5), bearing 4 dorsal setae below its apical part as in Fig. 7; teeth present on median part of lateral margin. Anal point (Figs 5, lateral; 7, dorsal; 10 ventral) 65µm long, maximum width 75-80µm at base and 25µm in median part, drop-like with bifid apex, with 12-14 setae including 4-5 placed laterally and 8-9 on ventral side. Sternapodeme broadly rectangular, 115-120µm long and 80-85µm wide, slightly swollen latero-medially, lateral horn-like projections present basally; inner branch linear; outer branch smaller, projecting upwards and turns over distally to join the median part of the sternapodeme; phallapodeme nearly S-like in shape, linearly elongated, bifurcate in median part. Superior volsella (Figs 7, 9) about 90µm long, 53-55µm maximum width, sub-triangular, longitudinally directed, wide at base and gradually tapered distally to apex, setiger area (SA) with 7-8 setae located laterally close to the outer margin, inner margin bare, longer setae on inner margin absent; inner median area markedly wrinkled dorsally; digitus absent; *Micropsectra*-seta placed on a distinct rounded tubercle. Median volsella (Fig. 8) 120-125µm long, 15µm maximum width, stem uniformly linear, nearly S-like, reaching distal third of inferior volsella; lamellar setae (Figs 8, 11) typically subulate (lanceolate), parallel-sided proximally, broadened medially with curved setae-like apices. Inferior volsella (Figs 7, dorsal; 8, ventral) about 190µm long, 25µm maximum width, wider at base and distal part, reaching beyond half length of gonostylus, slightly bent inwards distally, presence of a distinct transversal protrusion medially, setiferous ventral lobe well developed and bearing 5 long setae. Gonocoxite 150µm long, with 8-9 setae. Gonostylus (Figs 7-8) 190µm long and about 40µm maximum width, broadly shaped, moderately swollen medially, tapering in its distal half to a pointed apex; median and distal inner margin bearing 1-2 rows of 8-10 fine long setae. HR 0.79.

Pupal exuviae

(n = 2 male exuviae; Figs 13-18)

Pupal exuviae of *Micropsectra oksanae* sp. n. resemble those of the *atrofasciata*-group. Total length 5.00-5.10mm. General colouration brown to dark brown; frontal apotome and thorax brownish; abdominal segments brownish except for segment VIII and anal segment which are dark brown, muscles marks blackish and distinct on segments I-VIII, genital sac brownish. Cephalothorax including frontal apotome weakly wrinkled, scutal hump weak; thorax with

granulations restricted to two small areas located on anterio-median and median part close to the thoracic suture.

Cephalothorax. As in Figs 13-16 including frontal apotome (Fig. 13), side view of thorax (Fig. 14), thoracic horn (Fig. 15) and thoracic mound (Fig. 16). Frontal apotome (Fig. 13), frontal tubercules 60µm long and 50µm at maximum width and typically cylindrical, frontal setae 145-155µm long. Thorax (Fig. 14) with 1 median antepronotal seta 140µm long and 1 lateral antepronotal seta 125µm long; precorneal setae respectively 130, 105 and 115µm long; dorsocentrals Dc_1-Dc_2 sub-equal (about 100µm long), Dc_3-Dc_4 sub-equal (about 120µ long), distance between Dc_2 and Dc_3 225µm; thoracic horn (Fig. 15) about 400µm long, distinctly swollen in its proximal part, narrowed distally, with numerous long setae located mostly along the ventral margin.

Abdomen (Fig. 17). All pleurae bare. Tergite I bare. Tergite II almost covered by points and small spines except for one postero-median oval patch; posterior transverse row of hooks on tergite II occupying about 45% of tergite width, composed of about 130 hooklets in a single row; Pedes spurii B obvious but weak. Armament on tergites III-V as in Fig. 17. Tergites III-V with a pair of longitudinal bands on either side of mid-line, each with long spines: continuous on tergites III-IV shorter, sparse and less spinulated on tergite V. Pairs of long spines on tergites III-V becoming gradually shorter and less extensive: 22-24 long spines (tergite III); 37-40 on IV, 5-7 on V, 3-4 on VI. Lateral setae on segments I-IV: 1, 2, 2, 1; lateral taeniae on segments II-VIII: II-III (1), IV (2), V (3), VI-VII (4), VIII (5). Postero-lateral comb of segment VIII (Fig. 18) 60µm long, about 35µm maximum width, paddle-like in shape, consists of 4-5 rows of unequal straight teeth, longest tooth 40µm long, placed medially. Anal lobe 250µm long, 350-360µm maximum width, bearing 2 long dorsal setae located on posterio-median part; fringe with 26-27 taeniae in a single row. Genital sac about 300µm long, overreaching tip of anal lobe by 100-110µm.

Larva

Unknown.

Taxonomic remarks

Based on some comparative taxonomic data from the literature (Reiss, 1969a, 1969b, 1974; Stur and Ekrem, 2006; Anderson *et al*., 2013, Table 2; Giłka, 2011, Giłka and Jazdzewska, 2010), as well on some unusual morphological characters found in the male adult and pupal exuviae of *Micropsectra oksanae* sp. n., this new species keys between the *attenuata*-group and the *atrofasciata*-group. Nevertheless, based on a similar chaetotaxy of the anal lobe of the wing, the absence of a digitus and the shape of the median volsella, *M. oksanae* sp. n. can be tentatively placed near to *M. auvergnensis* and *M. roseiventris*. However, the following

distinguishing characters will easily separate *M. oksanae* sp. n. from other members of the genus *Micropsectra* including members of the *atrofasicata*-group, especially *M. auvergnensis* and *M. roseiventris*.

Male adult. Dorsal triangular hump on tergite IX of *M. oksanae* sp. n. without setae (Figs 5, 7), while it bears setae in *M. roseiventris* (Fig. 6); anal point drop-like dorsally with bifid apex as in *M. roseiventris* (Reiss, 1974, Fig. 5) except for the dorso-apical part of the crest (Figs 5-6, lateral), which is distinctly rounded apically in *M. oksanae* sp. n. (Fig. 5) but markedly pointed apically in *M. roseiventris* (Fig. 6); superior volsella (Figs 7, 9) of *M. oksanae* sp. n. sub-triangular, longitudinally elongated, with unusual distribution pattern of setae on setiger area, differently figured in the *atrofasciata*-group, *M. auvergnensis* (Reiss, 1969a, Fig. 11), *M. roseiventris* (Reiss, 1974, Fig. 5); lamellar setae of median volsella of *M. oksanae* sp. n. subulate, terminating in a long curved tail-like apex (Fig. 11), while it is spoon-like in *M. auvergnensis* (Reiss, 1969a, Fig. 11) or flattened and uniformly tapered apically in *M. roseiventris* (Fig. 12; Giłka, 2011, Fig. 183; Langton and Pinder, 2007, Fig. 103A).

Pupal exuviae. Cephalothorax. Frontal tubercles (Fig. 13) well developed with typical cylindrical shape in *M. oksanae* sp. n. is differently figured and weakly developed in the *atrofasciata*-group; thorax (Fig. 14) with two granulose areas located anteriorly and posteriorly close to the thoracic suture; thoracic mound (Fig. 16) L-like and well developed. All pleurae bare in *M. oksanae* sp. n. while shagreen is present on pleurae III-V in *M. roseiventris* and on pleurae II-VI in *M. auvergnensis*; armament on tergites III-VI belongs to the *atrofasciata*-type with sparsely distributed spines on tergite V; lateral taeniae present on segments II-VIII (1, 1, 2, 3, 4, 45) of *M. oksanae* sp. n. are differently distributed in *M. auvergnensis* and *M. roseiventris* (respectively 0, 0, 2, 3, 4, 4, 5 and 1-2, 1-2, 2-3, 4, 4, 5); comb of segment VIII paddle-like in shape (Fig. 18) and composed of 4-5 strong teeth in *M. oksanae* sp. n. while is semi-circular with 8-12 unequal crowded teeth in *M. roseiventris* (Fig. 19).

Ecology and geographical distribution

Material consisting of male adults, male pharate adults and pupal exuviae of *Micropsectra oksanae* sp. n. was collected in the upper basin of two pristine karstic streams. Habitats where the examined material was sampled consist of shady stretches of cold mountain helocrenes and streams with small waterfalls and sandy to gravely substrata, which deserve greater consideration and preservation. Bryocolous, hygropetric and madicolous habitats represent the most common and possibly favoured aquatic areas for larval populations. *M. oksanae* sp. n. belongs to the crenobiontic and rhithrobiontic community of species investigated by Lindegaard (1995). Emergence was recorded in May. *Micropsectra oksanae* sp. n. currently is only known to occur in two lowland streams located in south-eastern France (Var Department). Its geographical distribution may be restricted to the eastern part of the continental Tyrrhenian

Province as extensive collecting in this hot spot area of high endemism has not resulted in additional specimens being found. The continental Tyrrhenian Province extends from southern Spain to north-western areas of Italy.

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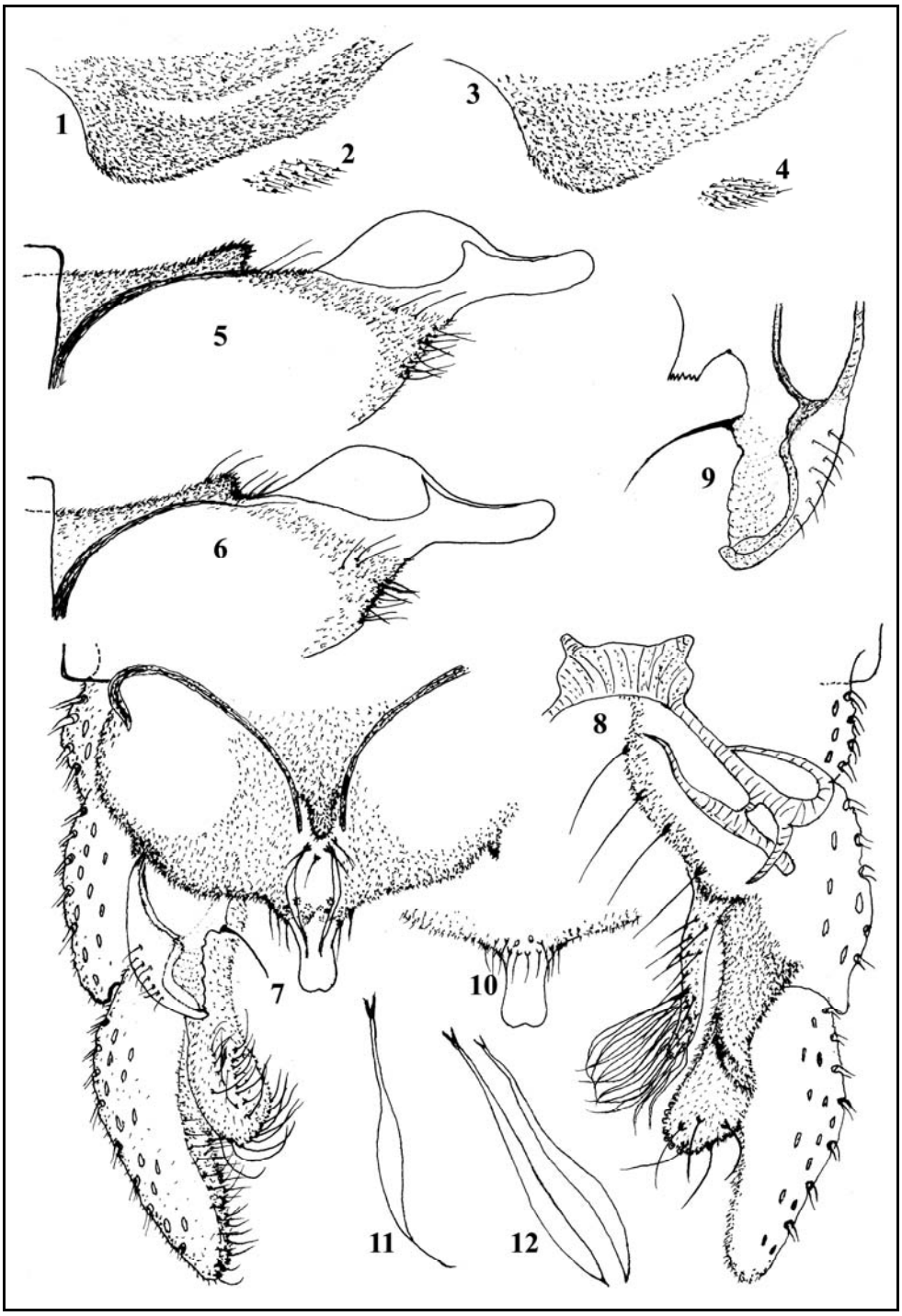
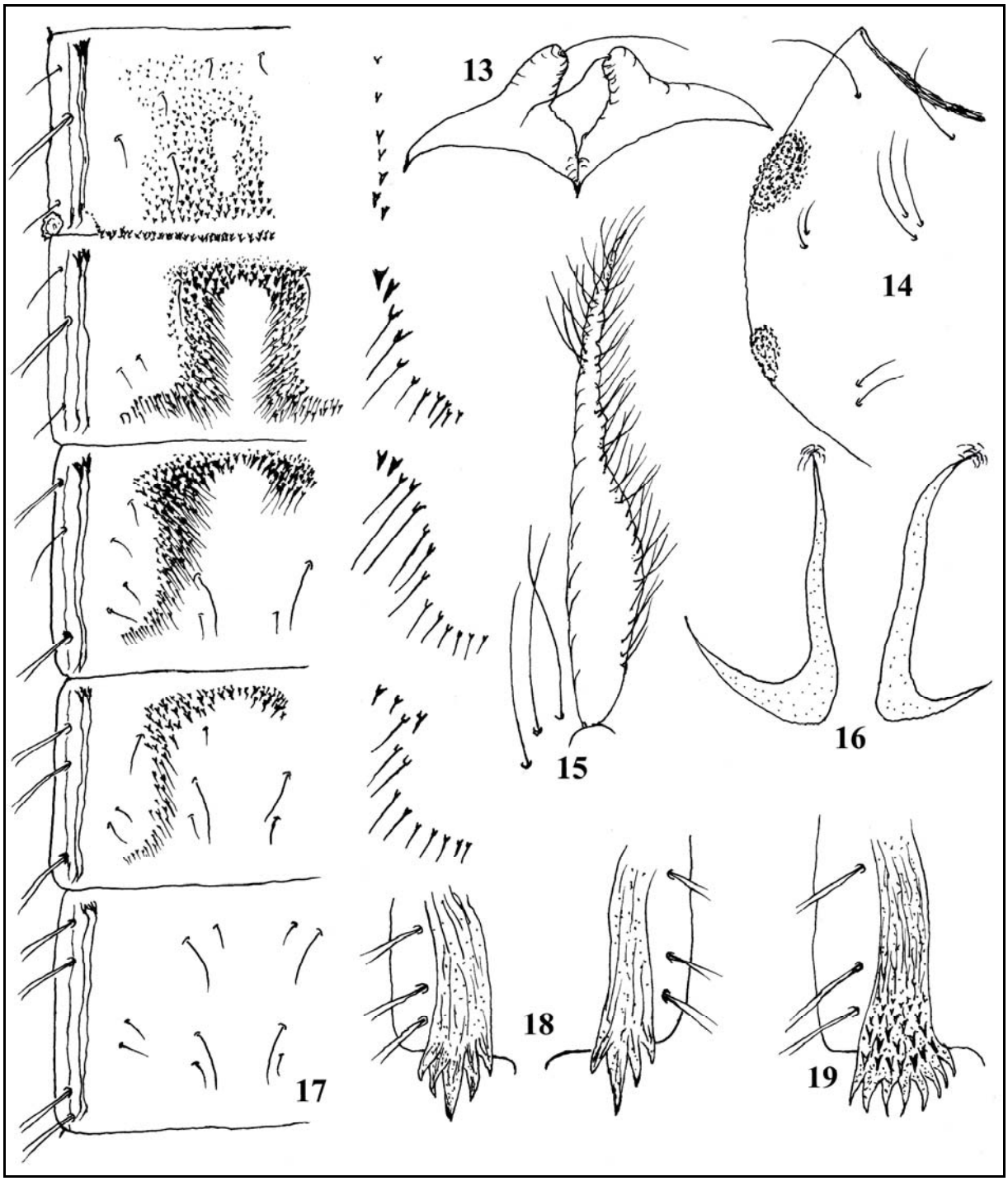


FIGURES 1-12. Male adult of *Micropsectra* spp. Squamal area with details of microtrichia of: (1-2) *M. oksanae* sp. n., (3-4) *M. roseiventris*. Tergite IX and anal point (lateral) of: (5) *M. oksanae* sp. n.; (6) *M. roseiventris*. *M. oksanae* sp. n.: (7-8) hypopygium in dorsal (7) and ventral view (8, without tergite IX and anal point); (9) superior volsella; (10) anal point, ventral. Differentiated setae of median volsella of: (11) *M. oksanae* sp. n., (12) *M. roseiventris*.



FIGURES 13-19. Pupal exuviae of *Micropsectra oksanae* sp. n. (13) frontal apotome; (14) thorax; (15) thoracic horn; (16) thoracic mound; (17) abdominal segments II-VI (dorsal), with details of armament on tergites. Posterio-lateral comb of segment VIII of: (18) *M. oksanae* sp. n., two aspects; (19) *M. roseiventris*.

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MICROPSECTRA ALYSSAE SP. N. AND *M. EKREMI* SP. N., TWO NEW SPECIES INHABITING GLACIAL SPRINGS AND PEAT BOGS IN THE EASTERN PYRENEES, FRANCE (DIPTERA: CHIRONOMIDAE, TANYTARSINI)

J. Moubayed-Breil[1] and P. Ashe[2]
[1]*Consultant in Freshwater & Marine Biology, 10 rue des Fenouils, F-34070 Montpellier, France.*
e-mail: <joelmb34@free.fr>
[2]*33 Shelton Drive, Terenure, Dublin 12, D12 PK68, Ireland.*
[1]Corresponding author.

Abstract

Micropsectra alyssae sp. n. and *M. ekremi* sp. n. are diagnosed and described based on associated material of adults, pharate male and female adults and pupal exuviae collected in glacial springs and acid peat bogs (altitude 2000-2300m) in the upper basin of the River Mantet (Mantet Nature Reserve, Eastern Pyrenees, south-western France). The descriptions include the male and female adults and pupal exuviae for *M. alyssae* sp. n. and *M. ekremi* sp. n., with taxonomic notes on some related *Micropsectra* species. The geographical distribution of *M. alyssae* sp. n. and *M. ekremi* sp. n. is currently restricted to their type locality. Remarks on the taxonomic position and ecology of the two new species are given.
Key words: Chironomidae, *Micropsectra alyssae* sp. n., *M. ekremi* sp. n., glacial springs, peat bogs, Eastern Pyrenees (south-western France), conservation.

Introduction

Data on the taxonomy, geographical distribution and ecology of the genus *Micropsectra* Kieffer, 1909 from the Palaearctic Region (Shilova, 1976; Reiss, 1969a, 1969b, 1971, 1982, 1983; Cranston *et al.*, 1989; Stur and Ekrem, 2006; Ekrem *et al.*, 2010; Giłka, 2009, 2011; Giłka and Jazdzewska, 2010; Sæther and Spies, 2013; Moubayed-Breil and Ashe, 2018b) show that about 45 valid species are currently known from Europe and neighbouring regions.

In continental France, the genus *Micropsectra* is represented by about 32 taxa including 25 valid species and 6-7 undescribed species: *M. alyssae* sp. n.; *M. andalusiaca* Marcuzzi, 1950; *M. appendica* Stur and Ekrem, 2006; *M. apposita* (Walker, 1856); *M.* cf. *aristata* Pinder, 1976; *M. atrofasciata* (Kieffer, 1911); *M. attenuata* Reiss, 1969; *M. auvergnensis* Reiss, 1969; *M. chionophila* (Edwards, 1933); *M. ekremi* sp. n.; *M. junci* (Meigen, 1818); *M. lacustris* Säwedal, 1975; *M. lindrothi* Goeghebuer, 1931; *M. mendli* (Reiss, 1983); *M. nohedensis* (Moubayed and Langton, 1996); *M. notescens* (Walker, 1856); *M. oksanae* Moubayed-Breil and Ashe, 2018 (previously cited as *M.* sp. 6 in Moubayed-Breil and Ashe, 2016); *M. pallidula* (Meigen, 1830);

M. radialis Goetghebuer, 1939; *M. recurvata* Goetghebuer, 1928; *M. roseiventris* (Kieffer, 1909); *M. shrankelae* Stur and Ekrem, 2006; *M. sofiae* Stur and Ekrem, 2006; *M. styriaca* Reiss, 1969 and *M. uliginosa* (Reiss, 1969).

In this paper *Micropsectra alyssae* sp. n. and *M. ekremi* sp. n. are described as male and female adults and pupal exuviae based on associated material recently collected in pristine glacial springs and acid peat bogs located in the protected area of the Mantet Nature Reserve (upper basin of the River Mantet, Eastern Pyrenees, altitude 2000-2300m). In both diagnoses and descriptions of the two new species, the male and female adults and pupal exuviae are compared with some known or recently recorded *Micropsectra* species from the Eastern Pyrenees: *M*. cf. *aristata*, *M. attenuata*, *M. atrofasciata*, *M. auvergnensis*, *M. nohedensis*, *M. shrankelae*, *M. sofiae* and two undescribed species: *M*. sp. 1 and *M*. sp. 2.

The recent updated list of **807** taxa previously reported from continental France in Moubayed-Breil (2017), was updated to **820** including 7**81** valid known chironomid species in Moubayed-Breil *et al.* (2018) and Moubayed-Breil and Ashe (2018a, b). Consequently, the descriptions of *M. alyssae* sp. n. and *M. ekremi* sp. n. increases the total number of known *Micropsectra* species from continental France to **25** and to **822** taxa including **783** valid known species and **40** undescribed taxa. Remarks and discussion on closely related *Micropsectra* species, as well as comments on the ecology and geographical distribution of the two new species, are given.

Materials and methods

Morphological terminology and measurements follow Sæther (1980), Pinder and Reiss (1986) and Spies (1998) for the imagines and Sæther (1980), Anderson *et al*. (2013) and Langton (1991, 1994) for the pupal exuviae. For the male hypopygium feature "*Micropsectra*-seta" see Giłka and Jazdzewska (2010, Figs 8, 10).

Type material was preserved in 80-85% alcohol, and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid then washed in about 60% ethanol before mounting on slides. Part of the abdomen and the haltere of the male adult are preserved in 85% ethanol for an eventual DNA analysis.

Description

Micropsectra alyssae Moubayed-Breil and Ashe, sp. n.

Material examined

Holotype. **France**, Mantet Nature Reserve (Eastern Pyrenees), Callau acid springs and peat bogs, upper basin of Ressec stream, altitude 2000-2300 m, 42° 28' 38" North, 02° 18' 26" East, 05 August 2010, 1 male pharate adult, leg. J. Moubayed-Breil. Environmental data of aquatic habitat: crystalline water, conductivity 15-20µS/cm, pH 5-5.3; temperature 4-8°C.

Paratypes (all leg. J. Moubayed-Breil). 4 pharate adults (2 males and 2 females), 3 pupal exuviae (2 males and 1 female); same locality and data as for holotype.

The Holotype (on 2 slides including the male adult and its pupal exuviae) is deposited in the collections of National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland. Remaining paratypes are deposited in the senior author's collection.

Diagnostic characters

The European *Micropsectra* species nearest to *M. alyssae* sp. n. is *M. aristata* based, in particular, on the shape of the median volsella. The pupal exuviae of the new species likely belongs to the *atrofasciata*-group on the basis of the distribution pattern of armament on tergites III-V. However, *M. alyssae* sp. n. can be separated from other related members of the genus by the following combination of distinguishing characters.

Male adult. Anal lobe of wing not projecting, squamal area densely covered with dark to blackish proclinate microtrichia (directed forwards). The shape of tergite IX including crest and anal point is atypical; tergite IX broadly rectangular, posterior margin tapering distally; anal point long, drop-like in shape, with rounded apex; superior volsella oblong to tubercle-like with longitudinal extension, anterio-dorsal inner surface covered with dense macrotrichia, digitus long, thumb-like, and markedly projecting upwards medially; median volsella moderately short (90-95µm long), stem linear with both simple and lanceolate setae; sternapodeme typically sub-rectangular at base which is distinctly swollen latero-medially.

Pupal exuviae. Frontal tubercle well developed and typically conical; thoracic horn distinctly swollen medially, rows of long setae starting near the distal half; thoracic mound typically large with thumb-like apical projection; granulation on thoracic suture located anteriorly and medially; specific distribution pattern of armament on tergites III-V.

Etymology

The new species is named '*alyssae*' after our colleague Dr Alyssa Anderson (Northern State University, South Dakota, U.S.A.), who is actively working on the taxonomy and DNA barcoding of Tanytarsini species.

Male adult

(n = 7: 2 male pharate adults + 5 adults; Figs 1-6, 8-13)

A large sized *Micropsectra* species. Total length 5.60-6.40mm. Wing length 3.65-3.75mm. TL/WL 1.53-1.71. Colouration brown to dark brown, thorax contrasting light brown to blackish scutal thoracic strips. Head, legs and abdominal segments dark brown, anal segment contrasting brown to dark brown.

Head. Eyes bare; anterio-median and distal part of the inner margin of eyes densely covered with hairs; frontal margin with a distinct triangular tubercle located medially on the coronal triangle; frontal tubercles absent. Temporal setae 18-19 including 13-14 inner and 5 outer verticals. Clypeus sub-rectangular with about 33-35 setae in 7 rows. Palp 5-segmented; length (in µm) of segments: 90-95, 100-105, 360, 200, 220; palpomere 3 markedly longer than fourth; palpomere 3 (Figs 1-2) with 5-6 sensilla clavata and several pin shaped sensilla coeloconica (about 5). Antenna 13-segmented, 1440-1450µm long; ultimate flagellomere 940-950µm long, well developed, clubbed and bearing 1 distinct apical seta; antennal groove reaching segment 2; AR 1.88-1.90.

Thorax. Lobes of antepronotum widely separated (Fig. 3), lateral antepronotals 4-5, median antepronotals absent; acrostichals 14 in 1-2 rows; dorsocentrals 20-21 including 11-12 located proximally in 1-2 rows and 8-9 grouped distally; prealars 4. Scutellum with about 16 setae placed in 2 groups of on each side of the median area, which is bare. *Wing*. Brachiolum with 3 setae, all veins and cells heavily covered with setae, anal lobe not projecting; squamal area (Figs 4-5) densely covered with blackish proclinate microtrichia (directed forwards); squama bare; veins R_1, R_{2+3} with numerous setae, remaining veins bare. *Legs*. Tarsomere ta_1 of PI longer than tibia; length (in µm) of tibial spurs: PI, 20; PII, 30 and 20; PIII, 50 and 40. Length (µm) and proportions of legs PI-PIII as in Table 1.

TABLE 1. *Micropsectra alyssae* sp. n.: length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs.

P	Fe	Ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
PI	1510	1250	1750	940	720	535	245	1.40	1.85	1.58	3.20
PII	1750	1780	835	560	445	310	220	0.47	2.85	4.23	2.67
PIII	1450	1310	725	485	365	225	170	0.55	2.80	3.80	2.30

Hypopygium (Figs 8-9) as illustrated in dorsal (Fig. 8), and ventral view (Fig. 9, without anal point and tergite IX). Tergite IX (Fig. 8, dorsal) about 200 µm maximum width at median part (between the lateral teeth), broadly sub-rectangular to sub-square, with a nearly straight posterior margin which is narrowed distally and turned over inwards at apex and with 2 distinct rounded expansions located laterally below the lateral teeth; anal tergite bands (ATB) about 200 µm long, 17-20 µm maximum width, widely open basally and converging but not joined posteriorly and abruptly terminated well before base of anal point, not reaching crests of anal point; projecting elevated hump (dorsal tubercle) on median area present (clearly visible in lateral view, Fig. 6), with 4 dorsal setae located below its apical part; teeth on median part of

lateral margin present. Anal point in dorsal, lateral and ventral view (Figs 6, 8, 12) 75µm long, 50-55µm maximum width at base, nearly parallel sided to drop-like in shape, larger at base and apex than medially, with 16-18 setae including 6 placed laterally (3 on each side of base of anal point) and 10-12 on ventral side (in 2 rows). Sternapodeme broad rectangle-like, slightly swollen latero-medially, 120-125µm long and 50-55µm maximum width, lateral horn-like basal projections present; coxapodeme linearly elongated, outer part turns over distally to join the basal part of sternaopodeme; phallapodeme linearly elongated, nearly S-like in shape and bifurcate in its median part, outer smaller branch projecting upwards to join the distal part of coxapodeme. Superior volsella (Figs 8, 10) about 105-115µm long, 70-75µm maximum width, elongated lobe-like and vertically projecting, wider at base and constricted in its third distal part; setiger area (SA) with 9-10 short setae located anterio-medially and distally, inner margin with 2 long setae, inner anterio-dorsal surface with field of macrotrichia; digitus 40-45µm long, about 12-15µm maximum width, thumb-like and bent upwards medially at a right angle, apex rounded; *Micropsectra*-seta on basal inner margin absent. Median volsella (Figs 9, 11, 13) 90-95µm long, 20-25µm maximum width, stem uniformly linear, bent downwards medially, reaching distal half of inferior volsella, lamellar setae subulate (Fig. 13) and typically ending with long curved tail-like apices. Inferior volsella (Figs 8, dorsal; 9, ventral) 250-255µm long, 50-55µm maximum width, wider in its distal part, reaching beyond half length of gonostylus, longitudinal dorsal setiferous groove present; setiferous ventral lobe weakly developed, with 4 long setae inwardly directed. Gonocoxite 190-200µm long, 75-80µm maximum width, with 11-13 setae. Gonostylus 250µm long and 60-65µm maximum width, broadly shaped, moderately swollen basally and distally; median and distal inner margin bearing 2-3 row of numerous fine long setae. HR 0.80.

Female adult

(n = 2 female pharate adults; Figs 15, 17-21)

Colouration as in the male adult except for the antennae, which are brownish. TL 5.70-6.80mm. WL 3.70-3.80µm. TL/WL = 1.54-1.79.

Head. Temporal setae 11 including 8 inner and 3 outer verticals. Clypeus sub-rectangular with up to 30 setae in 6-7 rows. Palp 5-segmented; length (in µm) of segments: 35 (1 and 2 fused), 75, 85, 160; palpomere 3 with 3-4 sensilla clavata and 2-3 pin shaped sensilla coeloconica. Antenna 5-segmented, 625µm long; ultimate flagellomere (Fig. 15) 125µm long, clubbed and bearing 1 distinct apical seta; antennal groove reaching segment 1; AR 0.25.

Thorax. Lobes of antepronotum gaping, lateral antepronotals 5-6, median antepronotals absent; acrostichals consist of 14-15 long setae (75-80µm long) mostly inserted in 2 rows; dorsocentrals 21-22 including 4 grouped proximally and 17-18 in 1 row; prealars 3-4 in 1 row.

Scutellum with about 16 setae. *Wing*. Brachiolum with 3 setae; veins R_1, R_{2+3} densely covered with setae, remaining veins bare. Squamal area of wing as in the male; squama entirely bare.

Genitalia. Genitalia in dorsal and ventral view as illustrated in Fig. 17. Notum about 135µm long, rami distinct. Sternite VIII with 32-34 setae (16-17 on each side of the notum). Gonapophysis VIII (Figs 17-19). Dorsomesal lobe nearly linear in its proximal half, rounded in its distal half; ventro-lateral lobe sub-triangular, broad basally and narrowed apically; apodeme lobe (Figs 17, 19) base sinuous, forking medially into two branches apically. Seminal capsules (Fig. 17) 110µm long, 90µm maximum width, typically spherical and slightly sclerotized at base; spermathecal ducts with loops and separate openings. Tergite IX nearly semi-circular, not divided, with more than 50 long setae. Gonocoxite (Fig. 20) broadly sub-triangular, bare and covered with dense macrotrichia. Cercus (Fig. 21) normally developed with rounded apex, outer margin undulating.

Pupal exuviae

(n = 4: 2 males, 2 females; Figs 23, 25-29)

Total length 5.65-6.85mm. General colouration yellowish to brownish; frontal apotome and thorax brownish; abdominal segments brownish, anal segment dark brown with wrinkles, genital sac brownish. Cephalothorax including frontal apotome moderately wrinkled, scutal hump well developed; thorax with granulations restricted to 2 small areas located on anterio-median and median areas close to the thoracic suture.

Cephalothorax as in Figs 23, 25-26 including frontal apotome (Fig. 23), thorax (Fig. 25) and thoracic horn (Fig. 26). Frontal apotome (Fig. 23), frontal tubercules 80-85µm high, 150-155µm wide at base**,** typically conical, frontal setae 120-125µm long. Thorax (Fig. 25) with 1 median antepronotal seta 130µm long and 1 lateral antepronotal 110µm long; precorneal setae respectively 160, 90 and 100µm long; dorsocentrals Dc_1-Dc_2 and Dc_3-Dc_4 subequal (about 100-110 µ long), distance between Dc_2 and Dc_3 190-200µm; thoracic horn 310-320µm long, distinctly swollen in its proximal part, narrowed distally with pointed apex, numerous long setae mostly present along the outer margin and located almost on distal half; thoracic mound (Fig. 27) large and well developed, broad longitudinally with a thumb-like to lobe-like outer projection, which is bent downwards.

Abdomen (tergites II-VI, Fig. 28). All pleurae bare. Tergite I bare. Armament present on tergites II-VI as in Fig. 28. Tergite II covered with dense field of points (anterio-median area) and small spines (postero-median area); oval longitudinal bare area present posterio-medially; transverse row of hooks occupying about 55% of tergite width, composed of about 140 hooklets in 1 row; Pedes spurii B distinct but weak. Tergites III-V, each with a pair of elongated long spine bands on either side of mid-line: continuous on tergites III-IV, becoming shorter and less

spinulated on tergites V-VI. Pairs of long spines on tergites III-VI becoming gradually shorter and less extensive: 22-24 long spines (tergite III), 37-40 (IV), 5-7 (V), 3-4 (VI). Tergites VII-VIII bare. Lateral setae on segments I-IV: 1, 2, 2, 1; lateral taeniae on segments IV-VIII: IV (2), V-VII (4), VIII (5). Posterio-lateral comb of segment VIII (Fig. 29) consists of 4-5 unequal teeth including 1 much larger (37-40µm long) located medially. Anal lobe 220-230µm long, 330-340µm maximum width, 2 dorsal setae about 180µm long present on posterio-median part; taeniae on fringe with 22-25 (in male), 26-28 (in female) in 1 row. Male genital sac about 270-275µm long, 130 µm maximum width, overreaching tip of anal lobe by 100-110µm.

Larva

Known but not described.

Taxonomic remarks

Male adult. Only the basal part of the squamal area is densely covered with blackish microtrichia (Fig. 4), while both basal and distal parts are blackish in *Micropsectra atrofasciata*, *M. recurvata* and *M. roseiventris* (Moubayed-Breil and Ashe, 2018b, Fig. 3). Tergite IX with a distinct dorsal hump, differently figured in *M. atrofasciata*, *M. sofiae*, *M. schrankelae* of the *atrofasciata*-group (Figs 46-48), and absent in the *attenuata*-group (*M. attenuata*, Reiss 1969, Fig. 4; *M. nohedensis* and *M. auvergnensis*, Moubayed and Langton, 1996, Figs 3, 11). Superior volsella sub-oval, occasionally bi-lobed in its distal half, with digitus atypically projecting upwards medially (Figs 8, 10). Lamellar setae of median volsella subulate with long tail-like apices (Figs 9, 11, 13), while they are aristate and abruptly tapered distally in *M. aristata* (Pinder, 1976, Fig. 3; Langton and Pinder, 2007, Fig. 103B).

Female adult. Last flagellomere of *M. alyssae* n. sp. with 1 single pre-apical seta (Fig. 15), while it bears 2 pre-apical setae (Fig. 16) in *M.* sp. 1 (a closely related East Pyrenean species). Dorsomesal lobe (Fig. 17) swollen medially, while it is linearly elongated in *M. aristata* (Fig. 22).

Pupal exuviae. Frontal tubercles (Fig. 23) well developed and markedly conical, which are domed in *M. atrofasciata* (Fig. 24; Langton, 1991, Fig. 147n) and *M. aristata* (Stur and Ekrem, 2006, Figs 6B, 7E); rows of long setae on thoracic horn located up to the median part, which are inserted near the base in other related species of the *atrofasciata*-group; thoracic mound nose-like to thumb-like (Fig. 27), is much broader in the Pyrenean *Micropsectra* sp. 1 (Fig. 30); posterio-lateral comb of segment VIII (Fig. 29), is differently figured in *M.* sp. 1 (Fig. 31), while a nearly similar shape is observed in *M. atrofasciata* (Stur and Ekrem, 2006, Fig. 7H).

***Micropsectra ekremi* Moubayed-Breil and Ashe, sp. n.**

Material examined

Holotype. **France**, Mantet Nature Reserve (Eastern Pyrenees), Callau acid peat bogs and springs, upper basin of Ressec stream, altitude 2000-2300m, 42° 28' 38" North, 02° 18' 26" East, 05 August 2010, 1 male pharate adult, leg. J. Moubayed-Breil. Environmental data of aquatic habitat: crystalline water, conductivity 15-20µS/cm, pH 5-5.3; temperature 4-8°C.

Paratypes (all leg. J. Moubayed-Breil). 4 pharate adults (2 males and 2 females), 3 pupal exuviae (2 males and 1 female); same locality and data as for holotype.

Holotype (on 2 slides including the male adult and its pupal exuviae) is deposited in the collections of National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland. Remaining paratypes are deposited in the senior author's collection.

Diagnostic characters

Although the general shape of the pupal exuviae resembles species belonging to the *attenuata*-group (*sensu lato*), some characters found in the male adult are similar to those observed in the *atrofasciata*-group. However, *Micropsectra ekremi* n. sp. can be easily separated from other related *Micropsectra* species by the following combination of characters.

Male adult. Squamal area of wing yellowish and densely covered with pale proclinate microtrichia (directed forwards), squama bare; tergite IX with a distinct triangular hump (clearly visible in lateral view); anal point broadly triangular; superior volsella spherical but lacking digitus; lamellar setae of median volsella subulate and ending with long curved tail-like apices; inner ventral margin of gonocoxite with two distinct lobes (posterior one larger).

Pupal exuviae. Frontal apotome weakly domed, frontal tubercles quite indistinct; thoracic horn markedly swollen medially; thoracic mound broadly triangular, armament on tergites III-VI consists of a very specific and unusual distribution pattern of spines located on either side of the mid-line.

Etymology

The new species is named '*ekremi*' after our colleague Professor Torbjørn Ekrem (Museum of Natural History and Archaeology, NTNU, Trondheim, Norway), who is actively working on the taxonomy and DNA barcoding of Tanytarsini species.

Male adult

(n = 2: 2 male pharate adults; Figs 32, 35, 37-39, 44-45)

A relatively small sized *Micropsectra* species (especially wing, palp segments and legs). Total length 3.60-3.70mm. Wing length 1.65-1.70mm. TL/WL 2.17-2.18. Colouration brown to dark brown, thorax mostly light brown, scutal stripes dark brown. Head, legs and abdominal segments brownish; squamal area of wing yellowish to pale; abdomen and anal segment contrasting brown to dark brown.

Head. Eyes bare; hairs on inner margin of eyes indistinct; frontal margin nearly straight with a distinct triangular tubercle located medially on the coronal triangle; frontal tubercles weak. Temporal setae 10-12 including 7-8 inner and 3-4 outer verticals. Clypeus sub-rectangular with 12-13 setae in 3-4 rows. Palp 5-segmented with short segments; length (in µm) of segments: 25, 35, 45, 45, 75; palpomere 3 with 2-3 sensilla clavata and a few pin-like sensilla coeloconica. Antenna 13-segmented, about 950µm long; ultimate flagellomere 590µm long, weakly clubbed and lacking apical seta; antennal groove reaching segment 3; AR 1.64.

Thorax. Lobes of antepronotum separated; antepronotals absent; acrostichals consisting of 8 long setae (70µm long); dorsocentrals 15-16 in 1-2 rows; prealars 3-4 grouped together. Scutellum with about 20 setae. *Wing*. Brachiolum with 2 setae; all veins and cells heavily covered with setae; squamal area (Fig. 32) yellowish and densely covered with pale proclinate microtrichia (directed forwards); squama bare. *Legs*. Tarsomere ta_1 of PI and PII longer than tibia. Length (in µm) of tibial spurs: PI, about 50; PII, 40 and 20; PIII, 35 and 20. Length (µm) and proportions of legs PI-PIII as in Table 2.

TABLE 2. *Micropsectra ekremi* sp. n.: length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs.

P	Fe	Ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
PI	835	560	720	430	310	245	155	1.29	1.86	1.94	3.20
PII	895	650	740	520	370	295	170	1.14	0.83	2.09	2.30
PIII	825	710	590	225	180	145	120	0.82	3.17	2.60	2.40

Hypopygium (Figs 37-38) as illustrated in dorsal (Fig. 37) and ventral view (Fig. 38, without anal point and tergite IX). Tergite IX 165µm maximum width, 125µm wide between the lateral teeth, semi-circular, slightly narrowed distally; anal tergite bands (ATB) widely open basally, converging posteriorly and abruptly terminated well before base of anal point, not reaching crests of anal point; a projecting elevated hump (tubercle) on median area (clearly visible in lateral view, Fig. 35), 6 dorsal setae located between the posterior part of the ATB (3 on each

side, Fig. 37); teeth on median part of lateral margin present. Anal point in lateral, dorsal and ventral view (Figs 35, 37, 44) 55µm long, 40µm maximum width at base, broadly triangular, with 18-20 setae including 6 placed laterally (3 on each side of base of anal point) and 12-14 on ventral side (in 1-2 rows). Sternapodeme rectangular, about 15-20µm long and 30-35µm wide, bearing two small lateral projections; coxapodeme composed of a linear elongate inner part which turns over at base to join the upper outer part; phallapodeme weakly S-like in shape, bifurcate in distal part, outer branch projecting upwards to join the distal part of coxapodeme. Superior volsella (Figs 37, 45) about 45-50µm long, 40µm maximum width, spherical and slightly narrowed in distal part; setiger area (SA) with 6-7 dorsal setae, inner margin with 2 longer setae located medially; digitus absent; *Micropsectra*-seta placed on a weak rounded tubercle. Median volsella (Figs 38) about 200µm long and15µm maximum width, stem nearly S-like, uniformly linear except on its distal part which is tapering apically and reaching terminal part of inferior volsella; 9-11 typical long subulate setae (Fig. 39) present on distal third (Fig. 38). Inferior volsella (Figs 37, dorsal; 38, ventral) about 190µm long, 25µm maximum width, wider at base and distal part, reaching beyond half length of gonostylus, slightly bent inwards distally, presence of a distinct transversal protrusion medially, setiferous ventral lobe well developed and bearing 5 long setae. Gonocoxite 150µm long, with 10-11 setae. Gonostylus (Figs 37) about 165µm long and about 50µm maximum width, broadly shaped, moderately swollen medially, slightly tapering distally and truncate apically; median and distal inner margin bearing 1-2 row of 8-10 fine setae. HR 0.91.

Female adult

(n = 2: 2 female pharate adults; Figs 49, 50-54).

A small sized female *Micropsectra* species. Colouration as in the male adult except for the antennae and abdomen, which are yellow brownish. TL 3.80-3.90mm. WL 1.70-1.80µm. TL/WL = 2.17-2.24.

Head. Frontal tubercles weakly developed; temporal setae 10-11 including 7-8 inner (in 1 row) and 3-4 outer verticals. Clypeus sub-rectangular with 13-15 setae in 3-4 rows. Palp 5-segmented with short segments; length (in µm) of segments: 25, 35, 45, 45, 75; palpomere 3 with 1-2 sensilla clavata, thin and setae-like in shape. Antenna 5-segmented, 480-485µm long; ultimate flagellomere (Fig. 49) 145µm long, linearly elongated to weakly clubbed with 1 distinct pre-apical seta; antennal groove reaching segment 1; AR 0.42.

Thorax. Lobes of antepronotum gaping, antepronotals absent; acrostichals consist of 8-9 long setae 70µm long, inserted in 1-2 rows; dorsocentrals 15-16 in 1-2 rows; prealars 3-4 grouped together; scutellum with about 20 setae. *Wing*. Brachiolum with 2 setae; veins R_1, R_{2+3} densely covered with setae, remaining veins bare; anal lobe as in the male adult; squama bare.

Genitalia. Genitalia with gonapophysis VIII in dorsal and ventral view as illustrated in Fig. 50. Notum 155-160µm long, rami distinct. Sternite VIII with 30-32 setae (15-16 on each side of the notum). Dorsomesal lobe distinctly rounded proximally and swollen in distal part; ventrolateral lobe (Figs 50, 52) bulbous to sub-circular, rounded basally and narrowed apically; apodeme lobe (Figs 50-51) basal part curving upwards, forking medially into two branches. Seminal capsules (Fig. 50) 110µm long, 90µm maximum width, sub-spherical and sclerotized medially and laterally; spermathecal ducts with loops and separate openings. Tergite IX (Fig. 53) semi-circular, not divided, with more than 40 long setae located in 5-6 rows; gonocoxite semi-circular, with 3-4 setae. Cercus (Fig. 54) normally developed, inner margin swollen, outer margin undulating.

Pupal exuviae

(n = 5: 3 males + 2 females; Figs 55, 57-63)

Total length 3.90-4.00mm. General colouration brown to dark brown; frontal apotome and thorax brownish; abdominal segments brownish except for segment VIII and anal segment which are dark brown, muscles marks blackish and distinctly represented on segments I-VIII, genital sac brownish. Cephalothorax including frontal apotome weakly wrinkled, scutal hump weak; thorax with granulations restricted to the antero-median area extending close to the thoracic suture and above dorsocentrals Dc_1-Dc_2.

Cephalothorax. Cephalothorax as in Figs 55, 57-59 including frontal apotome (Fig. 55), thorax (Fig. 57) and thoracic horn (Figs 58-59). Frontal tubercules (Fig. 55) present but weakly developed, frontal setae about 55µm long. Thorax (Fig. 57) with subequal median and lateral antepronotals (each about 90µm long); precorneal setae respectively 90, 95, and 105µm long; dorsocentrals Dc_1-Dc_2 (40-45µm long) about 2.5 times shorter than Dc_3-Dc_4 (about 105-110µ long), distance between Dc_2 and Dc_3 175-180µm; thoracic horn 250-260µm long, distinctly swollen in its posterio-median part, narrowed distally with pointed apex, numerous long setae mostly present along the outer margin and inserted a short distance from its base; thoracic mound (Figs 60-61) 140µm long, 140µm maximum width at base, broadly triangular to sac-like in shape, narrowed distally and strongly bent downwards.

Abdomen. Abdominal tergites II-VI as in Fig. 62. Field of shagreen present on pleurae of segments II-VI, dense on II-IV, becoming gradually less extensive on V-VI. Tergite I bare. Armament on tergites II-VI as in Fig. 62. Tergite II covered with dense field of points in anterio-median area and small spines in posterio-median part; bare oval area present posterio-medially; transverse row of hooks occupying about 60% of tergite width, composed of about 120 hooklets in 1 row; Pedes spurii B distinct but weak. Tergites III-VI, each densely covered with a pair of spine bands extending posteriorly on either side of mid-line; patches of short and

stout spines on anterio-median area with anterio-lateral extension only present on tergites IV-VI, pair of patches occasionally interrupted only on tergite V; posterio-median bands of long vertically directed spines present on tergites III-V; remaining area of tergites III-V densely covered with various sizes of spines, shorter in anterior and becoming gradually longer in posterior area. Length (in µm) of longest spines (posterior bands) on tergites III-VI: 40-50 (III); 35-40 (IV-V); 25-30 (VI). Tergites VI-VIII bare. Lateral setae on segments I-IV: 1, 3, 3, 1; lateral taeniae on segments IV-VIII: IV (2), V (3), VI-VII (4), VIII (5). Posterio-lateral comb of segment VIII (Fig. 63) consists of 4-5 teeth including 2 large sized (30-35µm long) and 2-3 smaller teeth. Anal lobe of male (175µm long, 270µm maximum width) and female (185µm long, 330µm maximum width); 2 dorsal setae about 190µm long present on posterio-median part; fringe with 18-19 taeniae (in male), 20-21 (in female). Genital sac of male about 265-270µm long, overreaching tip of anal lobe by 120-125µm.

Larva

Known but not described.

Taxonomic remarks

The morphological affinities of both male adult and pupal exuviae of *Micropsectra ekremi* sp. n. are difficult to deduce or associate with one of the known groups of the genus *Micropsectra*, except for some species which key in both the *attenuata*-group and the *atrofasciata* group. Moreover, while there is ample taxonomic data in the literature on the *atrofasciata*-group our knowledge of the *attenuata*-group is still very limited and less well known. Therefore, compared to other members of the genus, *M. ekremi* sp. n. can be tentatively keyed to the *attenuata*-group (sensu lato) rather than the *atrofasciata*-group based on resemblance of some common features highlighted in the following combination of characters: a relatively small sized *Micropsectra* species; lamellar setae of the median volsella subulate (Figs 38-39) and resemble those of the *attenuata*-group (spoon to lanceolate shaped, Figs 40-43); weakly developed frontal tubercles; distribution pattern of armament on tergites III-V. However, some distinguishing characters found in the male and female adult and pupal exuviae of *M. ekremi* sp. n. will easily separate the new species from all other members of the genus. A separate group may be required to accommodate *M. ekremi* sp. n.

Male adult. Squamal area of wing (Fig. 32) yellowish and densely covered with pale microtrichia in *M. ekremi* which is quite similar to that of *M. auvergnensis* and *M. nohedensis* (Figs 33-34), while it is blackish in: *M. atrofasciata*, *M. recurvata*, *M. oksanae* and *M. roseiventris* (Moubayed-Breil and Ashe, 2018b, Figs 2-3); tergite IX and anal point of *M. ekremi* sp. n. with a distinct triangular hump (Fig. 35, clearly visible in lateral view), differently figured in the *atrofasciata*-group (*M. atrofasciata*, *M. schrankelae*, *M. sofiae*, Figs 46-48) or

absent in the *attenuata*-group (*M. attenuata*, Reiss, 1969, Fig. 4; *M. nohedensis* and *M. auvergnensis*, Moubayed and Langton, 1996, Figs 3, 11); superior volsella spherical in *M. ekremi* sp. n. (Fig. 45) but similarly spherical in the *atrofasciata*-group while it is foot-like in the *attenuata*-group; lamellar setae of median volsella lanceolate in *M. ekremi* sp. n. (Figs 38-39) which are foliate in the *attenuata*-group (Figs 40-43, for *M. auvergnensis*, *M. attenuata*, *M. nohedensis* and *M*. sp. 1).

Female adult. Last flagellomere of *M. ekremi* sp. n. (Fig. 49) not clubbed and nearly linear, while it is distinctly clubbed and straight in *M. nohedensis* (Moubayed and Langton, 1996, Fig. 5); dorsomesal lobe distinctly swollen in distal part in *M. ekremi* sp. n. (Fig. 50) but is markedly linear in *M. nohedensis* (Moubayed and Langton, 1996, Fig. 10).

Pupal exuviae. Armament on tergites III-VI (Fig. 62) composed of very distinct and unusual fields of long vertically directed spines located posteriorly, which is completely different to what is figured in all of the known members of the *attenuata*-group (e.g.: *M. attenuata*, Reiss, 1969, Fig. 7; *M. nohedensis* and *M. auvergnensis*, Moubayed and Langton, 1996, respectively Figs 12-13 and Figs 16-17).

Ecology and geographical distribution

Material of male adults, male and female pharate adults, pupal exuviae and larvae of both *Micropsectra alyssae* sp. n. and *M. ekremi* sp. n. was collected in two glacial springs and acid peat bogs (Plate 1) located in the upper basin of the River Mantet (altitude 2000-2300m). Emergence was mainly recorded from late spring to summer (June to September).

Despite extensive investigations throughout various high mountain springs and peat bogs located in the Eastern Pyrenees the geographical distribution of both *M. alyssae* sp. n. and *M. ekremi* sp. n. remains restricted to their type localities in the Mantet Nature Reserve.

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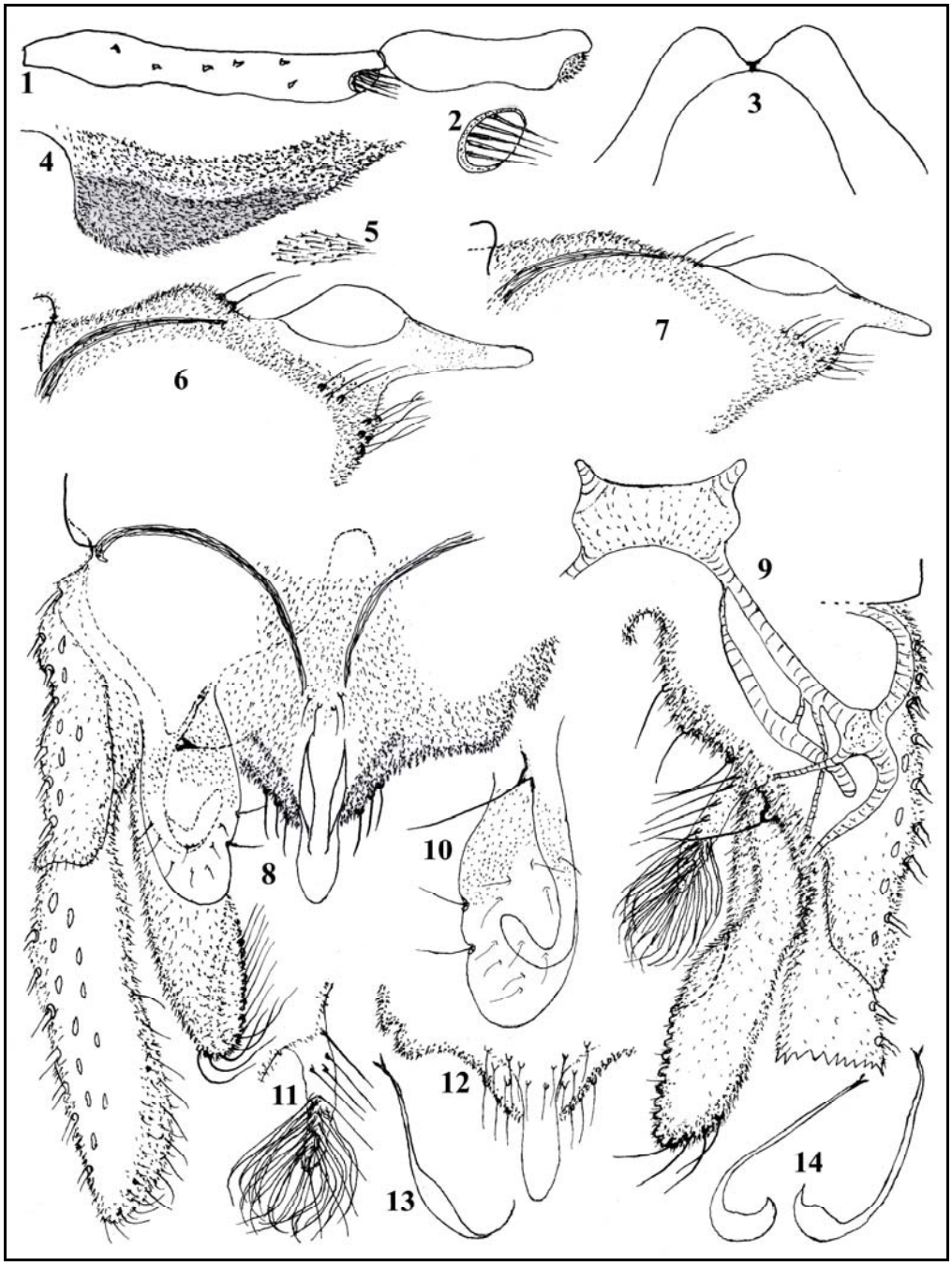
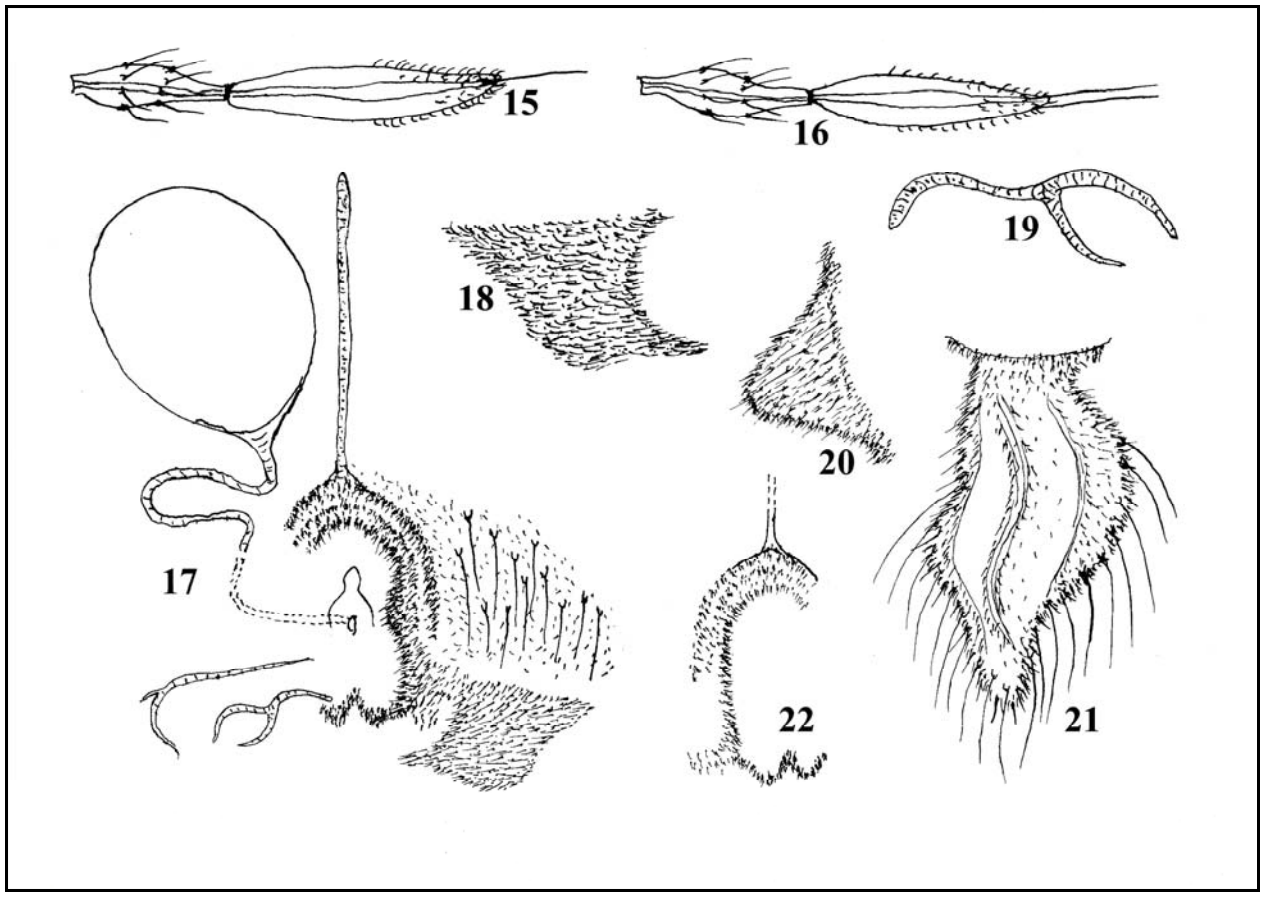
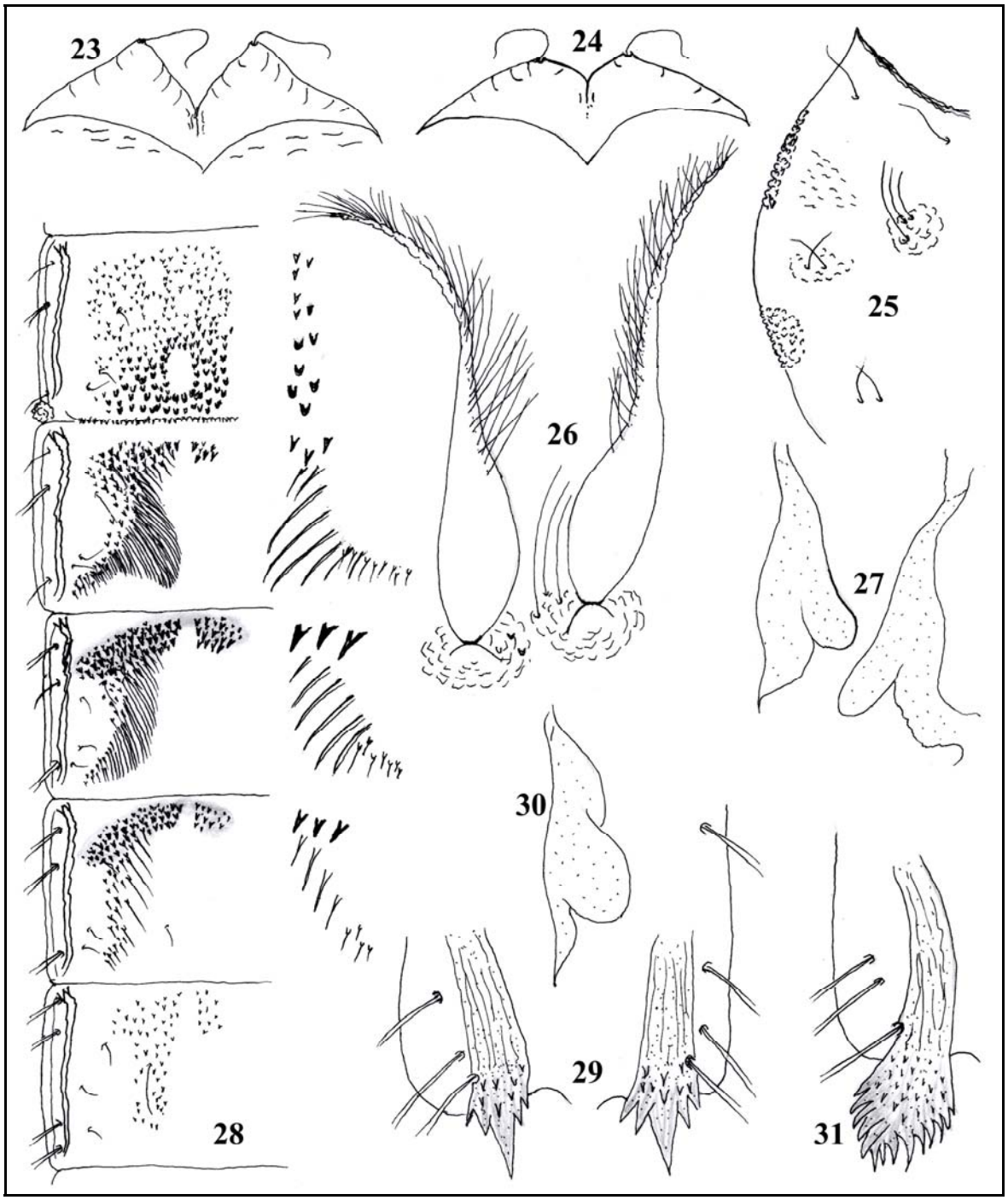
PLATE 1. Glacial springs and acid peat bogs at the Mantet Nature Reserve (altitude 2000-2300m), France: type locality of both *Micropsectra alyssae* sp. n. and *M. ekremi* sp. n. Photograph © J. Moubayed-Breil, 5 August 2008.



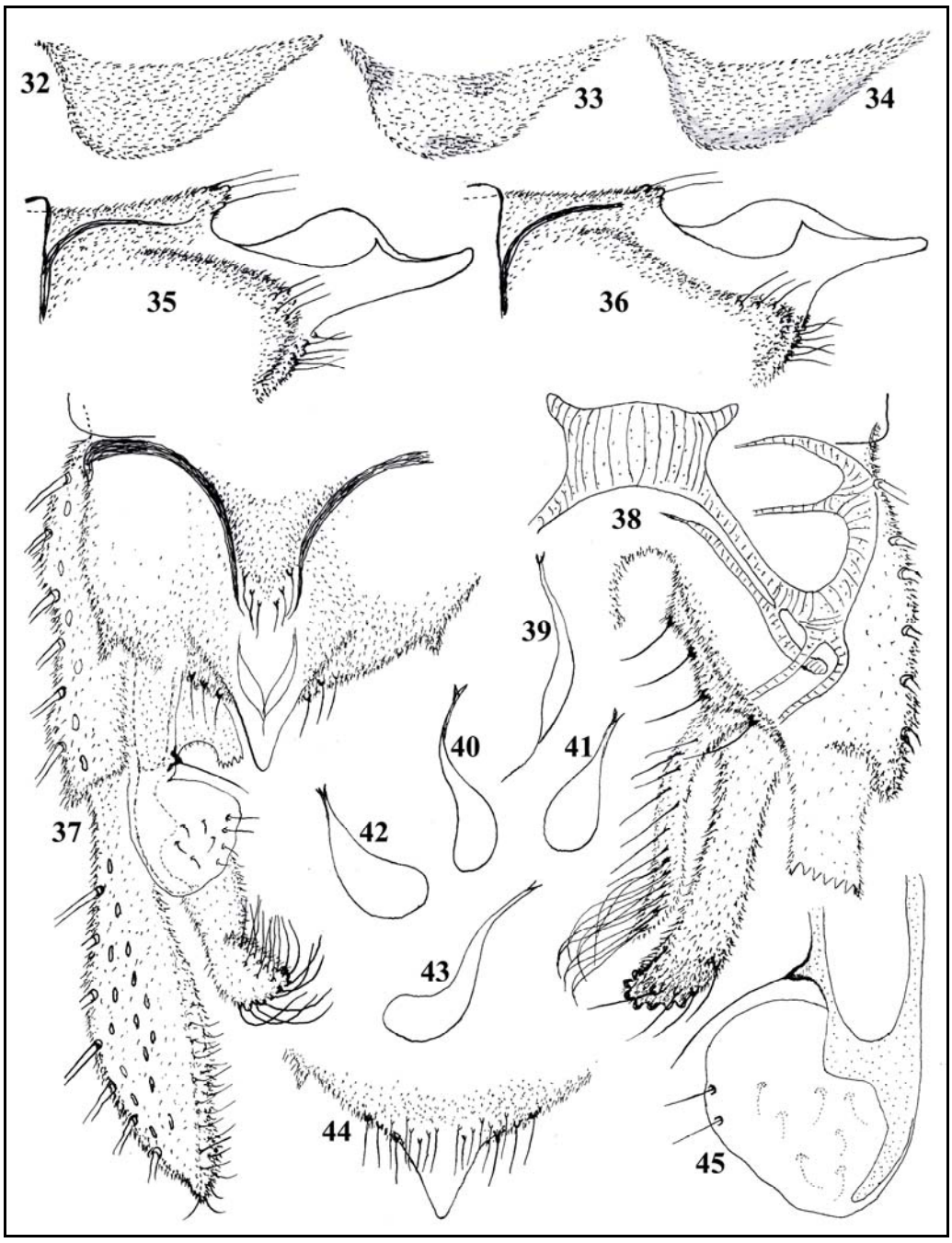
FIGURES 1-14. Male adult of *Micropsectra* spp. *M. alyssae* sp. n.: (1-2) palpomeres 2-and details of sensilla coeloconica; (3) lobes of antepronotum; (4-5) squamal area and details of microtrichia. Tergite IX and anal point (lateral) of: (6) *M. alyssae* sp. n.; (7) *M*. sp. 1. *Micropsectra alyssae* sp. n.: (8-9) hypopygium in dorsal (8) and ventral view (9, without tergite IX and anal point); (10) superior volsella; (11) median volsella; (12) anal point, ventral. Differentiated setae of median volsella of: (13) *M. alyssae* sp. n., (14) *M*. sp. 1.



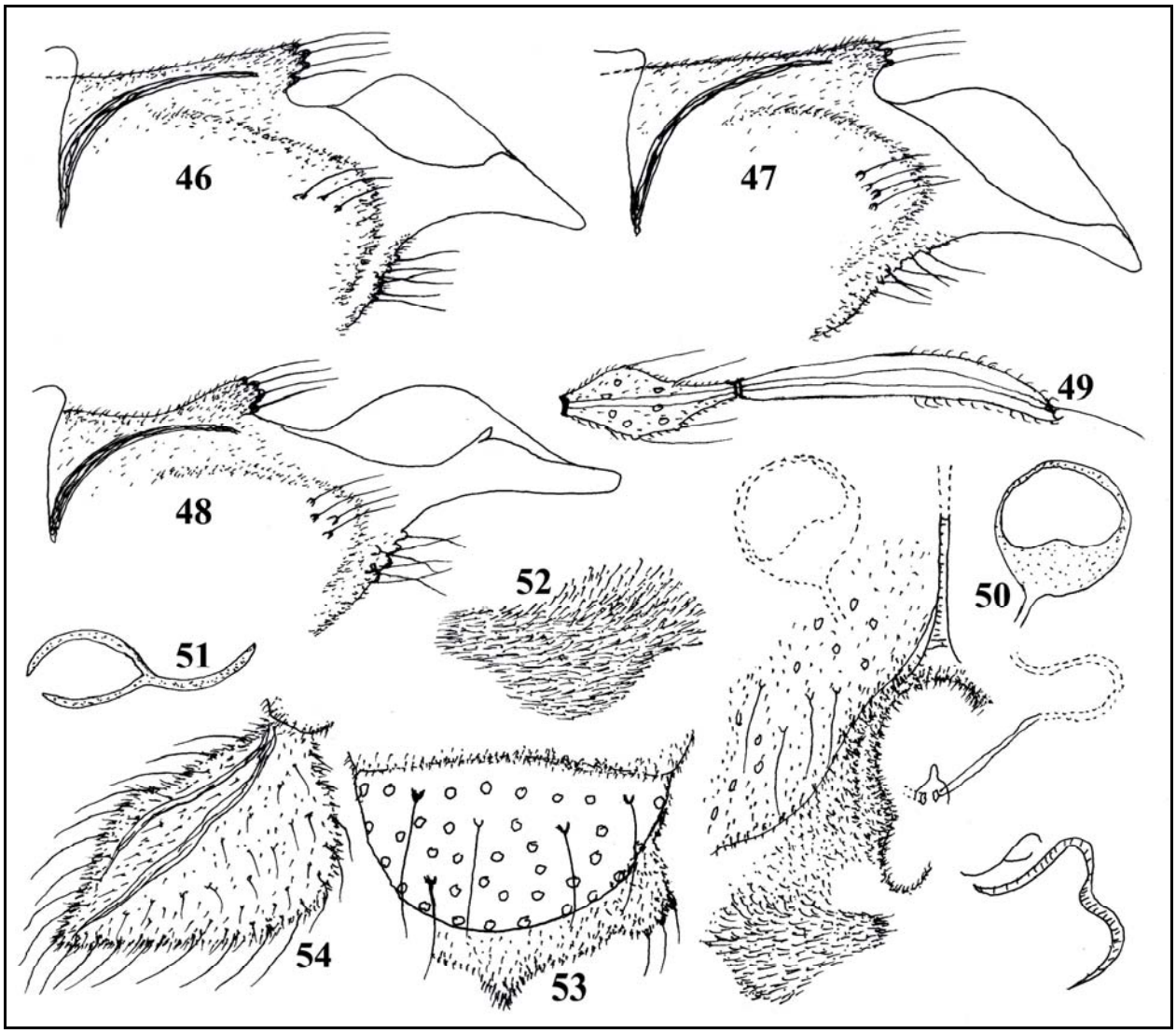
FIGURES 15-22. Female adult of *Micropsectra* spp. Fourth and last flagellomeres of antenna of: (15) *M. alyssae* sp. n., (16) *M*. sp. 1. *Micropsectra alyssae* sp. n.: (17) genitalia, ventral and dorsal view; (18) ventrolateral lobe; (19) apodeme lobe; (20) gonocoxite, dorsal; (21) cercus. *Micropsectra* sp. 1: (22) dorsomesal lobe.



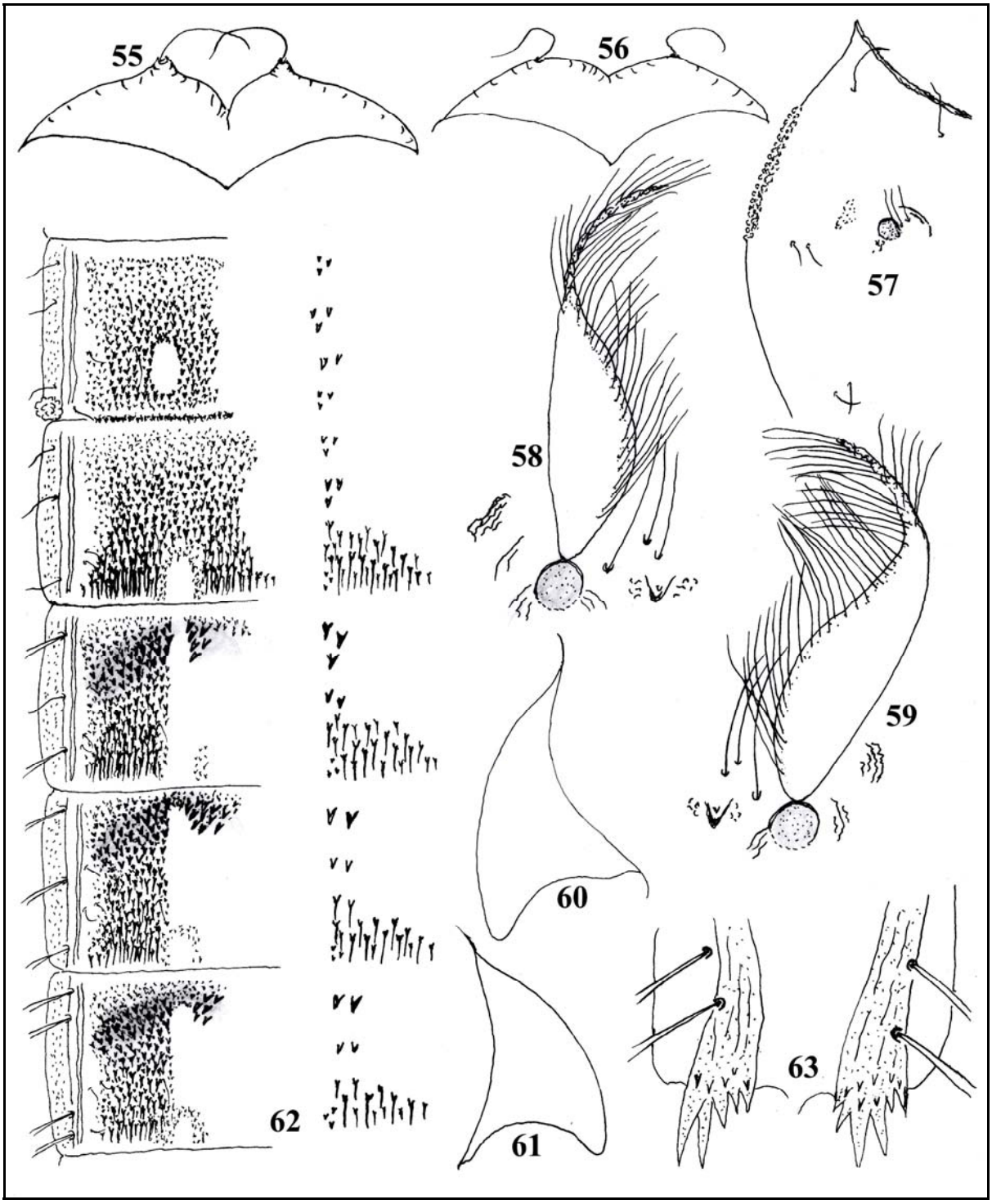
FIGURES 23-31. Pupal exuviae of *Micropsectra* spp. Frontal apotome of: (23) *M. alyssae* sp. n., (24) *M. atrofasciata*. *Micropsectra. alyssae* sp. n.: (25) thorax; (26) thoracic horn, two aspects; (27) thoracic mound, two aspects; (28) abdominal segments II-VI (dorsal), with details of armament on tergites; (29) posterio-lateral comb of segment VIII, two aspects. *Micropsectra* sp. 1: (30) thoracic mound; (31) posterio-lateral comb of segment VIII.



FIGURES 32-45. Male adult of *Micropsectra* spp. Squamal area with microtrichia of: (32) *M. ekremi* sp. n.; (33) *M. nohedensis*; (34) *M. auvergnensis*. Tergite IX and anal point (lateral) of: (35) *M. ekremi* sp. n., (36) *M.* sp. 2. *M. ekremi* sp. n.: (37-38) hypopygium in dorsal (37) and ventral view (38, tergite IX and anal point removed). Differentiated seta of median volsella of: (39) *M. ekremi* sp. n.; (40) *M. auvergnensis*; (41) *M. attenuata*; (42) *M. nohedensis*; (43) *M.* sp. 2. *Micropsectra ekremi* sp. n.: (44) anal point, ventral; (45) superior volsella.



FIGURES 46-54. Male and female adult of *Micropsectra* spp. Male tergite IX and anal point (lateral) of: (46) *M. atrofasciata*; (47) *M. sofiae*; (48) *M. schrankelae*. *Micropsectra ekremi* sp. n., adult female: (49) fourth and last flagellomere of antenna; (50) genitalia, ventral and dorsal view; (51) apodeme lobe; (52) ventrolateral lobe; (53) tergite IX and gonocoxite, dorsal; (54) cercus.



FIGURES 55-63. Pupal exuviae of *Micropsectra* spp. Frontal apotome of: (55) *M. ekremi* sp. n., (56) M. sp. 1. *Micropsectra ekremi* sp. n.: (57) thorax; (58-59) thoracic horn, two aspects; (60-61) thoracic mound, two aspects; (62) abdominal segments II-VI (dorsal), with details of armament on tergites; (63) posterio-lateral comb of segment VIII, two aspects.

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RECOGNITION OF TWO ADDITIONAL FOSSIL SUBFAMILIES IN THE CHIRONOMIDAE (DIPTERA) – †DUNGEYELLINAE SUBFAM. NOV. AND †CRETODIAMESINAE KALUGINA STAT. NOV.

Patrick Ashe[1], Declan A. Murray[2] and James P. O'Connor[3]
[1]*33 Shelton Drive, Terenure, Dublin 12, D12 PK68, Ireland.*
e-mail: <patrick.ashe1983@gmail.com>
[2]*Emeritus Associate Professor, Freshwater Biodiversity Ecology and Fisheries Research Group, School of Biology and Environmental Science, University College Dublin, Belfield, Dublin 4, Ireland*. (address for correspondence: *Meadesbrook, Ashbourne, Co. Meath, A84 K727, Ireland*).
e-mail: <declan.murray@ucd.ie>
[3]*Emeritus Entomologist, National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland.*

Abstract

A new subfamily, **†Dungeyellinae subfam. nov.**, is erected to accommodate the monotypic †*Dungeyella gavini* Jarzembowski, Azar & Nel, 2008. In addition, the subfamily **†Cretodiamesinae** Kalugina **stat. nov.** (with one included genus and species †*Cretodiamesa taimyrica* Kalugina, 1976) is elevated from its former status as the tribe †Cretodiamesini in the subfamily Diamesinae.

Key words: Chironomidae, Diptera, fossils, †Dungeyellinae (new subfamily), †Cretodiamesinae (stat. nov.), colour coding of wing venation.

Introduction

A World Catalogue of Chironomidae is currently being compiled of which two volumes are already published (Ashe and O'Connor, 2009, 2012). During the compilation of the volume on the fossil Chironomidae, it became evident that two known fossil genera, each with a single species, could not be accommodated within any of the existing 12 subfamilies (one fossil and 11 extant): †Aenneinae Ansorge, Buchonomyiinae Brundin & Sæther, Chilenomyiinae Brundin, Aphroteniinae Brundin, Podonominae Thienemann & Edwards, Tanypodinae Skuse, Usambaromyiinae Andersen & Sæther, Telmatogetoninae Wirth, Diamesinae Kieffer, Prodiamesinae Sæther, Orthocladiinae Kieffer and Chironominae Newman.

The monotypic fossil species †*Dungeyella gavini* Jarzembowski, Azar & Nel, 2008, is known from a single adult female specimen preserved in 125.0 to129.4 Mya Lower Cretaceous Wealden amber from the Isle of Wight in southern England (Mya = Million years ago). This species, with a wing length of only 0.62mm, is amongst the smallest of the known chironomids.

Several distinctive features of the wing preclude its inclusion in any of the known subfamilies. A new subfamily, **†Dungeyellinae subfamily nov.**, is proposed for this distinctive genus and species.

The fossil species †*Cretodiamesa taimyrica* Kalugina, 1976, is known from three specimens (two males, one female) preserved in 83.6 to 86.3 Mya Upper Cretaceous Taimyr amber from northern Siberia in Russia. Diagnostic features of the male include: (i) the antenna having two sclerotized rods with long pubescence that is confined to the outer edges ensuring that the antennal plume lies in a single dimension and (ii) the posteriorly directed non-articulating gonostyli that are fixed in position and cannot be bent inwards. These two features, in combination with the adult female antenna having 14 flagellomeres are unique. Therefore, separate subfamily status, as **†Cretodiamesinae** Kalugina **stat. nov.**, is proposed to accommodate the monotypic species.

The original descriptions and diagnoses of the fossil genera †*Dungeyella* and †*Cretodiamesa* are modified and updated in this paper, taking account of recent changes in terminology.

Homology of wing venation of Diptera (and outgroup Mecoptera) with respect to Chironomidae

Colour coded diagrams of the wing venation of each of the two fossil species are given here to facilitate discussion of relevant features on the respective wings. The colour coding is partially based on that given in Krzemiński and Krzemińska (2003, Figs 1A-G). They used different colours for specific longitudinal sector veins (e.g. green for all radial veins, red for medial veins and black for cubital veins) although the colours used for the crossveins were not consistent (either black or green) and black was also used for the wing margin (including the Costa). Since the Order Mecoptera is considered to be the group from which the Diptera evolved, this colour coding was used to demonstrate how the basal Diptera wing (*op. cit.* Fig. 1G) evolved from those Mecoptera with dipteroidal venation (*op. cit.* Figs 1A-F).

During the 6th International Congress on Dipterology (in Fukuoka, Japan), Saigusa (2006) distributed to all delegates a privately published paper entitled *Homology of wing venation of Diptera* (now freely available online) revising the wing terminology of Diptera and resolving conflicting opinions relating in particular to the posterior veins, including part of the Medial, Cubital and Anal veins. The changes proposed by Saigusa (2006) included: confirmation that the vein $\mathbf{CuA_1}$ of McAlpine (1981) is actually $\mathbf{M_4}$; and $\mathbf{CuA_2}$ is now **CuA**; the "vein" labelled **CuP** (of McAlpine, 1981) is not a true vein, but a pseudovein; that $\mathbf{A_1}$ is now **CuP**; and that $\mathbf{A_2}$ is now $\mathbf{A_1}$ - the names of the corresponding cell names are also affected and changed. These changes are clearly identified in Saigusa (2006, Fig. 8A) and can be easily compared with the outdated McAlpine figure reproduced in Saigusa (2006, Fig. 8B).

At the 8th International Congress on Dipterology (2016 in Potsdam, Germany), the accepted

position for chapters in the then forthcoming *Manual of Afrotropical Diptera* was that all authors would use the older and partially outdated wing terminology first given in the *Manual of Nearctic Diptera* (McAlpine, 1981) which was little changed apart from a few slight modifications in *Contributions to a Manual of Palaearctic Diptera* (Merz and Haenni, 2000) and in the *Manual of Central American Diptera* (Cumming and Wood, 2009). In Potsdam, the senior author lobbied delegates that, for the *Manual of Afrotropical Diptera*, the wing terminology proposed by Saigusa (2006) should be adopted in recognition of the accepted fact that the Mecoptera are the outgroup for the Diptera. By the end of the Potsdam conference, it was agreed that all prospective authors of the *Manual* would use the revised newer terminology. However, in the adult morphology and terminology chapter of the *Manual of Afrotropical Diptera* the vein labelled as "**m-cu**" in Cumming and Wood (2017, Fig. 43a) is incorrect – what is labelled is **not** the crossvein but merely the base of $\mathbf{M_4}$ – the real **m-cu** is correctly indicated and labelled in McAlpine (1981, Fig. 67), Merz and Haenni (2000, Fig. 47) and Saigusa (2006, Fig. 8A).

The same colour coding of Krzemiński and Krzemińska (2003) is used here, with some modifications: (i) to account for more recently adopted changes in terminology of some veins; (ii) acceptance that the "vein" previously termed the posterior Cubitus (**CuP**) is **not** a true vein but merely a fold in the wing that is now designated the pseudovein – the real **CuP** vein is the next posterior vein after the pseudovein, and (iii) the recognition that a continuous Costa around the entire perimeter of the wing is the plesiomorphic basal condition in Diptera, although in most extant, primitive and fossil taxa it is not continuous but is thickened and usually terminates in either the anterior wing margin or near the wing apex.

Another change proposed here, which appears not to have been recognized before, is that the **cubital fork** occurs as two distinct types. It can be either:-

(a) **U-shaped Cubital Fork** (**U-sCuFk**) which is formed where the base (or part of the base) of $\mathbf{M_{3+4}}$ (or $\mathbf{M_4}$) + **m-cu** + **CuA** come together. This is the plesiomorphic (basal or ancestral) condition in Diptera that occurs in some basal Chironomidae. In the outgroup Mecoptera with dipteroidal venation illustrated in Krzemiński and Krzemińska (2003) the cubital fork is **U-shaped** but is more variable, especially in relation to the medial branch component which can be formed by the base (or part of the base) of either $\mathbf{M_4}$, or $\mathbf{M_{3+4}}$ or $\mathbf{M_{5+6}}$. Examples of these Mecoptera with dipteroidal venation are: $\mathbf{M_4}$ + **m-cu** + **CuA** (*op. cit.* Fig. 1F); $\mathbf{M_{3+4}}$ + **m-cu** + **CuA** (*op. cit.* Figs 1C-E); or $\mathbf{M_{5+6}}$ + **m-cu** + **CuA** (*op. cit.* Figs 1A-B). Note that $\mathbf{M_5}$, $\mathbf{M_6}$ and $\mathbf{M_{5+6}}$ do not occur in Diptera.

(b) **V-shaped Cubital Fork** (**V-sCuFk**) which is formed at the fusion point between $\mathbf{M_{3+4}}$ (or $\mathbf{M_4}$) and **CuA**. This is the apomorphic (advanced or derived) condition in Diptera and occurs in most Chironomidae (except some basal taxa).

The colour coding proposed for the Diptera (including Chironomidae) and those Mecoptera with dipteroidal venation is outlined below. This coding may also be applicable to other insect orders but may require some modification for more complex wing venations:-

BLACK = for the entire outer wing margin (proposed here).
ORANGE = for the Costa (proposed here).
YELLOW = for all Scutal veins (as in Krzemiński and Krzemińska 2003).
GREEN = for all Radial veins (as in Krzemiński and Krzemińska 2003).
RED = for all Medial veins (as in Krzemiński and Krzemińska 2003).
PURPLE = for all Cubital veins (proposed here).
BLACK DASHED LINE = for the pseudovein (proposed here).
SKY BLUE = for all Anal veins (as in Krzemiński and Krzemińska 2003).
DARK BLUE = for all Crossveins (proposed here).

Note also that when there are two clearly defined crossveins between **M** and **CuA** the anterior crossvein is called **bm-m** and the posterior crossvein is **m-cu** (see Fig. 2). When only a single crossvein remains between **M** and **CuA,** it is the result of fusion and is called **bm-cu** (see Fig. 5). Much more details on all aspects of the wing venation will be included in the forthcoming fossil chironomid volume.

†DUNGEYELLINAE Ashe, Murray & O'Connor **Subfamily Nov.**
Type-genus: †*Dungeyella* Jarzembowski, Azar & Nel, 2008 by present designation.
Included species: †*Dungeyella gavini* Jarzembowski, Azar & Nel, 2008.

Subfamily and generic diagnosis
Adult female

A small species, wing length 0.62mm, width 0.25mm.

Head: Antenna simple, with 11 flagellomeres, distal flagellomeres beaded except for the large swollen and elongated terminal segment (Fig. 1). Maxillary palp short, 4 segmented, all segments subcylindrical, segment 4 longer and slightly narrower than basal three segments.

Thorax: Tibial spur simple, spur formula 1,1,1; hind tibial comb present, in one row. Tarsomere 4 cylindrical, shorter than tarsomere 5.

Wing (Fig. 2): Twice as long as broad (beyond arculus). Wing membrane with numerous setae between $\mathbf{R_{4+5}}$ and $\mathbf{M_{1+2}}$. Brachiolum with five short and one long setae. First axillary sclerite with one long and four or five short setae. Costa, thickened anterolaterally, not extended, ending at apex of $\mathbf{R_{4+5}}$. Sc present, very short (about one third wing length), not terminating in costa, thin beyond humeral vein. **Rs** forming a short connection between the base of $\mathbf{R_{4+5}}$ and $\mathbf{R_1}$. Radius with only two branches ($\mathbf{R_1}$ and $\mathbf{R_{4+5}}$) - $\mathbf{R_2}$, $\mathbf{R_3}$ and $\mathbf{R_{2+3}}$ absent. $\mathbf{R_1}$ half

length of $\mathbf{R_{4+5}}$. $\mathbf{R_{4+5}}$ short, terminating together with **Costa** in anterior margin, well short of wing apex. Median vein with two branches $\mathbf{M_{1+2}}$ and $\mathbf{M_{3+4}}$ with distal portions of both veins relatively desclerotised. Wing with four crossveins: **h**, **r-m**, as well as two crossveins (**bm-m** and **m-cu**) between **M** and **CuA**. A strong angle on $\mathbf{M_{3+4}}$ at the end of **m-cu**. The connection between the basal part of $\mathbf{M_{3+4}}$, **m-cu**, and the apical part of **CuA** creates a **U-shaped** cubital fork (**U-sCuFk**). Pseudovein present, parallel and close to **CuA**, almost reaching wing margin. **CuA** curved, distally more weakly sclerotised. **CuP** not indicated on figure, possibly present, maybe difficult to orientate the specimen to observe it. Anal area broad with oblique desclerotised anal vein ($\mathbf{A_1}$) - the position and basal termination point of this vein indicates that it is $\mathbf{A_1}$ and not **CuP**. Anal lobe absent.

Abdomen: Abdomen broad. Female genital appendages only partly visible.

Systematic placement

To confirm separate subfamily status it is first necessary to exclude the possibility for placement of †*Dungeyella* in any of the 12 currently recognized subfamilies. Diagnostic characters used in this undertaking are outlined below.

Aphroteniinae, *Usambaromyiinae, Telmatogetoninae, Orthocladiinae* and *Chironominae*. The lack of any crossvein(s) between **M** and **CuA** in all five subfamilies excludes the possibility that †*Dungeyella* (with two such crossveins) could belong to any of these subfamilies.

Chilenomyiinae. In the adult female of *Chilenomyia* Brundin, the antenna (with 14 flagellomeres) and five segmented maxillary palps are both distinctly elongated; legs densely clothed in scale-like setae; **Costa** well extended beyond $\mathbf{R_{4+5}}$ and reaching wing apex. In †*Dungeyella*, the antenna (with 11 flagellomeres) and four segmented palps are both very short; legs without scale-like setae; **Costa** not extended beyond $\mathbf{R_{4+5}}$ and terminating in anterior wing margin well short of wing apex. Based on these differences between the two genera, †*Dungeyella* can be excluded from the Chilenomyiinae.

†*Aenneinae and Tanypodinae*. In all †Aenneinae and the majority of Tanypodinae, $\mathbf{R_{2+3}}$ is forked distally into separate $\mathbf{R_2}$ and $\mathbf{R_3}$ veins but in those few Tanypodinae genera in which $\mathbf{R_{2+3}}$ is absent the wing membrane is densely covered in microtrichia. In †*Dungeyella*, the combination of $\mathbf{R_{2+3}}$ absent and the wing membrane not densely covered in microtrichia excludes it from belonging to either subfamily.

Diamesinae and Prodiamesinae. In both subfamilies, $\mathbf{R_{2+3}}$ is usually present but if absent then $\mathbf{R_1}$ and $\mathbf{R_{4+5}}$ are narrowly separated by no more than the width of a radial vein. †*Dungeyella* can be excluded from both subfamilies because of the combination of $\mathbf{R_{2+3}}$ absent, and $\mathbf{R_1}$ and $\mathbf{R_{4+5}}$ being widely separated from one another.

Buchonomyiinae. In Buchonomyiinae, the combination of a female antenna with 14 flagellomeres; **Costa** and $\mathbf{R_{4+5}}$ well extended towards but not reaching wing apex; wing membrane with numerous setae; and long **Scutal** vein will separate it from †*Dungeyella*. In contrast, †*Dungeyella* has the following: female antenna with 11 flagellomeres; **Costa** and $\mathbf{R_{4+5}}$ abbreviated, terminating in anterior wing margin well short of wing apex; wing membrane with setae restricted between $\mathbf{R_{4+5}}$ and $\mathbf{M_{1+2}}$; and a very short **Scutal** vein - the combination of these characters will exclude it from Buchonomyiinae.

Podonominae. In Podonominae the combination of: the wing base lacking setae on the first axillary sclerite; the long **Costal extension** reaching or almost reaching the wing apex; and the very long vein $\mathbf{R_{4+5}}$, will distinguish podonomine wings from †*Dungeyella*. For the same features, †*Dungeyella* has: five or six setae on the first axillary sclerite; **Costal extension** is absent and $\mathbf{R_{4+5}}$ is very short. These features, taken together will exclude †*Dungeyella* from the Podonominae.

Jarzembowski *et al*. (2008: 290) remarked that "The wing venation of *Dungeyella* n. gen. is rather similar to that of *Libanochlites* Brundin from the Lower Cretaceous amber of Lebanon (Veltz *et al*., 2007) except that vein R_{4+5} is shorter". However, in contrast to that opinion, apart from the fact that both are chironomid wings there is little similarity between them. Differences on the wing of †*Libanochlites* (Brundin, 1976, Fig. 4) include: a long extension on the **Costa** reaching the wing apex; **Costa** very long; $\mathbf{R_{4+5}}$ very long and curved upwards; one crossvein (**bm-cu**) between **M** and **CuA**; and a **V-shaped** cubital fork (**V-sCuFk**) is present. Conversely, the opposite conditions are found in †*Dungeyella*: **Costa** lacking an extension; **Costa** much shorter; $\mathbf{R_{4+5}}$ short and straight; two distinct crossveins (**bm-m** and **m-cu**) between **M** and **CuA**; and a **U-shaped** cubital fork (**U-sCuFk**) is present. Cranston *et al*. (2012) also reaffirmed that †*Libanochlites* belongs in the Podonominae and not to the Tanypodinae as interpreted by Azar *et al*. (2008).

In the key to Holarctic chironomid subfamilies in Oliver and Dillon (1989), †*Dungeyella* keys to either the Buchonomyiinae or the Podonominae because of: the presence of a crossvein between **M** and **Cu**, the absence of $\mathbf{R_{2+3}}$ and a wide space separating $\mathbf{R_1}$ and $\mathbf{R_{4+5}}$. However, in this key it does not fit satisfactorily in either subfamily. In the original description of †*Dungeyella*, Jarzembowski *et al*. (2008) indicated that its subfamily placement was uncertain but that it showed some affinities, in particular, with the Buchonomyiinae and Podonominae noting it as a "tiny buchonomyiine/podonomian with specialised wing venation". Jarzembowski *et al*. (2008) highlight one important character, the presence of setae on the first axillary sclerite of the wing base, a condition which occurs in both †*Dungeyella* and Buchonomyiinae supporting affinities between them. For †*Dungeyella*, Jarzembowski *et al*. (2008) also mention

"a strong angle on M_{3+4} at the end of m-cu" – as indicated in Fig. 2 and in the text this feature is part of the **U-shaped** cubital fork (**U-sCuFk**).

The above data support the fact that †*Dungeyella* cannot be accommodated in any of the existing subfamilies and thus a new subfamily **†Dungeyellinae subfam. nov.** is created here.

In both †*Dungeyella* and †Aenneinae, the most distinctive features on the wing are the presence of two very clearly defined crossveins (**bm-m** and **m-cu**) between **M** and **CuA** and a distinct **U-shaped** cubital fork (**U-sCuFk**). Among extant chironomids, the only genus known in which these features are equally clearly defined is in *Afrochlus* Freeman (subfamily Podonominae) as figured in Cranston and Edward (1998, Fig. 6). In a few other Podonominae, and in one or two other basal subfamilies, these features, when they occur, are much less clearly indicated. The presence of two clearly defined crossveins and a **U-shaped** cubital fork (**U-sCuFk**) is the plesiomorphic basal condition in Chironomidae. Other features indicating a basal position for †Dungeyellinae include those shared diagnostic wing features (the presence of crossvein(s) between **M** and **Cu**, the absence of $\mathbf{R_{2+3}}$ and a wide space separating $\mathbf{R_1}$ and $\mathbf{R_{4+5}}$.) which cause Buchonomyiinae, Podonominae and †Dungeyellinae to key out together. Another important character shared between Buchonomyiinae and †Dungeyellinae is the presence of setae on the first axillary sclerite on the wing base – this feature is regarded as plesiomorphic. Other features in †Dungeyellinae which are considered apomorphic include the presence of a very short **Scutal vein** and that both the **Costa** and $\mathbf{R_{4+5}}$ terminate together on the anterior wing margin (well short of the wing apex). Taking into account all the above data ,†Dungeyellinae is regarded here as the apomorphic sister group to those subfamilies which are considered to be the most basal in Chironomidae i.e. †Aenneinae + Buchonomyiinae + Chilenomyiinae + Aphroteniinae + †Dungeyellinae (Fig. 7). There is a strong possibility that if or when the unknown male of †*Dungeyella* and more female specimens are found, additional taxonomic information may be available which might help confirm or better resolve its phylogenetic placement.

†CRETODIAMESINAE KALUGINA, 1976, STAT. NOV.

†Cretodiamesini Kalugina, 1976a: 87 (as a tribe of Diamesinae) - English translation in Kalugina (1976b).

Type-genus: †*Cretodiamesa* Kalugina, 1976.

Included species: †*Cretodiamesa taimyrica* Kalugina, 1976.

Subfamily and generic diagnosis

Adult male and female

A medium sized species, wing length 1.51mm in male, similar length in female.

Head: Eyes bare with long narrow drawn out dorsomedial extensions in male (Fig. 3), extensions lacking in female. Maxillary palps 5 segmented, segment 5 long and almost equal to the combined lengths of segments 2 to 4. *Male antenna* (Fig. 3). Male antenna with 8 segments (scape, large spherical pedicel and 6 flagellomeres), flagellomeres 1-5 greatly abbreviated, washer-like in shape. Flagellomere 6 (terminal segment) very large, distinctly shaped, with two arcuate sclerotized rods, each pubescent on outer edge and with a non-pubescent (colourless or white) membrane stretched between the rods. These rods thin out and join up apically, forming a relatively small offset terminal lobe - this lobe may be a remnant of flagellomere 7 although there is no membrane separating it from the rest of flagellomere 6. Terminal lobe colourless, forming an obtuse angle with the longitudinal axis of antenna. The long antennal pubescence is located along the sides of the large flagellomere 6 (i.e. on the outer edge of each rod) and therefore the male antennal plumage is flat and confined to a single plane. Antennal ratio 6.0. *Female antenna* (Fig. 4). Female antenna with 16 segments (scape, pedicel and 14 flagellomeres), flagellomeres 1-14 small, similar in size, shape and bead-like (i.e. moliniform), 11-14 darker than flagellomeres 1-10.

Thorax: Postnotum with well developed median groove. Single spur on fore tibia, two spurs of approximately similar length on middle and hind legs, one pseudospur apparently present on tarsomeres 1-2 of middle and hind legs. Spiniform spurs present on the tibia of the fore, middle and hind legs and on tarsal segments 1-2 of the middle and hind legs. Tarsomere 4 cylindrical, longer than tarsomere 5 on fore and hind legs, equal in length on middle legs. Claws simple. Leg ratio 0.5 in male, 0.48 in female.

Wing (Fig. 5): Wing length (in male): 1.51mm. Wing transparent with fine punctuation in both male and female, female similar except with sparse short macrotrichia near wing tip and wing, as is usual, somewhat broader in width. **Radius** with three branches ($\mathbf{R_1}$, $\mathbf{R_{2+3}}$ and $\mathbf{R_{4+5}}$), all terminating in the **Costa**. Free end of **Costa** long, extended well beyond apex of $\mathbf{R_{4+5}}$ and terminating near wing apex. $\mathbf{R_{2+3}}$ distinct, weaker than $\mathbf{R_1}$ and $\mathbf{R_{4+5}}$ and mostly medially located between these two veins, basally $\mathbf{R_{2+3}}$ is very close to $\mathbf{R_{4+5}}$. $\mathbf{R_s}$ not distinctly separate, essentially located at point where the bases of $\mathbf{R_{4+5}}$ and $\mathbf{R_{2+3}}$ together fuse with the base of $\mathbf{R_1}$. **Sc** long, extending beyond $\mathbf{R_s}$, apically fading-out and terminating just short of the **Costa**. Crossvein **r-m** between **R** and **M** distinct. A single crossvein, **bm-cu** between **M** and **CuA** is present. The fusion point between $\mathbf{M_{3+4}}$ and **CuA** creats a distinct **V-shaped** cubital fork (**V-sCuFk**).

Male Hypopygium (Fig. 6): Laterosternite IX and sternite IX separate (based on four illustrations of the hypopygium in dorsoventral, lateral, ventrolateral and ventral views - Kalugina 1976a, Figs 3 k-n). Posterior margin of Tergite IX gently rounded - a rounded structure located between the posterior margin of the tergite and the bases of the gonocoxites is apparently an air bubble. Gonocoxites oblong, about twice as long as broad, each with a spine-like process medially on the inner margin. Gonostyli pale yellow, resembling mittens, each with

thumb-like process on dorsal side, mega seta absent. The posteriorly directed gonostyli are fixed in position and neither can be independently reflected towards or away from the gonocoxite.

Female Genitalia: Not described or illustrated in Kalugina (1976a).

Systematic placement

Kalugina (1976a) noted that †*Cretodiamesa* occupies an intermediate phylogenetic position showing affinities, in particular with the Tanypodinae on one side of the chironomid phylogenetic tree and the Diamesinae + Orthocladiinae on the other side. In creating the tribe †Cretodiamesini, Kalugina (1976a) favoured placing it in the Diamesinae as the affinities seemed closer.

In the subfamily keys of Oliver and Dillon (1989) and Sæther *et al*. (2000), †Cretodiamesinae readily keys to the couplet including the Diamesinae and Prodiamesinae based on the combination of several diagnostic characters including (i) wing with crossvein "M-Cu" [now = **bm-cu**] present, (ii) $\mathbf{R_{2+3}}$ present and (iii) $\mathbf{R_{2+3}}$ simple (i.e. not forked into separate $\mathbf{R_2}$ and $\mathbf{R_3}$ branches) and wing membrane either bare or with at most a few setae on distal half. Another important feature is that the male laterosternite IX and sternite IX are separate. These features combined indicate a placement in the semifamily Chironomoinae (Telmatogetoninae + Diamesinae + Prodiamesinae + Orthocladiinae + Chironominae).

Features indicating a relationship with the semifamily Tanypodoinae (Podonominae + Tanypodinae + Usambaromyiinae) include (i) female antenna with 14 flagellomeres and (ii) male antenna with an offset terminal lobe (possibly representing flagellomere 7) which Kalugina (1976a) noted is similar to that found in some Tanypodinae.

The very peculiar male antenna and the rearwards directed gonostyli fused to the gonocoxites are regarded here as unique autapomorphies for †Cretodiamesinae - the latter feature is not the same as or is in any way related to the fusion between gonocoxites and gonostyli found in the Chironominae.

In conclusion, the available evidence, including a female antenna with 14 flagellomeres in †*Cretodiamesa* while the remaining subfamilies of the semifamily Chironomoinae have 13 flagellomeres or less, indicates that †Cretodiamesinae occupies the most basal position in the semifamily Chironomoinae, i.e. †Cretodiamesinae + Telmatogetoninae + Diamesinae + Prodiamesinae + Orthocladiinae + Chironominae (Fig. 7).

A re-examination of the original type material using more advanced techniques now available for examining amber fossils, may reveal additional taxonomic details, not discernable at the time when the original description by Kalugina (1976a) was published, that may help confirm its phylogenetic placement.

Phylogenetic relationships between chironomid subfamilies

Phylogenetic relationships between the 14 chironomid subfamilies (Fig. 7) are based partly on Ansorge (1999), Ashe and O'Connor (2009, 2012), Cranston *et al*. (2012) and this paper (for †*Dungeyellinae* and †*Cretodiamesinae*). In Figure 7, solid lines showing the relationships between nine of the extant subfamilies are based on DNA analysis in Cranston *et al*. (2012). Dotted lines (Fig. 7) are used to show the relationships based on morphology of the remaining five subfamilies (two extant Chilenomyiinae and Usambaromyiinae – DNA not yet available and three fossil subfamilies) to the nine subfamilies treated in Cranston *et al*. (2012).

Ansorge (1999) placed Aenneinae as the basal-most sister group to all other chironomid subfamilies and this is followed here. Based on morphology of the adult males and females the Usambaromyiinae are considered here to be the apomorphic sister-group of Tanypodinae + Podonominae - Ashe and O'Connor 2012: 4-5 plus removal here of Chilenomyiinae to a more basal position. Ashe and O'Connor (2012: 4) indicated that Chilenomyiinae may occupy a more basal position in the phylogeny, between the Buchonomyiinae and Aphroteniinae – this position is favoured here. More details on this line of reasoning will be given in the forthcoming volume on fossil Chironomidae (Ashe and O'Connor, in prep.).

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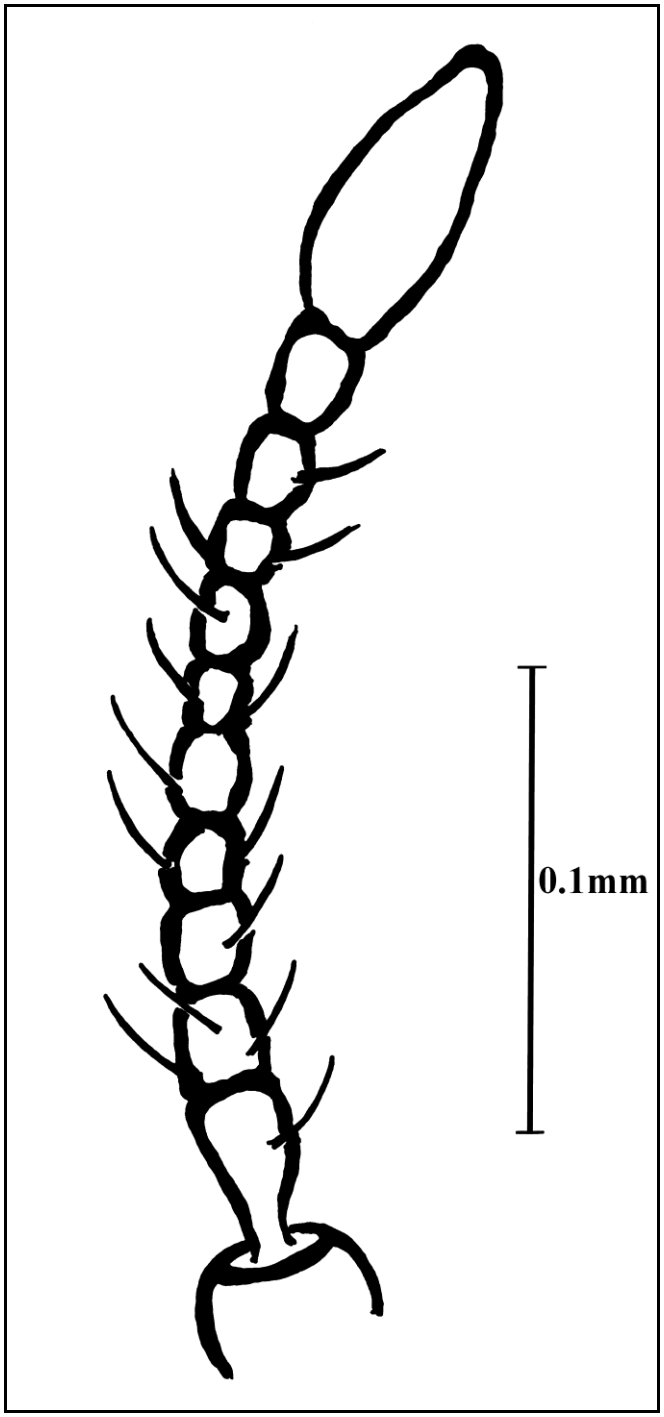

FIGURE 1. Antenna of adult female of †*Dungeyella gavini* (redrawn after Jarzembowski *et al*. 2008, Figure 3C).

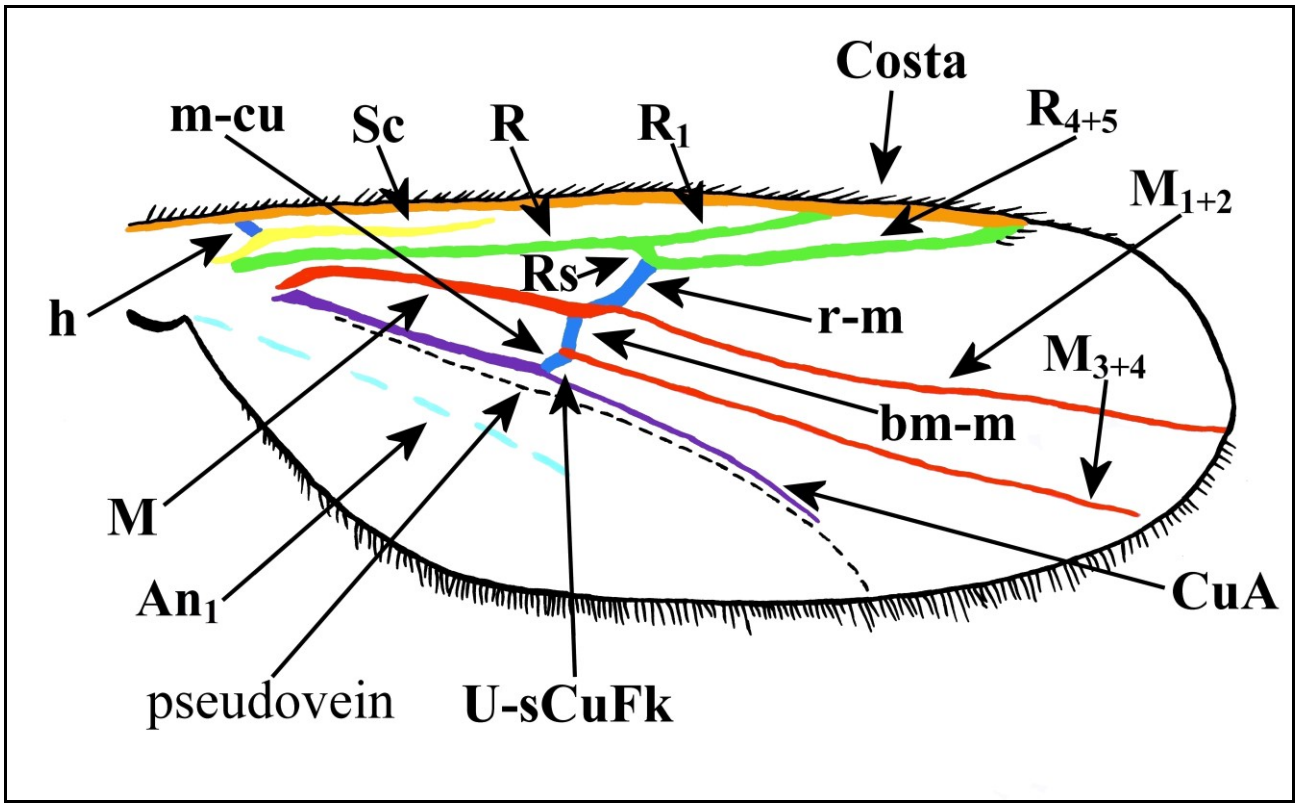

FIGURE 2. Wing of adult female of †*Dungeyella gavini* (redrawn after Jarzembowski *et al*. 2008, Figure 3A). Wing is modified and colour coded. Colour coding for all veins is explained in the text.

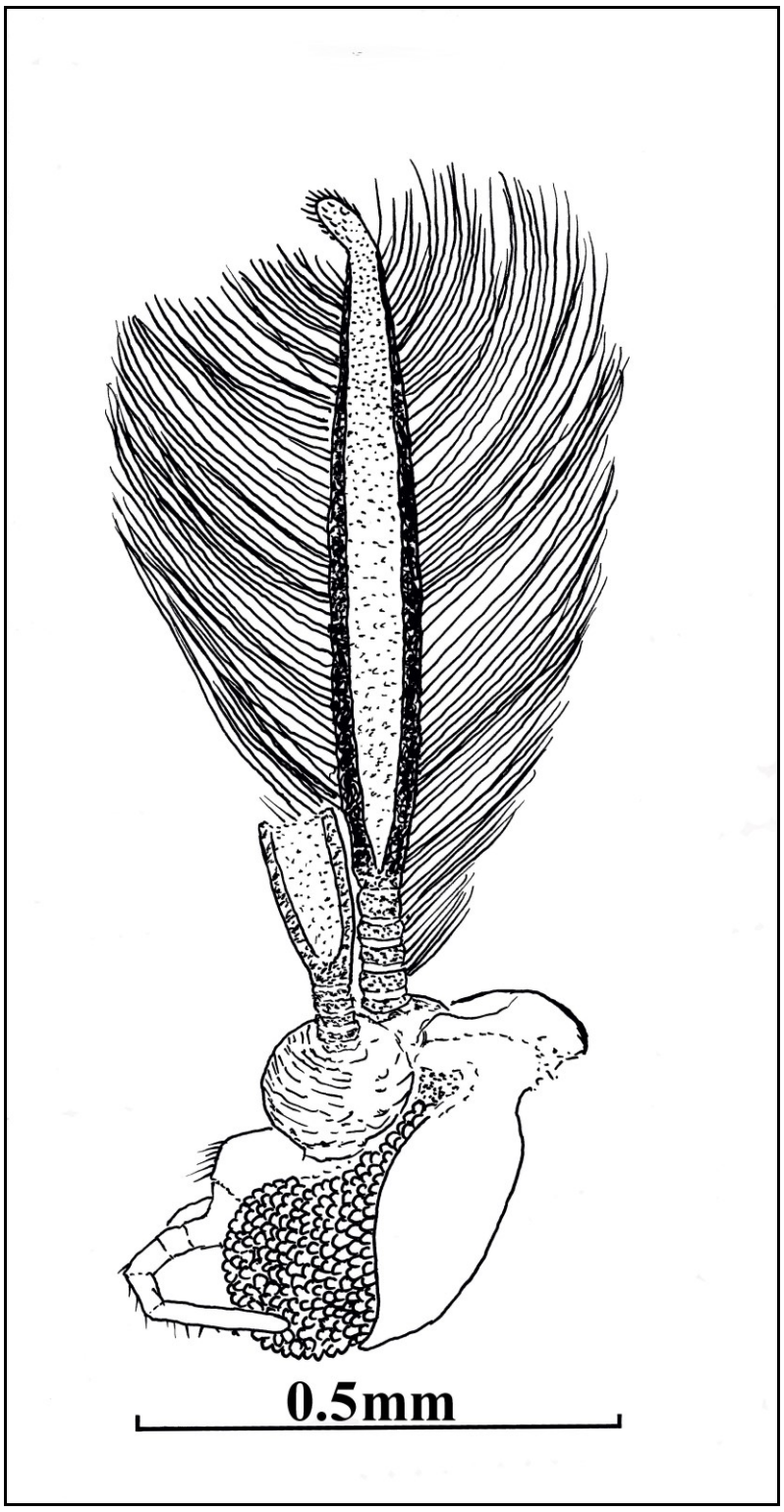

FIGURE 3. Head of adult male of †*Cretodiamesa taimyrica* (redrawn after Kalugina 1976a, Figure 2) showing eye with dorsomedial extension and antenna.

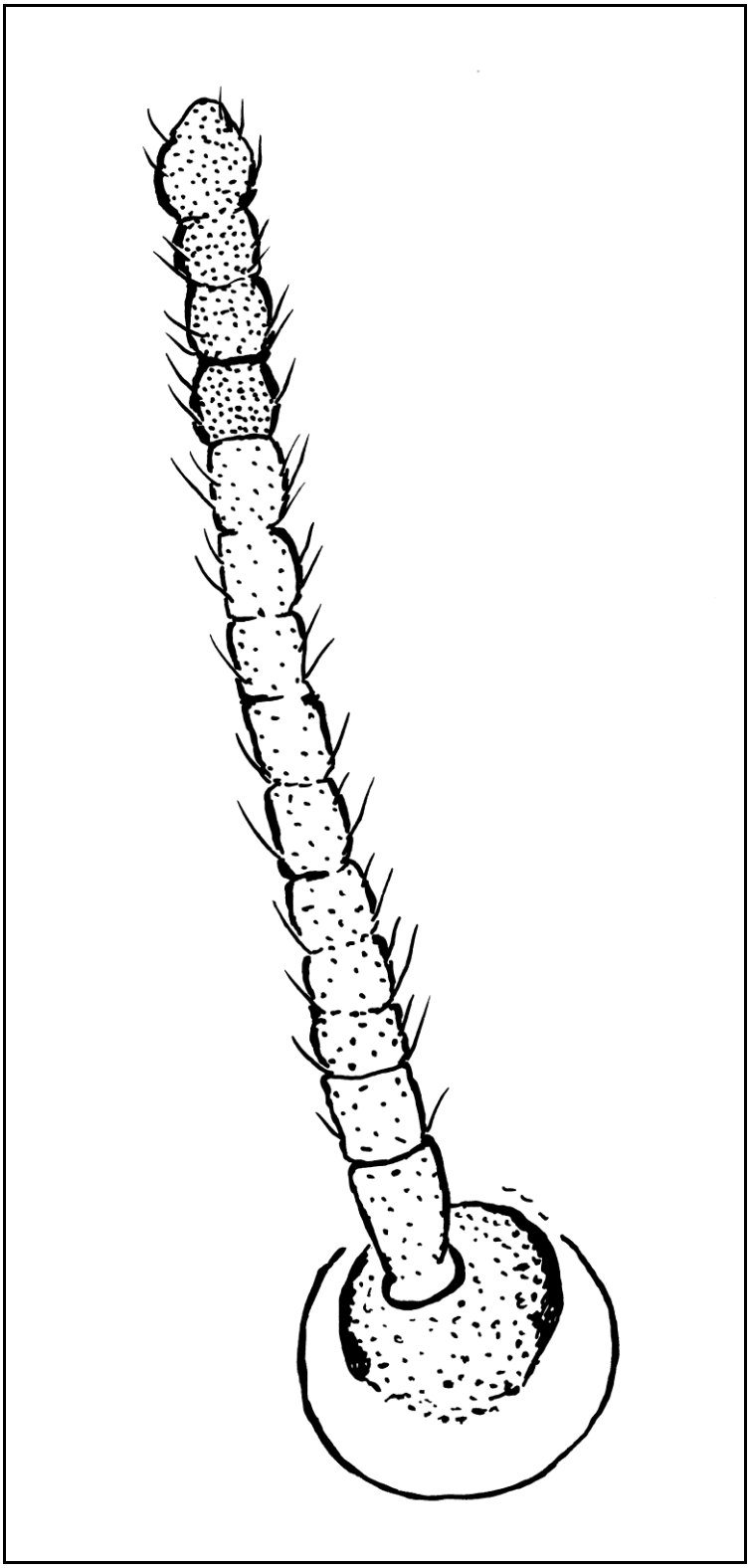

FIGURE 4. Antenna of adult female of †*Cretodiamesa taimyrica* (redrawn after Kalugina 1976a, Figure 4a).

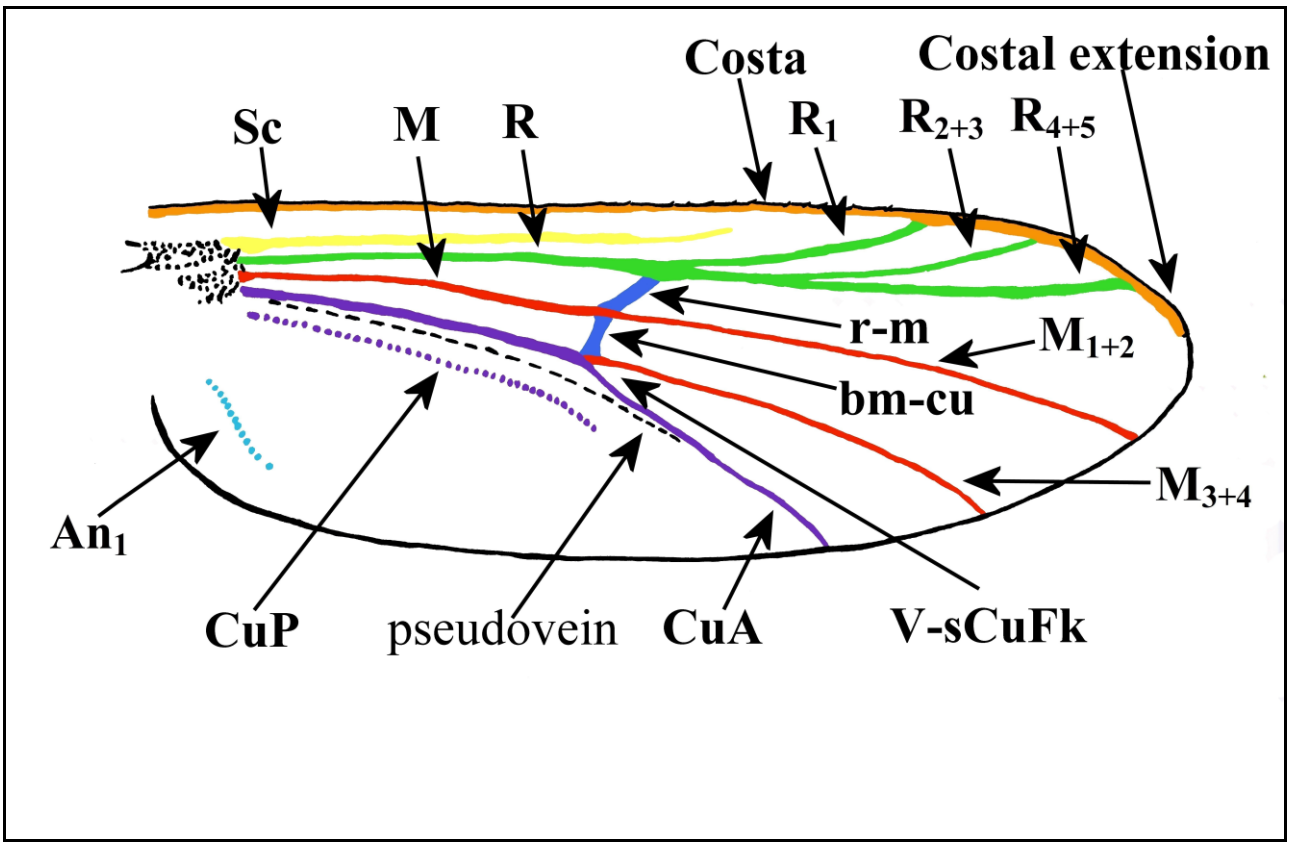

FIGURE 5. Wing of adult male of †*Cretodiamesa taimyrica* (redrawn after Kalugina 1976a, Figure 3a including some details from wing of adult female, Figure 4b). Wing is modified and colour coded. Colour coding for all veins is explained in the text.

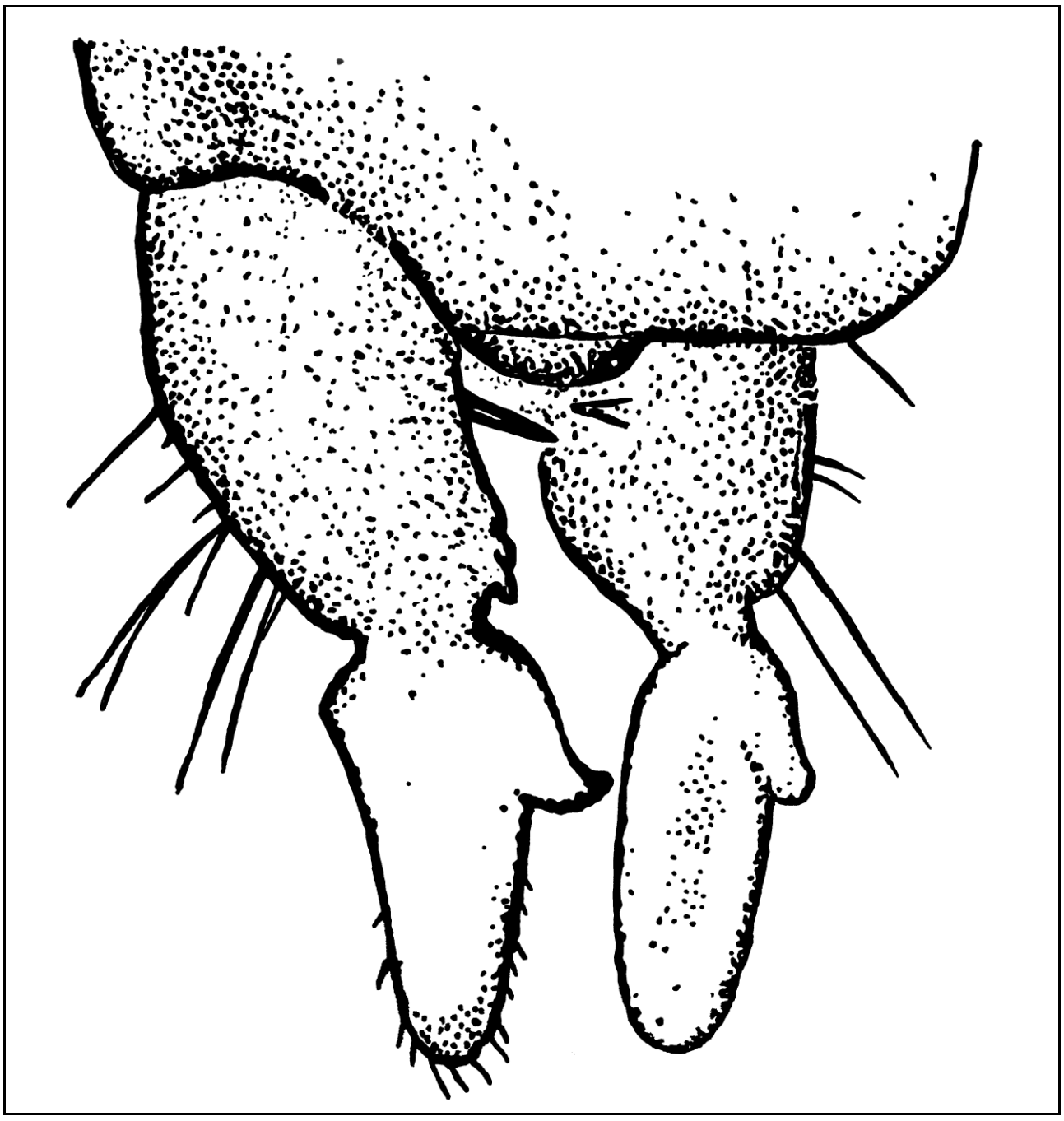

FIGURE 6. Hypopygium of adult male of †*Cretodiamesa taimyrica* (redrawn after Kalugina 1976a, Figure 3o).

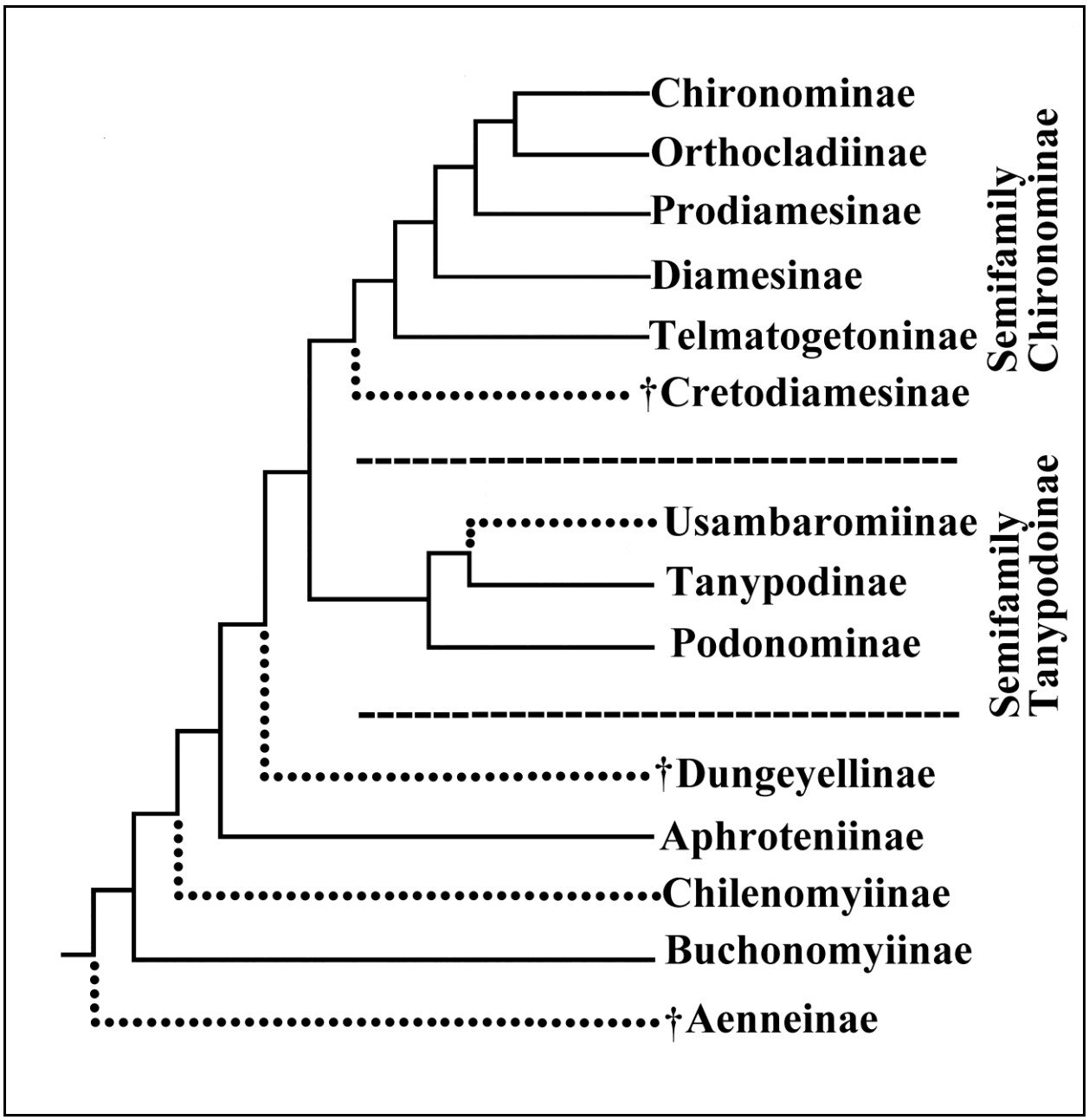

FIGURE 7. Phylogenetic relationships between the 14 chironomid subfamilies. Solid lines show the relationships between nine of the extant subfamilies that are based on DNA analysis in Cranston *et al*. (2012). Dotted lines are used to show the relationships to these nine subfamilies based on morphology in the remaining five subfamilies - two extant (Chilenomyiinae and Usambaromyiinae - DNA not yet available) and the three fossil subfamilies. Dashed lines are used to separate the Semifamily Chironomoinae from the Semifamily Tanypodoinae and the latter from the basal-most five subfamilies.

BOOK REVIEW

Atlas of the hydrophiloid beetles of Britain and Ireland by G. N. Foster, D. T. Bilton, M. Hammond and B. H. Nelson. FSC Publications, Telford, U.K. 2018. ISBN 978 1 906698 63 8. 175 x 250mm format, soft cover. 306pp including 98 maps, 41 photographs and four graphs. Available from FSC Publications at <www.field-studies-council.org/publications> for £25 plus postage.

Thanks to the dedication of a number of people, and in particular Garth Foster and Brian Nelson, water beetles are now sufficiently well-known in Ireland that their conservation status can be reliably established based on up-to-date data. It allows the bold statement to be made in the introduction that "any conservation effort [in wetlands] not taking them into account must be considered suspect." With this book, and its recently published siblings, we now have easy access to an important ecological group from wetland habitats.

The atlas is comprehensive and well-produced, and will in practice be a companion volume to the 2014 Royal Entomological Society key to hydrophiloid beetles (Foster, Bilton and Friday, 2014) (which excuses the lack of beetle photographs in this book other than one on p. 8). It is the second in a trilogy which summarises and maps water beetle habitat and distribution (the first (Foster, Bilton and Nelson, 2016) was reviewed from an Irish perspective by O'Connor (2018)). The core of the atlas is the series of 97 10km^2 species distribution maps (and accounts in the case of a very rare species and members of a species complex), covering 103 species of hydrophiloid beetles, 70 of which have been recorded from Ireland. Each map is accompanied by detailed text on taxonomy and identification, life-cycle, habitats and distribution and in many cases natural enemies. Photographs of the habitats are provided, noting the species recorded therein, for many species. The introductory section of the book contains acknowledgement of 566 named recorders, an overview of recording, sampling and hydrophiloid biology, with an up-to-date table of all Hydradephaga and Hydrophiloidea with their occurrence in Great Britain, Ireland, the Isle of Man and the Channel Islands, and their respective conservation status in Britain and Ireland. A bibliography of 603 references, and a full generic and species index is also provided.

There is much to like about this book. The most striking is the extent of spatial coverage of Irish distribution data, remarkable for an atlas of non-charismatic invertebrates. Flight ability is mentioned for each species, as well as many other aspects of biology (such as microbial parasites) not normally recorded. All *Cercyon* species are covered, not just the aquatic species. The statuses of all Irish species are tabulated, and the synonyms used by Johnson and Halbert's (1902) list are mentioned. Habitat range can be seen from the substantial number of habitat photographs, with many from Ireland. There are also many fascinating snippets of tangential information (for instance, I did not know that John Owen collected beetles in the 1950s before

he emigrated to Australia). Last but not least, the book is of a convenient size that handles easily.

Ireland is especially well proportionally represented compared to Great Britain, which is usually not the case for an insect atlas. However, there are some questions. *Sphaeridium bipustulatum* is mapped with one recent record (in County Clare), but it was also recorded from five localities by Johnson and Halbert (1902). The text mentions these, but they are not mapped, presumably because, as mentioned, the museum material has not been re-examined. However, have the Johnson and Halbert records for *S. marginatum* been mapped? But this question is rather mean-spirited as *Sphaeridium* are dung beetles rather than strict water beetles (which is the main focus of the series), and it is particularly welcome that the terrestrial species have been treated equally to their aquatic relatives in this volume.

Another question arises from the recent Kerry record of *Enochrus quadripunctatus* in Map 63, as the text mentions that this is not confirmed and this species is absent from the Irish list in Table 1. As record sources are presumably in the website databases, I went searching for this possible record. The Biodiversity Ireland database does not mention this species (other than as a synonym (sensu auctt. partim) for *E. fuscipennis* (Thomson) but, unexpectedly, the NBN database map has an accepted record from near Kindrum Lough in North Donegal. I do not wish to enter the debate about whether all records of rare species should be published or not, but this provides a notable example of a database record which can be confusing.

Finally, I wonder about the use of the category 'regionally extinct' for species which were recorded in the past but which have not been rediscovered. This eliminates the species from any conservation consideration, but, if rediscovered, it would be most likely classified as endangered, the highest conservation rating. An example is the moss species *Calypogeia suecica*, classed as regionally extinct as it had been searched for, but which has been recently rediscovered in Killarney National Park by Rory Hodd and Joanne Denyer. Could *Hydrochus angustatus* be in a similar position? Would it be considered to be extinct in the Isle of Man if it had not been rediscovered there in 2009?

There are also a few minor errors, but none that cannot be easily coped with. For instance: the reference to the hydrophiloid key (Foster, Bilton and Friday, 2014) should have included the part number (5b), as the volume (4) refers to all Coleoptera; also this work is cited as Foster *et al*. (2015) on p. 18. The page numbers referred to in the contents are out by two and four pages for many genera (an easy thing to happen as pages expand in the final proof!), e.g. p. 254 is cited for *Megasternum* when it should be p. 250. The caption to Fig. 6 cites *Anacaena lutescens*, when it should be *Helophorus obscurus*. On p. 8, *Spercheus emarginatus* was last seen in England in 1956 according to the text, but 1954 according to the figure caption.

Notwithstanding the above minor points, this excellent and stimulating book can be unhesitatingly recommended to entomologists, aquatic biologists, and ecologists.

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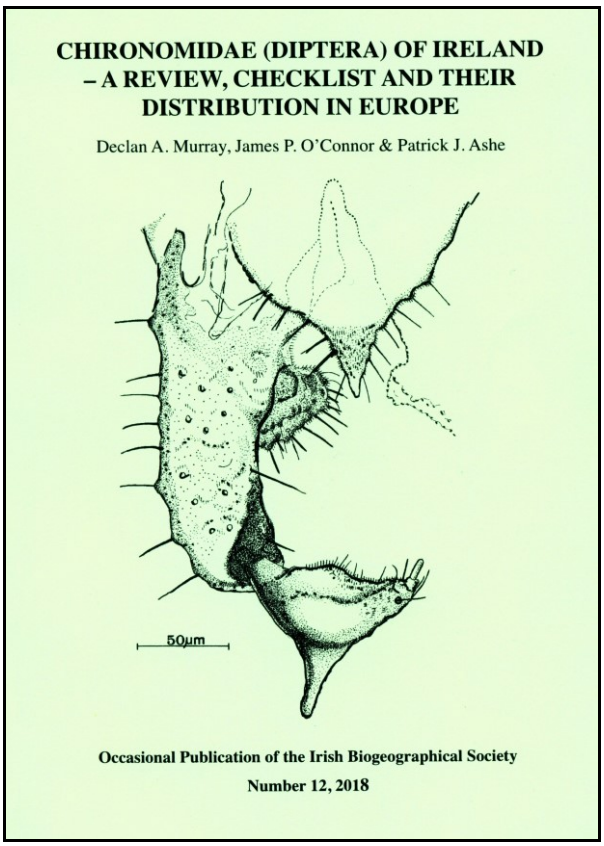
Jervis A. Good

NEW PUBLICATION



Chironomidae (Diptera) of Ireland – a review, checklist and their distribution in Europe by Declan A. Murray, James P. O'Connor and Patrick J. Ashe.

Published on the 18 May 2018 by the Irish Biogeographical Society in association with University College Dublin and the Environmental Protection Agency. *Occasional Publication* **Number 12**. ISBN 978-0-9550806-9-2. Thread Sewn. Size A5. 416 pages. Text with 1042 figures (black and white), frontispiece and 25 plates (colour and black & white).

Studies on the Irish Chironomidae are briefly reviewed. A checklist of 520 species and 20 species level taxa, is provided. *Chironomus striatus* Strenzke, 1959 is removed from the Irish list. Summary distribution data are given with accompanying maps depicting the known Irish and European distributions for the species currently on record from Ireland. Data from 22,468 species records up to December 2017 from 1,247 locations in the 32 Counties and 40 hydrometric areas and some off-shore islands of Ireland are summarised.

Copies may be obtained by writing to The Irish Biogeographical Society c/o Dr James P. O'Connor, National Museum of Ireland, Kildare Street, Dublin 2, Ireland or by e-mail to: the Treasurer Mr John Walsh <ampersandwalsh@gmail.com> or the Editor Dr James P. O'Connor <joconnor@museum.ie>. Price €20 or £15, plus postage & packaging outside Ireland.

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