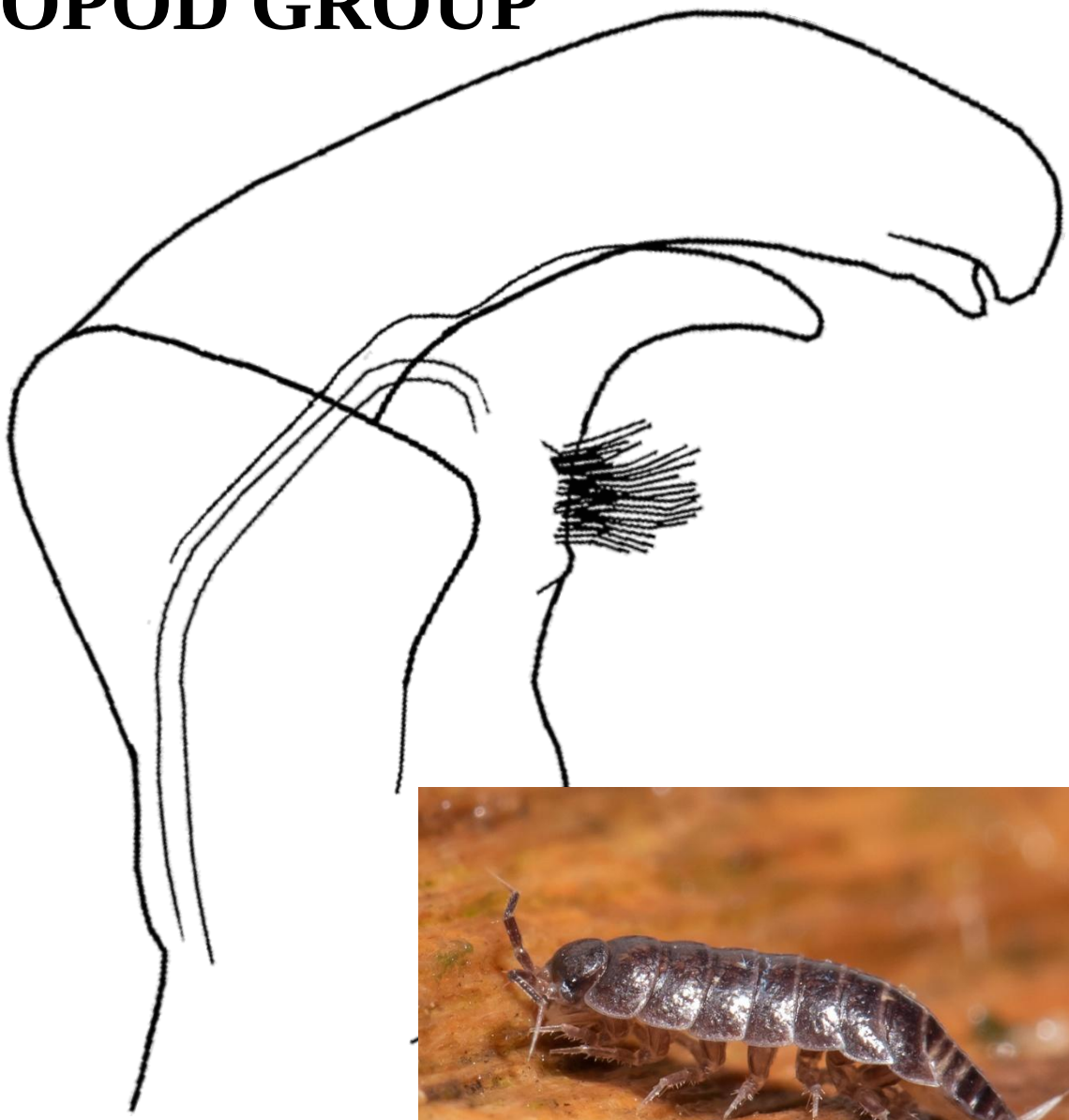
ISSN 2513 9444

Bulletin of the BRITISH MYRIAPOD and ISOPOD GROUP



Volume 35 (2023)

Bulletin of the British Myriapod & Isopod Group: Volume 35 (2023)

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Cover illustration: *Polydesmus taranus* Verhoeff, male gonopod; a millipede new to Britain.

Cover photograph: *Hyloniscus riparius* (C. Koch); a woodlouse new to Britain. © Gary Farmer.

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ISSN 2513-9444

Editorial

Looking back (via the BMIG website) at old volumes of the BMIG Bulletin and its predecessors, the BMG Bulletin (1972 – 2000) and Isopoda (1987 – 1990), a period of more than fifty years, makes one realise how much has been achieved, how our myriapod and isopod fauna has increased in terms of species and how much has been written about it.

This year a milestone was reached with the publication of the long-awaited Atlas of the Centipedes of Britain and Ireland written by one of our editors Tony Barber. This significant piece of work is the culmination of many years of dedication and perseverance by Tony and will surely be an important reference for many years to come.

Publications such as the centipede atlas lay "marks in the sand" regarding the status of our fauna at a particular point in time, a useful setting down of the situation up until this point and the building of blocks for the future. However, as this volume of the bulletin shows, the situation is ever-changing. We include here articles giving details of two new species for our fauna, one millipede and one woodlouse. The newly discovered *Polydesmus taranus* is described and details given on how to distinguish it from the very similar *Polydesmus asthenestatus*. The find of the new woodlouse to Britain *Hyloniscus riparius* is also documented. Every year it seems there are new species being added to the British list.

In addition, we continue to gain information about the ecology of our species, and this is represented here by an article on aspects of the ecology of the millipede *Trachysphaera lobata,* one of our rarest and most threatened species. The Bulletin has consistently included information about structural abnormalities, particularly in centipedes and here we have an illustration of an abnormal, presumably damaged, female *Lithobius forficatus* from London.

Our present-day knowledge continues to build on the foundation of others, and Britain has a legacy developed from a number of prominent scientists working on our groups. One whose name is regularly associated with some of our more common species of myriapod is the naturalist W.E. Leach (1790-1836), who first formally separated the myriapods from the arachnids and crustaceans as a group of their own. We include here an article outlining some details of his life, together with some corrections to species and higher taxa names and their dates. A short consequential note on millipede names follows this. Sadly, in 2022 we lost the prominent Norwegian myriapodologist Bjarne Meidell (1943-1922) and we are also saddened to note the death of Jean-Paul Mauriès of Paris, one of the founders of the international myriapod group C.I.M. (Centre International de Myriapodologie). We include an obituary of Bjarne and we hope an obituary of Jean-Paul will follow in due course; the influence of both extended to our shores.

Regularly we look outside the boundaries of our countries to compare and contrast with the faunas elsewhere and include faunistic accounts where they may be of interest to British readers. David Cabanillas of Spain reports on centipedes collected from various locations in Europe and colleagues from Belarus & Poland present some myriapod records from the latter country. Back on our own shores the Bulletin is the vehicle for presenting information about species found during our annual field meetings and this year's reports are of two pre-covid ones in 2018 (Longtown; South Wales & Herefordshire and 2019 (Newton Stewart, SW Scotland). Hopefully, those for 2022 (Preston Montford) and 2023 (Cannington) will be ready for publication rather more quickly.

Hyloniscus riparius (C. Koch, 1838); a pygmy woodlouse new for the UK from the Worcestershire Avon (Isopoda: Oniscidea: Trichoniscidae)

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Abstract

The woodlouse *Hyloniscus riparius* (C. Koch) is reported new for the UK from a river-side meadow in the Vale of Evesham, Worcestershire. A brief description with figures is provided to enable identification and information is given about habitats and microsites inhabited. This central European species is almost certainly an unintentional, probably recent, introduction into the Vale. Additional British and Irish sites for this 'expansive species' must await discovery.

Key words: Isopoda, Oniscidea, *Hyloniscus riparius*, new for UK, identification, habitats, distribution.

Introduction

In Britain and Ireland the 'pygmy woodlice' of family Trichoniscidae ((Isopoda: Oniscidea: section Synocheta) are currently represented by 16 native or naturalised species (i.e. species capable of breeding outdoors) (Gregory, 2009). As the vernacular name suggests these are generally small species, many 4 mm or less in length. Their elusive, often soil dwelling, habits and difficulty of identification (often requiring dissection of male pleopods) mean they are relatively under recorded compared to the larger surface dwelling woodlice of section Crinocheta.

The genus *Hyloniscus* Verhoeff, 1908 (Isopoda: Trichoniscidae) contains 26 species mainly distributed across eastern and central Europe (Schmalfuss, 2003). Only one species, *Hyloniscus riparius* (C. Koch, 1838) has reached Western Europe, a species with a very widespread distribution across central and eastern Europe and which has been introduced into North America (Schmalfuss, 2003). In north-west Europe it has been expanding its range in recent decades (Wijnhoven, 1993; Berg *et al*., 2008; De Smedt *et al*., 2020). For example, in The Netherlands *H. riparius* was originally only known from inside glasshouses of the Botanic Gardens at Utrecht in 1942 (Holthuis, 1945) and was not recorded outdoors in the 'wider countryside' until 1991 (Wijnhoven, 1993), but within 17 years had become widespread across much of the country (Berg et al., 2008). Following its discovery in The Netherlands Bilton (1993) suggested "a strong possibility that the species may be 'hiding' in the UK". Despite a false alarm along the River North Esk in Scotland in 2010, which turned out to be an unexpected outlying population of *Oritoniscus flavus* (Budde-Lund) (Sivell & Gregory, 2015), there have been no reported sightings in Britain nor Ireland.

Here we report the first discovery of *Hyloniscus riparius* (C. Koch, 1838) in Britain; the first trichoniscid 'pygmy woodlouse' since the discovery of *Trichoniscoides helveticus* (Carl) over three decades earlier (Hopkin, 1990; Gregory, 2009).

The discovery

On 12th April 2022 while searching under flood debris at Haines Meadows, Wick, Worcestershire, adjacent to the river Avon (SO968470, VC37) , one of us (GF) noticed many small, fast- moving, deep purple woodlice. They were similar in appearance to *Trichoniscus pusillus* agg., but something about them wasn't quite right. A few were captured for closer inspection. The following day additional

specimens were found on the river bank on the opposite side of the Avon at Lower Moor under scattered flood debris (Farmer, 2023).

Using the AIDGAP key (Hopkin, 1991) these were readily keyed by GF to *Oritoniscus flavus* (Budde-Lund), due to the eye comprising a single ommatidium, which ruled out the ubiquitous *Trichoniscus pusillus* agg. In Britain *O. flavus* (which is widely distributed across south-east Ireland) is only known as an introduction near Llanelli in south Wales and along the River Esk near Edinburgh (Gregory, 2009; Maguire, 2020). This species was obviously more widespread than originally thought, so could it have gone undetected in English river valleys?

Images were sent to SJG for confirmation who thought that despite the eye clearly comprising a single ommatidium they didn't look quite right for *O. flavus*. SJG forwarded the images to Warren Maguire who's familiar with this species in Scotland (Maguire, 2020) who agreed that they were not *O. flavus*, but possibly *Hyloniscus riparius*. Thus, a site visit was hastily organised with GF for the following week to correspond with the BMIG field meeting that was held in the adjacent county of Shropshire. Thus, on 22 April 2022 SJG, in the company of Warren Maguire, Thomas Hughes and Annie Northfield, were shown around Haines Meadows by GF (Fig. 1). Among the specimens collected by SJG were three males which proved to be *H. riparius*.

The following year a second population of *H. riparius* in the Vale of Evesham was discovered some 8 km upstream at The Valley (Evesham Country Park), north of Evesham (01.iv.2023, SP049471, VC 37) and also found at the same location by Paul Richards (16.iv.2023, SP049470) (record submitted to iRecord).

These are the first recorded occurrences of *Hyloniscus riparius* (C. Koch, 1838) in the UK.

Figure 1: Searching among flood debris on Haines Meadows, 22 April 2022, where *Hyloniscus riparius* and *Trachelipus rathkii* were recorded.
Recorders (from left to right) Warren Maguire, Annie Northfield, Gary Farmer and Thomas Hughes. Image by Steve Gregory

Figure 2: *Hyloniscus riparius*, live specimen observed at Haines Meadows, April 2022.
A) Dorsal view; B) Lateral view, showing single ommatidium. Images © Gary Farmer

Identification

Diagnosis

Hyloniscus riparius is a well pigmented woodlouse with a smooth body surface, a strongly discontinuous (stepped) pereion-pleon body outline and the eye comprising a single ommatidium (Fig. 2). It is capable of rapid movement. The shape of the male 7th pereiopod and the male 1st and 2nd pleopods are diagnostic.

Figure 3: *Hyloniscus riparius*, preserved specimens from Haines Meadows, 22nd April 2022. A) Size comparison of male (above) and gravid female (below); B) Head of male showing single ommatidium; C) Antenna shown flagellum comprising 'tapered cone' of c. six indistinct articles and terminal clump of bristles; D) Pereiopod 7 of male showing hooked projection at base of merus (arrowed) (also see Fig. 5A); E) Merus of pereiopod 7 of a female showing feebly developed projection at base (arrowed). Images by Steve Gregory.

Comparison with other species

More detailed information is given below, based on specimens (3♂♂, 15♀♀) collected by SJG from Haines Meadows on 22 April 2022 and freshly preserved in 75% ethanol. The specimens are currently retained in the personal collection of SJG. Comparison is made with two potential confusion species; *Trichoniscus pusillus* agg. and *Oritoniscus flavus*. All three species are included in the illustrated key, to the woodlice of northern France, which includes colour images (Noël & Séchet, 2021). Other detailed descriptions with figures are provided by Vandel (1960), Gruner (1966) and Wijnhoven (2000).

In the field confusion with the ubiquitous *Trichoniscus pusillus* agg. is highly likely, due to its similar appearance (i.e. size, shape and colour), but *H. riparius* is capable of more rapid movement. To add to the confusion, both species may be recorded together as observed at Haines Meadows. Using the standard British identifications guides (i.e. Hopkin, 1991 and Oliver & Meechan, 1993) both live animals and preserved material of *H. riparius* will readily key to *Oritoniscus flavus* due to the smooth body surface and the eye comprising a single ommatidium. However, the three ommatidia that are characteristic of *Trichoniscus* spp. are not always easy to discern in a photograph of a live specimen as they are 'fused' into a rounded triangle and surrounded by black pigment.

Live specimens of *H. riparius* are darkly pigmented reddish to purple-brown in life (Fig. 2) and covered with pattern of pale flecks (due to the absence of pigment corresponding to muscle insertions; Vandel, 1960). The eye and body pigments are retained upon preservation in alcohol (Fig. 3A-B). *Trichoniscus pusillus* agg. tends to be slightly paler in colour, whereas *O. flavus* tends to be a deeper, shinier purple with pale streaks bordering the epimera and has a more rounded 'stouter' appearance (Fig. 4). In the case of *T. pusillus* agg. body and eye pigments are also retained upon preservation, but in contrast all pigment rapidly fades (to straw-white) in preserved *Oritoniscus flavus*. The antennal flagellum of *H. riparius* is of a typical trichoniscid shape of a 'tapered cone' comprising five to seven very indistinct articles terminating in a group of bristles (Fig. 3C). In *T. pusillus* agg. the flagellum is typically composed of four indistinct articles.

Figure 4: *Oritoniscus flavus*, live specimen observed at Inveresk, Midlothian.
Note stouter appearance than *H. riparius* and broad pale markings bordering epimera (compare with Fig. 2A). Image from BMIG Website © Warren Maguire

Of the 18 specimens of *H. riparius* collected by SJG just three (17%) are male and these are conspicuously smaller and darker, noticeably so even in the field, than the larger paler females (Fig. 3A). The three male specimens are 2.9 mm, 3.0 mmm and 3.1 mm in length (front of cephalon to tip of telson). Of the fifteen females collected eight are gravid (bearing 'eggs' and therefore fully grown) and these ranged in body length from 4.5 mm to 5.0 mm. This Worcestershire material is smaller than specimens recorded from continental Europe. In France Vandel (1960) gives up to 8 mm length for females (and comments that males are much smaller); in Germany Gruner (1966) gives 5 mm for males and females to 6.9 mm; and in The Netherlands Wijnhoven (1993) gives up to 4 mm for males and up to 6 mm for females.

Male sexual characters

The male pereiopod 7 bears a diagnostic hooked projection at the base of the merus which is directed ventrally (Fig. 3D, 5A)*. Male pleopod 1 (Fig. 5B) has a large triangular exopodite, rather elongated and with a transparent lobe at its extremity. The much smaller triangular endopodite bears an elongated terminal spine. Male pleopod 2 (Fig. 5C) has a slender endopodite comprises two articles; the distal article, which terminates in a bluntly rounded tip, is about 2.5 times longer than the basal one.

*Females may also bear a small bump/poorly defined hook on pereiopod 7 (Wijnhoven, 2000) and this is seen to a greater or lesser extent in the female specimens examined from Haines Meadows (Fig. 3E).

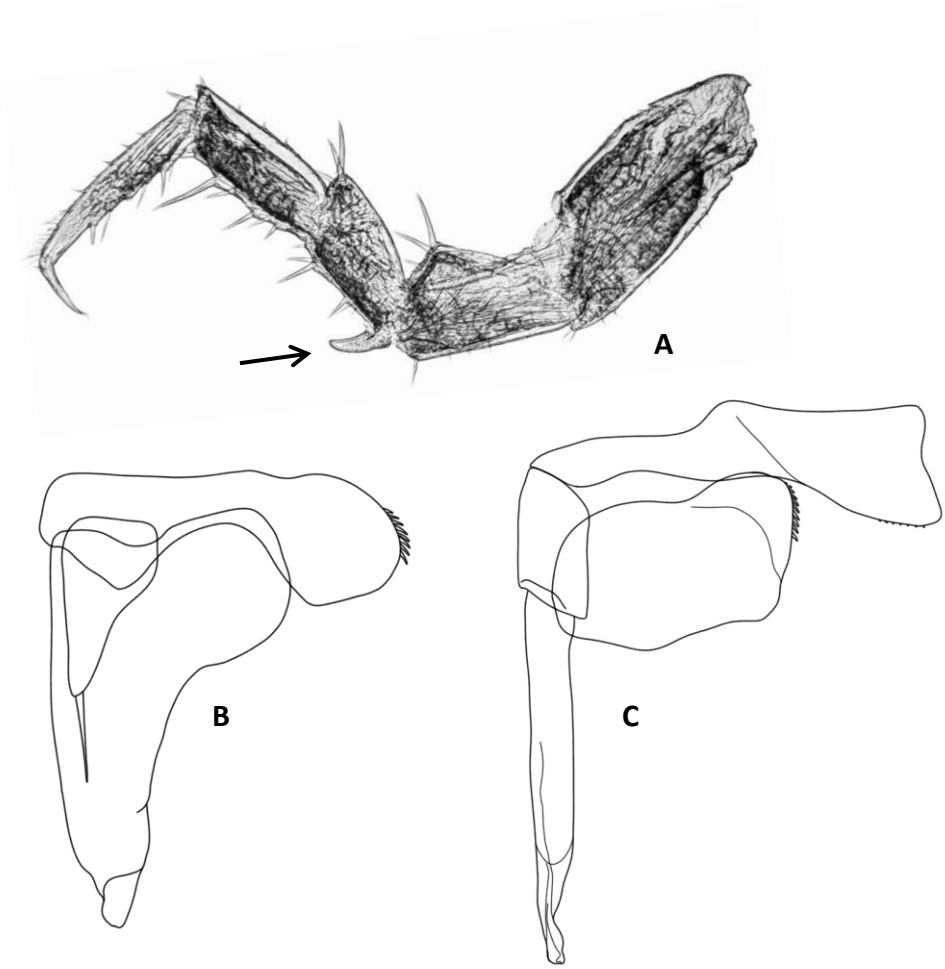

Figure 5: *Hyloniscus riparius* male, from Haines Meadows, 22 April 2022 (Thomas Hughes, leg./det.). A) Pereiopod 7, indicating diagnostic hooked spur at base of merus (arrowed); B) Pleopod 1, line drawing; C) Pleopod 2, line drawing. Images © Thomas Hughes.

Habitats and Distribution

Occurrence in Vale of Evesham

Haines Meadows lie in the flat, fertile lands known as the Vale of Evesham. The meadows are located on the south side of the river Avon at Wick, Worcestershire, and consist of a series of agriculturally improved grasslands purchased in separate plots between 2013 to 2017. They were bought as a restoration project by Vale Landscape Heritage Trust (https://valetrust.weebly.com), to return to traditional floodplain grazing pasture and hay meadows. The fields flood most years and earth bunds remain as a reminder of how the flood waters were managed to encourage grass growth in the past. The grasslands were species-rich but the diversity of plants has been lost over time due to early hay cutting and the use of herbicides and fertilizers. Since 2017 all chemical use has stopped and hay cutting in late summer has resumed. In the past all flood debris was removed from Haines Meadows but since about 2016 natural flood debris has been left to rot down adjacent to old flood-management banks as habitat. The 'Warwickshire' Avon rises in Naseby, Northamptonshire and flows for about 85 miles (137km) before entering the river Severn at Tewksbury.

Hyloniscus riparius is a surface dwelling species (Vandel, 1960) and at Haines Meadows specimens were found under flood debris, mainly comprising dead wood (Fig. 1), where it proved to be locally frequent. Searches were also made among the grassland sward beyond the accumulations of flood debris and under dead wood in a nearby small river-side copse, but additional specimens were not found. The habitat and micro-sites where *H. riparius* is recorded are very similar to those noted in The Netherlands and Belgium (see *In North-west Europe* below). Other woodlice recorded with *H. riparius* by SJG on 22 April 2022 are *Trichoniscus pusillus* agg. Brandt, *Philoscia muscorum* (Scopoli), *Oniscus asellus* Linné, *Porcellio scaber* Latreille, *Trachelipus rathkii* (Brandt) and, on higher ground, *Platyarthrus hoffmannseggii* Brandt. Millipedes recorded are *Polydesmus inconstans* Latzel, *Polydesmus coriaceus* Porat, *Proteroiulus fuscus* (Am Stein), *Ophyiulus pilosus* (Newport), *Cylindroiulus britannicus* (Verhoeff), *C. punctatus* (Leach) and *Brachyiulus pusillus* (Leach). Three centipedes, *Geophilus flavus* (De Geer), *Lithobius melanops* Newport and *Cryptops hortensis* Donovan, are also recorded.

Habitats in north-west Europe

In both The Netherlands and Belgium (Berg *et al.*, 2008; Smedt *et al*., 2020) it is apparent that *H. riparius* is strongly associated with water courses, often riverine flood plains, but also smaller canals, streams and ditches, especially where these are contiguous with larger river systems. It is tolerant of seasonal inundation, as is *Trachelipus rathkii* (Brandt), and both species are typically found together (Berg *et al*., 2008; Wijnhoven, 2000; Février, 2014) (as indeed observed in the Vale of Evesham). It seems to favour water courses with some tree cover, such as Poplar *Populus* spp. and Willow *Salix* spp., rather than open meadows, but it also occurs on the banks of streams and rivers bisecting villages and towns. It is frequently found in synanthropic habitats, such as botanical gardens, greenhouses and cemeteries (Berg *et al*., 2008; Smedt *et al*., 2020) suggesting it is readily dispersed by human activity.

When found, *H. riparius* is typically numerous. Microsites inhabited include among damp leaf litter, moss and flood debris, beneath dead wood and stones or within compost heaps (Vandel, 1960; Berg *et al.*, 2008; Wijnhoven, 2000; Smedt *et al*., 2020). As with many trichoniscid woodlice it is most easily found when ground conditions are damp and it moves deeper into the soil during the drier summer months (Wijnhoven, 2000) and in Belgium it is more frequently found in late autumn and winter (Boeraeve, *et al*., 2021). In parts of western Russia, where *H. riparius* has colonised since the 1990s, it may account for up to 99% of all woodlice specimens recorded and is reported to have caused a decline in abundance of native indigenous woodlouse species (Gongalsky *et al.*, 2013). Such species competition has not been documented in north-west Europe. However, Wijnhoven (2000) notes that

H. riparius, which is tolerant of long term submergence, tends to dominate the wettest areas, whereas *T. pusillus* agg. is more abundant in other areas.

Distribution in north-west Europe

Hyloniscus riparius has a very widespread distribution across central and eastern Europe and has been introduced to North America (Schmalfuss, 2003), where it can be locally abundant and is still expanding its range (De Smedt, P, pers. comm.). Vandel (1960) considered *H. riparius* to be an 'expansive species', and in recent decades it has expanded its range into north-west Europe (Berg *et al*., 2008; Séchet *et al*., 2012; De Smedt *et al*., 2020). In addition, it is also spreading eastwards into Russia (Gongalskya *et al.*, 2013).

Although long known from eastern France (Alpes, Vosges), and as an accidental introduction at a botanical garden in Paris (Vandel, 1960), it is only in recent years that *H. riparius* has been recorded as far west as Auvergne, Central France (Séchet *et al*., 2012). In the Netherlands, *H. riparius* was recorded from inside glasshouses of the Botanic Gardens at Utrecht in 1942 (Holthuis, 1945), but it was not recorded outdoors in the 'wider countryside' until 1991 when it was discovered at Ooijpolder close to the border with Germany, from where it is believed to have colonised (Wijnhoven, 1993). When the Atlas of The Netherlands was published seventeen years later (Berg *et al*., 2008) it was reported to be widespread across much of the country. Similarly in Belgium *H. riparius* was first recorded in 1998 (Lock & Vanacker, 1999) and is now considered common across central and eastern parts of the country and thought to be dispersing via both river catchments and human activity (De Smedt *et al*., 2020), but at the edges of its current range seems to be colonising new territory primarily through human activity (De Smedt, P, pers. comm.). Supporting the idea of *H. riparius* being a recent colonist in Belgium all specimens of *Trichoniscus pusillus* agg. (the most likely confusion species) held by the Royal Belgian Institute of Natural Sciences (RBINS) were re-identified and no historical records of *H. riparius* were discovered (De Smedt *et al*., 2018).

Thus, in both The Netherlands and Belgium there is evidence of initial establishment and a subsequent progressive colonisation along river catchments and through human activity.

Discussion

It is unexpected that the first recorded occurrence of the central European *Hyloniscus riparius* is in central England, beside the Avon in the Vale of Evesham. More obvious colonisation routes would be via the southern and eastern coasts of England and penetrating inland via major river systems such as the Thames Valley. However, *H. riparius* has often been initially recorded from inside glasshouses at the edge of its range (e.g. Holthuis, 1945; Vandel, 1960; Berg *et al*., 2008). The Vale of Evesham and surrounding area is known for its market gardening heritage (www.explorethepast.co.uk/project/market-gardening-heritage) and more recently large areas have been covered by glasshouses to grow produce through the year (including both areas from which *H. riparius* has been recorded). There is a large movement of crops and associated materials in and out of the Vale, moving across many countries. So there is ample opportunity for species to enter the area through imported goods and then spread along the river valley. Therefore, given the isolated nature of the Vale of Evesham observations, we consider that the population of *H. riparius* here is not a relict native population, but an unintentional introduction.

In the Vale of Evesham *H. riparius* appears to be well established locally, at least at Haines Meadows and Lower Moor on opposite sides of the Avon. The presence of gravid females in the samples indicates that breeding is occurring. Evidence in The Netherlands and Belgium suggests that if conditions are suitable then *H. riparius* is able to rapidly increase in abundance and readily disperse to colonise new sites (Berg *et al.*, 2008; Smedt *et al*., 2020). Thus, it is quite possible that *H. riparius* will also be found at other sites in the Vale of Evesham. Given its frequent association with *Trachelipus rathkii* perhaps in

the first instance the few known floodplain meadow sites for this latter species should be targeted (these are listed in Farmer, 2021). *Hyloniscus riparius* is known to be dispersed with flood debris during flood events and it will be interesting to see whether this woodlouse turns up elsewhere. However, given its synanthropic tendencies, ideally surveys should also include nearby garden centres, glasshouses, gardens, churchyards, etc.

It is also of great interest that all of the known sites for *H. riparius* discovered so far, and several additional nearby sites along the Avon, support an isolated cluster of localities for *Trachelipus rathkii* (Farmer, 2021), a species previously known as far north and west from the catchments of the upper Thames and the Gloucestershire Severn (Gregory, 2009). Both *H. riparius* and *T. rathkii* are often found together in flood plain habitats across Europe and both species have been spread globally far beyond their respective native European ranges (Schmalfuss, 2003). In North America these two species also frequently co-exist (De Smedt, P., pers. comm.). It is possible that both *H. riparius* and *T. rathkii* share the same source of colonisation into the Vale of Evesham.

It is perhaps just a matter of time before *H. riparius* is discovered along other river systems in England, such as the Severn, the Thames or the Great Ouse, where its frequent associate *Trachelipus rathkii* is known to be present. It could be easily over-looked since its most likely confusion species, the ubiquitous *Trichoniscus pusillus* agg., is rarely given a second look by most woodlouse recorders. An intensive 'tetrad' survey of Oxfordshire in the 1990s, which is bisected by the Thames Valley, did not record *H. riparius* (Gregory & Campbell, 1995). However, there have been few surveys of the Thames flood plain in recent decades and it is possible that *H. riparius* may be awaiting discovery as an 'overlooked' recent colonist? There is no obvious reason why *H. riparius* should not occur at other sites in Britain or Ireland, not just on riverside meadows, but perhaps more likely (if Belgium and The Netherlands are a guide) in synanthropic sites, such as glasshouses or gardens.

We encourage all to keep a look out for this easily over-looked woodlouse, which based on evidence in north-west Europe, could be expected to rapidly colonise new sites along the Worcestershire Avon and potentially spread into other river catchments, such as the Severn and the Thames.

Acknowledgements

We thank Thomas Hughes for allowing the use of his figures of a male specimen he collected from Haines Meadows in April 2022. Warren Maguire kindly allowed the use of his image of *Oritoniscus flavus*. We are grateful to Pallieter De Smedt (Ghent University) for his useful comments on the submitted manuscript.

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Polydesmus taranus Verhoeff, 1936, a millipede new to Britain, 'hiding' among additional British localities for *Polydesmus asthenestatus* Pocock, 1894 (Diplopoda: Polydesmida: Polydesmidae)

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Abstract

Polydesmus taranus Verhoeff, 1936 is reported new to the fauna of the British Isles from three synanthropic sites in southern England and the Channel Isles. At two of these sites *P. taranus* was found associated with *Polydesmus asthenestatus* Pocock, 1894, a morphologically similar species (including male gonopods), which are the second and third British records. A brief description with figures is provided, and comparison is made with *P. asthenestatus*, to enable identification. Information is provided about habitats and micro-sites inhabited and associated species. *Polydesmus taranus*, and indeed also *P. asthenestatus*, must surely be awaiting discovery at additional synanthropic sites in Britain, possibly both species together.

Key words: Polydesmidae, *Polydesmus taranus*, new for UK, identification, habitats, distribution.

Introduction

Seven species of *Polydesmus* Latreille are listed from Britain and Ireland by Lee (2006). An eighth species, *Polydesmus asthenestatus* Pocock, 1894, was discovered in Co. Down, Northern Ireland in 2008, where it has subsequently proved to be widespread (Anderson, 2015).

On 9 September 2020 a visit was arranged to Lamorran House Gardens, St. Mawes, Cornwall (SW843331), primarily to look for woodlice, millipedes and centipedes. This subtropical Italianate inspired garden is about 2 acres (c. 0.8 ha) in extent, lies on a south facing slope and, lying on a narrow peninsular, is surrounded by the sea on three sides. It has not experienced a major frost since 1987 (www.lamorrangardens.co.uk/about.html). A wide array of sub-tropical plants, including many from the southern hemisphere, are successfully cultivated. Towards the top of the gardens several specimens of a small fast-moving darkly pigmented polydesmid millipede were collected from among deep accumulations of damp leaf litter.

The specimens proved to be immature, but included two sub-adult males just 8 mm in length. These seemed to be a good morphological fit for *Polydesmus asthenestatus*, but since this would be the first British record for this species then the collection of mature males (which are winter active; Anderson, 2015) was required to confirm this determination. Meanwhile in November 2020 *P. asthenestatus* was confirmed as a British species based on a mature male specimen collected from a limestone cave in south Devon (Knight, 2021). A return visit to Lamorran House Gardens by the author was arranged a year later in November 2021 to look for mature winter active *Polydesmus* males.

Polydesmus taranus new to Britain

The return visit to Lamorran House Gardens on 28 November 2021 resulted in the collection of several adult male specimens of 'small' *Polydesmus* species. This included three specimens of *Polydesmus asthenestatus* (a determination confirmed by Per Djursvoll, University Museum of Bergen, from images of the gonopod), the second British record (Table 1). However, it was apparent that there were four slightly larger male specimens in the sample (Fig. 1) that appeared to have subtly different gonopods, which were initially thought to be natural species variation. However, images posted on the BMIG

online group (IMBI, 2021) were provisionally identified as *Polydesmus taranus* Verhoeff, 1936 by Per Djursvoll who subsequently confirmed this determination following examination of a male specimen.

Figure 1: Relative size of *Polydesmus* males collected from Lamorran House Gardens.
Polydesmus taranus (top) c. 10.5 mm in length; *Polydesmus asthenestatus* **(**below) c. 8.5 mm in length.

Subsequently, there have been two additional observations of *Polydesmus taranus* in the British Isles (Table 1). On 6 November 2022 Andy Marquis collected a male *Polydesmus taranus* from Le Foulon Cemetery, St. Peter Port on Guernsey (Channel Islands) (WV319781, VC113) (Fig. 2). This identification also confirmed by Per Djursvoll from images posted on the BMIG online group (IMBI, 2022) and record details subsequently submitted to iRecord (https://irecord.org.uk/). Then on 8 January 2023 Mark Telfer (pers. comm.) collected both *Polydesmus taranus* and *P. asthenestatus* at Ventnor Botanic Gardens, Isle of Wight (SZ5476, VC10) (images of slide mounted gonopods seen by the author). Here one male *P. taranus* and two male *P. asthenestatus* were collected from inside an un-heated glasshouse and an additional male *P. asthenestatus* was found outdoors under a stone. In April 2023 an additional locality for *P. asthenestatus* was discovered on the Isle of Man by Sue Harvey (record details submitted to iRecord).

These are the first recorded occurrences of *Polydesmus taranus* Verhoeff, 1936 in the British Isles. These records (Table 1) also include the second, third and fourth British localities for *P. asthenestatus.*

Table 1: Known locations of *Polydesmus taranus* and *P. asthenestatus* in the British Isles

Locality	**'County'**	**Date**	***P. taranus***	***P. asthen-estatus***	**Source**
Kitley Cave	Devon	21.xi.2020		1♂	Knight, 2021
Lamorran House Gardens	Cornwall	28.xi.2021	3♂♂	2♂♂	pers. obsv.
Le Foulon Cemetery	Guernsey	06.xi.2022	1♂		Marquis, A.
Ventnor Botanic Gardens	Isle of Wight	08.i.2023	1♂	3♂♂	Telfer, M.G.
Laxey	Isle of Man	23.iv.2023		1♂	Harvey, S.

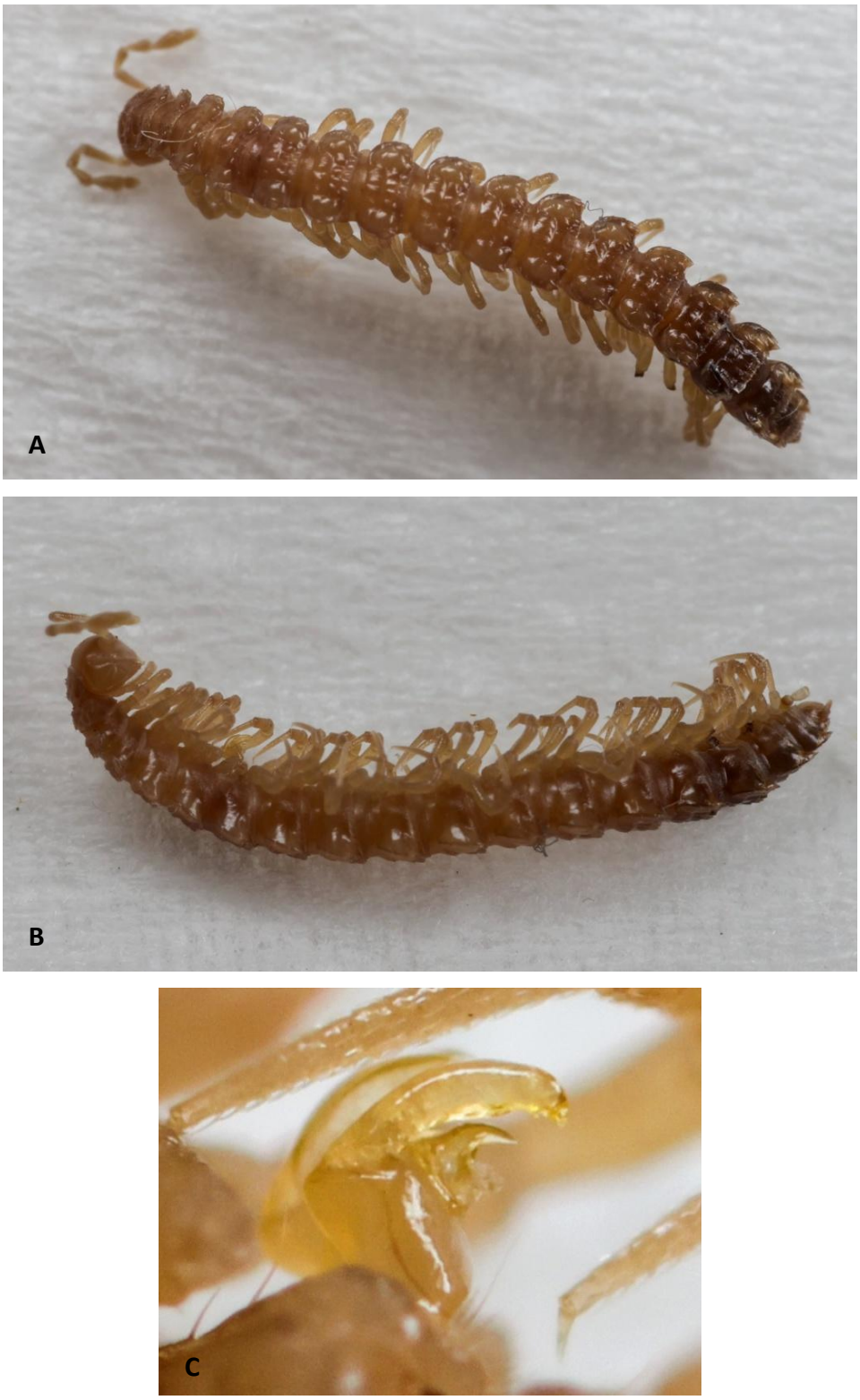

Figure 2: *Polydesmus taranus* male, specimen from Le Foulon Cemetery, Guernsey
A) Dorsal view; B) Lateral view; C) Male gonopods in situ. Images © Andy Marquis.

Identification

Adults of *Polydesmus taranus* have 20 body rings (including collum). Colour is a reddish brown with distinct dorsal sculpturing similar to that seen in other more widespread British *Polydesmus* species. This is a relatively small species with the three male specimens collected from Lamorran House

Gardens ranging in body length (head to telson) from 10 to 10.5 mm. In his original description Verhoeff (1936) gives 10⅓ to 10⅔ mm, while Attems (1940) gives 10 to 11 mm. It is, however, consistently larger than *P. asthenestatus* (as noted by Mauries, 1969). Specimens of *P. asthenestatus* collected from Lamorran House Gardens ranged between 8 to 9 mm in length, while Pocock's (1895) original description gives body length as 8 mm and Verhoeff (1936) gives 8½ to 9½ mm for *P.asthenestatus* ssp. *borgotarensis* (a synonym of *P. asthenestatus*, Sierwald & Spelda, 2022). Probable females of both species collected from Lamorran House Gardens are slightly larger than their respective males.

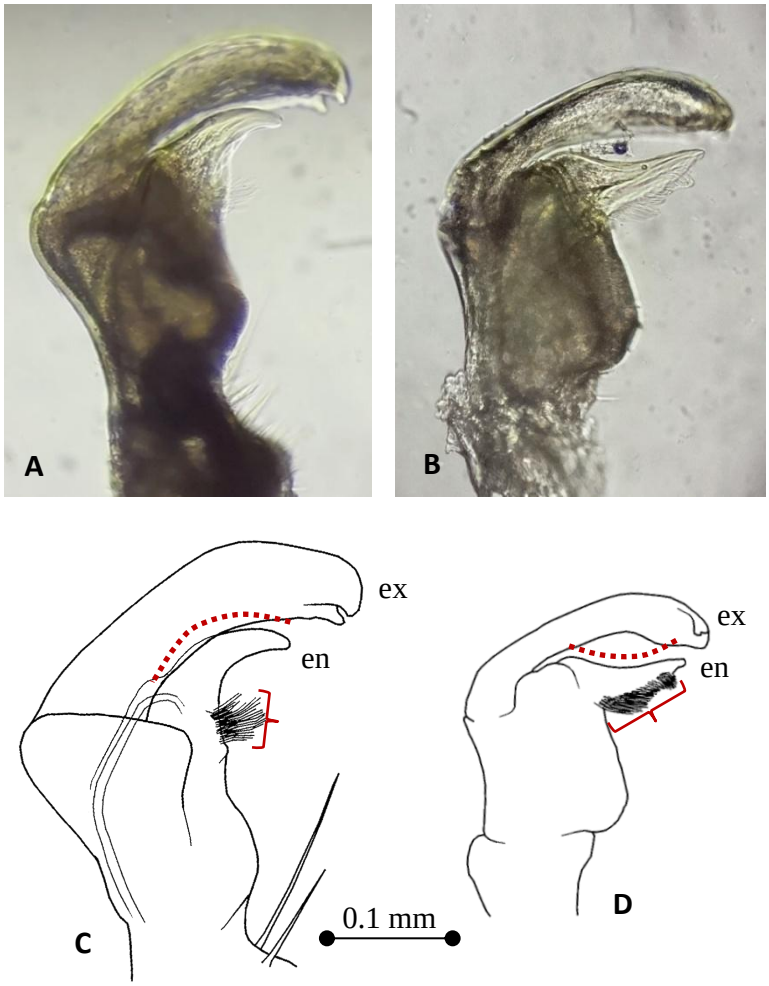

Figure 3: *Polydesmus* male telopodites, external view, from Lamorran House Gardens.
A, C) *Polydesmus taranus;* B, D) *Polydesmus asthenestatus.* Note curvature of endomere (en) relative to exomere (ex) (red dotted line) and extent of hairs on hairs of the pulvillus (bracketed).

In mature males the telopodite of the gonopods of *P. taranus* are very similar to those of *P. asthenestatus* (Fig. 3A-D), but otherwise quite distinct from other British *Polydesmus* species. In both species the exomere of each telopodite is broadened apically with a bluntly rounded tip, but that of *P. taranus* is relatively broader compared to its length. The most reliable character to separate the two species is the shape of the endomere (en) (the solenomere of Anderson, 2015). In *P. taranus* this is curved with a convex upper surface that lies parallel to the curvature of the exomere (ex) (Fig. 3A, 3C). In contrast the endomere of *P. asthenestatus* has a concave upper surface opposing the curvature of the exomere giving a 'pincer-like' appearance to the gonopod structure (Fig. 3B, 3D). In addition the hairs

of the pulvillus (of the endomere) are restricted to distinct clump at the base in *P. taranus*, but extend further distally on *P. asthenestatus*. Male gonopods of both species figured in Verhoeff (1936, figs. 75 & 76), Mauriès (1969, figs 27 & 28) and in Demange (1981, figs. 174 & 175).

Distribution and habitats

Polydesmus taranus is only known from a handful of localities and where it is native to a restricted area of north-west Italy (Liguria) and the adjacent (French) island of Corsica (Kime & Enghoff, 2011). Here, it has been recorded from among humus in *Quercus*/*Castanea* woodland on sandstone (in Liguria) and gullies in granite formations (on Corsica) and by old walls and heaps of stones. The few records suggest this is an upland species favouring shady mountains above 500 m a.s.l. (Kime & Enghoff, 2011).

In contrast, in the British Isles *Polydesmus taranus* is currently known from three lowland localities either on the south coast of England or the Channel Islands; Lamorran House Gardens, Cornwall; Ventnor Botanic Gardens, Isle of Wight; and Le Foulon Cemetery, Guernsey (Table 1). All three areas are known for their relatively warm climate where a good number of exotic plants from various parts of the World can be grown out-of-doors, suggesting that *P. taranus* may be a warmth-loving species. It is known that its congener *P. asthenestatus,* which is also native to north-western Italy, is tolerant of low winter temperatures that can occur in Northern Ireland (Anderson, 2015). Although within its native range *P. taranus* is an upland species (Kime & Enghoff, 2011), and possibly tolerant of winter cold, its current known 'southern' distribution suggests that this may not be the case. So far mature males have been found in November and January suggesting that this is another winter active species (as is its congener *P. asthenestatus*).

At Lamorran House Gardens specimens of *Polydesmus taranus* were collected along with specimens of *P. asthenestatus* from two sample sites. The first towards the top of the gardens, beyond the Koi Carp pond, where a considerable depth of damp leaf litter has accumulated beneath shrubs in an un-managed corner (Fig. 4A). Other millipedes collected here include *Chordeuma proximum* Ribaut, *Blaniulus guttulatus* (Fabricius), *Cylindroiulus britannicus* (Verhoeff) and *C. punctatus* (Leach). The second sample was from an area where deep leaf litter had collected beneath shrubs, including closely spaced tree ferns (Fig. 4B). Of particular note here is the discovery of a population of a previous unknown polyzoniidan millipede *Siphonethus dudleycookeorum* Moritz *et al*., 2022 (which is named in honour of the gardens' owners). Other associated millipedes found here include *Haplopodoiulus spathifer* (Brölemann) (which was abundant), *C. britannicus, C. punctatus* and a single female *Brachyiulus* sp. The introduced Australian landhopper *Arcitalitrus dorrieni* (Hunt) was numerous at both locations.

At Le Foulon Cemetery the single male specimen of *P. taranus* was found in association with the millipedes *Anamastigona pulchella* (Silvestri) (another millipede native to northern Italy), *B. guttulatus* and *Leptoiulus belgicus* (Latzel) and the Landhopper *A. dorrieni.*

At Ventnor Botanic Gardens a single male *Polydesmus taranus* (and two male *P. asthenestatus*) was collected from inside an unheated glasshouse (Mark Telfer, pers. comm.).

An over-looked species?

It is of note that at both Lamorran House Gardens and Ventnor Botanic Gardens *Polydesmus taranus* was found associated with *P. asthenestatus*. In both cases the specimens collected that subsequently proved to be *P. taranus* were initially thought to be natural species variation of *P. asthenestatus* until closer examination revealed that they were indeed two distinct species. Historically it seems that *P. taranus* has been repeatedly confused with *P. asthenestatus* (both were initially included under the name *P. dispar* Silvestri, 1895) (Kime & Enghoff, 2011). This was highlighted by Mauriès (1969) who found that material collected in 1902 and attributed to *P. dispar* (now considered a synonym of *P. asthenestatus* by Millibase, Sierwald & Spelda, 2022) actually contained male specimens of both *P.*

taranus and *P. asthenestatus*. In Demange (1981) both species key out together under the name *P. asthenestatus*/P. taranus (?), but gonopods of both species are illustrated (i.e. figs. 175 and 174, respectively).

Polydesmus taranus (and indeed also *P. asthenestaus*) must surely be awaiting discovery at additional sites in Britain. Currently *P. taranus* is only known from synanthropic sites, two ornamental gardens and a graveyard (near a garden centre), but it may be found in other 'disturbed' habitats. It is stressed that all recorders who find 'small' *Polydesmus* species should be aware that both *P. asthenestatus* and/or *P. taranus* may be present in the samples.

Figure 4: Deep accumulations of leaf-litter under shrubs at Lamorran House Gardens where both *Polydesmus taranus* and *P. asthenestatus* were recorded.
A) Unmanaged corner above the Koi Carp pond; B) Area with tree ferns (where the polyzoniidan *Siphonethus dudleycookeorum* sp. nov. was also found).

Acknowledgements

I am indebted to Robert and Maria-Antoinette Dudley-Cooke, owners of Lamorran House Gardens, for allowing unrestricted access to survey for invertebrates in 2020 and 2021.

I thank Per Djursvoll, University Museum of Bergen, for examining a male specimen from Lamorran House Gardens and confirming the identification as *Polydesmus taranus*. Both Per Djursvoll and Hans Reip, Senckenberg Research Institute, kindly provided relevant literature.

I also thank Andy Marquis, Mark Telfer and Sue Harvey for allowing the inclusion in this paper of their subsequent discoveries of *P. taranus* and/or *P. asthenestatus*. Andy Marquis kindly permitted the use of his images of a male *P. taranus*.

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Ecological studies on *Trachysphaera lobata* (Ribaut, 1954) (Glomerida: Glomeridae) in the UK, with comments on the results of a taxonomic study

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Introduction

Trachysphaera Heller, 1858 is a genus of dwarf pill millipedes typified by a strongly ornamented and modified shape; they roll into tight balls that resemble tiny calcareous stones (Fig. 1) and it has also been suggested they resemble a small, white mass of fungi (D. Antič, pers. comm. regarding Facebook discussion). Dwarf pill millipedes are a challenge to study, their small size, and appearance like grains of sand, makes them difficult to find; in the experience of the authors often only a few specimens are found at any one time, but this may not be the situation in some caves (D. Antič, pers. comm.). Being tiny, their taxonomic features can be hard to see. Also, being pill millipedes they have telopods (instead of the gonopods found in most millipede groups) which are used to hold the females during mating rather than transfer sperm (Haacker, 1964), consisting of a chela and syncoxite. Their general morphological characters are also very variable, depending for example, upon developmental stage, amount of damage or proximity to moult (D. Antič, pers. comm.).

Figure 1: Habitus of *Trachysphaera lobata* from East Cliff. Photograph © J. Paul Richards.

Trachysphaera is the third most diverse genus of the order Glomerida and is distributed mainly in the Euro-Mediterranean region, the Caucasus and reaching Germany, Poland and the UK in the north (Antić *et al*., 2021).

Specimens of *Trachysphaera* were first found in the UK from East Cliff, Bembridge on the Isle of Wight, in 1984 (Jones & Keay, 1986). No males were present in this first collection and as the original description of this species uses male characters to separate *T. lobata* from *T. pyrenaica* (Ribaut, 1907) this made positive species identification difficult. However, they were identified as *T. lobata* using somatic characters from Demange (1981) and they were examined by J.-P. Mauriès at Paris Natural History Museum.

History of *T. lobata* in the UK

The report of the first finding at Bembridge also included that of a second site at the Duver in September 1984 (Jones & Keay, 1986). This has subsequently been recognised as an error, however the species was found in an area of scrub close to Bembridge Harbour a few hundred metres west of the East Cliff site, although this site has since been cleared and developed into a holiday park. The site at East Cliff was visited several times by Andy Keay and others and in 1986 *T. lobata* was found to occur in densities up to 5600 per m^3 but only when selectively sampling small pockets of suitable substrate (Jones & Keay, 1986). In August 2004 three days of sampling yielded only two specimens and later that same year none were found during a further four days of fieldwork (Keay, 2004).

In 2010 *Trachysphaera* was reported from two locations in South Wales, one at Bynea, Llanelli in 2007 and one at Llanwrtyd in 2009 (Harper, 2010). The presence at the first location was confirmed in March 2011 by Ian Morgan (Wilbrandt *et al*., 2015). In 2018 another population was discovered in caves in Prideaux Woods, Cornwall (Urquhart and Lee, 2019). Having mostly been collected in caves in France the habitat for this find was not unexpected.

Trachysphaera lobata was given the status RDBK (Red Data Book): Insufficiently Known, by Bratton (1991). In 2004 the British Myriapod and Isopod Group (BMIG) was given a grant by Natural England to improve understanding of this species and its ecology by undertaking field work on the Isle of Wight to establish its continued presence and the extent and density of the population. In 2011 the invertebrate conservation charity Hymettus made a successful bid to DEFRA to fund research on several Biodiversity Action Plan (BAP) priority species. One of the species was *T. lobata* and the British Myriapod and Isopod Group was asked to undertake the research. The work included the collection of specimens for the genetic studies reported on by Wilbrandt *et al*. (2015) in order to confirm the species of the populations in Wales and the Isle of Wight.

Methods

The site at Bembridge was visited on two separate occasions in 2005 and 2011. On 6-7 January 2005 a total of 22 man hours was spent in the field (Fig. 2). As specimens were quickly located, an estimate of the population density was carried out by counting the number present from a standardised volume ($400cm^3$) of soil/leaf litter dug with a small trowel or with a bulb planter. Samples were passed through a sieve and the resulting fine material examined in the field. Samples were taken across the woodland from the sea shore to the base of the marl cliff and along the length of the woodland. Samples were not taken randomly and after a short time it was relatively easy to recognise the sandy, humus rich pockets of soil within which the species was found. The majority of the specimens were returned to the field after counting, but 54 were removed for morphological and life history studies, some were photographed and most are now preserved in the BMIG reference collection at Dinton Pastures. Two further days were spent searching woodland on the Isle of Wight that appeared, from maps, to be potential habitat for *Trachysphaera* based on similarity to the East Cliff woodland.

Figure 2: Searching for *Trachysphaera* at the East Cliff site.

On 22–24 February 2011 a further collecting trip was undertaken to East Cliff and non standardised hand searching was undertaken to collect 25 specimens for morphological and genetic studies (see below). The extent of the occupied area of habitat was assessed by searching for the millipede while moving east and west along the coast. In addition, one further woodland was searched as a potential *Trachysphaera* site.

The taxonomic and DNA part of this study has been published by Wilbrandt *et al*. (2015). Specimens from East Cliff collected in 2011 were sent with some from South Wales to the A. Koenig Research Museum in Bonn (ZFMK). A small number of specimens of *Trachysphaera* from other locations were also available for comparison. This included *T. lobata* from the Dordogne, France (collected by Desmond Kime); *T.* cf *pyrenaica* from Leitza collected as part of the BMIG field visit to the Basque area of Spain in 2009; *T.* cf. *pyrenaica* from Midi-Pyrenees, France (collected by Alex Schönhofer) and *T.* cf. *drescoi* from Aquitaine, France (collected by Alex Schönhofer).

In Bonn, scanning electron microscopy and multi-layer image photography were used to look at the male telopods, the anal shield, the anterior parts of the body including head, collum, thoracic shield and tergite 3 and the mid body tergites to compare ornamentation and colouration. DNA extraction was carried out on the same specimens.

Results

Population at East Cliff, Bembridge

The *T. lobata* site consisted of a narrow belt of semi-natural deciduous woodland dominated by Sycamore (*Acer pseudoplatanus*) with some Ash (*Fraxinus excelsior*) and Turkey Oak (*Quercus cerris*). The ground flora was dominated by mats of Ivy (*Hedera helix*), Nettle (*Urtica dioica*) and various grass species with some Bramble (*Rubus fruticosa* agg.), Dog's Mercury (*Mercuralis perennis*) and fern species.

In 2011 the woodland stretched for approximately 800m along the foot of an unconsolidated cliff approximately 7m high and facing roughly north-north-east. The maximum depth of woodland was approximately 50m and it ended in a wave eroded cliff between one and two metres high at the top of the beach. At either end of the woodland there were increasing amounts of human disturbance with gardens and buildings reaching down to the shore. The whole site is underlain by Bembridge limestone which outcrops approximately 30m offshore as low rock ledges. This is overlain by Bembridge Marls which form the platform on which the woodland grows. The cliff behind the woodland is a raised beach formed during the Ipswichian period. Sands and gravels eroded from the cliff cover the marls to varying depths and have created pockets of lighter soils within the heavy clay.

Within the area of woodland the population was not evenly distributed. The number of animals found within a 400cm^3 sample of soil varied from 0 in most of the samples to 11 in one (Table 1).

Table 1: Numbers of *Trachysphaera lobata* collected from sampling locations at East Cliff in 2005.

Grid reference	40/647887	40/648887	40/649886	40/651885	Totals
No. of samples	19	40	14	8	81
No. of specimens	2	53	22	0	77

This patchiness of distribution appeared to be related to the nature of the substrate. *T. lobata* was only found in pockets of humus rich, sandy soil with or without coarser pebbles (Fig. 3). It was absent from any samples of clay soil or those taken from slumps at the base of the unconsolidated cliff where the soil was often sandy but lacked any organic material. No specimens were found in the litter layer and the millipede appeared to be most abundant at a depth of about 15cm, confirming observations by Jones and Keay (1986). Even where the substrate appeared suitable, many samples failed to produce any specimens.

Figure 3: Suitable substrate for *Trachysphaera*. 3 specimens are arrowed.

Based on the figures in Table 1 (77 individuals from 81 soil samples) this gives an estimated population density for the East Cliff woodland of 2377 individuals per cubic metre of soil. However, this figure significantly over-estimates the population size as it is based on samples selected from pockets of sandy soil considered the most likely to support the species. Using similarly selective techniques, Jones and Keay (1986) quoted a figure equivalent to 5600 individuals per cubic metre for the population density in 1984. This higher figure referred to a restricted area of the woodland in the centre of the range as determined by this study.

The extent of woodland occupied by *T. lobata* was found to be approximately 200m in length in 2005 and 120m longer to the east and 10m longer to the west in 2011. This increase of more than 50% does not necessarily mean an increase in population as the distribution within the woodland is uneven and was not quantified in any way in 2011. In addition, erosion continues on the shoreline and, while new cliff slumps are occurring on the inland side of the woodland it will take time for them to become suitable for the millipede. In addition, it is unknown if this new habitat is being generated at a greater or lesser rate than the shoreside erosion.

Although there appeared to be a healthy breeding population of *T. lobata* at Bembridge in 2005 there is evidence of a decline in population density over a 20-year period. In addition, the coastal strip is actively eroding and the woodland is slowly being washed into the sea. A large lump of concrete found isolated on the beach in 2005 was within the woodland in 1986 and it was estimated that the site has eroded by 5m in 15 years (0.33m/annum). Erosion rates around Bembridge are reported to be between 0.3 and 0.75m/annum generally with that at Tyne Hall, adjacent to the woodland where *Trachysphaera* was found, eroding at less than 0.15m/annum (Posford Duvivier, 1990). The woodland inhabited by *T. lobata* is less than 10 000 m^2 in area and is only approximately 50m in width (Fig. 4). Should the amount of erosion remain constant it will have disappeared in 150 years and suitable habitat for the millipede will have gone well before this.

Figure 4: Showing the narrow strip of woodland at East Cliff in which *Trachysphaera* has been found at East Cliff and the coastal erosion.

Other threats to the site include offshore dredging, extracting material for commercial use and the felling of trees to alleviate health and safety issues relating to the public footpath through the woodland. Loss of trees is likely to cause drying of the soil as well as decline in the amount of organic matter going into the soil each year.

Other sites on the Isle of Wight

The Bembridge Harbour site is now a holiday home development. Six standardised soil samples (400 cm^3 each) were taken here but no *Trachysphaera* were found. Priory Woods, Hillway Woods, Centurion's Copse, Bembridge Down and Bembridge Lodge were the other woodlands visited. No specimens of *Trachysphaera* were found in any of these and only one, Centurion's Copse, appeared to have suitable conditions and might be worthy of further study.

Sex ratio and age structure of *T. lobata* collected in 2005

Of the 54 specimens collected, 40 were adult of which 11 were mature males. Previously no males had been found at Bembridge and it had been thought that the population might be parthenogenetic. However, the 3:1 female:male sex ratio in the samples from 2005 indicated otherwise. The mean diameter of mature males was 1.84 mm and of females with 11 tergites was 2.21 mm, as with many other species of millipede the males are slightly smaller than the females.

The remaining 14 specimens belonged to the two eldest immature stadia. The presence of juveniles suggests that the population is breeding. The small number of juveniles represented in the samples is probably a result of the difficulties in finding them as the smallest specimens collected were just 0.8 mm in diameter when enrolled and are thus very difficult to see in the field.

Male specimens were also found in the South Wales population. Examination of the male telopods from these and the East Cliff males showed slight differences from those in the type description.

Numbers and dimensions of *T. lobata* collected in 2005

The dimensions of those specimens collected are shown in Table 2. These are maximum diameter when enrolled.

Table 2: Dimensions of *T. lobata* specimens. Measurements are width of tergite 2 (thoracic shield) and whole diameter of rolled up animal in mm.

Number of tergites	Male	Female	Juvenile
9			2 specimens Tergite 2: 0.6 Max diameter: 0.8
10			12 specimens Tergite 2: 0.6-1.0 Max diameter: 0.9-1.1
11	11 specimens Tergite 2: 1.1-1.5 Max diameter: 1.5-2.2	29 specimens Tergite 2: 0.9-1.8 Max diameter: 1.4-2.5	

Molecular analysis (results summarised from Wilbrandt *et al.*, 2015)

The maximum likelihood tree supports the monophyly of *T. lobata* (97%) although the relationships between the three analysed populations are less clear (see Fig. 5).

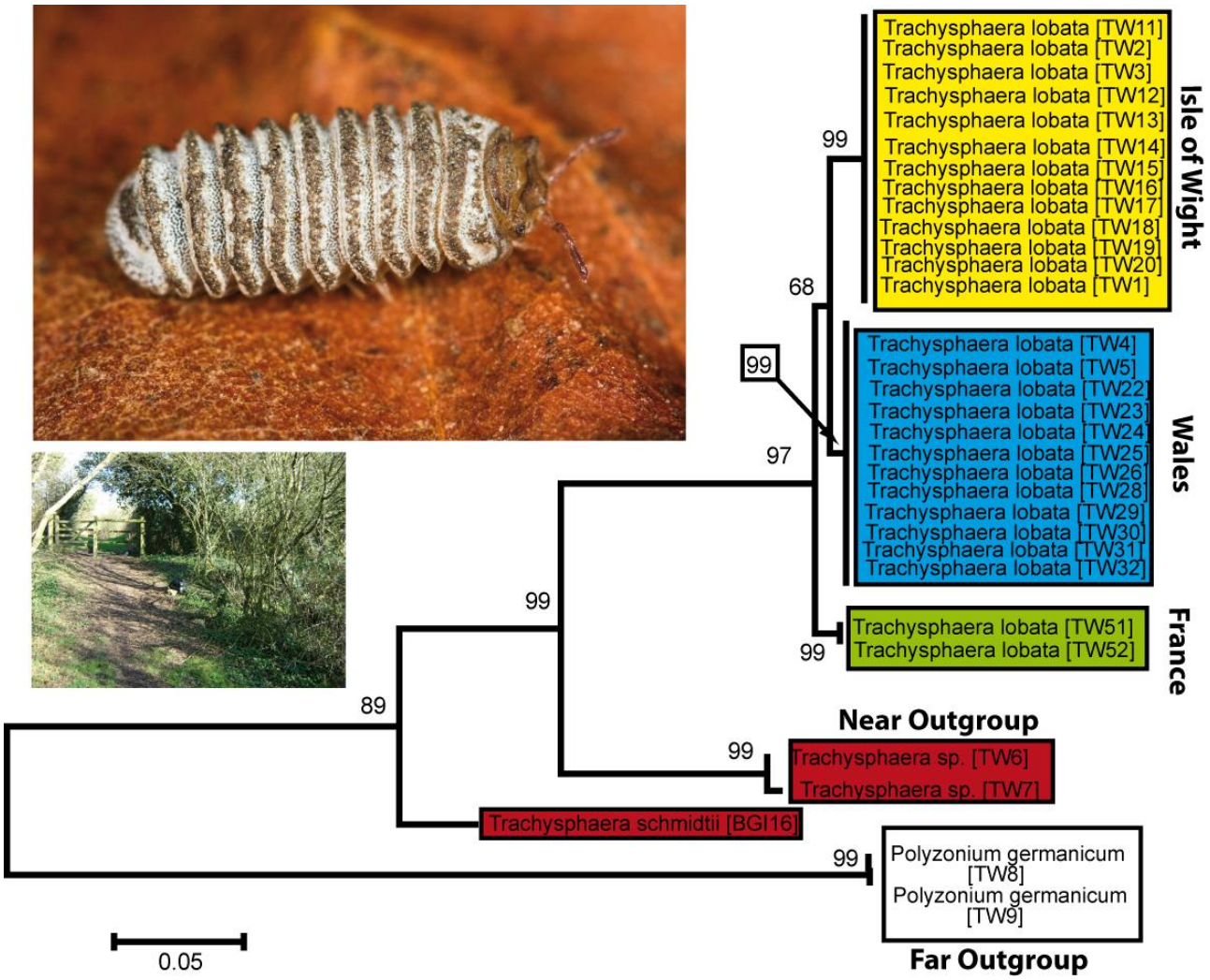

Figure 5: Maximum likelihood tree of 32 COI sequences of *Trachysphaera* and outgroup specimens (from Wilbrandt *et al.*, 2015)

Based on their mitochondrial DNA Wilbrandt *et al*. (2015) concluded that the UK *Trachysphaera* populations clearly belong to *T. lobata* and this was corroborated by the morphological data. The Isle of Wight and Welsh populations show unique haplotypes. The study was not able to trace the origin of the populations in the UK due to difficulties of getting more samples from France. However, the Isle of Wight and Welsh populations were found to have separate origins, although it is not known if this is the result of two separate anthropogenic introductions or two relic populations of a once more widespread distribution.

Morphological comparisons (summarised from Wilbrandt *et al.*, 2015).

A total of 15 morphological characters commonly employed in the taxonomy of *Trachysphaera* were investigated for their taxonomic value, these included for example setae and grooves on the anal shield and the number of tubercles on the posterior margin of tergite 10.

Most of the somatic characters studied showed considerable variation, sometimes to a large degree, for example the number of toothed rows on the collum was variable on each side of the same individual. However, some characters were found that were constant between populations and species, such as the endotergum, or the underside of the tergites, a character that has proved helpful in the taxonomy of the giant pill millipede order Sphaerotheriida (VandenSpiegel *et al*., 2002; Wesener, 2009).

The chela of the male telopods of individuals studied by Wilbrandt *et al*. (2015) showed huge variation within species, between species and even within the same individual, so they are unlikely to help with species identification, unlike in the Sphaerotheriida (Wesner, 2009).

Antić *et al.* (2021) concluded that the structure of the telopod syncoxite was the best character to determine species of *Trachysphaera*, in combination with some somatic traits, although this study did not include *T. lobata* it seems unlikely that this species would be significantly different.

Antič (pers. comm.) has also commented that the angle of view of the telopods is important and those of sub adult males are very different to those of mature males. There is also some difference of opinion over the clarity with which the telopods can be viewed using SEM, Wilbrandt, *et al.* (2015) concluded that this is helpful because of the ability to ensure the point of view is standard for all individuals examined. (See Fig. 6 which illustrates those parts of the male telopods mentioned here).

Therefore, the only characters that were consistent within a species but different between species were the number of rows of tubercles at the posterior margin of tergite 10 (*T. lobata* has two rows and *T. pyrenaica*, *T. cf. rousseti* and *T. cf. drescoi* have only a single row) and the presence of a protuberance on the anal shield in males (*T. lobata* lacks this and the other species have it). This, together with the telopod syncoxite should enable accurate species identification.

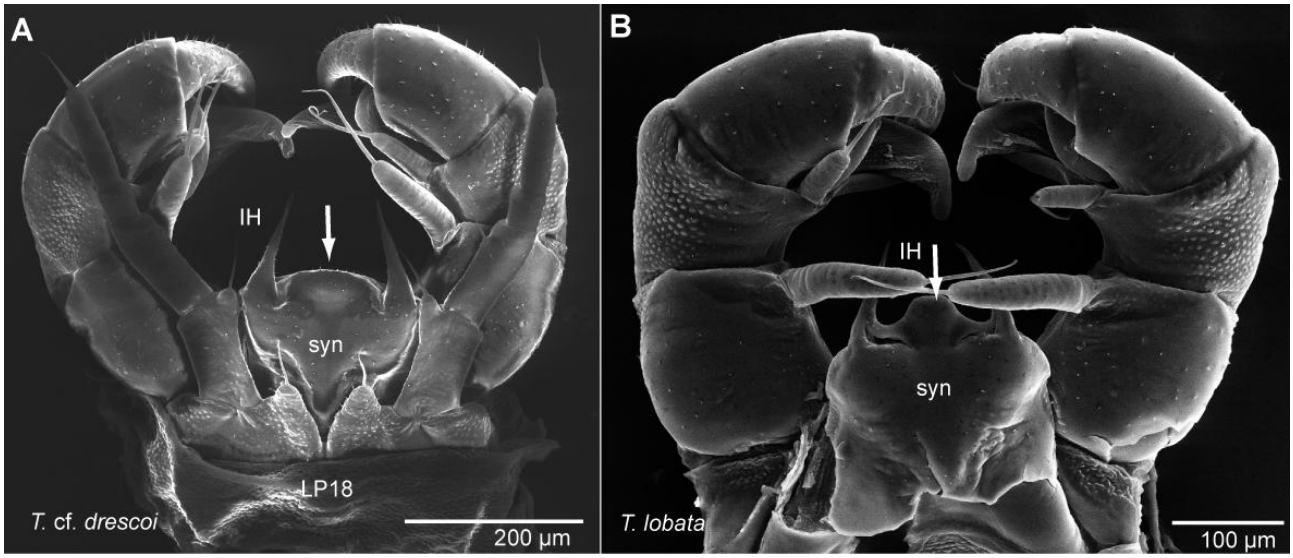

Figure 6: Scanning electron microscopy images of the telopod of *Trachysphaera* species, anterior view. A) *T.* cf. *crescoi* from Sare, France (ZFMK MYR 80), leg pair 18 with telopod; B) *T. lobata* from the Isle of Wight, U.K. (ZFMK MYR 898), telopod.

Arrows point to lobe of syncoxite (the only discernible difference in the telopods of both species). Abbreviations: IH = inner horns of syncoxite; LP18 = leg pair 18; syn = syncoxite of telopod.

Conclusions

The genetic studies (Wilbrandt *et al.,* 2015) have confirmed that this group of tiny millipedes are challenging to study and get good data from. However, they show that the British populations at Bembridge and Llanelli were referrable to *T. lobata*. The two population centres in the Isle of Wight and Wales are considered to be from separate origins although the reason for this is not known.

In 2005 the population at East Cliff, Bembridge included males, females and juveniles and was therefore presumed to be breeding successfully. While the population density had declined from that present in

1986 it was still likely to be a viable population, although restricted to small pockets of suitable substrate (areas with rich humus content as well as sandy elements) within a narrow strip of woodland.

Further searches for this species in Centurion's Copse would be worthwhile, as well as other places where the same rock type outcrops, for example on the west side of the Isle of Wight and in Dorset.

The current site at Bembridge is very vulnerable and is eroding fast. If the species could be found at a less vulnerable location then the future of *T. lobata* in the area would be more secure. Further findings of *T. lobata* at other sites in Wales and its recent discovery in Cornwall (Urquhart & Lee, 2019) are also helpful, lending support to the idea that it might be more widespread in the UK than previously thought and that exploration of caves/mines might be interesting. However, as species of *Trachysphaera* are so tiny in size with complex surface structures, new discoveries require careful checking to identify.

Acknowledgements

Study of the specimens on the Isle of Wight in 2005 was funded by English Nature and Roger Key was instrumental in obtaining this grant. Financial support for the work in 2011 was provided through the UK Government's Department for the Environment, Food and Rural Affairs through a research contract for Project WC0786, understanding the status, autecology and taxonomy of UK biodiversity action plan species, administered by Hymettus.

Thanks to Steve Gregory, Desmond Kime, Ian Morgan, Hans Reip, Alex Schönhofer and others who collected specimens for use in this study. Thank you also to J. Paul Richards for allowing us to use his photographs. We are grateful to Dragan Antič for comments on drafts of the paper and for his insights gleaned through his studies of species of *Trachysphaera* in the Balkans.

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William Elford Leach and his myriapod studies

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Abstract

W.E.Leach (1790-1836) made significant contributions to British zoology and these included not only the creation of a separate Class Myriapoda, distinct from crustaceans and other arthropods but also the description of a number of new myriapod genera and species. There has been some confusion about the actual dates of certain publications and an attempt is made to clarify these. The Brewster's Encyclopædia article is spread between 1813 and 1814 whilst the paper in the Linnean Society *Transactions* was actually published in 1816. Some brief biographical details are also given.

Introduction: W.E.Leach

The name of Leach is associated with a number of common centipedes and millipedes found in Britain and Ireland as a result of several publications during the second decade of the nineteenth century but there has been some slight confusion over precise dates of these so that it seems appropriate to review them and to include a few short biographical notes. W.E. ("Elford") Leach also worked extensively on crustaceans (in the modern sense) and possibly a similar review of our isopods might be useful sometime. Apart from the naming of numerous animal species and the splitting off of the myriapods as a separate group from the crustaceans, arachnids and insects, Leach played a major role in the move from the artificial classification of Linnaeus which had persisted in Britain to the concept of a natural classification and made significant contributions to the progress of British zoology.

William Elford Leach was born in Plymouth in 1790, the youngest of four children of George Leach, an attorney. He attended Plympton Grammar School and later a boarding school at Chudleigh. In 1803 he entered a five-year medical apprenticeship at the Devon and Exeter Hospital in Exeter later moving to London in 1808 at the age of 17 and subsequently to Edinburgh, qualifying in medicine at St. Bartholomew's Hospital (London) and the Universities of Edinburgh and St. Andrews. It was not his intention to practise medicine and he subsequently returned to his zoological interests, becoming assistant librarian in the Zoology Department of the British Museum in 1813 and subsequently assistant keeper in the Natural History Department where he had set himself to sort out the collections.

Always interested in a wide range of natural history, as a teenager he had collected a centipede from gardens around Exeter which he did not recognise from his reading. Realising that it was new to science, he gave it the name *Scolopendra hortensis* (hortensis = from a garden), before sending it to Edward Donovan, well-known author of a monthly magazine on British insects. Donovan published an account, with an illustration, giving it Leach's suggested name (Donovan, 1810) and although Leach himself was often cited in the past as the authority for the name, Jeekel (1999) showed that Donovan was, in fact, the correct authority. Donovan's paper may have been the first time Leach was actually mentioned in connection with myriapods, "collected from gardens in Exeter by Mr Leach".

Leach went on to read his first paper to the Linnean Society (on *Melöe*, oil beetles) in 1809 shortly after his election to the Society at the age of 18 and it was published in their *Transactions* in 1813. Before taking up his post at the museum he had already edited and published *Fauna Orcadensis* based on a

manuscript of Rev. George Low and a monograph on beetles and had "in press" papers on fish and insects and encylopædia articles including his review of crustaceans, myriapods and arachnids

Scolopendra hortensis (From Donovan, 1810)

As well as becoming a leading expert on Crustacea, he published on a wide variety of animals both vertebrate and invertebrate. His *Malacostraca Podophthalam Britanniæ* had reached part 17 in 1820. The contributions to *Zoological Miscellany* were numerous, there were reports on specimens collected on expeditions, contributions towards encylopædias, work on a synopsis of British Mollusca and articles on such diverse subjects as insects, barnacles, fish, frogs and bats. Publications listed for the period from 1813 to 1821 (when he was working in the Museum) occupy more than nine pages of the bibliography in Harrison & Smith's (2009) Ray Society account of his life and family, *Rifle Green by Nature* from which much of the biographical material in the present account is taken. He was elected FRS in 1815.

A number of the locations of species given in his works reflect his connections with both the Westcountry (Devonshire, Danmonia, Dartmoor) and Scotland (Edinburgh, Caledonia) as well as London.

Interestingly in a paper read in 1809 to the Wernerian Society of Edinburgh, Stewart (1811) had listed the myriapods *Scolopendra forficata, Julus terrestris, Julus sabulosus* and *Julus oniscoides* (*Glomeris marginata*) in a list of insects found in the neighbourhood of Edinburgh. Leach, by then at university in that city, joined the Wernerian Society in 1811, reading a paper to them in April on the Eproboscidea (Diptera).

Today, we would probably have described Elford Leach as a "workaholic" with all his published work in addition to his curatorial duties and service on the Council of the Linnean Society, etc. He had planned to visit the Orkney Islands for three months in 1819 but this was deferred and by the summer of 1820 he had not been in Devon for 18 months. At his request, the Museum Trustees granted him two months leave during the summer closure but he worked on regardless. In September he had a breakdown, was in a state of mental collapse and needed professional help. In due course, in 1822, the Trustees granted retirement with an annuity and other contributions. He spent time partly in London and partly in Devon and elsewhere in care or with friends but in October 1824, with his sister Jenny, he was in London on his way abroad and by December they were settled in Nice, a location renowned for the health of its climate.

Whether Leach travelled to Nice for recuperation or to collect specimens, the first certainly seemed to have happened and so did the latter; it seems that he was out collecting insects virtually every day for the first six months as well as working on various manuscripts. During excursions with fellow naturalist Antonio Risso they were collecting a wide range of animals (including millipedes). A paper describing some new barnacles was sent to the *Zoological Journal* of London, naming two species after his colleague whilst Risso, correspondingly named new animal species after Leach. Risso, himself, had listed centipedes and millipedes in his account of the natural history of Nice and the Alpes Maritimes (Risso,1826; see Appendix 2) and presumably much of this derives from his work in collaboration with Leach.

Jenny and Elford left Nice in July, travelling up into the mountains and through Italy and France, returning to Devon in January 1826 having made entomological collections throughout the journey. They returned to Italy later that year spending time in Rome and Genoa and elsewhere, Leach having donated his personal collection of insects and other material to the British Museum. The Leachs, having arrived in Rome, now remained in Italy it seems but spent some time in Malta in 1832. In July 1836 they settled in San Sebastiano Curone in Piedmont, having moved there to try to escape the cholera epidemic in Genoa but, before the end of August, Elford Leach had died of that disease at the age of 45 and his ashes were interred there.

GUGLIELMO ELFORD LEACH ESIMIO D^{re} E FIS^{co}
D'ISTORIA NATURALE PROF^{re} EGREGGIO
ACCADEMICO ED AGGREGATO A DIVERSA SOCIETA'
LETTERARIE E SCIENTIFICHE…"

William Elford Leach eminent doctor and naturalist, Professor of Natural History, distinguished academic and associate of diverse literary and scientific societies…

From the memorial stone, commissioned by his sister Jenny (from Harrison & Smith, 2009).

Leach's publications relating to myriapods

There are four publications, dating from the 1810s, where Leach lists genera and species and describes new ones in relation to centipedes and millipedes. In *Brewster's Edinburgh Encyclopædia* of 1813/5, in the *Linnean Society Transactions* published in 1816, in an *Encyclopædia Britannica Supplement*, also of 1816 and in the third volume of his *Zoological Miscellany* (1817). A report of his presentation of the Linnean Society paper was published by de Blainville in *Bulletin des Sciences* (Blainville, 1816).

It should be borne in mind that at time there may have been quite a long interval between the presentation of a paper at a meeting and its final publication in printed format. Also, that original species descriptions of this period tend to be rather brief (and in Latin). For a species description to be recognised, there must be published written description; being described verbally at a meeting does not constitute a formal description.

The Edinburgh Encylopædia account

In 1813-15, Leach, by now at the British Museum, contributed a section on "Crustaceology" to *Brewster`s Edinburgh Encylopædia* (Leach, 1813/5). In his opinion, the myriapods should have been correctly referable to the Class Crustacea rather than to the Class Arachnides where they had been placed by Lamarck and Latreille. Along with the two crustacean orders Entomostraca and Malacostraca, he proposed a third, Myriapoda, comprising two tribes, Tetracera (Families Asellides & Oniscides, which we now think of as isopod crustaceans; Table 1) and Millepedia (Familes Julides & Scolopendrides, i.e. millipedes & centipedes).

The publication date of this article is 1813 (pp.383-384), 1814 (pp.385-437, 765-766) and a plate, CCXXXI, in a later volume (1815) (Harrison & Smith, 2009) i.e. the first two pages date from 1813 but the myriapods (pp. 376-386) are described in the 1814 part so the author and date for these species names, such as that for *Lithobius variegatus*, the date should be 1814 (i.e. *Lithobius variegatus* Leach, 1814) and not 1813 as, for example, used in the recent centipede atlas (Barber, 2022).

The plate shows various arthropods including both a millipede and a centipede but the bound copy accessible in the Biodiversity Heritage Library does not appear to have a legend so that it is difficult to determine which species are depicted.

Table 1. Classification of the Crustacea (in part) based on Leach, 1813/15

Class CRUSTACEA
- **Order I ENTOMOSTRACA**
  - **TRIBES:** Thecata, Ostracoda, Gymnota
- **Order II MALACOSTRACA**
  - **TRIBES:** Brachyura, Macrouri, Gasterouri
- **Order III MYRIAPODA**
  - **Tribe I: TETRACERA**
    - Family ASELLIDES
      - Genera: *Asellus, Idotea, Anthoura, Ctmotea, Sphaeroma, Nesea, Campecopea*
    - Family ONISCIDES
      - Genera: *Ligia, Philoscia, Oniscus, Porcellio, Armadillo*
  - **Tribe 2: MILLEPEDA**
    - Family JULIDES
      - Genera: *Glomeris, Julus, Polydesmus, Pollyxenus, Craspedosoma*
    - Family SCOLOPENDRIDES
      - Genera: *Scutigera (Scutegera), Scolopendra, Cryptops, Lithobius, Geophilus*

Diplopoda

For millipedes, we have genera *Glomeris*, *Julus* (Linnaeus' original genus), *Craspedosoma*, *Polydesmus* and *Pollyxenus* (*Polyxenus*). *Polyxenus lagurus* had been placed by Linnaeus in the genus *Scolopendra* with the centipedes; the generic name derives from Latreille, 1802 as does *Glomeri*s. Jeekel (1970) gives details of the official acceptance of the spelling *Polyxenus* (with a single l) according to the decision of the ICZN with *Pollyxenus* being regarded as an "incorrect" original name

Previously recognised species were *Glomeris Marginata*, *G. Pustulata* (southern France & Germany) and *G. Ovalis* (– of Linnaeus and others "Inhabits the ocean"). *Julus Terrestris* (Europe), *J. Sabulosus*, *J. Maximus* (America), *J. Fuscus* (India) and *J. Indus* (India), *Polydesmus Complanatus* and *Pollyxenus Lagurus* (Europe).

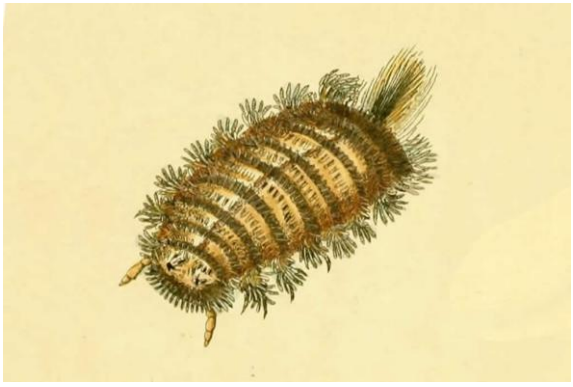
Newly described taxa were *Julus Niger* (by far the most common species in the neighbourhood of Edinburgh), *Craspedosoma Polydesmoides* (Devonshire, often occurring under stones) and *Craspedosoma Raulinsii* (or *Rawlinsii*) (under stones near Edinburgh, where it appears to be pretty common). In relation to *C. Polydesmoides* Leach notes regarding this species '*Julus Polydesmoides*, Montagu's MSS' but there appears to be no record of the manuscript therefore Leach 1814 is presumed to be first published description of this species. The name *C. Raulinsii* commemorates Richard Rawlins, an entomologist, who had collected millipedes in and around Edinburgh with Leach and who had died shortly after moving to Devon in 1812.

"We have now most sincerely to lament the premature death of this gentleman, who, had he survived, would have proved one of the greatest ornaments in the department of Zoology including the animals without vertebrae that has ever appeared in this country. His industry and acquirements were truly astonishing, and his zealous ardour remained to his last moments" (Leach, 1814).

"This genus (*Craspedosoma*) was proposed by my much lamented friend Richard Rawlins Esq. who discovered the first species" (Leach, 1816a). There has been a recent discussion about the correct spelling of this species name. In the 1813-1815 account it is clearly *Craspedosoma Raulinsii* spelled with a "u" but everywhere else Leach uses a "w" and in Rawlins' actual name it is a "w". This issue has been discussed by Read & Enghoff (2023) in another article in this bulletin, where it is concluded that the name *C. raulinsii* is correct and should be used.

Amongst the author's comments were that *Pollyxenus lagurus* was not yet observed in Britain and that *Polydesmus complanatus* was very frequent about Edinburgh and London.

He also noted that in regard to *Julus* that there were several species or varieties which inhabit this country but the marks by which they are distinguished are not sufficiently well known to enable us to give an account of them; it would be highly beneficial to breed from the young state and mark the changes produced (colour, new feet, etc.).



Pollyxenus lagurus **(**From Leach, 1817)

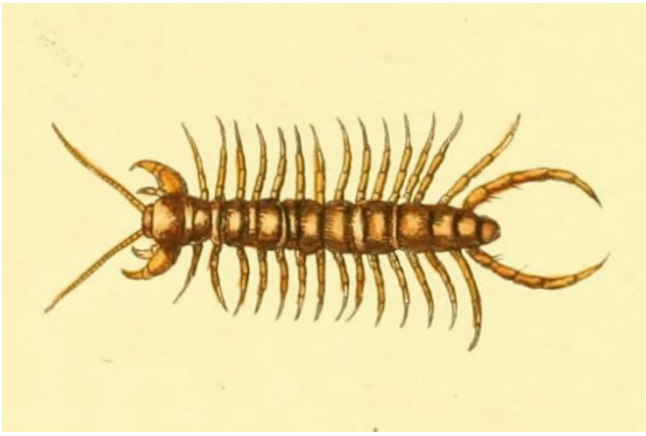
Julus terrestris is not known from Britain or Ireland and it appears that Leach's specimens are referable to *Julus scandinavicus* Latzel, 1884. Linnaeus had described a black coloured snake millipede from Scandinavia in 1758 as *Julus terrestris*. It is almost certain that the species he described was not that which we now know as *Julus scandinavicus* because at that time the species was not widely distributed across Scandinavia, although it has become much more widespread since. Leach, and other people, used the name *Julus terrestris* to refer to a variety of black Julid species (both the true *terrestris* and others) and it was not until 1884 that Latzel clarified the situation along with describing *Julus scandinavicus* as a replacement name for some of the specimens that Leach and others had been referring to as *Julus terrestris* (thanks to Henrik Enghoff for providing clarity on this).

P. complanatus and the similar *Polydesmus angustus* Latzel, 1884 had not been distinguished at this time and it seems almost certain that it was the latter that was being observed in Britain where *P. complanatus* is unknown.

Chilopoda

For centipedes, previously all included in the genus *Scolopendra*, Leach introduced new genera whose names we recognise today, *Cryptops*, Ge*ophilus* and *Lithobius*. *Scutigera* had been named by Lamarck in 1801. Leach confined the genus *Scolopendra* to the so called "giant centipedes" such as *Scolopendra morsitans*.

Amongst previously the described centipede genera and species that were included in his account was *Scutigera Coleoptrata* (which he spells as *Scutegera* and lists *Cermatia* as a synonym). His statement that every joint has two pairs of feet (compared with one pair in others) seems strange at first until one realises that the trunk of *Scutigera* has only seven tergites and so appears from above as having that number of segments. Other previously described species were *Lithobius Forficatus* and *Geophilus Electricus*, both described in the genus



Lithobius forficatus (From Leach, 1817)

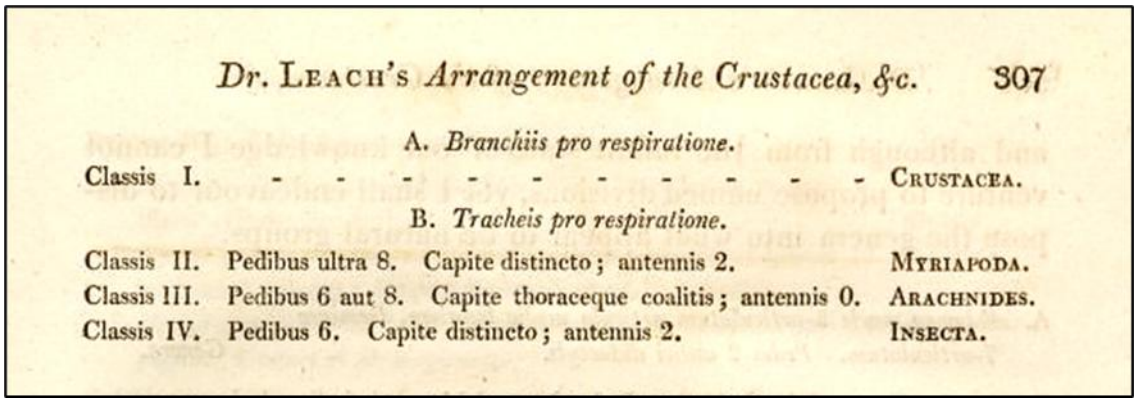
Scolopendra by Linnaeus (1758) together with the *Cryptops hortensis* of Donovan. Chilobase 2.0 (Bonato *et al*., 2016) cites Leach, 1815 (i.e. 1816a of the present account) as the origin of the generic name *Cryptops* but it was used in this 1814 publication.

New species, reported for the first time, were *Lithobius Variegatus* (Devonshire) and *Lithobius Lævilabrum* (common in Scotland – now recognized as synonymous with *L forficatus*). As an "Observation" he adds "Besides the species of this family which have been here described, are many more inhabiting this country but their natural history is so imperfectly understood...." The account also included descriptions of four species of *Scolopendra, S. spinipes, S. inermis,* and *S. inequalis* and *S. morsitans,* all from countries other than Britain, of which only the last, described by Linneaus in 1758, seems to be recognised by Chilobase and a search for *S. inermis* only attributes it to Newport, 1845 without any synonymy. We have been unable to trace any information about the other species listed.

The Linnean Society paper

A paper read to the Linnean Society in three sessions during April, May and June1814 was subsequently published in their *Transactions* (Leach, 1816a). To quote the author, "The object of this paper is chiefly to call the attention of Entomologists to examine into the propriety of constituting a new class to comprehend the Syngnatha and Chilognatha of Fabricus, which Latreille and Lamarck have arranged with the Arachnides." i.e. bringing together the Syngnatha (centipedes) and Chilognatha (millipedes) to form a fourth class, Myriapoda, now excluding woodlice and their allies.

For its historical interest his table of the four classes is reprduced here: Note that members of the Myriapoda are characterised by having tracheal respiration and more than eight legs.



Dr. LEACH'S *Arrangement of the Crustacea, &c.* 307

A. *Branchiis pro respiratione.*

Classis I.	- - - - - - - - - -	CRUSTACEA.

B. *Tracheis pro respiratione.*

Classis II.	Pedibus ultra 8. Capite distincto; antennis 2.	MYRIAPODA.
Classis III.	Pedibus 6 aut 8. Capite thoraceque coalitis; antennis 0.	ARACHNIDES.
Classis IV.	Pedibus 6. Capite distincto; antennis 2.	INSECTA.

Figure 1: Extract from Leach (1816a)

The paper is more detailed in its treatment of centipedes and millipedes than the account in *Brewster's* and woodlice are no longer included in Myriapoda. The precise publication date of this paper has been unclear with 1814 as in *Faune de France Chilopodes*, (Brolemann, 1930) and *Centipedes of the British Isles* (Eason, 1964), 1815 (as in a number of accounts including the millipede *Synopsis*, Blower, 1985, the millipede atlas, Lee, 2006, and the new centipede atlas, Barber, 2022) and 1816 all being quoted. Reference to Harrison & Smith (2008), indicates that the paper was read on 19th April, 3rd May and 1st June 1814 but published on 24th January 1816 a date confirmed by consultation with the Linnean Society (Raphael, 1970; Will Beharrel *pers. comm.*). Although the part concerned with the Myriapoda was dated 1815, it was not actually published until 1816.

The Myriapoda comprises two orders, Chilognatha (millipedes) and Syngnatha (centipedes), the former including three families plus a reference to *Polyxenus* and the latter, three families with the lithobiomorphs and scolopendromorphs together.

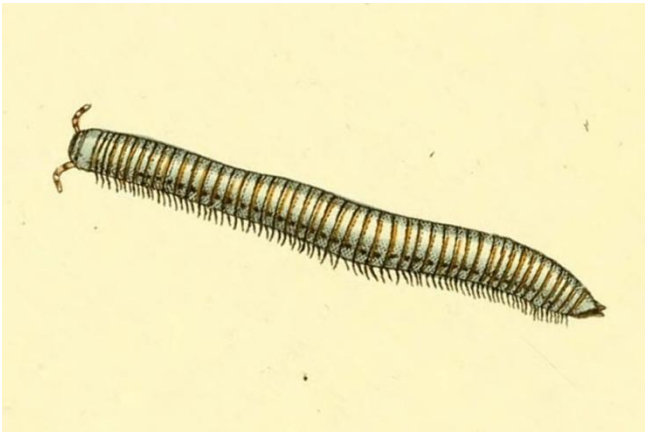
Table 2 Classification of the Myriapoda (based on Leach, 1816a)

Class II MYRIAPODA
Ordo CHILOGNATHA
Family I Glomerides
Genus: *Glomeris* Latr**.**
Family II Julides
Genera: *Julus, Craspedosoma*
Family III Polydesmides
Genus: *Polydesmus* Latr,
Obs. *Pollyxenus* Dom.Latr. mihi invisum
Ordo SYNGNATHA
Family I Cermatides
Genus: *Cermatia* Illig.
Family II Scolopendrides
Genera: *Lithobius, Scolopendra, Cryptops*
Family III Geophilides
Genus *Geophilus*

Diplopoda

Previously described millipedes referred to (with Leach's original descriptions, exactly as given in the publication, in brackets following the name) are *Glomeris pustulatus* (Lusitania frequens), *G. marginata* (in Europâ sub lapidibus), *Julus sabulosus* (in Europæ sabulosis inter muscos et sub lapidibus passim), *Julus niger* (propre Edinburgum sub lapidibus passim; in Arran Insulâ), *Julus terrestris* (Europæ sabulosus, sylvis), *Craspedosoma Rawlinsii* (inter muscos et sub lapidib propre Edinburgum vulgatissima), *Craspedosoma polydesmoides* (in Danmonià propre Plymouth, sub lapidibus passim) and *Polydesmus complanatus*.

New species listed are *Julus Londinensis* (in sylvis Londinium propre inter muscos haud infrequens) [*Cylindroiulus londinensis*], *Julus punctatus* (sub cortice arborum et inter muscos passim) [*Cylindroiulus punctatus*] and *Julus pusillus* (propre Edinburgum sub lapidibus; in Battersea Fields, Londinium propre, inter graminum radices) [*Brachyiulus pusillus*].



Julus Londinensis **(**From Leach, 1817)

The author also includes *Julus pulchellus* which seems to be the species described by Fabricus as *Blaniulus guttulatus*. Leach describes it as "corpore pallidisime flavascente-albido, lateribus utrinque linea punctorum cocciniorum, segment ultimo inermi" which certainly sounds like *Blaniulus guttulatus* with its pale body and row of red spots and this is the view of Millibase (Sierwald & Spelda, 2023). However, its description as "common in the mountainous districts of Great Britain, under moss: it is sometimes found also in gardens at the roots of plants" is, perhaps, surprising.

Chilopoda:

Family I Cermatides and the genus *Cermatia* (*Scutigera*) are referred to but no species is named. For the second Family (II) Scolopendrides, British species listed include *Lithobius forficatus* (Angliâ, Hiberniâ rarior*), Lithobius variegatus* (Danmoniâ australi sub lapidpus passim), *Lithobius Lævilabrum* (Caledonia et Insulis adjacebntibus) and *Cryptops hortensis* (in hortis in co. Devon, haud infrequens). Along with Linnaeus' *Scolopendra morsitans*, four new species of *Scolopendra* were included, *S. gigas*, *S. alternans*, *S. subspinipes* and *S. trigonopoda*. *S. trigonopoda* does not seem to be currently recognised by a search using this name in Chilobase, but it does, however, cite *Ethmostigmus trigonopodus* (Leach, 1817). The same source lists *S. gigas* as *S. gigantea* Linnaeus, 1758.

Family III Geophilides included *Geophilus subterraneus* [*Stigmatogaster subterranea*] (no location given), *Geophilus longicornis* [*Geophilus flavus*] (prope Edinburgum et Londinium sub lapidus) and new species listed were *Geophilus acuminatus* (Roborough Down nr Plymouth, Battersea Fields) and *Geophilus carpophagus* (in fructibus Danmoniæ passim).

Following his description of *Geophilus acuminatus*, Leach comments that "To this division of the genus *Geophilus*, *Scolopendra electrica* of authors with two other indigenous and some exotic species belong; but as I have not had opportunities of examining the living animals, I shall at present forbear from giving any account of them".

The Encyclopædia Britannica Supplement account

Also dated from 1816 was an account of myriapods included within the subject Annulosa in the *Supplement to Encyclopædia Britannica* (Leach, 1816b). This seems to be more or less completely derivative, referring back to the *Transactions* account with little new material and a limited list of species although family names are now given as Glomeridea. Julidea, Polydesmidea, Cermatidea, Scolopendridea and Geophilidea. Under *Cermatia* (attributed to Illiger and to Leach and synonymised with *Scutigera*), it includes the species *Coleoptrata* (in the Family Cermatidea).

The Zoological Miscellany

Since 1789, George Shaw had been publishing a monthly journal, *Naturalist's Miscellany*. He had also published an account of a new centipede *Scolopendra subterranea* [*Stigmatogaster subterranea*] in the Linnean Society *Transactions* (Shaw, 1794) and written an article *Scolopendra* Centipede which appeared in his *General Zoology* (Shaw, 1806a) referring to *Scolopendra morsitans*, *Scolopendra Plumieri* (not recognised in Chilobase), *Scolopendra forficata* [*Lithobius forficatus*], *Scolopendra electrica* [*Geophilus electricus*] and *Scolopendra subterranea*. In the same volume (Shaw, 1806b) under *Julus* he refers to *Julus sabulosus*, *Julus Indus* (Great Indian Julus) and *Julus lagurus* (Hare-Tailed Julus).

After Shaw's death in 1813, his publishers were keen to continue with the *Naturalist's Miscellany* and Leach came to an arrangement with them to continue this work which he did, the name having been changed to *Zoological Miscellany*, commencing in 1815. In the third and last volume (Leach, 1817) was included the Class Myriapoda. The price of the three volumes together was advertised as £4.15s and coloured figures were by R.P.Nodder.

There were no family names given in this account of the Class Myriapoda, only Orders (Chilognatha and Syngnatha), genera (*Glomeris*, *Julus*, *Craspedosoma*, *Polydesmus*, *Pollyxenus*, *Cermatia*, *Lithobius*, *Scolopendra*, *Cryptops*, *Geophilus*) and species and the article was bears the title *The Characters of the Genera of the Class Myriapoda, with Descriptions of some species*.

Diplopoda

Millipedes were listed as *Glomeris marginata*, *Julus sabulosus*, *Julus Londinensis*, *Julus niger*, *Julus terrestris* (see previous comment regarding this species), *Julus punctatus*, *Julus pulchellus*, *Julus pusillus*, *Craspedosoma Rawlinsii*, *Craspedosoma polydesmoides*, *Polydesmus complanatus* (see previous comment regarding this species) and *Pollyxenus lagurus* with no new species added.

Chilopoda

Previously described centipedes listed were *Lithobius forficatus*, *L. variegatus* (Habitat in Anglia occidentali; præsertim in Danmonia), *Cryptops hortensis*, *Geophilus carpophagus*, *Geophilus subterraneus*, *Geophilus acuminatus* and *Geophilus longicornis*. *Lithobius vulgaris* was the name given to his previously described *Lithobius lævilabrum*, itself a synonym of *Lithobius forficatus*.

To these were added our first named halophilic centipede, *Geophilus maritimus* [*Strigamia maritima*] (in Britannia inter scopulos ad littoral maris vulgatissime) and *Cryptops Savignii* (Habitat in Musei Britannici horto). The latter is now considered to be a synonym of the subsequently described *Cryptops anomalans* (see: Lewis, 2014a). Leach also referred to *Cermatia livida* from Madeira, now considered a synonym of *Scutigera coleoptrata*. Five species of *Scolopendra* were included, the same as in the *Transactions* paper (Leach, 1816a).

Geophilus maritimus (Detail from Leach, 1817)

A late report on millipedes (Plymouth Institution)

To quote Harrison & Smith, "Devon's distance from London was such that its intellectual society formed independently and in 1810 (Henry) Woollcombe and a small group of like-minded individuals planned the formation of a modern *Athenæum*, a new scientific and philosophical society for this rapidly expanding community…" The Plymouth Institution held its inaugural meeting in October 1812 and Elford Leach was one of the founder members. In due course a proposed *Transactions* was to be published and Leach seems to have been submitting articles for the planned first volume for some years, certainly since he was at the British Museum but there seemed to be serious delays before the first volume of the *Transactions of the Plymouth Institution* which finally appeared in 1830.

Amongst the articles was a note by William Elford Leach MD, FRS, etc, an honorary member of the society; "Description of some new species of the class Myriapoda" (Leach, 1830). These were five species of *Julus* and *Euopes rissonianus* all from southern Europe all of which, apart from one, had probably already been named in Risso (1826) by the time the Plymouth article was published. Species accepted as valid are *Julus annulatus* (*Julus annulatus* Risso, 1826), *Julus modestus* (*Julus modestus* Risso, 1826) and *Julus piceus*, now known as *Leptoiulus piceus* (Risso,1826). *Julus aimatopus* may be a misprint for *Julus aimatopodus* Risso, 1826 (a synonym of *Ommatoiulus sabulosus*) which MilliBase flags up as a less strict, matching extant record. *Julus trilineatus* is not referred to in Risso's account and when checked in MilliBase with either Leach or Risso as an authority does not seem to be recognised, only the *J. trilineatus* of C.LKoch, 1847.

The situation regarding *Euopus rissonianus* is more complex than suggested in Harrison & Smith's (2008) comment that Risso had missed one of Leach's species, *Euopes rissonianus*, In fact, Risso had included *Callipus rissonius* (Leach) ("Sous les pierres du Lazaret et de Baus-Rous"), in his list having coined the new generic name *Callipus* and *Callipus rissonius* is given as a junior synonym of *Callipus*

foetidissimus by MilliBase. Brolemann (1935) and Demange (1981) give as the authority for the genus *Callipus* "Leach apud Risso, 1826" and list *C. foetidissimus* as (Savi, 1819), Savi having been the original describer of *Iulus fœtidissimus*.

Leach's (1830) name, with the spelling *rissonianus* rather than *rissonius* ("not uncommon in gardens, groves, and woods in the south of France, and in Italy") is accepted by MilliBase as *Euopus rissonianus* Leach, 1830 with *Euopus* Leach,1830 being listed as a synonym of *Callipus*. Only one species of *Callipus*, *C. foetidissimus* is listed in Brolemann (with several varieties) and by Demange from mainland France and it seems not at all improbable that Leach's and Risso's species were the same.

Acknowledgements

Will Beharrel, Librarian of the Linnean Society of London and to that Society for information relating to the date of publication of their Transactions (Leach, 1816a, Raphael, 1970). Also to Lucio Bonato (Università degli Studi di Padova), Greg Edgecombe (Natural History Museum, London) and Henrik Enghoff (Zoologisk Mueum, København) for valuable information and advice on nomenclature.

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Appendix 1: List of myriapod genera & species described by W. E. Leach 1814-1817 (with current names)

1813-15 (1814) Edinburgh Encyclopædia

Diplopoda:

Genera:	*Craspedosoma* Leach 1814
Species:	
Julus Niger	*Tachypodoiulus niger* (Leach, 1814)
Craspedosoma Raulinsii	*Craspedosoma raulinsii* Leach, 1814
Craspedosoma Polydesmoides	*Nanogona polydesmoides* (Leach, 1814)

Chilopoda:

Genera	*Cryptops* Leach 1814
	Geophilus Leach 1814
	Lithobius Leach 1814
Species:	
Lithobius Variegatus	*Lithobius variegatus* Leach, 1814

1816 Transactions of the Linnean Society

Diplopoda:

Species:	
Julus Londinensis	*Cylindroiulus londinensis* (Leach, 1816)
Julus punctatus	*Cylindroiulus punctatus* (Leach, 1816)
Julus pusillus	*Brachyiulus pusillus* (Leach, 1816)

Chilopoda:

Species:	
Geophilus acuminatus	*Strigamia acuminata* (Leach, 1816)
Geophilus carpophagus	*Geophilus carpophagus* Leach, 1816 ss
Scolopendra Gigas	*Scolopendra gigantea* Linnaeus, 1758
Scolopendra alternans	*Scolopendra alternans* Leach, 1816
Scolopendra subspinipes	*Scolopendra subspinipes* Leach, 1816
Scolopendra trigonopodus	*Ethmostigmus trigonopodus* (Leach, 1816)

1817 Zoological Miscellany

Diplopoda:

No new genera or species

Chilopoda:

Species:	
Geophilus maritimus	*Strigamia maritima* (Leach, 1817)
Cryptops Savignii	= *Cryptops anomalans* Newport, 1844

Appendix 2: Higher taxa (orders & families)

Diplopoda

Higher order millipede taxa attributed to Leach in the recent classification (Enghoff *et al*., 2015) with corrected dates as proposed here.

Leach's name & date	**As listed in Enghoff *et al*. (2015)**	**Proposed here**
1816a Family Glomerides 1816b Family Glomeridea	Order Glomerida Leach, 1814 Family Glomeridae Leach, 1816	Order Glomerida Leach, 1816 Family Glomeridae Leach, 1816
1816a Family Polydesmides 1816b Family Polydesmidea	Order Polydesmida Leach, 1816 Family Polydesmidae Leach, 1816	Order Polydesmida Leach, 1816 Family Polydesmidae Leach, 1816
1814 Family Julides 1816a Family Julides 1816b Family Julidea	Family Julidae Leach, 1814	Family Julidae Leach, 1814

Chilopoda

Leach, (1814) had included *Scutigera* (spelled *Scutegera*) in the Family Scolopendrides. In the *Transactions Linn.Soc.* paper (Leach 1816a) he has a Family Cermatides including *Cermatia* (= *Scutigera*) and similarly in the Encyclopædia Britannica account, Leach, 1816b) in Cermatidea. Note that *Lithobius* was included in the family Scolopendrides / Scolopendridea at this time. Centipedes are today included in five orders, Geophilomorpha, Scolopendromorpha, Lithobiomorpha, Scutigeromorpha and Craterostigmomorpha, the first four generally attributed to Pocock, 1895. There is some degree of variation in the delineation of families and sub-families by different authors.

Family level centipede taxa attributed to Leach in a recent taxonomic account (Bonato *et al*. (2011) are listed below but it appears that the attribution of Leach's name to Scutigeridae / Scutigerinae is incorrect (Many other sources apparently give Gervais, 1837). The attribution of Leach, 1814 to Scolopendridae / Scolopendrinae / Scolopendrini is correct. That to Geophilidae is also Leach but the correct date for this is now recognised as 1816, the date of the relevant publication (Lucio Bonato, *pers.comm*,).

Leach's name & date	**As listed in Bonato *et al*. (2011)**	**Proposed here**
1816a Family Cermatides 1816b Family Cermatidea	Family Scutigeridae Leach, 1814 Sub-family Scutigerinae Leach, 1814	Not attributed to Leach
1814 Family Scolopendrides 1816a Family Scolopendrides 1816b Family Scolopendridea	Family Scolopendridae Leach, 1814 Sub-family Scolopendrinae Leach, 1814 Tribe Scolopendrini Leach, 1814	Family Scolopendridae Leach, 1814 Sub-family Scolopendrinae Leach, 1814 Tribe Scolopendrini Leach, 1814
1816a Family Geophilides 1816b Family Geophilidea	Family Geophilidae Leach, 1815	Family Geophilidae Leach, 1816

Appendix 3: Myriapods listed by A. Risso (1826) from the Alpes Maritimes

(Current names derived from MilliBase (**Sierwald & Spelda, 2023)** or Chilobase (Bonato *et al*., 2016); the spellings Chilognates and Jullus are those given in Risso's original account)

Les Chilognates (Chilognathes)

Glomeris (Lat.), (Glomeris)	*G. marginata* (G. marginé)	(*Glomeris marginata*)
	G. castaneus (N.) (G. châtain)	(*Onychoglomeris castanea*)
	G. guttatus (N.) (G. tacheté)	(presume *G.guttata* Rosso, 1826)
Jullus (*Julus*) (Lin.), (Jules)	*J. sabulosus* (Lin.) (J. des sables)	(*Ommatoiulus sabulosus*)
	J. aimatopodus (N.) (J. incarnat)	(*Ommatoiulus sabulosus*)
	Demange (1981) refers to this as *O. sabulosus aimatopodus*]	
	J. annulatus (N.) (J. annelé)	(*Julus annulatus*)
	J. modestus (N.) (J. modeste)	(*Julus modestus*)
	J. piceus (N.) (J.noirâtre)	(*Leptoiulus piceus*)
Callipus (N.) (Callipe)	*C. rissonius* (Leach) (C. de Risso)	(*Callipus foetidissimus*)
Craspedosoma (Leach) (Craspedosome)	*C. polydesmoïdes* (Polydesmoïde)	(*Nanogona polydesmoides*)
Polydesmus (Lat.) (Polydesme)	*P. complanatus* (P. lisse)	(*Polydesmus complanatus*)
	[*Polydesmus complanatus* is not listed in Demange (1981) but *P.angustus* is]	
Polyxenus (Lat.) (Polyxéne)	*P. lagurus* (P. en pinceau)	(*Polyxenus lagurus*)

Les Syngnathes

Cermatia (Ill.) (Scutigère)	*C. variegata* (N.) (S. variée)	(*Scutigera coleoptrata*)
Lithobius (Lam.) (Lithobie)	*L. forficatus* (L. fourche)	(*Lithobius forficatus*)
	L. longicornis (N.) (L. à longues cornes)	(*Eupolybothrus longicornis*)
Geophilus (Leach) (Géophile)	*G .longissimus* (G. très long)	(*Himantarium gabrielis*)

On the species names of some British millipedes

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Introduction

The dates when the species descriptions, made by Leach in the 19th century, of some British centipedes and millipedes were published are discussed at some length in another article in this bulletin (Barber and Read, 2023). One of the species is that referred to in current checklists, such as on the British Myriapod and Isopod Group website, as *Craspedosoma rawlinsii*, and this has been the subject of recent discussion regarding its spelling (Dolejč & Kocourek, 2019).

Craspedosoma rawlinsii or *raulinsii*?

In the original description by Leach (1813-1815) the species is clearly spelled *Craspedosoma Raulinsii* with a "u" although everywhere else in the text Leach uses a "w". It is also clearly stated that the species was named to commemorate Richard Rawlins, an entomologist with whom Leach had worked, however Rawlins' actual name was spelt with a "w". Although the spelling *rawlinsii* has been that in general circulation in British literature, Jeekel (1970), Hoffman (1999) and more recently McAlpine & Shear (2018) have pointed out that the original spelling of *Raulinsii* should be the correct one. McAlpine & Shear (2018) give a much fuller account including a detailed discussion regarding Leach and his competency in Latin, pointing out that the letter W is not present in the Roman alphabet and also discussing why he might have changed the spelling at a later date. Dolejš & Kocourek (2019) also discussed this subject but retained the use of the spelling *rawlinsii* recommending that a case should be put to the Commission on Zoological Nomenclature to keep the accepted spelling.

It appears that there is no valid argument for emending the spelling of a species name because it does not agree with that of a name of a person for whom the species was described and that the original spelling as published by the author, regardless of any typos or misspellings, should be adopted. Therefore, despite the fact that MilliBase (Sierwald & Spelda, 2023) gives the form "*raulinsii*" as "unaccepted" and accepts *Craspedosoma rawlinsii* the correct spelling should be *raulinsii* (with a lower case *r*).

Cylindroiulus latestriatus or *latistriatus*?

It seems that the history of the name of this species is somewhat similar to that of *Craspedosoma raulinsii*. In the original description by Curtis in 1845, the first mention of the species is given as *Julus latistriatus*, although subsequent mentions in the same paper use the spelling *latestriatus*. This original spelling was used by Brade-Birks & Brade-Birks (1919) and was also reinstated by Jeekel in 2002, with the relevance of this highlighted to HJR some years ago by Bob Mesibov (pers. comm). As above, since the original description was clearly linked to the spelling *latistriatus*, this should be the correct version used. Millibase (Sierwald & Spelda, 2023) lists a large number of synonyms for this species, but all the spellings are listed as *latestriatus* rather than *latistriatus.*

i or ii at the end of names?

There has also been some debate about the use of -ii at the end of species names. In the time of Leach, when those describing species were fluent in Latin, it was common practice to Latinise names so, when

naming species after a person, for a man the name would end in -ius and the grammatically correct Latin derivative would be to end in -ii, hence *raulinsii*.

Today, people do not generally learn Latin and are much less familiar with the language. The practice of Latinising people's names is now generally obsolete and it is widely accepted that a species named for a man would end in a single -i. The use of -ii would only be made if the person's name ended in an i. For older names, the form, -i or –ii, as used the original description should be used.

Conclusion

In the forthcoming revision of the 1985 synopsis (Blower, 1985) it is intended the species names will be spelled as follows:

Craspedosoma raulinsii and *Cylindroiulus latistriatus*.

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New records of centipedes (Myriapoda, Chilopoda) from some European countries

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Abstract

European centipedes collected by colleagues in England, France, Germany, Norway, Portugal, Sweden and Switzerland are reported. Ecological data on these captures are also provided.

Key words: *Cryptops*, *Dignathodon*, *Eupolybothrus*, *Geophilus*, *Henia*, *Lithobius*, *Schendyla*, *Scolopendra*, *Stigmatogaster*, *Strigamia*.

Introduction

Centipedes are a predatory group of soil-dwelling myriapods which comprise more than 500 species in Europe (Zapparoli, 2003, Bonato & Minelli, 2014; Enghoff, 2016). Comprehensive works on the class Chilopoda have been developed in several European countries, for example in Belgium (Lock, 2000a, 2000b), Bulgaria (Stoev, 2002), France (Brolemann, 1930; Iorio, 2014; Iorio *et al*., 2022, 2023), Italy (Bologna *et al*., 2022), Lithuania (Tuf *et al*., 2015), Fennoscandia and the Nordic countries (Andersson *et al*., 2008, 2013), Netherlands (Berg *et al*., 2008), Poland (Kaczmarek, 1979), Portugal (Machado, 1952), Romania (Matic, 1966, 1972), Spain (Serra, 1980; Iorio & Voigtländer, 2019), Switzerland (Am Stein, 1857; Stöckli, 2009) and the United Kingdom (Eason, 1964; Barber, 2009, 2022), amongst others. Many regional studies on centipedes are also known from Austria (Koren, 1986, 1992), Belgium (Lock *et al*., 2001; Dethier & Hubart, 2010), Italy (Gobbi *et al*., 2020; Baini & Zapparoli, 2022), Germany (Voigtländer, 2007, 2009; Reip & Voigtländer, 2009), Greece (Simaiakis *et al*., 2004, 2005, 2016), Hungary (Novák & Dányi, 2010), Luxembourg (Kime, 2007), Netherlands (Jeekel, 1978; Jeekel & van der Hammen, 1983), Portugal (Serra, 1988; Gregory & Lewis, 2015), Romania (Ion, 2008; Giurginca *et al*., 2017), Slovakia (Stašiov & Svitok, 2014), Spain (García-Ruiz & Serra, 2003; Cabanillas, 2019a, 2021) or Switzerland (Gilgado *et al*., 2022), amongst others. Other works have contributed to expanding our knowledge on the centipede fauna of Europe (Eason, 1982; Bonato *et al*., 2012a, 2017; Bonato & Minelli, 2014; Iorio, 2021). Nevertheless, many countries have poorly been studied due to the small numbers of myriapodologists and the unavailability of samples. Since centipedes are a neglected group within the Phylum Arthropoda, even small contributions play an important role in increasing morphological and ecological knowledge. Bearing this in mind, certain samples deposited in the author's collection could provide complementary data to extend the known distribution and ecology of European centipedes. The main aim of this work is to provide the myriapodologist community with new collecting data on 24 centipede species from seven European countries.

Material & methods

Specimens collected by colleagues and collaborators from different parts of Europe (England, France, Germany, Norway, Portugal, Sweden and Switzerland) during their diplopodological and entomological surveys, were kindly provided and deposited in the author's collection to provide material for future publications. Specimens were searched for under rocks, logs or leaf-litter and then hand collected. Some subterranean traps (70-100 cm deep), consisting of glass jars baited with smelly cheese, filled with

propylene glycol as preservative substance (see Giachino & Vailati, 2010), were also installed in the Mesovoid Shallow Substratum.

A binocular stereo microscope, model AmScope SM-1TSZZ-144S-10M-3PL (3.5-180x), was used to study specimens. Identification keys and morphological works were consulted to determine the species (Brolemann, 1930; Machado, 1952; Eason, 1982; Barber, 2008; Iorio, 2010a, 2010b, 2021; Bonato *et al*., 2012b, 2014; Voigtländer *et al*., 2017; Iorio *et al*., 2022). Taxonomical criteria of Ganske *et al.* (2020) were followed for Lithobiomorpha, Iorio (2021) for Himantariidae and Bonato *et al.* (2016) for the remaining taxa. Coordinates are expressed in the Universal Transverse Mercator system (Datum ETRS89).

Abbreviations: *leg*. = *legit* (collector), LP - leg pairs. MSS – Mesovoid Shallow Substratum. spec. = specimen/s.

Results

Class Chilopoda
Order Geophilomorpha
Family Dignathodontidae

***Dignathodon microcephalus* (Lucas, 1846)**
Material examined: Portugal – Algarve, Faro, Mexilhoeira Grande, near A ROCHA Life: 1♀ with 81 LP (S. Santos García *leg*.), 10/11/2021, under a rock in a grassland (29S 534 4111).

***Henia (Chaetechelyne) vesuviana* (Newport, 1845)**
Material examined: France – Provence-Alpes-Côte d'Azur, Hautes-Alpes, Veynes, near Les Villages des Jeunes: 1♂ with 73 LP and 1♀ with 79 LP (S. Santos García *leg*.), 01/04-15/05/2021, under a rock in a valley (31T 724 4935). **Germany** – Freiburg, Lörrach, Grenzach-Wyhlen: 1 juvenile with 73 LP (B. Braschler & J.D. Gilgado *leg*.), 17/09/2020, in an urban forest (32T 397990 5268381). Freiburg, Lörrach, Inzlingen: 1♂ with 65 LP, 1♀ with 69 LP, 1♀ with 71 LP and 2♀ with 73 LP (B. Braschler & J.D. Gilgado *leg*.), 17/09/2020, in the boundaries of a beech forest (32T 400586 5270962). **Switzerland** – Aargau, Rheinfelden, Altägerte, Z'loch: 1♀ with 71 LP (S. Skillman *leg*.), 23/05/2018, in a grassland near crops (32T 410019 5263359). Basel-Stadt, Basel: 1♀ with 71 LP (J.D. Gilgado *leg*.), May 2018, in an urban park (32T 396224 5269724). Binningen: 1♂ with 65 LP (J.D. Gilgado *leg*.), 17/10/2018, probably in a garden (32T 39 526).

Family Geophilidae

***Geophilus carpophagus* Leach, 1815**
Material examined: England – Norfolk, King's Lynn: 3♀ with 55 LP (S. Santos García *leg*.), 03/11/2020, under bark of a decaying log in a woodland (31U 328165 5852128).

***Geophilus easoni* Arthur, Foddai, Kettle, Lewis, Luczynski & Minelli, 2001**
Material examined: England – Norfolk, Sandringham: 1♀ with 49 LP (S. Santos García *leg*.), 14/11/2020, under bark of a decaying log in a woodland (31U 332457 5857019).

***Geophilus electricus* (Linnaeus, 1758)**
Material examined: Switzerland – Basel-Landschaft, Liestal, Lupsingen: 1♀ and 1 juvenile with 69 LP (B. Braschler *leg*.), May 2018, in a mixed forest (32T 402340 5256264).

***Geophilus flavus* (De Geer, 1778)**
Material examined: England – Norfolk, Sandringham: 1♀ with 57 LP (S. Santos García *leg*.), 14/11/2020, under bark of a decaying log in a woodland (31U 332457 5857019). **France** – Provence-Alpes-Côte d'Azur, Hautes-Alpes, Veynes, near Les Villages des Jeunes: 1♂ with 53 LP (S. Santos

García *leg*.), 01/04-15/05/2021, under a rock in a valley (31T 724 4935). **Norway** – Eastern Norway, Innlandet, near Hamar: 1♀ with 57 LP, 13/09/2022 (S. Santos García *leg*.), under a rock near crop fields of *Allium cepa* L. (Onion) and *Brassica oleracea* L. var. *botrytis* (Cauliflower) (32V 613 6742).

Family Himantariidae

***Stigmatogaster subterranea* (Shaw, 1789)**
Material examined: Switzerland – Basel-Stadt, Bitburg-Prüm, St. Chrischona: 1♂ with 79 LP (J.D. Gilgado *leg*.), 16/09/2019, soil trap in a mixed forest of coniferous trees and beech (32T 400229 5270010).

Family Linotaeniidae

***Strigamia acuminata* (Leach, 1815)**
Material examined: Germany – Freiburg, Breisgau-Hochschwarzwald, Breitnau, Black Forest (surroundings of Hammerloch-Gut): 1♀ with 41 LP (J.D. Gilgado *leg*.), 19/07/2020, in a coniferous forest (32T 434459 5311585). **Switzerland** – Basel-Landschaft, Dornach: 1♂ with 39 LP and 2♀ with 41 LP (J.D. Gilgado *leg*.), 24/06/2019-24/07/2020, MSS trap in scree in a beech forest (32T 397688 5258332). Graubünden, Albula, Alvaneu: 1 juvenile with 39 LP (J.D. Gilgado *leg*.), 03/06/2019, near a river in a coniferous forest (32T 548768 5168071). Graubünden, Prättigau/Davos, road from Klosters-Serneus to Laret: 1♂ with 39 LP and 1♀ with 41 LP (J.D. Gilgado *leg*.), 03/06/2019, in a mountainous grassland (32T 567233 5188481).

Family Schendylidae

***Schendyla nemorensis* (C.L. Koch, 1837)**
Material examined: Switzerland – Basel-Stadt, Basel: 2♀ with 39 LP (J.D. Gilgado *leg*.), May 2018, in an urban park (32T 396224 5269724). Riehen: 1♀ with 41 LP (J.D. Gilgado *leg*.), May 2018, in a forest (32T 399013 5269875).

Order Lithobiomorpha
Family Lithobiidae

***Eupolybothrus (Eupolybothrus) longicornis* (Risso, 1826)**
Material examined: France – Provence-Alpes-Côte d'Azur, Hautes-Alpes, Veynes, near Les Villages des Jeunes: 1♂/1♀ (S. Santos García *leg*.), 01/04-15/05/2021, under a rock in a valley (31T 724 4935).

***Eupolybothrus (Leptopolybothrus) tridentinus* (Fanzago, 1874)**
Material examined: Switzerland – Basel-Landschaft, Dornach: 1♀ (J.D. Gilgado *leg*.), 24/06/2019-24/07/2020, MSS trap in scree in a beech forest (32T 397688 5258332).

***Lithobius agilis* C.L. Koch, 1847**
Material examined: Switzerland – Basel-Stadt, Basel: 1♂/1♀ (J.D. Gilgado *leg*.), May 2018, in an urban park (32T 396224 5269724).

***Lithobius crassipes* L. Koch, 1862**
Material examined: France – Provence-Alpes-Côte d'Azur, Hautes-Alpes, Veynes, near Les Villages des Jeunes: 1♀ (S. Santos García *leg*.), 01/04-15/05/2021, under a rock in a valley (31T 724 4935).

***Lithobius curtipes* C.L. Koch, 1847**
Material examined: Sweden – Norrland, Västerbotten, Vindeln: 1♂ (J. Díaz-Calafat *leg*.), 24/05/2021, under a rock in a mixed forest of *Picea abies* (L.) H. Karst, *Betula pendula* Roth and *Betula pubescens* Ehrh. (34W 439178 7132127).

***Lithobius forficatus* (Linnaeus, 1758)**

Material examined: England – Norfolk, King's Lynn: 1♂/1♀ (S. Santos García *leg*.), 05/11/2020, under a decaying log in a woodland (31U 328165 5852128). **France** – Provence-Alpes-Côte d'Azur, Hautes-Alpes, Veynes, near Les Villages des Jeunes: 1♀/1 *agenitalis* (S. Santos García *leg*.), 01/04-15/05/2021, under a rock in a valley (31T 724 4935). **Germany** – Freiburg, Breisgau-Hochschwarzwald, Breitnau, Black Forest (surroundings of Hammerloch-Gut): 1♀ (J.D. Gilgado *leg*.), 19/07/2020, in a coniferous forest (32T 434459 5311585). Freiburg, Lörrach, Inzlingen: 1♂ (B. Braschler & J.D. Gilgado *leg*.), 17/09/2020, in the boundaries of a beech forest (32T 400586 5270962). **Norway** – Eastern Norway, Innlandet, near Hamar: 1♀, 05/09/2022; 2♂/1♀, 06/09/2022; 1♀, 12/09/2022 and 1♀, 13/09/2022 (S. Santos García *leg*.), under a rock near crop fields of *Allium cepa* L. (Onion plant) and *Brassica oleracea* L. var. *botrytis* (Cauliflower) (32V 613 6742); near Ottestad: 1♀, 09/09/2022 (S. Santos García *leg*.), in a bathroom of a private house at night and 1♂ (S. Santos García *leg*.), 05/11/2020, under a rock near the road (32V 616 6736). Østlandet, Østfold, Løen: 1♀, 19/05/2022 (S. Santos García *leg*.), under moss in a mountainous environment (32V 387 6861). Trøndelag, Sør-Trøndelag, Trondheim, near Elvarli: 1♀, 09/06/2022 (S. Santos García *leg*.), under a rock near a road (32V 604 7029). Vestlandet, Møre og Romsdal, Ålesund, near Moa: 1 *agenitalis*, 08/05/2022 and 1♂, 19/05/2022 (S. Santos García *leg*.), under a rock near a road (32V 363 6928). **Sweden** – Götaland, Skåne County, Scania, Vivarp: 2♂/1♀ (J. Díaz-Calafat *leg*.), 16/08/2021, under a decaying log in a mixed forest of *Picea abies* (L.) H. Karst, *Betula pendula* Roth and *Betula pubescens* Ehrh. (33V 4367 62391). **Switzerland** – Basel-Landschaft, Liestal, Lupsingen: 1♂ (B. Braschler *leg*.), May 2018, in a mixed forest (32T 402340 5256264). Graubünden, Albula, road from Mulegns to Rona: 2♂ (J.D. Gilgado *leg*.), 03/06/2019, in a mixed coniferous forest (32T 547994 5154403).

***Lithobius macilentus* L. Koch, 1862**

Material examined: Germany – Freiburg, Breisgau-Hochschwarzwald, Breitnau, Black Forest (surroundings of Hammerloch-Gut): 1♂ (J.D. Gilgado *leg*.), 19/07/2020, in a coniferous forest (32T 434459 5311585). **Switzerland** – Basel-Landschaft, Dornach: 2♀ (J.D. Gilgado *leg*.), 17/02-30/06/2019, subterranean trap in scree in a beech forest (32T 397691 5258317); 2♀ (J.D. Gilgado *leg*.), 24/06/2019-24/07/2020, MSS trap in scree in a beech forest (32T 397688 5258332).

***Lithobius microps* Meinert, 1868**

Material examined: Switzerland – Basel-Stadt, Bitburg-Prüm, St. Chrischona: 2♂/4♀ (J.D. Gilgado *leg*.), 16/09/2019, soil trap in a mixed forest of coniferous trees and beech (32T 400229 5270010).

***Lithobius muticus* C.L. Koch, 1847**

Material examined: Switzerland – Aargau, Rheinfelden, Altägerte, Z'loch: 1♂ (S. Skillman *leg*.), 23/05/2018, in a grassland near crops (32T 410019 5263359).

***Lithobius piceus* L. Koch, 1862**

Material examined: Germany – Freiburg, Lörrach, Inzlingen: 1♀ (B. Braschler & J.D. Gilgado *leg*.), 17/09/2020, in the boundaries of a beech forest (32T 400586 5270962).

***Lithobius tricuspis* Meinert, 1872**

Material examined: France – Provence-Alpes-Côte d'Azur, Hautes-Alpes, Veynes, near Les Villages des Jeunes: 1♂ (S. Santos García *leg*.), 01/04-15/05/2021, under a rock in a valley (31T 724 4935). **Germany** – Freiburg, Lörrach, Inzlingen: 1♀ (B. Braschler & J.D. Gilgado *leg*.), 17/09/2020, in the boundaries of a beech forest (32T 400586 5270962). **Switzerland** – Basel-Landschaft, Dornach: 2♀ (J.D. Gilgado *leg*.), 24/06/2019-24/07/2020, MSS trap in scree in a beech forest (32T 397688 5258332).

Order Scolopendromorpha

Family Cryptopidae

***Cryptops (Cryptops) anomalans* Newport, 1844**
Material examined: Germany – Freiburg, Lörrach, Grenzach-Wyhlen: 1 spec. (B. Braschler & J.D. Gilgado *leg*.), 17/09/2020, in an urban forest (32T 397990 5268381). **Switzerland** – Basel-Landschaft, Binningen, Basel: 2 spec. (J.D. Gilgado *leg*.), 17/10/2018, probably in a garden (32T 39 526). Jura, Porrentruy, Saint-Ursanne: 1 spec. (J.D. Gilgado *leg*.), 28/06/2019, in a mixed forest (32T 360697 5247562).

***Cryptops (Cryptops) hortensis* (Donovan, 1810)**
Material examined: Germany – Freiburg, Lörrach, Inzlingen: 1 spec. (B. Braschler & J.D. Gilgado *leg*.), 17/09/2020, in the boundaries of a beech forest (32T 400586 5270962).

***Cryptops (Cryptops) parisi* Brolemann, 1920**
Material examined: France – Provence-Alpes-Côte d'Azur, Hautes-Alpes, Veynes, near Les Villages des Jeunes: 2 spec. (S. Santos García *leg*.), 01/04-15/05/2021, under a rock in a valley (31T 724 4935). **Switzerland** – Basel-Stadt, Bitburg-Prüm, St. Chrischona: 1 spec. (J.D. Gilgado *leg*.), 16/09/2019, soil trap in a mixed forest of coniferous trees and beech (32T 400229 5270010).

Family Scolopendridae

***Scolopendra oraniensis* Lucas, 1846**
Material examined: Portugal – Algarve, Faro, Mexilhoeira Grande, near A ROCHA Life: 1 spec. (S. Santos García *leg*.), 05/11/2021, under a rock in a grassland (29S 534 4111).

Discussion

Results mainly included species common in Europe which were previously known for each country (Bonato *et al*., 2016), although most records provided new location data which extended their local distribution range. Additionally, ecological remarks on habitat and microhabitat diversity provided useful information for better understanding the biology of the studied species. Epigean records agree with previous reports from each country (Machado, 1952; Voigtländer, 2007, 2009; Andersson *et al*., 2008, 2013; Reip & Voigtländer, 2009; Stöckli, 2009; Iorio, 2010a; Iorio *et al*., 2015; Barber, 2022; Gilgado *et al*., 2022). Hypogean records provided useful information to expand knowledge on the niche segregation of certain centipede species. This is particularly the case of *L. tricuspis*, which was previously not known to dwell in the Mesovoid Shallow Substratum. Nevertheless, its presence in the MSS is not surprising since *L. tricuspis* is a troglophile species commonly found in caves and mines (Serra, 1980; Minelli, 1985; Dethier & Hubart, 2010; Iorio, 2014; Iorio & Voigtländer, 2019). Other species, such as *E. tridentinus, L. macilentus* and *S. acuminata*, were previously collected in deep layers of soil (up to 95 cm) or in the MSS (Mammola *et al*., 2017; Tuf *et al*., 2017; Haľková *et al*., 2020). Swiss MSS traps (up to 100 cm deep) also captured these species.

There are still many European countries in which the centipede fauna is poorly studied. This is particularly the case of Norway, Portugal, Sweden and Switzerland (Bonato *et al*., 2016), where centipede records are scarce and there is a lack of faunistic studies. Nevertheless, there is an increasing trend in consulting photograph repositories and social media, in which naturalists provide their observations on myriapods. These resources can be useful to extend our knowledge in regional studies, especially when species are easily identifiable from pictures (Cabanillas, 2019b; Cabanillas & Robla, 2022). Amongst other photograph repositories, "iRecord" in the United Kingdom or "Biodiversidad Natural" in the Iberian Peninsula, are available for myriapodologists to acquire complementary data on species distribution. Social media, for example the popular Facebook groups of "Isopods and Myriapods of Britain and Ireland", "Miriápodos ibéricos y europeos (European Myriapoda)" or "Myriapod Morphology and Evolution", can also inform about the presence of unreported, rare or exotic species.

Although surveys should be increased in poorly studied areas of Europe, on-line databases are strongly recommended to be consulted in future works.

Acknowledgements

I would like to heartily thank José D. Gilgado, Brigitte Braschler, Stephen Skillman, Joan Díaz-Calafat and Samuel Santos García for providing specimens and useful environmental data for this study. I would like to express my gratitude to Étienne Iorio for confirming some aspects on the biology of *Lithobius tricuspis*, Steve Gregory for providing information on iRecord and Tony Barber for sharing valuable comments to improve the manuscript. I would also like to express my gratitude to André Burgers for revising the English text.

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Preliminary data on the myriapod fauna (Chilopoda and Diplopoda) of some nature reserves in Poland

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Key words: myriapod fauna, nature reserves, Poland, centipedes, millipedes, species.

Abstract

This is a small study of the myriapod fauna of eight nature reserves in the Mazowian Lowland and Pomeranian Lake District of Poland. Faunistic data concerning 3 species of centipede and 5 of millipede in the Mazowian Lowland and 2 centipedes and 3 millipedes in the Pomeranian Lake District are presented.

Introduction

The Myriapod fauna of Poland includes 147 species from four classes; Chilopoda, Symphyla, Pauropoda and Diplopoda (Wytwer, 2008). The myriapod fauna of nature reserves and National Parks have been unevenly explored in Poland (Kaczmarek, 1964, 1977, 1989; Jaśkiewicz, 1974; Jędryczkowski, 1985; Trojan & Wytwer, 1995; Leśniewska, 1997; Leśniewska & Taborska, 2003; Leśniewska *et al.*, 2011; Jastrzębski *et al.*, 2006; Jastrzębski & Stańska, 2007). In this short note new distributional data are reported for 11 species.

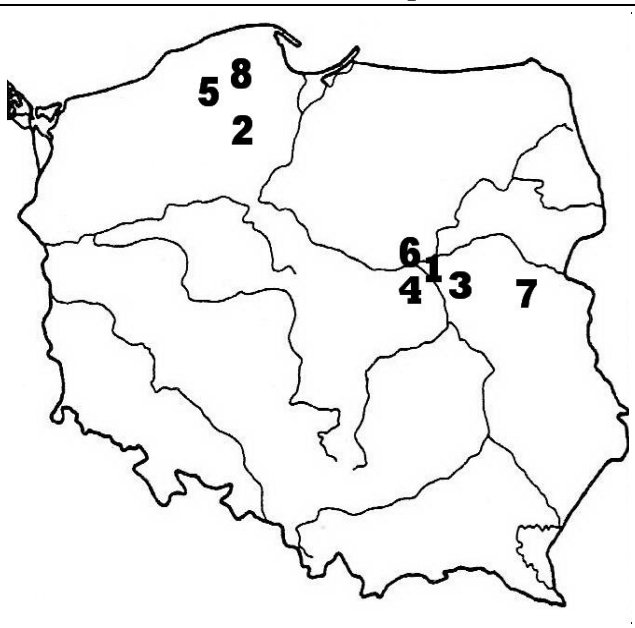
Material and Methods

The study was carried out between 07–25.06.2019 in eight Polish nature reserves (Table 1). Five of these are located in the Masovian Lowland (Bukowiec Jabłonowski, Mosty Kalińskie, Łosiowe Błota, Jezioro Kiełpińskie, Klimonty) and three in the Pomeranian Lake District (Żurawie Chrusty, Ustronie, Dolina Huczka).

1. Bukowiec Jabłonowski is a forest nature reserve (established 1990, area 37.74 ha). It is located in the Mazowieckie Voivodeship and adjoins the SE border of the city of Legionowo, near Warsaw. Objective of protection – forest stand of different age and species with stands of European beech and black birch. The age of individual oaks and beeches is up to 160 years. (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.580)
2. Mosty Kalińskie is a landscape phytocenotic natural reserve (established 2015, area 201.44 ha) and located in the Okuniewsko-Rembertowskie Forests. Along the Długa River, valuable riverside communities have survived, including, in particular, riparian forests, rushes and herbal communities. The purpose of protection is to preserve a fragment of the Długa River valley with a mosaic of forest and open habitats. (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.1578)
3. Łosiowe Błota is a peat bog phytocenotic natural reserve (established 1980, area 31.64 ha) located in the area of Las Bemowski, near Warsaw. The purpose of its creation was to preserve in their natural communities of fens locations of rare and protected plant species. (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.1050)

4. Żurawie Chrusty nature reserve is a peat bog reserve in the Kashubian Lake District within the area of the Kashubian Landscape Park (established 1990, area 21.82 ha). The aim of protection is to preserve, for scientific, educational and landscape reasons, the dystrophic lake, natural peat bog communities with rare plant species, which are a refuge for wetland birds. (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.578)
5. The "Ustronie" is a forest natural reserve (established 1958, area, 10.94 ha) located about 6 km from Czersk. The purpose of its creation was to preserve a protected fragment of stand of various ages and species with impressive specimens of very old pines, oaks and beeches. Plant communities occurring in the reserve are: not fully natural subcontinental oak-hornbeam forest (*Tilio-Carpinetum*), continental mixed forest (*Querco roboris-Pinetum*), marsh birch (*Vaccinio uliginosi-Betuletum pubescentis*) and currant alder (*Ribo nigri-Alnetum*). (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.104)
6. The "Kiełpińskie Lake" water nature reserve is the oxbow lake of the Vistula (established 1988, area 20.54 ha). It is located in the Łomianki, near Warsaw. The reserve includes the oxbow lake, as well as meadows, pastures and arable land of the 50 m wide coastal belt. The aim of protection is to preserve the Vistula oxbow lake with its characteristic fauna and flora. (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.1051)
7. The "Dolina Huczka" is a forest reserve (established 2007, area 11.95 ha). It was created to preserve valuable forest and spring biocenoses in the "Słupia Valley" Landscape Park. There are acidic and fertile beech forests, oak-hornbeam forests and riparian forests. An important element of the forests are tree stand fragments of natural origin, often exceeding the age of 150 years. (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.1302)
8. The "Klimonty" is a forest reserve (established 2015, area 109.20 ha) located near Klimonty (Mazowsze). It was created to preserve the wetland ecosystems as well as the complex of alder and riparian forests that constitute refuges for protected and endangered species of plants and animals. (https://crfop.gdos.gov.pl/CRFOP/widok/viewrezerwatprzyrody.jsf?fop=PL.ZIPOP.1393.RP.1574)

Table 1: Nature reserves in Poland from where samples were taken

No.	Date	Nature reserve	Location map
1	08.06.2019	Bukowiec Jabłonowski 52.385° N, 20.939° E	
2	07.06.2019 22.06.2019	Ustronie 53.757° N, 18.004° E	
3	10.06.2019 25.06.2019	Mosty Kalińskie 52.296° N, 21.266° E	
4	08.06.2019 23.06.2019	Łosiowe Błota 52.257° N, 20.861° E	
5	21.06.2019	Dolina Huczka 54.282° N, 17.316° E	
6	08.06.2019 23.06.2019	Jezioro Kiełpińskie 52.362° N, 20.873° E	
7	10.06.2019	Klimonty 52.168° N, 22.540° E	
8	22.06.2019	Żurawie Chrusty 54.336° N, 17.958° E	

The 93 specimens of centipedes and millipedes were collected by harvesting from plant debris, rotten wood, bedding, stubbing, etc. They were preserved in 96% ethanol. After identification they were deposited in the collection of the Zoological Department of Pomeranian University in Słupsk. Species identifications are based on Zalesskaja (1978) and Lokšina (1969). As a supporting source, Neckařová (2009) was also used.

This research was conducted with financial support to Artsiom Ostrovsky by the Polish Committee of UNESCO in 2019.

Results

Chilopoda

Order Lithobiomorpha Pocock, 1895
Family Lithobiidae Newport, 1844

Lithobius forficatus (Linnaeus, 1758)
Material examined: Bukowiec Jabłonowski nature reserve, 2♀, 3♂, 08.06.2019; Ustronie nature reserve, 3♂, 07.06.2019; 1♂, 22.06.2019; Łosiowe Błota nature reserve, 4♀, 6♂, 08.06.2019; 2♀, 3♂, 23.06.2019; Żurawie Chrusty nature reserve, 1♂, 22.06.2019; Dolina Chuczka nature reserve, 1♂, 21.06.2019; Jezioro Kiempinskie nature reserve, 1♀, 1♂, 23.06.2019; Mosty Kalińskie nature reserve, 3♀, 5♂, 25.06.2019.

L. erythrocephalus C.L. Koch, 1847
Material examined: Łosiowe Błota nature reserve, 3♀, 1♂, 23.06.2019: Ustronie nature reserve, 4♂, 07.06.2019; 1♀, 22.06.2019; Klimonty nature reserve, 1♀, 10.06.2019; Żurawie Chrusty nature reserve, 3♂, 22.06.2019.

Order Geophilomorpha Pocock, 1895
Family Geophilidae Leach, 1816

Geophilus flavus (De Geer, 1778)
Material examined: Łosiowe Błota nature reserve, 1 ex., 08.06.2019.

Diplopoda

Order Polyxenida Verhoeff, 1934
Family Polyxenidae Lucas, 1840

Polyxenus lagurus (Linnaeus, 1758).
Material examined: Ustronie nature reserve, 9 exx., 07.06.2019; Żurawie Chrusty nature reserve, 1 ex., 22.06.2019.

Order Glomerida Brandt, 1833
Family Glomeridae Leach, 1816

Glomeris tetrasticha (Brandt, 1833)
Material examined: Łosiowe Błota nature reserve, 13 exx., 23.06.2019.

Order Julida Brandt, 1833
Family Blaniulidae C. L. Koch, 1847

Nopoiulus kochii (Gervais, 1847).
Material examined: Żurawie Chrusty nature reserve, 1 ex., 22.06.2019.

Family Julidae Leach, 1814

Cylindroiulus punctatus (Leach, 1815).
Material examined: Dolina Chuczka nature reserve, 1♂, 21.06.2019.

Leptoiulus proximus (Němec, 1896).
Material examined: Łosiowe Błota nature reserve, 1 ex., 08.06.2019.

Rossiulus vilnensis (Jawlowski, 1925)
Material examined: Łosiowe Błota nature reserve, 2♀, 1♂, 08.06.2019; 3♀, 1♂, 23.06.2019.

Ommatoiulus sabulosus (Linnaeus, 1758).
Material examined: Jezioro Kiempinskie nature reserve, 1♂, 08.06.2019; 2 exx., 23.06.2019.

Order Polydesmida Pocock, 1887
Family Polydesmidae Leach, 1815

Polydesmus complanatus (Linnaeus, 1761) .
Material examined: Łosiowe Błota nature reserve, 1♂, 08.06.2019; 3♀, 1♂, 1 ex., 23.06.2019; Mosty Kalińskie nature reserve, 1♂, 25.06.2019.

Discussion and Conclusions

Preliminary data have been obtained confirming the presence of numbers of Myriapods species in 6 forest and 2 peat bog reserves in Pomerania and Mazovia.

A common inhabitant of the litter, *Lithobius forficatus*, has been recorded in all reserves, except for Klimonty. *Lithobius erythrocephalus* was common in 4 reserves, both in forest (Klimonty, Ustronie) and peat bog (Żurawie Chrusty, Łosiowe Błota). The single specimen of *Geophilus flavus* was found in the Łosiowe Błota reserve. The species composition and structure of chilopod communities in the Mazovia reserves have been described and analyzed in detail by Wytwer (1995). Both species of *Lithobius* were common, *Geophilus flavus* [familiar under it synonymic name *Necrophloeophagus flavus* (De Geer, 1778)] recorded in linden-oak-hornbeam forests.

Diplopoda were represented by 8 species. *Polyxenus lagurus* and *Polydesmus complanatus* were found more often than others – the first in two Pomeranian reserves, the second – in two reserves on Mazovia.

Our results were limited by our collecting methods; the main goal of our research was the inventory of protected beetle species and we did not use soil traps and soil samples. Our study is a preliminary one and its results cannot be used to assess the state of the communities.

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A female *Lithobius forficatus* (Chilopoda, Lithobiomorpha) with unusually damaged gonopod spurs

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In *Lithobius* the female gonopods each comprise three articles of which the basal ones bear two (or more) spurs whilst the apical article of the telopodite ends in a claw (Fig. 1). Recognition of these features when the underside of a specimen is examined immediately allows a female animal to be recognised as nothing similar is seen in males. Immature females may show these features in a partially developed state with, for instance, sometimes only one spur visible on each side (see, e.g. Eason, 1964, figs. 278, 298, 299, 321). The number and shape of the spurs and the appearance of the gonopod claws may be helpful in identification but in centipedes, unlike in millipedes, woodlice and insects, gonopods are of somewhat limited value in determining species.

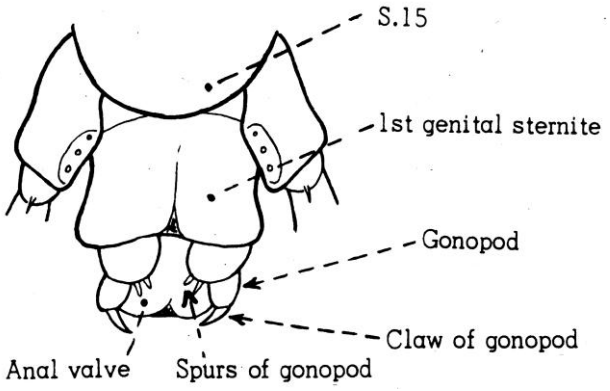

Figure 1: *Lithobius* ♀ gonopods (ventral)
(From Eason, 1964)

Eason (1964) describes the process of egg laying in *Lithobius*. Females lay a number of eggs, one by one at intervals of a few days, each of which, after leaving the vulva is covered in minute particles of soil forming a cement-like shell. This is, seemingly, based on a mucoid secretion, probably from the vulva, the egg being retained by the gonopod spurs whilst the claws are used to pulverise the soil, particles of which adhere to the mucus. The egg is left by the female in the surrounding soil or humus which it resembles. Lawrence (1987) shows a drawing of a female *Lithobius forficatus* holding a large egg by the "claw-like appendages", as he terms them (Fig. 2).

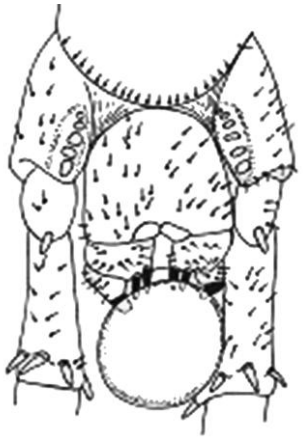

Figure 2: *Lithobius forficatus* ♀ holding egg
(From Lawrence, 1987)

In *Lithobius forficatus* (Linn.,1758), the female gonopods are described as bearing two conical gonopod spurs with occasionally a third on one side only (Figs. 3a, 3b). The claw has both dorsal and ventral denticles (giving it something of a trifid appearance) (Barber, 2009) (Fig. 3c).

Amongst a batch of specimens of centipedes collected by pitfall-trapping from London parks by Edward Milner in 2022 was an example of this species from Tower Hamlets Cemetery (01.iv.2022) in which the gonopod spurs were apparently broken to near the base on both sides. The specimen, presumably mature, was 27mm long (excluding appendages) and bore 6 + 6 teeth on the forcipular coxosternites (Fig. 4a). The appearance of the spurs was very distinctly short and tooth-like and there was darker pigmentation towards the distal ends (Figs. 4b, 4c). In addition denticles on the claws did not seem to be visible and the claw had a rather broad, blunt apex (Fig. 4d). A second female specimen showing similar damage was also collected from the same locality a year later (01.iv.2023).

Although various patterns of damage have been seen in *Lithobius*, where the animal survives and some sort of scar tissue is seen (e.g. Barber, 2011) but this is the first time I have seen this particular pattern. The pigmentation of the vestiges of the spurs might suggest that what is seen is due to healing and scar

tissue formation at the break points. It would be interesting to speculate on the cause of damage to all four spurs apparently simultaneously – possibly attempted predation e.g. by a larger carabid beetle perhaps. Alternatively, could it be, perhaps, be some sort of "wear and tear" effect on an elderly animal? It would also be interesting to know how far the condition of the spurs and claws might have affected the carriage and preparation of eggs.

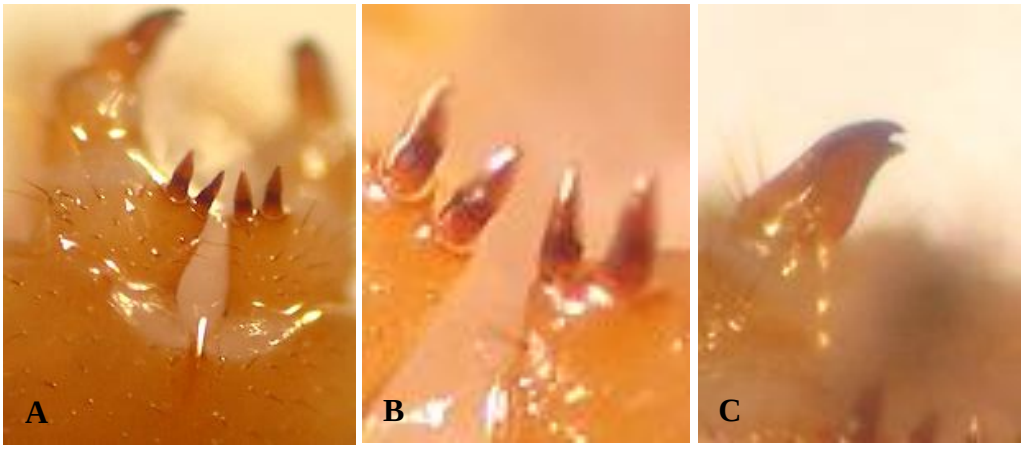

Figure 3: *Lithobius forficatus* undamaged female, Tower Hamlets Cemetery, London (01.x.2020)
A) Gonopods; B) Gonopod spurs, ventral; C) Left gonopod claw.

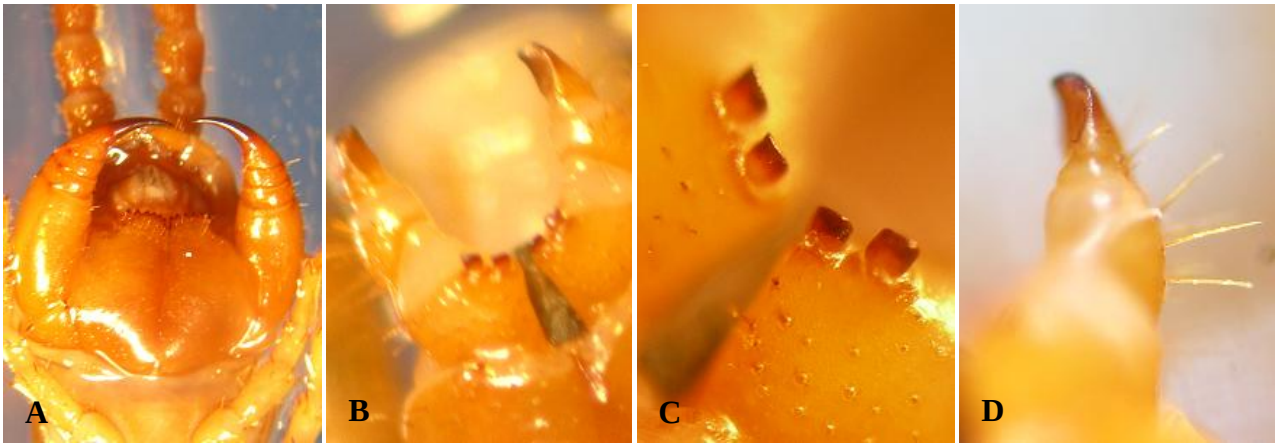

Figure 4: *Lithobius forficatus* damaged female, Tower Hamlets Cemetery, London (01.iv.2022)
A) Head, ventral; B) Gonopods; C) Gonopod spurs, ventral; D) Left gonopod claw.

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Report on the BMIG Field Meeting in South Wales 2018

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Introduction and background

The 2018 BMIG field weekend, held from 22nd to 25th March, was based in Longtown, Herefordshire on the Welsh border; a locality chosen to allow easy access to The Valleys of South Wales. Traditionally, BMIG's field meetings are held in a relatively poorly recorded part of Britain in order to fill the gaps in our knowledge. However, South Wales is a relatively well-worked area known to support a high diversity of woodlice, millipedes and centipedes (and indeed other taxa), including several Nationally Rare and Nationally Scarce species. Examples include the woodlice *Metatrichoniscoides celticus* Oliver & Trew, which was described new to science from South Wales (Oliver & Trew, 1981) and *Buddelundiella cataractae* Verhoeff which has proved to be widespread there (Gregory, 2009). Morgan (1994) reports the discovery of *Oritoniscus flavus* (Budde-Lund) from reclaimed saltmarsh near Llanelli, a woodlouse (then) otherwise only known from Ireland. Whilst surveying at the same site in 2007 Harper (2010) discovered a population of the pill-millipede *Trachysphaera lobata* (Ribaut), otherwise only known from the Isle of Wight at that time. In addition, there is a cluster of records of *Propolydesmus testaceus* (C.L. Koch) in South Wales (Lee, 2006). Among the centipedes there are scattered records for *Lithobius piceus* L. Koch, otherwise seemingly restricted to a discrete area of south-east England; *L. tricuspis* Meinert, which is primarily south-western; and *L. muticus* C.L. Koch, which is primarily south-eastern (Barber, 2009).

In 2008 BMIG held its annual field meeting at Swansea to target the uncommon species of the area with great success. A staggering 77 BMIG species were recorded; 25 centipedes, 30 millipedes and 22 woodlice (Morgan, 2011). This included the rediscovery of *Oritoniscus flavus* and *Trachysphaera lobata* at their known site, and from the Gower Peninsula the centipede *Henia vesuviana* (Newport) and also two new sites for the elusive woodlouse *Buddelundiella cataractae.*

Recent field work in The Valleys, a former coal mining area that lies north of Cardiff, has revealed an unprecedented nine species of millipede new to Britain since September 2014. These are the chordeumatidans *Ceratosphys amoena confusa* Ribaut, *Hylebainosoma nontronensis* Mauriès & Kime, *Psichrosoma cf breuili* (Mauriès), *Turdulisoma cf helenreadae* Mauriès, *Turdulisoma cf turdulorum* Mauriès and *Cranogona dalensi* Mauriès, and the julids *Cylindroiulus pyrenaicus* (Brölemann), *Cylindroiulus sagittarius* (Brölemann) and *Ommatoiulus moreleti* (Lucas) (Telfer *et al*., 2015; Gregory *et al*., 2018a; 2018b; Gregory & Owen, 2019; Owen & Gregory, 2021). Following the discovery of coal in The Valleys several hundred years ago, commodities, such as iron ore, have been imported in vast quantities into South Wales. It is quite possible that many (but probably not all) of these millipedes, and other invertebrates, simply hitched a lift from their place of origin and found the warm, but damp, climate of South Wales highly favourable (Morgan, 2011; Telfer *et al*., 2015; Gregory *et al*., 2018b; Gregory & Owen, 2019; Owen & Gregory, 2021).

BMIG members were joined for the meeting by an invited guest the German myriapodologist Thomas Wesener who presented two talks, the first introducing the German Barcode of Life - Myriapoda program and the second his own research on Madagascar.

Methods and Sites

A list of known sites for the nine recently discovered millipedes, and other sites of known interest, was provided to the meeting attendees with permission to collect specimens. Participants were free to undertake field work as they wished. Two organised site visits were arranged in advance. The first to Cwm Colliery spoil heaps, near Beddau was led by Liam Olds (Colliery Spoil Biodiversity Initiative) to see *Cranogona dalensi*, a millipede discovered there in 2016 (and previously recorded only from the Pyrenees). The second, to the gardeners' working area at St Fagans National Museum of History, was led by Mollusca expert Ben Rowson (National Museum of Wales) where an unidentified *Trichoniscoides* woodlouse was recorded in 2016.

During the field meeting 44 sites were visited, but some cover multiple monads (1km squares) and have been split to give 56 'locations'. The majority are in South Wales; mostly in the vice-counties of Glamorgan (VC41) or Monmouthshire (VC35), but one in Brecon (VC42) and a few sites across the border in Herefordshire (VC36) and West Gloucestershire (VC34). The sites visited were mainly a mixture of deciduous woodland/parkland or former colliery sites. Woodlands visited include: Coed Groes-faen where the millipedes *Ceratosphys amoena confusa* and *Hylebainosoma nontronensis* were first recorded in Britain in 2014; Craig yr Aber, near Bridgend where a diverse array of species has been recorded including the first records of the millipedes *Cylindroiulus pyrenaicus* and *Ommatoiulus moreleti* in 2017; and Sirhowy Valley Country Park where the millipede *Cylindroiulus sagittarius* was discovered in 2017. Former colliery sites include: Cwm Colliery Tip, near Beddau, a site comprising sparsely vegetated colliery spoil where the millipede *Cranogona dalensi* (aka the Beddau Beast) was found in 2016; and unknown sites such as the Big Pit National Coal Museum, Blaenavon, which has extensive sparsely vegetated colliery spoil heaps; and Blaenavon Ironworks. A few coastal sites were visited and, as mentioned above, the Gardens at St. Fagans, which includes several unheated glasshouses.

A summary of the sites visited and the sub-locations within these sites is shown in Table 1.

Table 1: List of sites visited. Recorders: KA - Keith Alexander, TB - Tony Barber, KC - Kevin & Nathan Clements, MD – Mike Davidson, SG - Steve Gregory, PL - Paul Lee, AL - Angela Lidgett, KL - Keith Lugg, HR - Helen Read, PR - Paul Richards, TW – Thomas Wesener, DW - Derek Whiteley

Site Code	Locality	Grid Ref	VC	Date	Recorders
1	Atlantic Wharf Cardiff	ST1975	41	21.iii.2018	DW
2	Craig yr Allt	ST1384	41	21.iii.2018	DW
3a 3b	Ogmore by the Sea Ogmore, banks of river	SS8675 SS8676	41	21.iii.2018	DW
4	Merthyr Mawr	SS8576	41	22.iii.2018	DW
5	Cardiff coastal grassland	ST2177	41	22.iii.2018	DW
6a 6b	Dunraven Bay Dunraven Park	SS8873 SS8872	41	22.iii.2018	DW
7	Ewenny Moor	SS9178	41	22.iii.2018	DW
8	Hopewell Mine Museum	SO6011	34	22.iii.2018	SG, KL
9	Longtown	SO3228	36	22.iii.2018	PR

10	Abersychan Quarry	SO2703	35	23.iii.2018	HR, TW, MD
11a 11b	Bettws Newydd	SO3506 SO3605	35	23.iii.2018	PR DW
12	Big Pit Coal Museum, Coity Tip	SO2309	35	23.iii.2018	PL, DW, TW, MD
13	Blaenavon Ironworks	SO2409	35	23.iii.2018	PL, DW, TW, MD
14	Blaensychan Valley, Colliery	SO2502	35	23.iii.2018	DW, HR, TW
15	Canons Tump Common, St Margarets	S03234	36	23.iii.2018	KA
16a 16b	Craig yr Aber, near Bridgend	SS8584 SS8585	41	23.iii.2018	AL AL, PR, DW
17	Crow Wood & Meadows NR	SO3435	36	23.iii.2018	KA
18	Parc Penallta Country Park	ST1395	41	23.iii.2018	TB, SG, KL, KC
19a 19b “	Sirhowy Country Park	ST2090 ST2191 “	35	23.iii.2018 23.iii.2018 24.iii.2018	SG, KL TB HR, TW
20	Snodhill Park, Peterchurch	SO3039	36	23.iii.2018	KA
21a 21b 21c 21d	Cwm Colliery Tips, Beddau	ST0686 ST0785 ST0786 ST0685	41	24.iii.2018	TB, HR, SG, KL AL SG MD
22a 22b	Escley Brook Valley, Longtown	SO3228 SO3329	36	24.iii.2018	KA
23a 23b	Olchon Valley, Llanveynoe	SO2733 SO2734	36	24.iii.2018	KA
24	Oldcourt Wood, Longtown	SO3329	36	24.iii.2018	KA
25	St Fagans, gardener's area	ST1177	41	24.iii.2018	TB, AL, DW, KL, SG, TW
26	Clytha Park	SO3609	35	25.iii.2018	DW
27	Coed Groes-faen, Bargoed	SO1400	41	25.iii.2018	AL
28	Coed y Cerrig NNR	SO2921	35	25.iii.2018	TB, KA
29	Strawberry Cottage Wood SSSI	SO3121	35	25.iii.2018	TB, KA
30	Two Rivers Meadow	SO5112	35	25.iii.2018	DW
31	Blakeneyhill Woods, Wenchford	SO6508	34	25.iii.2018	SG, KL
32	Blakeney, Café	SO6707	34	25.iii.2018	SG, KL
33	Sedbury by Chepstow (saltmarsh)	ST5592	34	20.iii.2018	MD
34	Mayhill, Monmouth	SO5112	35	21.iii.2018	MD
35	Offa's Dyke nr Caswell Wood	SO5400	34	21.iii.2018	MD
36	Wyegate Hill Wood, Offa's Dyke	SO5406	34	21.iii.2018	MD
37	Offa's Dyke, Hatterrall Hill	SO3125	36	22.iii.2018	MD
38	Offa's Dyke, Tre-wyn	SO3222	35	22.iii.2018	MD
39	St Mary's Church, Abergavenny	SO3014	35	22.iii.2018	MD
40	Cwm Du, Pontypool	SO2502	35	23.iii.2018	MD
41	Hay-on-Wye Castle Grounds	SO2342	42	25.iii.2018	MD
42a 42b 42c	Lugg, Hereford, agricultural land “ grassland “ woodland	SO5241 SO5240 SO5340	36	26.iii.2018	MD
43	Tupsley Quarry, Hereford (LNR)	SO5239	36	27.iii.2018	MD
44	Maerdy Colliery	SS9699	41	23.iii.2018	KC

Species recorded

During the course of the field meeting an incredible 71 BMIG species were recorded, including 22 species of centipede (Table 2), 31 species of millipede (Table 3) and 18 species of woodlice (Table 4). Not unexpectedly, the organised group visits to the St Fagans gardener's area and Cwm Colliery Tips, with many enthusiastic participants, proved to be the most prolific sites as 37 BMIG species (8 centipedes, 15 millipedes and 14 woodlice) and 29 BMIG species (8 centipedes, 12 millipedes and 9 woodlice) were recorded, respectively.

Twelve of the species recorded during the weekend are listed in the Natural England species status review (Lee, 2015) with a GB rarity status greater than common. Four are listed as Nationally Rare (*Lithobius piceus, Propolydesmus testaceus, Hylebainosoma nontronensis* and *Ceratosphys amoena confusa*) and eight are Nationally Scarce (*Lithobius curtipes* C.L. Koch, *L. macilentus* L. Koch, *L. muticus, L. pilicornis, Brachychaeteuma melanops* Brade-Birks & Brade-Birks, *Leptoiulus belgicus* (Latzel), *Cylindroiulus parisiorum* (Brölemann & Verhoeff) and *Armadillidium album* Dollfus. Three of these species also have a GB IUCN threat status other than Least Concern; one is considered Near Threatened (*Propolydesmus testaceus*) and two are Data Deficient (*Ceratosphys amoena* and *Hylebainosoma nontronensis*). These comprise an interesting mix of species characteristic of rural sites and species with synanthropic tendencies. These species are discussed in the relevant sections below.

Centipedes

In their account of Welsh centipedes, Barber & Gallon (2020), excluding doubtful, seashore and hothouse/building species, listed 31 species for the country as a whole with the same number for South Wales (vice-counties 35, 41-47) and a lower total (26) for North Wales (VCs 48-52). One species (*Lithobius tenebrosus* Meinert) has only one modern British record, from Aberystwyth (Keay, 1989).

The present account lists 22 species as having been collected (Table 2), all in the 2020 list. Of these, all but one were recorded from the Welsh vice-counties of Monmouthshire, Glamorgan or Brecon. The only *Lithobius borealis* Meinert record was from Herefordshire.

As mentioned above, there is an interesting mixture of animals with synanthropic tendencies and of "rural" types. This might be anticipated given the history and nature of the area. Guetté *et al.* (2017), quoted in Barber (2022) refer to species being differentiated along a continuum from urban "avoiders" to urban "dwellers" and we can see this concept as allowing us to potentially fit our centipede species at various points along the spectrum with, for instance, *Lithobius curtipes* being very much a rural species (see Barber, 2021) and *Cryptops anomalans* Newport (not recorded here but known from South Wales) as being very strongly synanthropic, probably throughout its British range. We need to also recognise that species may have different degrees of "synanthropy" depending on their geographical location, such as where in one part of Britain the species occurs in the "wild" in another it is highly dependent on human activity.

All three of our (outdoor) *Cryptops* species have synanthropic tendencies with *C. parisi* Brolemann, which has been recorded as far north as Aberdeen, probably only found in non-synanthropic sites in the South-West. Chilobase (Bonato *et al*., 2016) describe it as synanthropic in North Europe and North America whilst Wesener *et al.* (2016) describe it, along with *C. hortensis* (Donovan), as naturally occurring and widespread in Central Europe and generally classified as a mesophilous woodland species, although it may occur outside forests in northern Germany. British *C. hortensis* records are clearly biased towards more or less synanthropic sites but there is a fair proportion from rural ones, especially in the south.

Of the geophilomorphs reported, *Stigmatogaster subterranea* (Shaw) (formerly *Haplophilus subterraneus*) is widespread and common in the south-west in a variety of habitats but in more northerly

Table 2: Centipedes recorded during the Longtown 2018 field meeting. X = species recorded from site.
**Geophilus impressus* - formerly known as *G. insculptus* and more recently as *G. alpinus.*

Site number:	**2**	**8**	**10**	**12**	**13**	**14**	**16a**	**16b**	**18**	**19a**	**19b**	**21a**	**21b**	**21c**	**21d**	**23b**	**25**	**26**
10km square:	ST	SO	S0	SO	SO	SO	SS		ST	ST		ST				SO	ST	SO
Species	18	61	20	20	20	20	88		19	29		08				23	17	30
Stigmatogaster subterranea					X												X	
Schendyla nemorensis				X	X				X			X	X				X	
Strigamia acuminata						X												
Strigamia crassipes							X											
**Geophilus impressus*																		
Geophilus easoni				X														
Geophilus electricus													X					
Geophilus flavus									X									
Geophilus truncorum		X					X	X	X		X	X	X		X			
Cryptops hortensis		X		X					X			X	X	X	X		X	
Cryptops parisi			X							X	X						X	
Lithobius borealis																		
Lithobius crassipes				X														
Lithobius curtipes				X														
Lithobius forficatus	X	X		X								X					X	
Lithobius macilentus					X													
Lithobius melanops												X				X	X	
Lithobius microps				X	X				X			X	X	X	X			
Lithobius muticus							X	X										
Lithobius piceus								X										
Lithobius pilicornis				X		X		X				X					X	
Lithobius variegatus		X	X	X		X				X							X	X
Total 22 species / Total per site	1	4	2	9	4	3	6 sp.		5	3 sp.		site 21: 8 sp.				1	8	1

Table 2: Centipedes recorded (continued)

Site number:	27	28	29	30	31	34	35	36	37	38	39	40	41	42a	42b	42c	43	No. of locations
10km square: / Species	SO 10	SO 22	SO 32	SO 51	SO 60	SO 51	SO 50	SO 50	SO 32	SO 32	SO 31	SO 20	SO 24	SO 54			SO 53	
Stigmatogaster subterranea													X		X		X	5
Schendyla nemorensis																		6
Strigamia acuminata																		1
Strigamia crassipes																		1
**Geophilus impressus*	X												X				X	3
Geophilus easoni					X					X								3
Geophilus electricus																		1
Geophilus flavus										X				X				3
Geophilus truncorum					X													9
Cryptops hortensis						X						X					X	11
Cryptops parisi																X		5
Lithobius borealis									X									1
Lithobius crassipes																		1
Lithobius curtipes																		1
Lithobius forficatus				X		X	X			X	X				X		X	12
Lithobius macilentus																		1
Lithobius melanops												X				X		5
Lithobius microps		X						X		X	X	X	X		X	X	X	16
Lithobius muticus																		2
Lithobius piceus																		1
Lithobius pilicornis																		5
Lithobius variegatus	X	X	X		X	X	X	X		X								15
Total 22 species / Total per site	2	2	1	1	3	3	2	2	1	4	2	3	3	site 42: 6 sp.			5	

areas tends to be more obviously synanthropic. Of the two small species, *Schendyla nemorensis* (C.L.Koch) and *Geophilus truncorum* Bergsøe & Meinert, the latter is rarely found in synanthropic sites whilst the former occurs both in these and in rural locations. Our two terrestrial *Strigamia* species have records from a variety of sites but biased towards rural ones, more strongly overall in *S. acuminata* (Leach) than in *S. crassipes* (C.L. Koch). *Geophilus easoni* Arthur *et al*. is a typically rural animal but not, it seems, exclusively so. *Geophilus electricus* (Linnaeus) often seems to show synanthropic preferences and *G. impressus* C.L. Koch (formerly known as *G. insculptus* Attems or *G. alpinus* Meinert) and *G. flavus* (De Geer) are fairly common and widespread animals from a diversity of sites.

Of the species listed by Lee (2015) as nationally rare or nationally scarce, *Lithobius curtipes* (NS), *Lithobius macilentus* (NS), *Lithobius muticus* (NS), and *Lithobius piceus* (NR), are well towards the "avoiders" in the synanthropy spectrum but *Lithobius pilicornis* (NS), is mostly or entirely recorded from synanthropic sites although sometimes found in woodland in Cornwall.

In the 1988 Provisional Atlas (Barber & Keay, 1988), *L. piceus* is shown as recorded from a relatively small area of Surrey, Sussex and Hampshire whilst *L. muticus* seemed also to be restricted to south-east England, although to a much larger area of the Home Counties. We now know of the South Wales records for *L. piceus* but not so far from elsewhere here but *L. muticus*, on the other hand, has been recorded from a number of sites in both England (but not the northern areas) and Wales (Barber, 2022).

Lithobius macilentus differs from other British *Lithobius* species in being parthenogenetic (males occur in France). This would facilitate its spread to new sites and there are scattered records from across much of Britain though, seemingly, not from south-west England; more than two-thirds of records are from what are described as "rural" habitats. The status of *Lithobius curtipes* was reviewed by Barber (2021).

Lithobius variegatus Leach is a typically rural animal whilst *L. forficatus* (Linnaeus) occupies a wide variety of habitats in Wales, generally other than truly rural ones. *Lithobius melanops* Newport is often found in gardens and indeed indoors but also on the coast whilst *L. microps* Meinert is a small and common, often synanthropic animal. *Lithobius crassipes* L. Koch and *L. borealis* are medium sized species, both distinctly towards the "avoiders" end of the spectrum and seemingly occupying similar niches. The former is the common small/medium sized rural *Lithobius* of eastern Britain but also sometimes found elsewhere.

There is always an element of chance in any collection made and sampling method, season, microhabitat, etc, can all play a part, along with local rarity or patchy distribution, in what can be found in a sample made in the way of this meeting and several species, recorded in the Welsh list of 2020 were not recorded. In terms of "avoiders" these include *Lithobius tricuspis* (South Wales and south-west England) and the widespread *L. calcaratus* C.L. Koch. In addition *Geophilus osquidatum* Brölemann, a species found in various habitats in south-west Britain up as far as Shropshire (but with an outlying record from coastal Cumbria) was not found. Of the "dwellers", the two small species, both strongly synanthropic, *Schendyla dentata* (Brölemann & Ribaut) and *Henia brevis* (Silvestri) were not recorded nor the distinctive *Henia vesuviana* which has been found as far north as Lancashire.

Millipedes

Thirty one species of millipede were recorded during the field meeting (Table 3). The most diverse millipede fauna was recorded from the gardeners' area at St Fagans where 15 species were found, almost half the species list from the meeting. The only other sites where millipede species diversity reached double figures were Abersychan Quarry, Blaenavon Ironworks, Sirhowy Valley Country Park and Cwm Colliery Tips at Beddau. These are all sites with significant human influence and the few semi-natural locations visited by BMIG members appeared to be relatively species poor, a typical outcome from BMIG meetings.

Table 3: Millipedes recorded during the Longtown 2018 field meeting. X = species recorded from site.
**Chordeuma proximum*: 'F' indicates two sites where only female specimens were found, but this species has been previously recorded from both.

Site number:	**3b**	**5**	**7**	**8**	**9**	**10**	**11a**	**11b**	**12**	**13**	**14**	**16a**	**16b**	**17**	**18**	**19a**	**19b**	**21a**	**21b**	**21c**	**21d**
10km square:	SS	ST	SS	SO	SO	SO	SO		SO	SO	SO	SS		SO	ST	ST		ST			
Species	87	27	97	61	32	20	30		20	20	20	88		33	19	29		08			
Polyxenus lagurus							X	X													
Glomeris marginata	X					X				X						X	X				
Brachychaeteuma melanops				X							X							X			
Ceratosphys amoena confusa										X			X			X	X			X	
**Chordeuma proximum*				X					X		X	F	X			X	X			X	
Cranogona dalensi																		X	X	X	
Hylebainosoma nontronensis																					
Melogona gallica																	X				
Melogona scutellaris						X				X											
Turdulisoma cf helenreadae																					
Brachydesmus superus			X			X			X	X		X	X		X		X	X			
Macrosternodesmus palicola																					
Ophiodesmus albonanus																					
Polydesmus angustus				X		X			X	X	X				X	X	X	X			X
Polydesmus coriaceus																		X			
Propolydesmus testaceus		X																			
Blaniulus guttulatus						X															
Boreoiulus tenuis																					
Proteroiulus fuscus			X			X												X			
Nemasoma varicorne										X											
Cylindroiulus britannicus						X			X	X					X			X		X	
Cylindroiulus caeruleocinctus																					
Cylindroiulus parisiorum																					
Cylindroiulus punctatus						X				X			X	X	X			X		X	

Cylindroiulus pyrenaicus												X	X									
Cylindroiulus sagittarius																X	X					
Julus scandinavius						X			X	X						X		X		X		
Leptoiulus belgicus									X													
Ommatoiulus moreleti												X	X									
Ophyiulus pilosus						X			X	X							X					
Tachypodoiulus niger				X	X	X			X	X			X		X	X	X	X	X	X		
Total 31 species / Total per site	1	1	2	4	1	11	1 sp.		8	11	3	7 sp.		1	5	10 sp.		site 13: 12 sp.				

Table 3: Millipedes recorded (continued)

Site number:	**23a**	**23b**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**36**	**38**	**39**	**41**	**42a**	**42c**	**43**	**44**	**No. of locations**
10km square:	SO		ST	SO	SO	SO	SO	SO	SO	SO	ST	SO	SO	SO	SO	SO		SO	SO	
Species	23		17	30	10	22	32	51	60	60	59	50	32	31	24	54		53	99	
Polyxenus lagurus																				2
Glomeris marginata						X			X		X		X							9
Brachychaeteuma melanops			X																	4
Ceratosphys amoena confusa					X															6
Chordeuma proximum					F				X			X								11
Cranogona dalensi																				3
Hylebainosoma nontronensis					X															1
Melogona gallica																				1
Melogona scutellaris																				2
Turdulisoma cf helenreadae																			X	1
Brachydesmus superus	X		X					X	X				X							14
Macrosternodesmus palicola			X												X					2
Ophiodesmus albonanus			X												X					2
Polydesmus angustus			X	X				X	X	X					X	X				17
Polydesmus coriaceus			X													X		X		4

Propolydesmus testaceus																				1
Blaniulus guttulatus			X											X	X					4
Boreoiulus tenuis			X																	1
Proteroiulus fuscus	X	X	X																	6
Nemasoma varicorne	X	X					X													4
Cylindroiulus britannicus			X											X	X			X		10
Cylindroiulus caeruleocinctus			X	X										X						3
Cylindroiulus parisiorum			X																	1
Cylindroiulus punctatus						X	X		X							X		X		12
Cylindroiulus pyrenaicus																				2
Cylindroiulus sagittarius																				2
Julus scandinavius	X		X				X						X							10
Leptoiulus belgicus																				1
Ommatoiulus moreleti																				2
Ophyiulus pilosus			X																	5
Tachypodoiulus niger	X		X			X	X		X	X		X					X		X	20
Total 31 species / Total per site	5 sp.		15	2	3	3	4	2	6	2	1	2	3	3	5	4 sp.		3	2	

Seven of the nine species recorded as new to Britain from the area were collected during the weekend (Fig. 1). Six of these millipedes (*Cranogona dalensi, Hylebainosoma nontronensis, Turdulisoma cf helenreadae, Cylindroiulus pyrenaicus, C. sagittarius* and *Ommatoiulus moreleti*) were restricted to just one or two sites, usually where they were originally found. The exception was *Ceratosphys amoena confusa* that was present at six locations across five sites and is clearly well established. *Ceratosphys amoena* and *H. nontronensis* were first discovered at Bargoed in 2014 (Telfer *et al*., 2015), just in time to be included in the species status review (Lee, 2015). As so little was known about their occurrence in Britain they were listed as Data Deficient for the purposes of IUCN threat status but Nationally Rare due to the very small number of records. The remaining five species were not known in Britain at the time of the review and so have no rarity or threat status.

The only record of the flat-backed millipede *Propolydesmus testaceus* during the weekend came from coastal grassland near Cardiff where it was collected by Derek Whiteley. Lee (2015) lists this species as Nationally Rare as other than at a few scattered locations across southern England, it is known only from clusters of sites in Kent and in South Wales. The Cardiff locality appears to fit with the millipede's probable association with base-rich soils noted by Kime and Enghoff (2011).

Another three of the millipedes recorded during the weekend were listed as Nationally Scarce by Lee (2015). One of these, *Leptoiulus belgicus*, was found only at the Coity Tip site during the weekend although South Wales is part of the south-western stronghold for the species in Britain. The white chordeumatidan *Brachychaeteuma melanops* is more of a collectors' speciality being so small but although listed as Nationally Scarce, it has a widespread distribution across South Wales and southern England. BMIG members discovered the millipede in four sites over the weekend – Hopewell Mine Museum, Blaensychan Valley colliery, Cwm Colliery Tips (Beddau) and in the gardeners' area at St Fagans. The third of the Nationally Scarce species found is *Cylindroiulus parisiorum*. Only female specimens of *C. parisiorum* were collected from St Fagans and, ideally, males should be examined for certain identification. However, three recorders, Tony Barber (specimen determined by Steve Gregory), Mike Davidson and Angela Lidgett, collected the species independently, and the species has been found at the site previously by Christian Owen.

Woodlice

Eighteen species of woodlice were recorded from the 43 sites visited during the field meeting (Table 4). Not unexpectedly the four most frequently recorded species were *Oniscus asellus* Linnaeus (35 locations), *Porcellio scaber* Latreille (33 locations), *Philoscia muscorum sensu lato* (32 locations) and *Trichoniscus pusillus* agg. (27 locations). The remaining species were each recorded at ten or less.

Armadillidium nasatum Budde-Lund was recorded from five sites, either on colliery spoil or from other synanthropic habitats. *Porcellionides cingendus* (Kinahan) was found on saltmarsh at Sedbury near Chepstow by Mike Davidson. This species exhibits a predominantly south-western distribution in Britain where it favours coastal areas (Gregory, 2009). Of particular note is *Armadillidium album* found by Derek Whiteley at Merthyr Mawr. This woodlouse is listed as Nationally Scarce by Lee (2015) and is widely distributed along the South Wales coastline where it inhabits undisturbed dune systems and has been recorded on several previous occasions from this site (Gregory, 2009).

Although not routinely checked, most male specimens of *Oniscus asellus* that were examined proved to be *O. asellus spp. asellus.* The 'hybrid' taxa *Oniscus asellus X occidentalis* was recorded from a single site, Penallta Country Park.

Figure 1: Millipedes recently recorded new to Britain from South Wales that were recorded during the field meeting. A) *Ceratosphys amoena confusa* (pair in cop) was recorded from five sites; B) *Hylebainosoma nontronensis* was refound at Coed Groes-faen, Bargoed; C) The tiny *Cranogona dalensi* proved to be frequent at Cwm Colliery Tips, Beddau; D) *Turdulisoma cf helenreadae* was refound at Maerdy Colliery spoil heap; E) Both *Ommatoiulus moreleti* (larger specimen) and *Cylindroiulus pyrenaicus* (two small specimens) were refound at Craig yr Aber, Bridgend; F) *Cylindroiulus sagittarius* was refound at several localities along the Sirhowy Valley.

Images from BMIG website (www.bmig.org.uk). A, B, E & F © Christian Owen. C & D © Keith Lugg

Table 4: Woodlice recorded during the Longtown 2018 field meeting. X = species recorded from site.

* Where male specimens examined: a.a. = *Oniscus asellus ssp. asellus; a.x. = O. asellus X occidentalis;* s.s. = *Philoscia muscorum* sensu stricto

Site number:	**1**	**2**	**3a**	**3b**	**4**	**5**	**6a**	**6b**	**7**	**8**	**9**	**10**	**11a**	**12**	**13**	**14**	**15**	**16a**	**16b**	**17**	**18**	**19a**	**20**	**21a**	**21b**	**21c**	**21d**
10 km square:	ST	ST	SS		SS	ST	SS		SS	SO	SO	SO	SO	SO	SO	SO	SO	SS		SO	ST	ST	SO	ST			
Species	17	18	87		87	27	87		97	61	32	20	30	20	20	20	33	88		33	19	29	33	08			
Androniscus dentiger			X							X				X	X							X					
Haplophthalmus danicus												X															
Haplophthalmus mengii s.str.										X											X	X				X	X
Trichoniscoides sp. NTB																											
Trichoniscus provisorius												X		X							X			X			
Trichoniscus pusillus agg.						X	X			X	X			X	X	X	X	X	X		X	X		X	X	X	X
Trichoniscus pygmaeus										X											X	X				X	
**Oniscus asellus*		X				X				X		a.a.		X	a.a.	X	X	X	X		a.x.	X	X		X	X	a.a.
**Philoscia* sp. cf *muscorum*	X					X	X	X	X	s.s.			X	X	X	X				X	s.s.	s.s.		s.s.	X	s.s.	X
Platyarthrus hoffmannseggii							X			X						X											
Porcellio scaber	X	X	X	X						X				X	X	X				X	X	X	X	X	X	X	
Porcellio spinicornis															X												
Porcellionides cingendus																											
Porcellionides pruinosus																											
Armadillidium album					X																						
Armadillidium depressum										X																	
Armadillidium nasatum										X						X								X	X		
Armadillidium vulgare			X	X			X																	X	X		X
Total 18 spp. / Total per site	2	2	3 sp.		1	3	4	1	1	10	1	3	1	6	6	6	2	2 sp.		2	7	7	2	site 21: 9 sp.			

Table 4: Woodlice recorded (continued)

Site number:	**22a**	**22b**	**23a**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**36**	**37**	**38**	**39**	**40**	**41**	**42a**	**42b**	**42c**	**43**	**44**	**No. of loca-tions**
10 km square: Species	SO 32		SO 23	SO 32	ST 17	SO 30	SO 10	SO 22	SO 32	SO 51	SO 60	SO 60	ST 59	SO 51	SO 50	SO 32	SO 32	SO 31	SO 20	SO 24	SO 54			SO 53	SO 99	
Androniscus dentiger					X						X									X						8
Haplophthalmus danicus					X																					2
Haplophthalmus mengii s.str.					X																					6
Trichoniscoides sp. NTB					X																					1
Trichoniscus provisorius																										4
Trichoniscus pusillus agg.					X	X		X	X		X		X		X		X		X				X	X		27
Trichoniscus pygmaeus					X																					5
**Oniscus asellus*			X	X	a.a.	X	X	X	X	X	X		a.a.	a.a.	a.a.		a.a.	X	X	a.a.	a.a.		a.a.	a.a.		35
**Philoscia* sp. cf *muscorum*	X		X		s.s.	X				X	s.s.		X				X	X	X	X	X	X	X	X		32
Platyarthrus hoffmannseggii					X												X									5
Porcellio scaber	X	X	X		X	X		X	X	X	X	X	X			X		X	X	X	X			X	X	33
Porcellio spinicornis			X																							2
Porcellionides cingendus													X													1
Porcellionides pruinosus					X																					1
Armadillidium album																										1
Armadillidium depressum					X							X														3
Armadillidium nasatum					X							X														6
Armadillidium vulgare					X					X										X	X					10
Total 18 spp. / Total per site	2 sp.		4	1	14	4	1	3	3	4	5	3	5	1	2	1	4	3	4	5	site 42: 5 sp.			4	1	

For the purposes of this report records of *Philoscia muscorum* (Scopoli) have been treated as a species complex (*P. muscorum sensu lato*) unless male specimens were collected for examination. Following the discovery of *Philoscia affinis* Verhoeff in Britain in 2017 this predominantly western species has been shown to occur in South Wales (Gregory, 2020). However, male specimens collected from seven sites all proved to be the genuine *P. muscorum sensu stricto.* None-the-less it is possible that some of the records for *P. muscorum sensu lato* recorded during the field meeting, especially those from woodland, may have been *Philoscia affinis*.

One of the main reasons to visit St Fagans was to look for more specimens of an un-pigmented and blind trichoniscid, which on the basis of a male collected by Christian Owen and Mark Telfer two years earlier in 2016, appears to be a species of *Trichoniscoides* that would be new to Britain (Owen, C. and Telfer, M., pers. comm. to SJG). Unfortunately, just a single female was collected in 2018 despite searching in exactly the same location where the specimens were first collected in 2016. Several species of unpigmented and blind *Trichoniscoides* are known from western Europe (Vandel, 1960) so a return visit is required to collect more male specimens to determine the species identification.

Acknowledgements

We thank Christian Owen for readily making available the precise details of the locations of the many 'unexpected' discoveries in The Valleys. We also thank Karen Wilkinson (Natural Resources Wales) for arranging permissions to visit NRW sites and for providing relevant contact details for other sites. Permission to survey these other sites was provided by Alison Jones (Caerphilly County Borough Council), Gareth Roberts (Natural Resources Wales), Jade Skuse (The Big Pit), Richard Wistow (Rhondda Cynon Taf Council) and Steve Williams (Torfaen County Borough Council).

We are very grateful to Liam Olds (Colliery Biodiversity Initiative) and Ben Rowson (National Museum Wales) for leading the tours of Cwm Colliery spoil heaps and St Fagans gardens, respectively, and to Tony Theaker (Gardener at St Fagans) for allowing unrestricted access to the non-public 'gardener's working area'.

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Report on the BMIG field meeting in Newton Stewart in 2019

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Introduction and background

The 2019 BMIG field weekend, held from 25th to 27th April, was based at The Bruce Hotel, Newton Stewart in Dumfries and Galloway, south west Scotland.

The Solway coast of Dumfries and Galloway has proved an interesting area for species recording with a relict fauna possibly originating from a period of climatic optimum persisting in localised 'sun-trap' sites (Crowson, 1967). Supporting this view Harding (1975) highlights the occurrence of *Armadillidium pulchellum* (Zencker) at five sites. This includes the discovery of this species at Castlehill Point (NX8552) in 1962, the first ever record of an *Armadillidium* species in Scotland and a species previously only known from northern England (Westmorland, VC69 and Berwick, VC81). Harding (1975) also reports the discovery of *Armadillidium album* Dollfus at Torrs Warren (Luce Sands) (NX1152) in 1974, the most northerly known site in Europe (previously only known as far north as Cumberland, VC70).

BMIG (then two distinct entities; BMG and BISG) had previously visited Dumfries and Galloway (based at Dalry) back in 1997 and a summary of woodlice and millipede observations are reported by Gregory (1997) and Lee (1999) respectively. This field meeting visited sites mainly to the east of Newton Stewart. The woodlouse highlights were *Trichoniscoides saeroeensis* Lohmander, *Cylisticus convexus* (De Geer) and three sites for *Armadillidium pulchellum* from its (then) most northerly known locations in the UK (Harding & Sutton, 1985), all coastal sites. Of the millipedes there was *Cylindroiulus londinensis* (Leach) at Logan Gardens and *Thalassisobates littoralis* (Silvestri) was found in large numbers at Mullock Bay (part of the Kirkcudbright MOD Training Area). There is no account of the centipedes recorded.

Subsequently, BMIG has held additional field meetings in south west Scotland. In 2006 BMIG visited Ayrshire, with the highlight being the discovery of *Chordeuma sylvestre* C.L.Koch at Culzean Country Park, the first record in Scotland and only the third site in the UK (Collis, 2007). A field meeting based near Oban in 2007 produced sites for the centipedes *Geophilus seurati* Brolemann (then known as *G. gracilis*) on the coast and the rare *Lithobius lucifugus* L.Koch. Millipedes included several northern sites for *Chordeuma proximum* Ribaut and more sites for *Thalassisobates littoralis* and *Leptoiulus belgicus* Latzel (Collis, 2008; Barber, 2008; Barber & Gregory, 2008). Then in 2010 surveys in the Kintyre area revealed another site for *Lithobius lucifugus* in a coastal Kirkyard, another site for *Chordeuma sylvestre* at Brodick Castle on Arran and several additional sites for *Leptoiulus belgicus* (Barber, 2011; Gregory, 2016).

It was hoped in 2019 to find some species not recorded in 1997, but which were recorded during the later Ayrshire, Oban and Kintyre meetings, such as the millipedes *Chordeuma proximum* and *Leptoiulus belgicus* and the centipede *Geophilus seurati*.

In addition, the woodlouse *Philoscia affinis* Verhoeff was discovered in Britain in 2017 (Segers *et al.*, 2018) and examination of *Philoscia 'muscorum'* specimens collected from Oban during the 2007 field meeting were, over a decade later, found to be *P. affinis* (Gregory, 2018). This was a surprising 600 km further north than the previous records from south east England and therefore one of the aims of the field meeting was re-find this species in western Scotland and to determine if the Oban record was an outlier or if the species was more widespread and had been previously overlooked as *P. muscorum* (Scopoli)

Methods and Sites

A list of sites with permission to survey and collect specimens was provided to all participants who were free to undertake field work whenever and wherever they chose to record. Two organised site visits were arranged in advance. The first was to MOD land at Mullock Bay where *Armadillidium pulchellum* and *Thalassisobates littoralis* had been previously recorded at their northernmost locations in the UK (Gregory, 1997; Lee, 1999). The second was to Cally Gardens at Gatehouse-of-Fleet (Callygardens.co.uk), a site not previously visited by BMIG.

Forty sites were visited during the course of the field meeting, 26 in Wigtownshire (VC74) and 14 in Kirkcudbrightshire (VC73). These were mostly a mixture of coastal sites and ornamental gardens, but a few woodlands and other habitats were also visited. Coastal sites visited included: St Ninian's Cave (site 10) with an extensive pebble beach and coastal slope; Ringdoo Point, near Stranraer (site 14) with coastal grassland and a sandy beach known to support *Armadillidium album* (Harding, 1975); and Mullock Bay (site 21) with an extensive shingle beach known to support the millipede *Thalassisobates littoralis* (Lee, 1999) and the centipede *Geophilus seurati.* Ornamental gardens visited included: Dunskey Estate, near Portpatrick (site 6) with a walled garden and 19th century glasshouses; Logan Botanic Garden, Port Logan (site 8) with exotic plant collections, a walled garden and glasshouses; and Cally Gardens, Gatehouse-of-Fleet (site 15) with an 18th century walled garden with an ancient vinery. Woodland sites included The Forest, Hazelbank (site 12) and Kirroughtree Forest (site 30).

A summary of the sites visited and the sub-locations within these sites is shown in Table 1.

Table 1: List of sites visited.

Recorders: KA - Keith Alexander, WA - Wallace Arthur, TB - Tony Barber; SG - Steve Gregory, PH - Paul Harding, PL - Paul Lee, WM - Warren Maguire, HR - Helen Read, CU - Calum Urquhart, DW - Derek Whiteley

Site code	Location	Grid Ref.	VC	Date	Recorders
1	Carsluith shore	NX4854	73	24/iv/2019	DW
2	Kirkcowan, by A75, copse	NX3362	74	26/iv/2019	WA, TB
3	Craignarget	NX2551	74	26/iv/2019 28/iv/2019	SG, WM DW
4	Cumloden Deer Parks	NX4168	73	26/iv/2019	KA
5	Minnigaff Churchyard	NX4166	73	26/iv/2019	KA
6	Dunskey Gardens	NX0056	74	26/iv/2019	PL, HR, DW
7	Isle of Whithorn, St.Ninian's Chapel	NX4736	74	26/iv/2019	WA, TB
8	Logan Gardens	NX0942	74	26/iv/2019	WA, TB, PL, HR, DW
9	Port William	NX3344	74	26/iv/2019	WA, TB
10a	Port Castle Bay, St.Ninian's Cave	NX4235	74	26/iv/2019	WA, TB, PH

10b	Physgill Glen, St.Ninian's Cave	NX4336		27/iv/2019	KA
11	Monreith	NX3639	74	26/iv/2019	WA, TB
12	The Forest, Hazelbank	NX4448	74	26/iv/2019	WA, TB
13	Port Patrick	NW9953	74	26/iv/2019	PL, DW
14	Ringdoo Point, Luce Sands	NX1755	74	26/iv/2019	SG, WM, CU
15	Cally Gardens, Gatehouse-of-Fleet	NX6054 NX6055	73	27/iv/2019	WA, TB, SG, PL, WM, HR, CU, DW
16	Fleet Forest (by Cally)	NX6055	73	27/iv/2019	WA, TB
17	Cairnmore NNR (Visitor Centre)	NX5563	73	27/iv/2019	WA, TB
18	Fore Moor Moorland	NX5261	73	27/iv/2019	WA, TB
19	Dhoon Bay (picnic site)	NX6540	73	27/iv/2019	WA, TB
20	Galloway House Gardens	NX4744	74	27/iv/2019	KA
21	Mullock Bay MOD	NX7043	73	27/iv/2019	SG, PL, WM, HR, CU, DW
22	Mutehill shore	NX6848	73	27/iv/2019	HR, DW
23	Gatehouse Station, Old Railway Line	NX5462	73	27/iv/2019	WA, TB
24	Ravenshall Wood, beach	NX5252	73	27/iv/2019	SG, WM
25	Rocks of Garheugh	NX2650	74	27/iv/2019 28/iv/2019	KA DW
26	Newton Stewart	NX4165	74	28/iv/2019	WA, TB
27	Cairnbowie	NW9969	74	28/iv/2019	DW
28	Clachan Hill	NX0270	74	28/iv/2019	DW
29	Corsewall Point	NW9872	74	28/iv/2019	DW
30	Kirroughtree Forest	NX4564	73	28/iv/2019	SG
31	Creetown	NX4658	73	28/iv/2019	WM
32	Mull of Galloway, McTaggart's Rock	NX1530	74	28/iv/2019	KA
33	Planting End	NX1258	74	28/iv/2019	DW
34	Stair Haven	NX2053	74	28/iv/2019	DW
35	Stranraer beach	NX0961	74	28/iv/2019	DW
36	Wig Bay	NX0365	74	28/iv/2019	DW
37	Wigtown picnic site	NX4355	74	28/iv/2019	DW
38	Craigoch Park Moor	NX0053	74	29/iv/2019	KA
39	Dunskey Glen	NW9955	74	29/iv/2019	KA
40	Port Mora, Portpatrick to Black Head	NW9955	74	29/iv/2019	KA
41	Black Loch, Gargre Moor	NX2765	74	28/iv/2019	HR
42	Carstramom Wood	NX5960	73	27/iv/2019	DW

Species recorded

During the field meeting 57 BMIG species were recorded, including 14 species of centipede (Table 2), 23 of millipede (Table 3), 16 of woodlice and four of intertidal isopods (Table 4).

The organised group visits, with many enthusiastic participants, to Cally Gardens (site 15) (see Fig. 1), Logan Gardens (site 8) and Mullock Bay (site 21) proved to be the most prolific sites with 25 BMIG species (4 centipedes, 14 millipedes and 7 woodlice), 21 BMIG species (6 centipedes, 13 millipedes and 2 woodlice) and 19 BMIG species (4 centipedes, 7 millipedes and 8 woodlice) recorded, respectively. However, a group of just three recorders collected 19 BMIG species (4 centipedes, 12 millipedes and 3 woodlice) from Dunskey Gardens (site 6).

Seven of the species recorded during the weekend are listed in the Natural England species status review (Lee, 2015) as being Nationally Scarce (*Geophilus seurati*, *Allajulus nitidus*, *Choneiulus palmatus*, *Cylindroiulus londinensis* and *Armadillidium album*) or Nationally Rare (*Lithobius lapidicola* and *Thalassisobates littoralis*). No Red List species were found, but one centipede, *Lithobius lapidicola*, is considered Near Threatened.

Figure 1: BMIG members at Cally Gardens, Gatehouse-of Fleet.
Left to right – Callum Urquart, Warren Maguire, Paul Harding, Helen Read, Paul Lee, Keith Lugg, Steve Gregory and Derek Whiteley.

Centipedes

Not unexpectedly in a more northerly part of Britain, the number of species of centipede recorded, 14 species from 21 sites (Table 2), is not as great as it might be, for instance, in Southern England. Nevertheless, it includes a fair proportion of our common species, including two halophiles. What we do not see are either of the two terrestrial *Strigamia* species, both of which seem to be confined to more southern areas, although there are a few old records of *S. crassipes* from Southern Scotland. Neither do we note either of our *Henia* species, of which the most northerly British record is an indoor one of *H. vesuviana* from North Lancashire (it has been recorded slightly further north in Ireland). Somewhat surprisingly, *Geophilus flavus*, which might be expected, knowing its recorded distribution (up to Wester Ross) is not included in the present list nor is *G. easoni* (recorded as far north as Orkney).

Of species recorded, *Stigmatogaster subterranea*, which has been found north to Orkney, tends to be synanthropic in more northern locations, *Geophilus truncorum* is very much an urban "avoider",

whereas the similar sized *Schendyla nemorensis* occurs in both rural and urban sites; both of these small geophilomorphs are known as far north as Shetland. *Geophilus impressus* is a widespread species in both Britain and Ireland, again as far north as the Northern Isles. The seashore species *Strigamia maritima* occurs all around the British and Irish coasts from Jersey to Unst (Shetland) and is often, but not always, very abundant whilst *Geophilus seurati* has been less often recorded but has been found on the Argyll coast.

Two *Cryptops* species are known from Scotland, *C. hortensis* and *C. parisi* both tend to be more or less synanthropic away from Southern Britain / Ireland with records as far north as Sutherland (*C. hortensis*) and Aberdeen (*C. parisi*).

Of the two larger *Lithobius* species, *L. forficatus* is more or less ubiquitous and blank spaces on its distribution map are, maybe, as likely to be due to lack of recording effort in the area concerned as much as lack of suitable habitats. On the other hand, for Scotland, *L. variegatus* has been recorded largely, but not exclusively, in the more Atlantic counties so its presence in the present area is not unexpected.

Lithobius borealis and *L. crassipes* are both medium sized, rural "urban avoiders" but the relationship between the two species, which seem to occupy a somewhat similar niche in Britain, is not clear. There seems to be something of a westerly trend in *L. borealis* but with scattered records also across both Eastern Scotland and Eastern England. *L. crassipes,* on the other hand, does, from its distribution map, seem to have a distinct eastern preference but with records across many areas of England and Wales. It is, apparently, apart from a few isolated records, absent or rare in much of SW England and Southern Ireland.

Lithobius melanops is widely scattered across Britain and Ireland and many of its records are synanthropic ones from gardens and similar locations (and inside buildings). *Lithobius microps*, a relatively small animal, is more of a southern species, but again, often synanthropic. These two species, along with *L. forficatus*, are likely to be the lithobiids found in parks and gardens.

There are other species of *Lithobius* that might have been found: e.g. *L. calcaratus* (relatively uncommon apparently in much of Scotland*)* and *L. macilentus* (scattered records across much of Britain including Southern and Eastern Scotland). *Lamyctes emarginatus*, which is known from all parts of Britain, is markedly seasonal with a one-year life-cycle and records from February to May are rare.

The small and not very distinctive *Lithobius lapidicola* has been recorded in two contrastingly different types of site. First recorded from a greenhouse in the Royal Botanic Garden in Edinburgh and subsequently in other, similar sites, it was also found on the coast of East Kent and elsewhere on the eastern coast. Specimens from RBG Edinburgh and from Sandwich Bay were both identified as this species by the late E.H.Eason. Its status as Nationally Rare and Near Threatened, would perhaps seem more relevant to its "outdoor" occurrence in semi-natural habitats, but there is no way to differentiate from its occurrence in synanthropic habitats, such as Logan Gardens (site 8), where the species is most likely an accidental introduction.

Note on Nomenclature:

- *Geophilus impressus* has been recorded in the past under both the names *Geophilus alpinus* and *Geophilus insculptus*.
- *Geophilus seurati* has been recorded in Britain in the past as *Geophilus fucorum seurati* and possibly *Geophilus algarum.* The *algarum/fucorum/fucorum seurati* species seem to need further study: see the comments on this in the recent centipede atlas (Barber, 2022).
- *Lithobius borealis* had been recorded in the past as *Lithobius lapidicola* (e.g. Eason, 1964) but this is not the same species as *Lithobius lapidicola* Meinert, 1872 of the present account (see: Barber, 2022).

Table 2: Centipedes recorded during the Newton Stewart 2019 field meeting. X = species recorded from site.

National status: NR = Nationally Rare, NS = Nationally Scarce, NT = Near Threatened.

**Geophilus impressus* - formerly known as *G. insculptus* and more recently *G. alpinus.*

Site number:	**3**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**15**	**16**	**18**	**19**	**20**	**21**	**22**	**23**	**26**	**29**	**30**	**33**	**41**	**No. sites**
Haplophilus subterraneus		X		X	X		X		X		X	X					X					8
Schendyla nemorensis	X													X								2
Strigamia maritima	X				X									X								3
**Geophilus impressus*		X		X				X								X					X	5
Geophilus serauti (NS)														X	X							2
Geophilus truncorum								X		X						X						3
Cryptops hortensis		X	X						X	X												4
Lithobius borealis				X																		1
Lithobius crassipes														X							X	2
Lithobius forficatus				X		X			X							X	X		X			6
Lithobius lapidicola (NR & NT)				X																		1
Lithobius melanops		X							X													2
Lithobius microps																		X				1
Lithobius variegatus				X		X							X							X		4
Total 14 species / No. per site:	2	4	1	6	2	2	1	2	4	2	1	1	1	4	1	3	2	1	1	1	2	

Millipedes

23 species of millipede were recorded from 33 sites (Table 3). The two most frequently recorded were *Tachypodoiulus niger* (from 19 sites) and *Cylindroiulus punctatus* (from 16 sites).

The sites with the highest species richness counts were all cultivated habitats, either botanical gardens or plant nurseries. These three sites Dunskey Gardens (12 species), Logan Gardens (13 species), and Cally Gardens (14 species, including some striking 'pink' *Tachypodoiulus niger*: Fig. 2) were the most interesting from a conservation viewpoint also. All three of the Nationally Scarce millipedes seen during the weekend were found in one or more of these gardens.

The rarest millipede collected was the shoreline inhabitant *Thalassisobates littoralis*. Not surprisingly, this Nationally Rare species did not occur in any of the gardens but only on the MOD land at Mullock Bay where the shingle beach is a known site for the millipede.

The large black Julid *Cylindroiulus londinensis* was surprisingly widespread in the area for a Nationally Scarce species. In England the related *C. caeruleocinctus* is a common garden species away from the south-west, but it was only found at a single site, Logan Gardens, during the meeting. However, the much scarcer *C. londinensis* occurred in all three of the gardens visited as well as four other sites.

The two other Nationally Scarce species were restricted to single locations. Logan Gardens supported *Allajulus nitidus*, and Cally Gardens was home to *Choneiulus palmatus* amongst huge numbers of *Proteroiulus fuscus* in the decaying timbers forming the edges of raised beds. Both these millipedes tend to be synanthropic species in Scotland, at the northern limits of their ranges.

Cylindroiulus millipedes recorded at two sites by Steve Gregory were found to be infected with the host specific ectoparasitic fungus *Rickia laboulbenioides* De Kesel. The first on *C. britannicus* inside the vinery (a glasshouse) at Cally Gardens and the second on *C. punctatus* in dead wood at Kirroughtree Forest. In light of this discovery, voucher specimens of *C. britannicus* collected from Auchalton Meadows (NS335036, VC75, 08.iv.2006, Gregory, S. leg./det.) during the BMIG meeting in Ayrshire in 2006 were examined and also found to bear thalli of *R. laboulbenioides*. At the time (2019) these were the three most northerly sites for this fungus in the UK (which has subsequently been found from Arran and near Edinburgh (Gregory, 2021)).

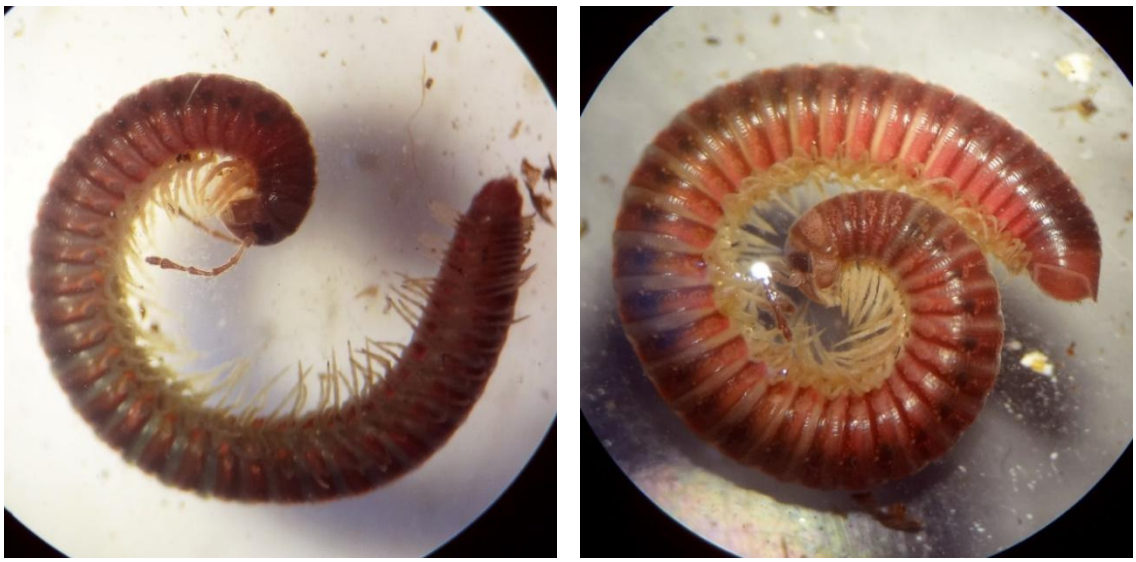

Figure 2: 'Pink' *Tachypodoiulus niger* from Cally Gardens; left male, right female.
Images by Steve Gregory

Table 3: Millipedes recorded during the Newton Stewart 2019 field meeting. X = species recorded from site.

National status: NR = Nationally Rare, NS = Nationally Scarce. XR = *Cylindroiulus* sp. bearing thalli of the ectoparasitic fungus *Rickia laboulbenioides.*

Site number:	**1**	**2**	**3**	**4**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**19**	**20**
Glomeris marginata		X								X			X				
Nanogona polydesmoides													X				
Melogona gallica					X					X			X				
Archiboreoiulus pallidus					X												
Blaniulus guttulatus	X				X								X				
Choneiulus palmatus (NS)													X				
Proteroiulus fuscus		X			X		X	X		X	X		X				
Thalassisobates littoralis (NR)																	
Allajulus nitidus (NS)							X										
Brachyiulus pusillus																	
Cylindroiulus britannicus					X		X						XR				
Cylindroiulus caeruleocinctus							X										
Cylindroiulus latestriatus		X	X			X		X	X		X	X					
Cylindroiulus londinensis (NS)		X			X		X	X					X	X			
Cylindroiulus punctatus	X	X		X	X		X	X		X	X	X	X				X
Ommatoiulus sabulosus					X		X	X				X	X				
Ophyiulus pilosus		X			X		X			X			X	X	X	X	
Tachypodoiulus niger	X	X			X		X	X		X		X	X	X		X	
Brachydesmus superus					X		X										
Polydesmus angustus		X			X		X						X				
Polydesmus coriaceus										X							
Macrosternodesmus palicola							X										
Ophiodesmus albonanus							X						X				
Total 23 species / No. per site:	3	8	1	1	12	1	13	6	1	7	3	4	14	3	1	2	1

Table 3: Millipedes recorded (continued)

Site number:	21	23	24	25	28	29	30	32	35	36	37	38	39	40	41	42	No. sites
Glomeris marginata	X			X										X		X	6
Nanogona polydesmoides																	1
Melogona gallica																	3
Archiboreoiulus pallidus																	1
Blaniulus guttulatus																	3
Choneiulus palmatus (NS)																	1
Proteroiulus fuscus		X			X					X			X				11
Thalassisobates littoralis (NR)	X																1
Allajulus nitidus (NS)																	1
Brachyiulus pusillus	X																1
Cylindroiulus britannicus																X	4
Cylindroiulus caeruleocinctus																	1
Cylindroiulus latestriatus	X		X	X				X						X			12
Cylindroiulus londinensis (NS)			X														7
Cylindroiulus punctatus	X				X		XR						X			X	16
Ommatoiulus sabulosus									X	X		X					8
Ophyiulus pilosus																X	9
Tachypodoiulus niger	X		X			X				X	X		X	X	X	X	19
Brachydesmus superus																X	3
Polydesmus angustus	X		X				X						X				8
Polydesmus coriaceus																	1
Macrosternodesmus palicola																	1
Ophiodesmus albonanus																	2
Total 23 species / No. per site:	7	1	4	2	2	1	2	1	1	3	1	1	4	3	1	6	

Woodlice

16 species of woodlouse were recorded from 36 sites (Table 4). Of the undisputed terrestrial woodlice (see paragraph below) by far the two most frequently recorded were *Porcellio scaber* (from 32 sites) and *Oniscus asellus* (24 sites), with *Trichoniscus pusillus agg.* (nine sites) next.

Ligia oceanica was recorded from six sites. However, according a 'genetic' analysis undertaken by Dimitriou *et al.* (2019), this species is more closely related to marine isopods of suborders Valvifera and Sphaeromatidea than to suborder Oniscidea (the true 'woodlice'). They examined (for the first time in Oniscidea) the evolutionary highly conserved nuclear protein-coding genes for Sodium-potassium pump (NAK) and Phosphoenolpyruvate Carboxykinase (PEPCK) (in addition to the traditionally used 18 s and 28 s ribosomal RNA genes). The implication for our UK fauna is that *Ligia oceanica*, our familiar Sea Slater, should no longer be considered a terrestrial 'woodlouse', but a marine intertidal isopod.

Overall the coastal sites proved the most interesting (see also **Intertidal Isopods** below). *Trichoniscoides saeroeensis* was recorded from three sites. Good numbers of *Armadillidium album* were recorded from Ringdoo Point, Luce Sands (site 14) (Fig. 3A). This species was first recorded there in 1974 (Harding, 1975), at its only known Scottish site (Gregory, 2009). Similarly, large numbers of *Armadillidium pulchellum* were seen at Mullock Bay (site 21) (Fig. 3B), where the species was also recorded during the in 1997 field meeting. *Cylisticus convexus* was also recorded from the coast at Craignarget (site 3) and also in unusually large numbers at Cally Gardens (site 15) (Fig. 3C).

Figure 3: Terrestrial Woodlice recorded during the BMIG 2019 field meeting.
A) *Armadillidium album* from upper drift line at Ringdoo Point; B) *Armadillidium pulchellum* from coastal grassland at Mullock Bay; C) Group of *Cylisticus convexus* at Cally Gardens; D) *Philoscia affinis* male from coastal grassland at Ringdoo Point. Images © Warren Maguire.

Perhaps the greatest surprise was that both Ringdoo Point and Mullock Bay also supported an abundance of *Philoscia affinis* (Fig. 3D), a species first reported from Britain from south east England in 2017 (Segers *et al*., 2018). In total *P. affinis* was found at five rural localities in both coastal habitats and inland woodland, whereas the only confirmed record for *P. muscorum* (i.e. male specimen examined) was from Cally Gardens (site 15), very much a synanthropic site. Unidentified *Philoscia* specimens were also observed at three additional coastal sites, but unfortunately were not collected for examination to enable species determination. Subsequently, *P. affinis* has been recorded further north from the islands of Lismore and Raasay, with possible females from Arran and Skye (Gregory, 2020).

These observations of *P. affinis* are important because during BMIG's previous field meetings in western Scotland (which predate the discovery of this species in Britain), *P. muscorum* had been widely recorded from Kirkcudbrightshire, Ayrshire, Argyllshire and Kintyre (Gregory, 1997; Collis, 2007; Collis, 2008; Gregory, 2016). One of these records (collected from Oban in 2007) has subsequently been shown by examination of voucher material to be *P. affinis*. Unfortunately, no additional voucher material of *Philoscia* collected during these meetings is available to check species identification. Thus, it seems quite probable that some (possibly many) populations of *P. muscorum* reported from western Scotland (and that are mapped as that species in Gregory (2009)) will be found to include, or to be entirely composed of, *P. affinis*.

Of the known UK species that were not recorded during the field meeting perhaps the most obvious omissions are *Haplophthalmus danicus*, which is known from scattered sites in southern Scotland, and *Platyarthrus hoffmannseggii*, which is known from the Solway Coast (Gregory, 2009). It is also surprising that no species of Waterlouse (Asellidae) were recorded, but these freshwater species do tend to be relatively under-recorded by active BMIG members compared to the terrestrial woodlice.

Intertidal Isopods

While intertidal isopods were not a specific focus of this field meeting, several sites were quickly checked, producing four species (Table 4), in addition to the 'honorary woodlouse' *Ligia oceanica* (which was found at six locations).

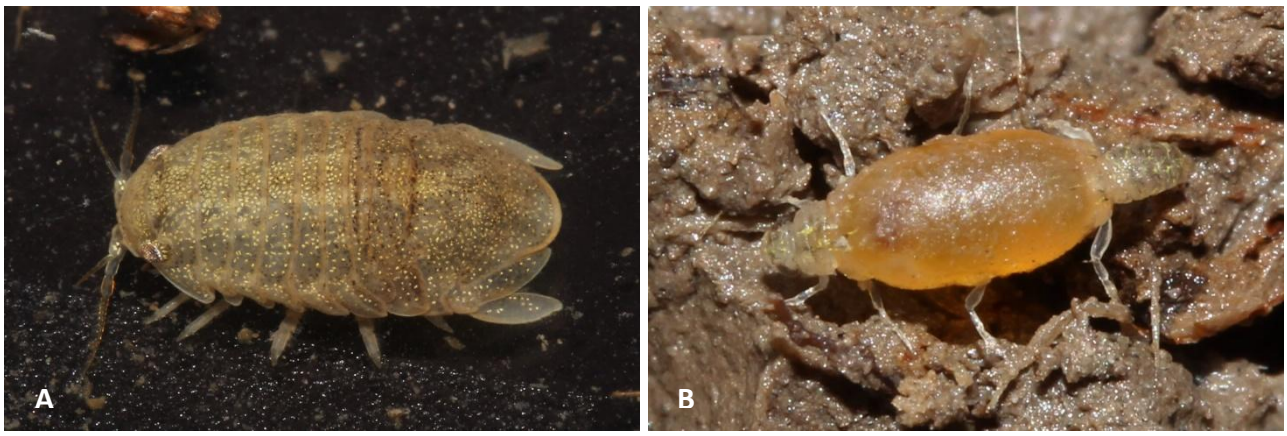

Figure 4: Intertidal Isopods recorded at Creetown during the BMIG 2019 field meeting.
A) *Lekanesphaera rugicauda* in upper saltmarsh pool; B) *Paragnathia formica* sub-adult female from a mud bank at the edge of saltmarsh. Images © Warren Maguire.

Table 4: Woodlice and intertidal isopods recorded during the Newton Stewart 2019 field meeting. X = species recorded from site.

National status: NS = Nationally Scarce.

Site number:	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21
Woodlice																			
Ligia oceanica	X	X										X					X		X
Androniscus dentiger														X					
Haplophthalmus mengii s.lat.														X					
Trichoniscoides saeroeensis		X																	X
Trichoniscus pusillus agg.	X	X											X	X				X	X
Trichoniscus pusillus s.str.														X					X
Trichoniscus pygmaeus																			X
Oniscus asellus		X	X		X	X	X		X	X	X		X	X	X	X	X	X	X
Philoscia affinis													X						X
Philoscia muscorum														X					
** Philoscia sp.*	X																		
Porcellio scaber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Porcellio spinicornis					X														
Cylisticus convexus		X												X					
Armadillidium album (NS)													X						
Armadillidium pulchellum																			X
Armadillidium vulgare																			
Total 16 species / No. per site:	4	6	2	1	3	2	2	1	2	2	2	2	5	7	2	1	3	3	8
Intertidal isopods																			
Jaera (Jaera) albifrons		X																	
Jaera (Jaera) nordmanni																			
Lekanesphaera rugicauda													X						
Paragnathia formica																			
Total 4 species / No. per site:	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	

Table 4: Woodlice and intertidal isopods recorded (continued)

Site number:	22	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	40	41	No. sites
Woodlice																			
Ligia oceanica		X																	6
Androniscus dentiger																			1
Haplophthalmus mengii s.lat.																			1
Trichoniscoides saeroeensis			X																3
Trichoniscus pusillus agg.		X						X						X					9
Trichoniscus pusillus s.str.																			2
Trichoniscus pygmaeus																			1
Oniscus asellus		X	X	X	X		X	X			X			X			X		24
Philoscia affinis		X						X								X		X	6
Philoscia muscorum																			1
** Philoscia sp.*													X	X					3
Porcellio scaber	X	X	X	X	X	X	X	X		X		X	X	X	X	X			32
Porcellio spinicornis																			1
Cylisticus convexus																			2
Armadillidium album (NS)																			1
Armadillidium pulchellum																			1
Armadillidium vulgare			X																1
Total 16 woodlice/No. per site:	1	5	4	2	2	1	2	4	-	1	1	1	2	4	1	2	1	1	
Intertidal Isopods																			
Jaera (Jaera) albifrons																			1
Jaera (Jaera) nordmanni		X																	1
Lekanesphaera rugicauda									X										2
Paragnathia formica									X										1
Total 4 species / No. per site:		1							2										

The very common *Jaera albifrons* (s.s.) was at Site 3 (Craignargert), under rocks around mid-tide. Despite its ubiquity, there was only one previous record of the species from SW Scotland in the National Biodiversity Network Trust (NBN) online atlas and database (https://nbnatlas.org/). Another *Jaera* species, the somewhat more distinctive *J. nordmanni*, was found in typical habitat (under stones in a stream meeting the shore) at Site 24 (Ravenshall Wood, beach). There were no previous records of this fairly common species on NBN in SW Scotland.

The common, ball-rolling *Lekanesphaera rugicauda* was found in its typical saltmarsh habitat at two locations, 14 (Ringdoo Point, under driftwood) and 31 (Creetown, in upper saltmarsh pools) (Fig. 4A). At this latter location, two bulbous sub-adult female *Paragnathia formica* (Fig. 4B) were also found in a mud bank at the edge of the saltmarsh, though no other individuals of the species could be found (including adult males which, unlike adult females, are present all year round) despite a good search of suitable habitat. There were no previous records of this poorly recorded but distinctive species in Scotland on NBN.

Acknowledgements

Paul Harding undertook the organisation of the field meeting, including arranging accommodation and obtaining permissions to survey and collect from sites, using site information kindly supplied by Peter Norman, Peter Garson, Bob Merritt and Craig Macadam.

Jonathan Warren, Scottish Natural Heritage, gave permission to collect specimens from SSSIs. Permission to visit various non-public sites was given by Kevin Hughes (Cally Gardens), Alastair Orr Ewing (Dunskey Estate), Richard Baines (Logan Botanic Garden) and Scott McLean (Range Officer, Kirkcudbright MOD Training Area). We thank all.

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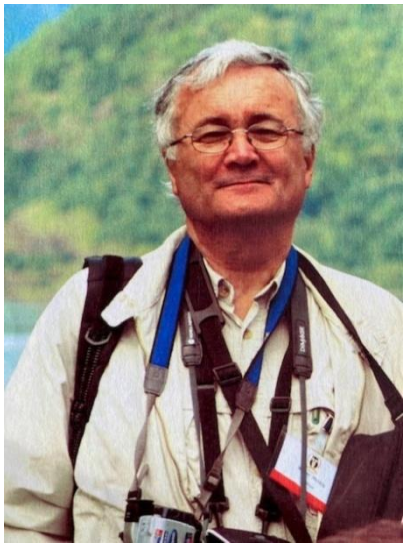
Obituary

Bjarne Andreas Meidell (1943 – 2022)



Bjarne Andreas Meidell passed away in Bergen on Tuesday 17 May 2022 (Norway's National Day!) at the age of 78 after a long illness.

Bjarne was born in Haugesund on the 21 September 1943. As a young biology student and research assistant at the Zoological Museum in Bergen, he was encouraged by Professor Hans Kauri to study myriapods, a previously little-noticed group in Norway, on which no major work had been done since the pioneer work by Edvard Ellingsen in the early nineteenth century. Bjarne started fieldwork in Rosendal in 1966, and after his master's degree in 1972 he got a position as university lecturer. Later in his life he served as head of the Zoological Museum for several periods and was also elected head of the Norwegian Association of Researchers (Forskerforbundet) in Bergen several times. In 2007 he retired from his positions at the Museum and until 2013, when he became a pensioner, he held a full-time position as the administrative head of the association.

Bjarne was an enthusiastic and good teacher, teaching various courses in Zoology. There are many students who will remember with pleasure the field courses he led annually at the field station in Rosendal and in Jutland, Denmark. I (HJR) attended one of these and remember it as being a very happy occasion, with everyone coming together each evening and Bjarne leading a discussion on our daily findings.

Bjarne attended all but the first and last meeting of the ICM and was elected honorary member of the society during the 16th ICM meeting in Olomouc, Czech Republic in 2014.

He organized the 13th International Congress of Myriapodology in Bergen, something he strongly desired to do and which was a very successful event. The warmthness of his welcome to everybody and the cheery nature of his organisation was typical of him as a person.

Bjarne was an early pioneer in the use of computers and created a national museum documentation project and a national database for museum objects. He also produced an early database of myriapod publications which he was generous in sharing. He was also the Norwegian representative in the "Nordic Code Centre", which compiled a list of scientific names. At the museum, he built up a large scientific collection of specimens collected both from freshwater and terrestrial environments.

Bjarne became particularly interested in the flat-backed Polydesmida and undertook several trips to the large collection at the MNHN in Paris. He built up the Bergen University Museum collection of myriapods, with emphasis on the Nordic fauna, which is now quite large. Two of Bjarne's students also worked on the Polydesmida. Aage Simonsen defended his PhD thesis on "Phylogeny and biogeography of the millipede order Polydesmida, with special emphasis on the suborder Polydesmidea" in 1990. Per Djursvoll, finished his master's thesis on polydesmids in 1998 and is now the collection manager at the museum, still working on this group. Bjarne was heavily involved in the publication of a Nordic book on Myriapoda, being published in the series Nationalnyckeln (Anderson et al. 2005), although teaching and especially administrative work at the Museum in Bergen took most of his time. In addition to myriapods, Bjarne was also interested in woodlice, earwigs, onychophorans and botany. As the Norwegian myriapod fauna shows many similarities to the British fauna, many of Bjarne's publications and observations have been very relevant to British workers over the years.

As a person, Bjarne was warm, kind and considerate to others. He had a tendency to be modest about his own achievements and he had a subtle sense of humour that could be relied upon to break the ice in more formal moments.

Bjarne is survived by his former wife Kari and their two sons Christian and Andreas, as well as five grandchildren. He was a loving father and grandfather.

A list of the scientific publications by Bjarne Andreas Meidell is available on the CIM website.

Per Djursvoll, Hilke Ruhberg & Helen Read

Bulletin of the British Myriapod & Isopod Group: Volume 35 (2023)

Contents

Cover illustration: *Polydesmus taranus* Verhoeff, male gonopod; a millipede new to Britain.

Cover photograph: *Hyloniscus riparius* (C. Koch); a woodlouse new to Britain. © Gary Farmer.

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ISSN 2513-9444