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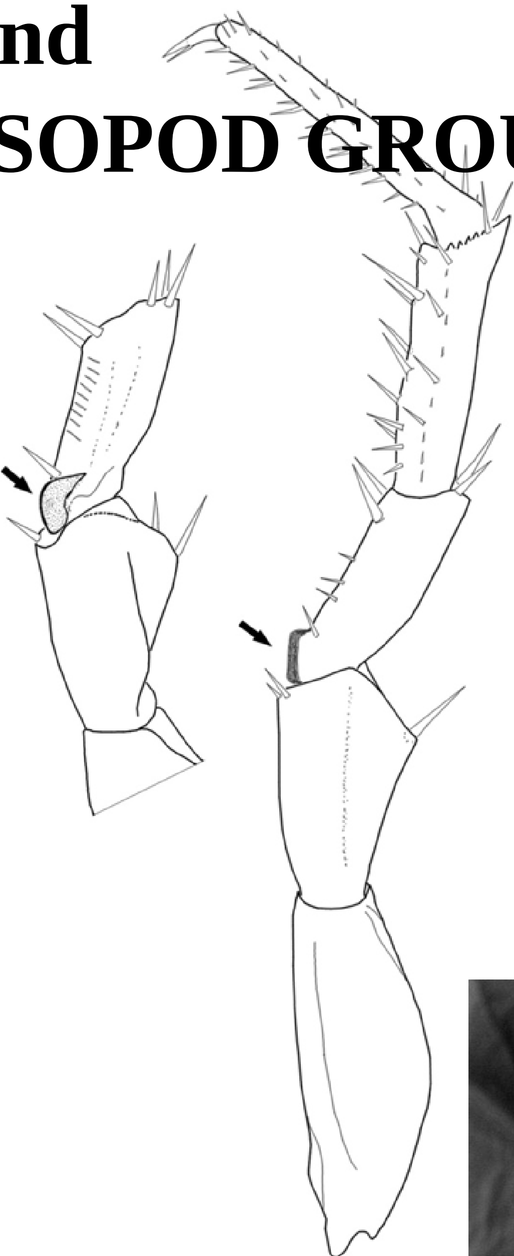
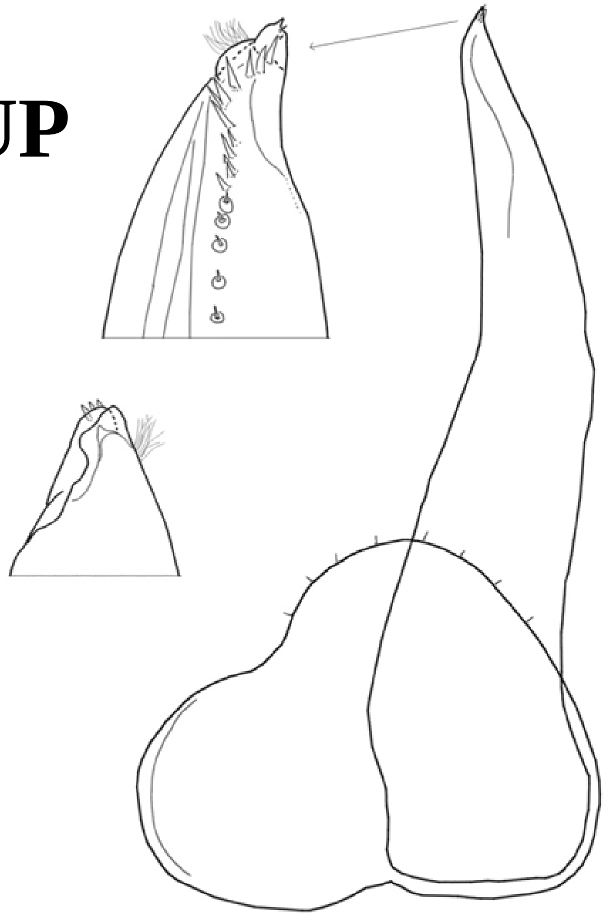
Bulletin of the BRITISH MYRIAPOD and ISOPOD GROUP





Volume 38 (2026)

Bulletin of the British Myriapod & Isopod Group: Volume 38 (2026)

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Editorial

Being able to see the intricate details of myriapods and isopods is essential for the accurate identification of many specimens, especially when distinguishing those that are morphologically very similar. Our understanding of the total number of species has increased along with improvements in microscopy, enabling the earlier British pioneers such as Newport and Pocock to realise that details of their fine structure were important. Once it was realised that there were too many species to be described on the basis of a short, written description illustrations began to appear. These relied on the ability of the worker to accurately draw and recognise what they could see in addition to actually being able to see tiny details. Today species are being distinguished on the basis of their genetic composition but the ability to accurately identify specimens by their morphology is still necessary in advancing our knowledge of distribution and ecology. Today most people have ready access to a camera on their phone, and some of these can take exceptionally good images of small invertebrates. The ability to take photographs through a hand lens or down a light microscope boosts the magnification level and means even tiny structures can now be photographed without specialist equipment. This can enable many (although not all) of our British myriapods and isopods to be identified to species without the need to kill them. The combination of good quality images, bespoke apps like iRecord and an active network of verifiers has not only produced some important information about species but has also encouraged new people to get involved in biological recording and learning more about our species groups.

However, it is important to know the crucial parts of the animal to photograph to enable species identification and, for unusual species, or those found in an unusual places, the verifiers may need additional images or, ideally, to see the specimen to be sure. Scanning electron microscopy (SEM) is relatively old technology now but, unlike light microscopes, is still out of reach for most naturalists and many research institutes. However, having a better awareness of the structures you are trying to see with a hand lens or microscope can be very helpful, and SEM images can be hugely useful in this respect. Drawings depend on interpretation by the artist, and images down a light microscope can be subject to distortion, in contrast SEM images are three dimensional and it is easy to see the various structures. They can also be very beautiful and evoke a sense of wonder at details not visible to the naked eye and the seemingly endless variety of our animals.

Paul Richards had an opportunity to use an SEM and BMIG was pleased to give a small grant to enable him to mount and photograph a selection of millipedes from his collection. The results are shown in this edition of the Bulletin and will also be placed on the BMIG website under the relevant species. The images are not intended to be a comprehensive image library, but Paul concentrated on those features that are useful for distinguishing the species. The results will no doubt help all of us looking at small specimens and wondering about for example, the structure of the first pair of legs in males that are normally difficult to see, or the details of complicated gonopods in the Chordeumatida. The images are worth browsing for more general reasons too, the body rings in *Melagona* (Chordeumatida) are clearly very different to those of the Julida, the variation in setation in the Julida is easy to be seen and the limbus (hind margin of each body ring) is clearly crenulate in *Allajulus nitidus* and *Haplopodoiulus spathifer* compared to the other Julids.

This volume of the Bulletin also includes a report of an ecological project on the woodlice *Hyloniscus riparius* and *Trachelipus rathkii* in flood meadows along the River Avon. The former species has only been known from Britain since 2022 so it is great to be able to improve our understanding of the habitats it prefers and its ecological relationships with other woodlice. The authors also used an ingenious method of sampling using refugia in areas where timed sampling was difficult. There is scope for many more ecological projects to be carried out without specialist equipment and we would be delighted to consider reports on these for the Bulletin. We are a friendly editorial team and would be very willing to help if you have no prior experience of publishing in similar journals.

Here we also report on the extension in range for a common British species, *Philoscia muscorum* in Spain. One potential project could be to look in more detail at the ecological relationship between this species and *Philoscia affinis*?

The BMIG field visits have been well attended in recent years and we encourage newcomers to myriapods and isopods as well as those with more experience, and especially attendees from outside the British Isles. We include here a report of the 2023 meeting in Cannington, Somerset.

Millipede (Diplopoda) identification characteristics viewed by scanning electron microscopy

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Introduction

During 2024 I had been undertaking some high magnification imaging of butterfly wing scales as part of a research project at the University of Sheffield. This involved taking images at magnifications up to x40,000 on a scanning electron microscope (SEM). When I finish working at the university, at the end of February 2025, I had the opportunity to continue accessing the SEM as an external user for a short time after my contract. During training in the use of the SEM I had used some invertebrate samples, such as millipede (Diplopoda) genitalia and harvestmen (Opiliones) palpal structures and found that they produced some interesting insights into their microscopic anatomy. In order to investigate this further and provide some valuable images to enhance existing identification material, I approached the British Myriapod & Isopod Group (BMIG) for some funding to pay for continuing access to the equipment.

Beyond the obvious differences in colour and size, the primary external features looked at for millipede identification include the shape of tail projections and jaw ‘cheeks’, eye arrangements, body striae and metazonite setae. However, as with many small invertebrates, the most diagnostic identification features for millipedes relate to structures associated with reproduction, such as those used for holding the couple together in the mating process or for transferring sperm. Although the actual genitalia are usually concealed, these secondary sexual characteristics—such as gonopods and other modified limb structures—are often more obvious and highly distinctive. However, these features can be challenging to observe under standard light microscopy. To help people to navigate through the descriptions in identification keys and to shed some light on the characters that point to species identity, I attempted to gather high magnification images of various millipede diagnostic characters using the electron microscope.

Method

The project aimed to capture images of key identification characteristics of as many British species as possible, at a resolution unattainable by standard light photography. These could show fine details of key ID features to enhance other current keys and identification information and be shared as an education and research resource for free via the BMIG website, social media and publications.

This use of the SEM hardly utilises its full potential for ultra-high magnification, as many of the characters used for identification rarely required magnification beyond x600. However, the capacity for creating high resolution images with a good depth of field means that the SEM reveals incredible detail of features only hinted at by most macro light photography. At SEM magnifications, unique and unimagined character details are revealed. However, there is little point in revealing the tiniest details if these are not visible to the majority of people trying to identify specimens under light microscopy. Such morphological species splitting may well be valuable once genetic studies suggest new taxonomic variations, but for this exercise, the aim is to support existing observable character recognition.

It was not possible to provide a standard set of images for all British species, due to time/cost constraints, specimen availability, preparation difficulties and the potential for imaging failures. However, representatives of 40 species of millipede known from Britain in 2025 were scanned, at least in part. This was achieved by the author utilising material from his own collection and from short-term targeted field collecting. This provided sufficient samples for a limited number of preparations within the time restrictions to represent a reasonable spread of taxonomic categories, with some key similar species for comparative purposes where possible.

The main difficulty was in preparing undistorted specimens and mounting them successfully to show characters in the right orientation. Each structure needed to be dissected out and then slowly dried without distortion. Material must be absolutely dry before entering the SEM vacuum chamber. Ideally this can be achieved by using a critical point dryer or hexamethyldisilazane (HMDS) as a desiccating medium, but these options were not available for preparation as an external researcher. Dehydration was therefore undertaken by passing specimens through a series of progressively higher concentrations of alcohol over a period of a few days. Each day the concentration of alcohol is increased by 5-10% until the specimens are in 100% ethanol. This is renewed a couple of times to ensure that all water has been replaced. The specimen is then removed from the liquid and allowed to air dry for a few minutes. It is then carefully placed on to an aluminium SEM mounting stub with conductive double-sided tape, in the preferred orientation (Figure 1: left & centre). This is then allowed to thoroughly dry for another day or more before being scanned. For delicate specimens, the final air-drying stage can be undertaken in an atmosphere of 100% alcohol (in an air-tight box with a ball of cotton wool soaked in alcohol) to slow the drying even further. Most diagnostic features in millipedes tend to derive from chitinous exoskeletal structures, so can be dried in this way, without the distortion seen in softer tissues.

Figure 1: Specimens glued to aluminium stubs and coated with gold.

Before scanning, the dehydrated specimens on the stub are coated with a very thin (~20nm) conductive layer of gold (Figure 1). Because the specimens are fixed in this position on the stub, they can generally only be viewed from a limited perspective, dependent on how effectively they were orientated before being coated. Given the size and delicacy of a specimen, it is not always possible to mount it in a precise, preferred viewpoint.

Gonopods often needed to be dissected away from surrounding legs and body rings to reveal the structures in a way that could be viewed by the microscope. Using fine forceps, and pins, the post gonopod rings were pulled away to often allow the gonopods to be viewed in situ (Figure 1: right). Once dissected, the structures to be examined are initially kept in 70% alcohol (ethanol or IMS/IDA) until dehydrated.

The microscope used to generate most of the images was a JEOL JSM-6010LA (Figure 2) (some initial scans were undertaken on a Tescan Vega3). They use a beam of electrons to create an image of the surface of the specimen, rather than light illuminating a specimen, as used in conventional microscopy. A white-hot filament generates electrons which are focused in a beam of up to 20 kVolts on the object. This electron beam is scanned across the surface of the object in a vacuum and the interaction of the beam with the conductive coating on the specimen releases secondary electrons. These are collected by a detector to produce a digital image of the specimen's surface. It should therefore be noted that a key feature of SEM imaging is that only images of physical surface structures are created, in monochrome, with minimal transparency, so colour patterns are not captured. Features that are highlighted by pigment, such as eye ocelli, are therefore more difficult to observe from only observing the surface cuticle (see Figure 3).

The focus, beam size and intensity, voltage, stigmatism, contrast and brightness can all be modified to generate the best image. How the specimen is mounted impacts how well it conducts and what views are possible. Due to the time restrictions on this project, the priority was to scan as many species as possible, rather than spending the limited time on achieving the very best image resolution at several magnifications. With an SEM it is very tempting to explore every tiny detail at high magnifications, but this does not provide material of use to anyone trying to separate species with a hand lens or under a light microscope.

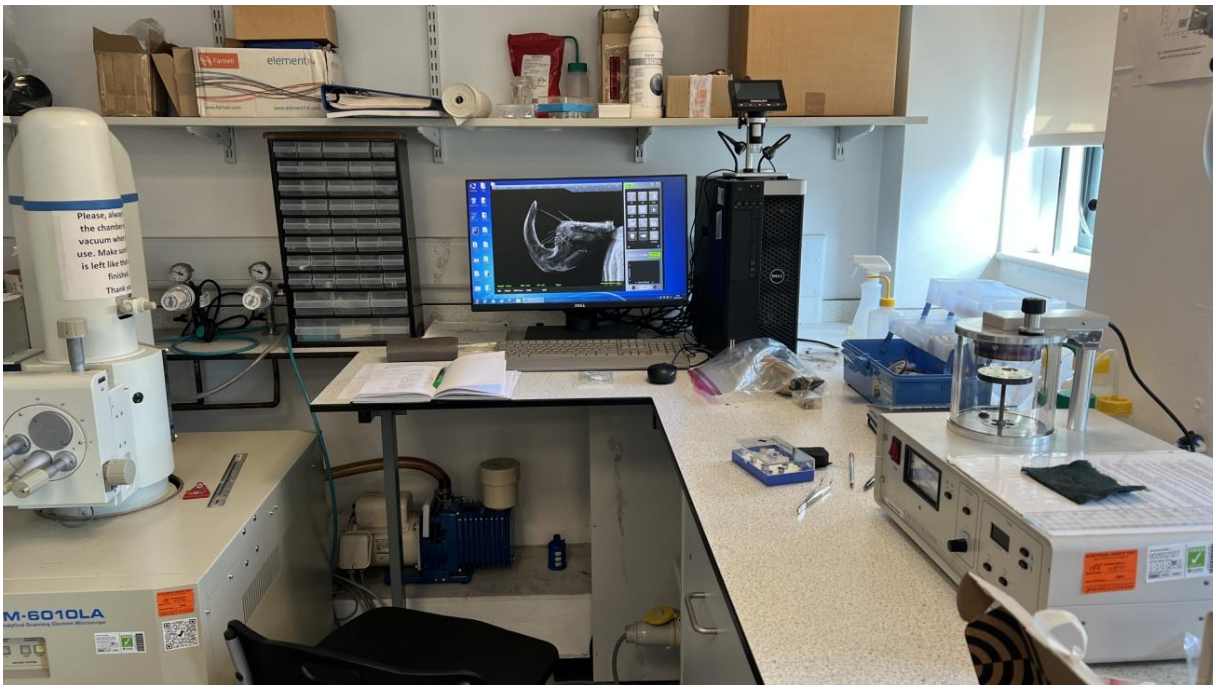


Figure 2 : The JEOL JSM-6010LA Scanning Electron Microscope (left), user interface and gold sputter-coater (right)

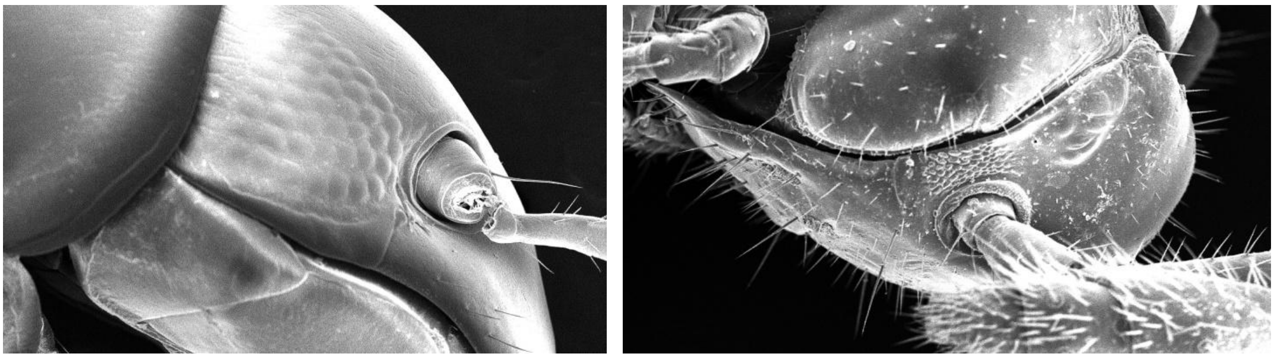


Figure 3: Ocelli of *Ophyiulus germanicus* and *Brachychaeteuma melanops*

Results

Preparation and scanning took 60 hours of which 17 hours was undertaken scanning on the SEM. Approximately 221 images were taken with examples of 40 British species. The primary aim was to capture images of tails, gonopods and other secondary sexual characters. Specific comparisons were also made of first leg modifications and coxal processes on the second leg in *Cylindroiulus* species and projections on cardo and stipes of the cheeks of species, where appropriate. Tails or whole bodies of 16 species were scanned and gonopods of 35 species. Samples of these are shown in galleries 1 and 2.

Hopefully these images will offer some clarification in the identification of similar species and new insights, particularly into the anatomy of millipede genitalia and other characters which are described in keys. Alongside existing macro images and drawings, it is hoped that they will bring some clarity for beginners and experienced researchers alike.

The gonopods of five different specimens of *Brachychaeteuma bradeae* were scanned to try to capture some of the variation known for this species (Clegg & Richards, 2007). Anterior median and lateral horns differed slightly, but did not show the variation that was hoped for (Gallery 1.)

One pleasing result was the undistorted images of the ectoparasitic fungus *Rickia laboulbenioides* on *Cylindroiulus latestriatus* (Figure 4.) It was expected that the dehydration process would create distortion in the presumed softness of the fungal fruiting bodies, but they seemed to have dried very successfully (Reboleira *et al*., 2018).

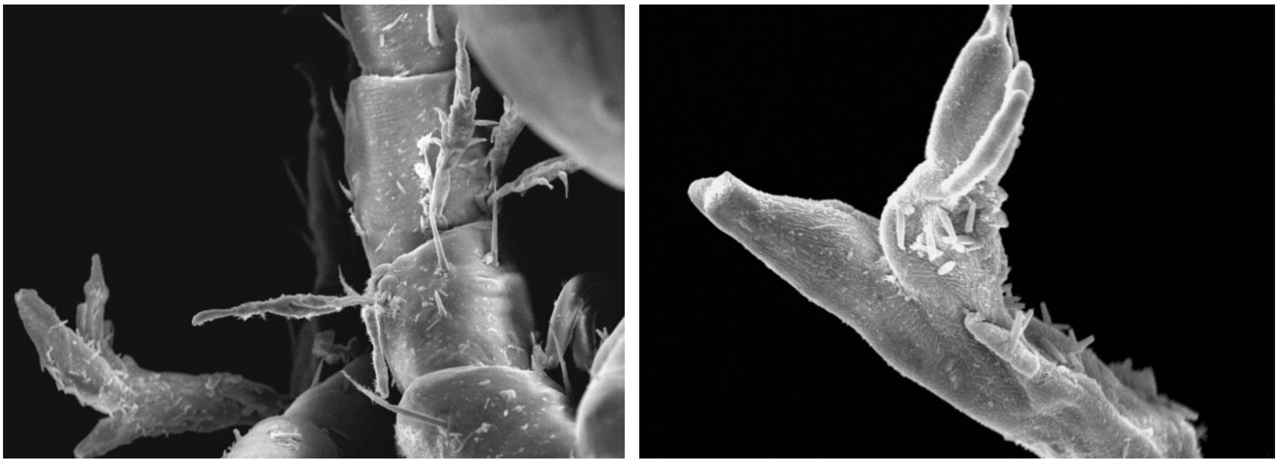


Figure 4: Fore legs of *Cylindroiulus latestriatus* with *Rickia laboulbenioides* fungus x400 and fungus detail x1000

The SEM showed the dorsal glands on the 16th ring of a male *Chordeuma proximum* (Gallery 1) which can be used to distinguish between this species and *Chordeuma sylvestre* (no image).

Although the orientation of the *Ophyiulus pilosus* specimen differs from that of *Ophyiulus germanicus*, there is still a noticeable difference in the hooked second leg structure. There is some indication of subtle differences in the shape and micro-sculpture, but the process that is only found at the base of the second leg of *Ophyiulus germanicus* is much more obvious (Gallery1.)

The variations in tail/telson/caudal projection structures speak for themselves (Gallery 2.) The SEM images also show the basal attachment points for setae on the anal valves even where these have been broken off, for example in *Cylindroiulus parisiorum* with at least 5 setae per valve.

The various differences shown across the scans are likely to be genuine inter-species variations, but it is also possible that the small sample size presents atypical features and artificial abnormalities created by the SEM preparation methods. Gonopods are presented as they were dissected, as intact as possible, but often with lost flagellae, or indistinct positioning between brachit, prosomerite, mesomerite, solenomerite and other structures. Each image should therefore be viewed with some caution, incase the individual in question may not offer the most typical representation for the species. However, the ability for revealing these potentially distinguishing and undescribed details shows the value that SEM imaging has in helping to identify seemingly similar species.

If future access to SEM resources was secured, it would be advantageous to develop a more systematic approach to imaging multiple specimens per species. This would be valuable for creating further reference images to clarify and reinforce the revelations seen through the initial somewhat opportunistic approach of this project.

The image files are available to the BMIG committee for use as required. It is anticipated that the images will be made more available as reference material within the species galleries on the BMIG website (https://bmig.org.uk/checklist/millipede-checklist). They may also appear on the Isopods and Myriapods of Britain and Ireland Facebook group if helpful for recorders with identification

The most complicated aspect of the project was the dissection and preparation of specimens and their mounting on stubs. As this has now been undertaken, the gold-coated material can be re-scanned if opportunity arises. In particular it would be interesting to investigate if these or additional specimens could be used to create three-dimensional views with rotational scanning electron micrography (rSEM) to enhance the insights further (Reboleira *et al*., 2018, Cheung *et al*., 2013).

For all their value in showing accurate images of species micro-anatomy for identification, there is no doubt that scanning electron microscopes also offer inspirational images and insight that the general public, as well as myriapod enthusiasts find fascinating. Hopefully these images will help to advance the wider understanding and appreciation of millipedes and provide new detailed information for training anyone wanting to become more involved or proficient in identification and recording. Such SEM images offer an innovative, high-quality addition to enhance any future teaching or publications in this field when presented alongside other species illustrations and photographs.

Acknowledgements

Thank you to everyone who made the project possible. I am grateful to Abby Shipley and Alan Dunbar in the School of Chemical, Materials and Biological Engineering (University of Sheffield) for providing Scanning Electron Microscopy access and training, and the British Myriapod & Isopod Group for the funding to use the SEM.

References

Cheung DK-B, Brunke A, Akkari N, Souza C, Pape T. (2013) Rotational Scanning Electron Micrographs (rSEM): A novel and accessible tool to visualize and communicate complex morphology. *ZooKeys*. **328**: 47–57. https://doi.org/10.3897/zookeys.328.5768

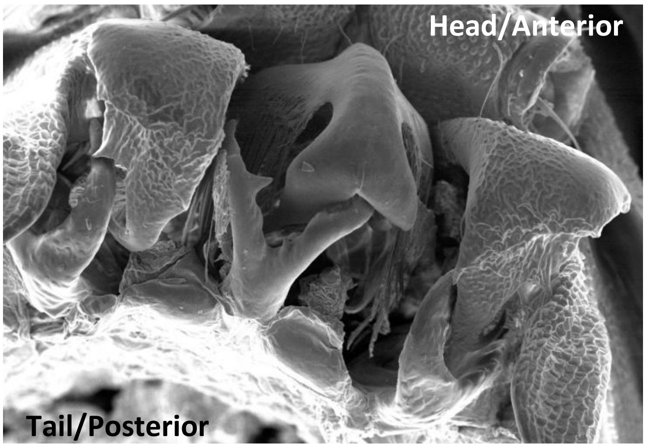
Clegg, P & Richards, JP. (2007) Street Safari: recording myriapods and isopods as part of a community project in Sheffield, UK. *Bulletin of the British Myriapod and Isopod Group* **22**: 36-43. https://bmig.org.uk/sites/default/files/bulletin/BullBMIG22%20p36-43%20Clegg%26Richards%20Street%20safari.pdf

Reboleira ASPS, Enghoff H, Santamaria S. (2018) Novelty upon novelty visualized by rotational scanning electron micrographs (rSEM): Laboulbeniales on the millipede order Chordeumatida. PLoS ONE 13(11): e0206900. https://doi.org/10.1371/journal.pone.0206900

Richards, JP. (2011) Introduction to Myriapods & Centipedes British Myriapod & Isopod Group/Nature Bureau. https://bmig.org.uk/sites/default/files/docs/Millipedes.pdf

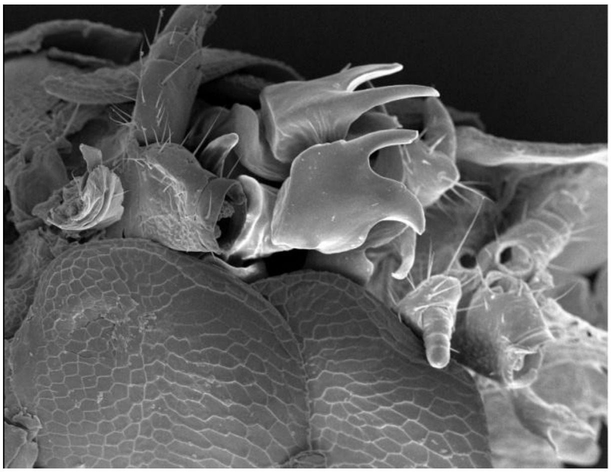
Gallery 1: Comparison of millipede gonopods and secondary sexual characters on SEM

All captions indicate original microscope magnification.

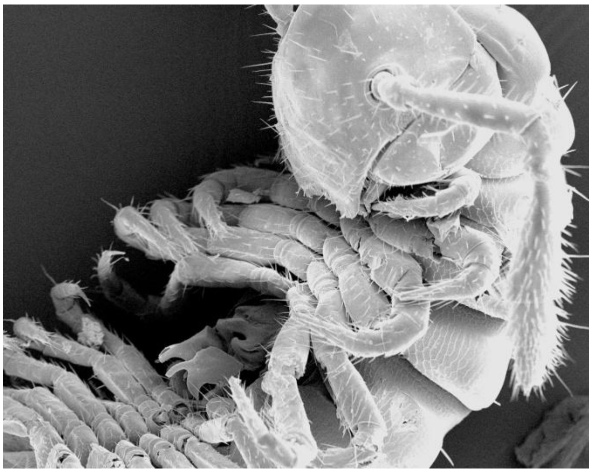


Nanogona polydesmoides **gonopods x220**

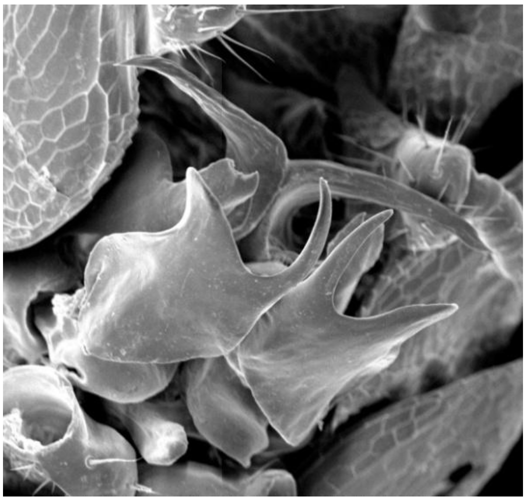
Brachychaeteuma melanops **x90**



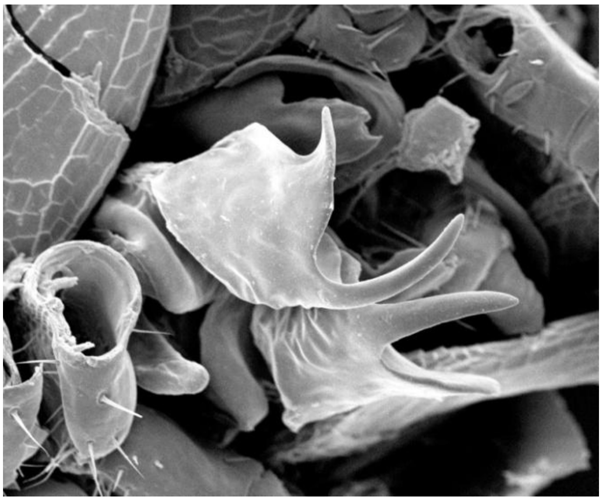
Brachychaeteuma bradeae **gonopods x170**



Brachychaeteuma bradeae **gonopods x55**

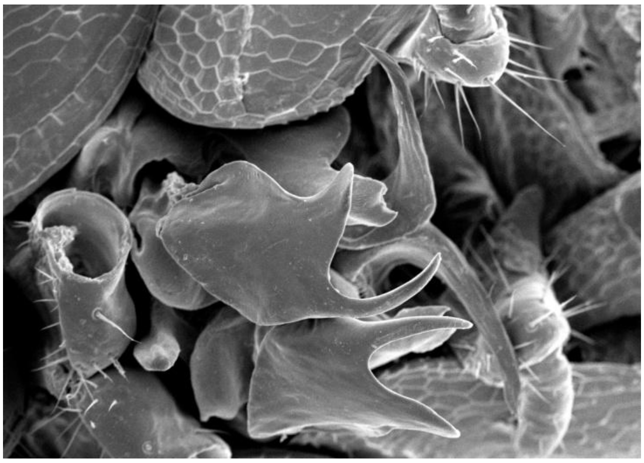


Brachychaeteuma bradeae **gonopods x300**

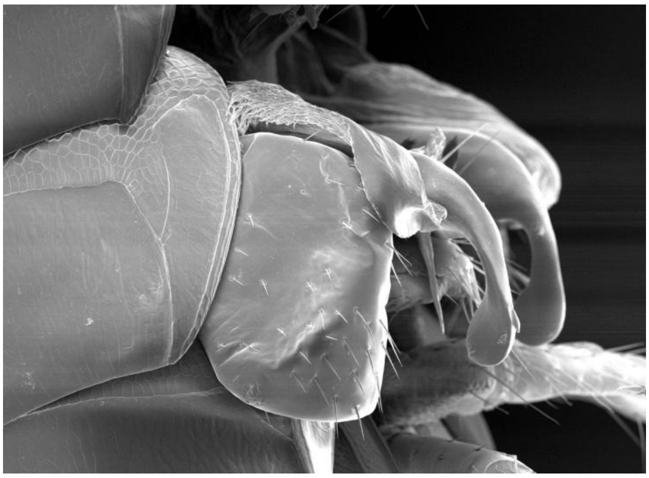


Brachychaeteuma bradeae **gonopods x300**

***Brachychaeteuma bradeae* gonopods x300**

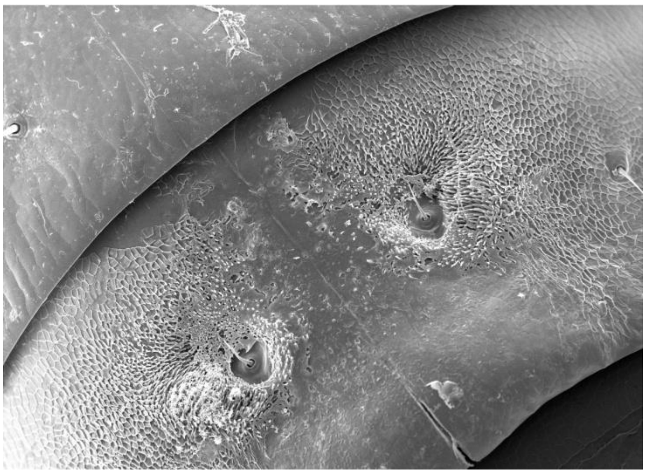


***Brachychaeteuma bradeae* gonopods x300**

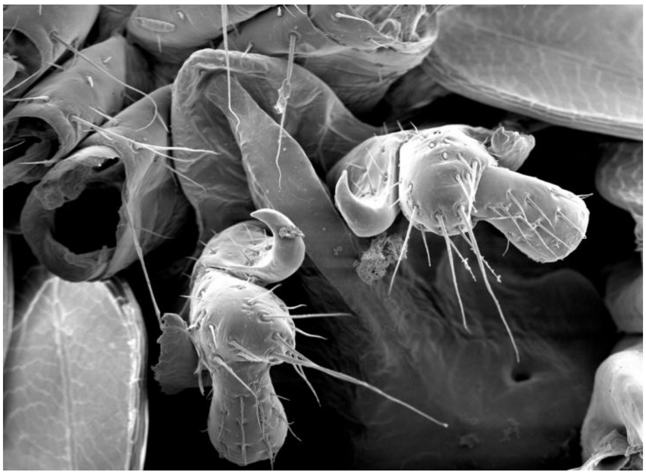


***Chordeuma proximum* gonopods x150**
(anterior upper left)

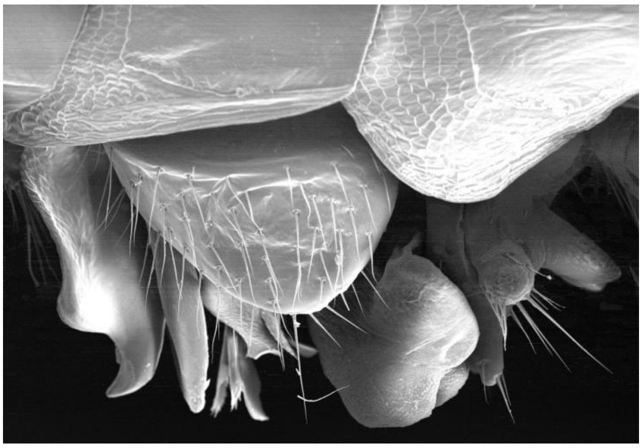
***Chordeuma proximum* gonopods x100**
(anterior upper left)



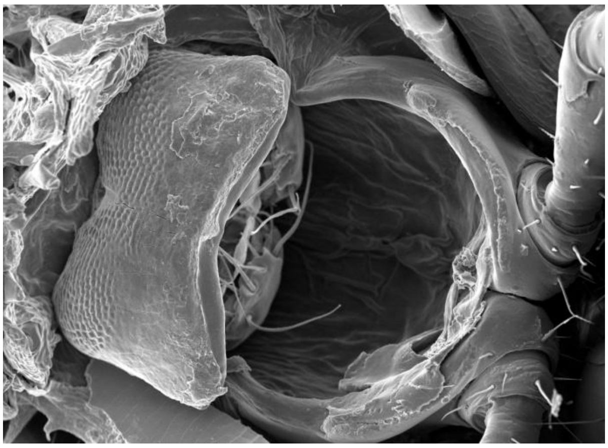
***Chordeuma proximum* male ring XVI glands x170** (anterior upper left)



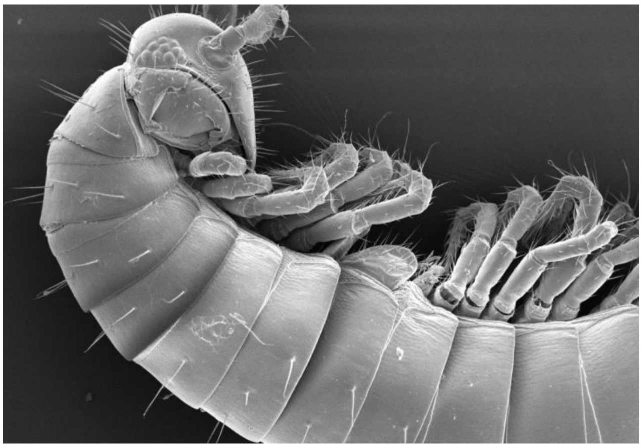
***Chordeuma proximum* gonopods x230**
(anterior upper left)



***Melogona gallica* gonopods x190**
(lateral, anterior left)

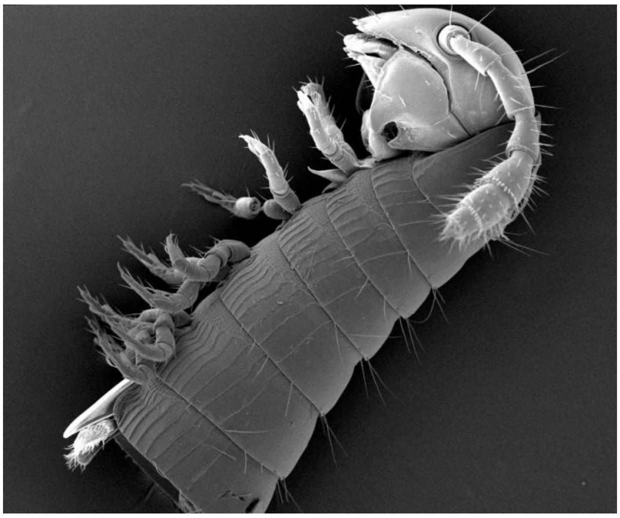


***Melogona gallica* vulva x230**

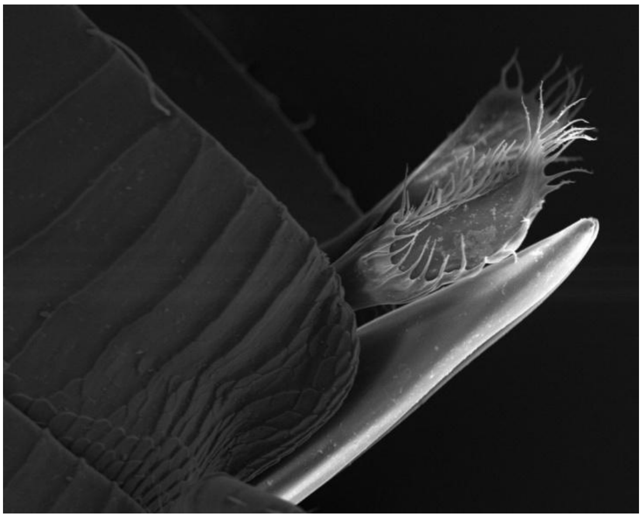


***Melogona scutellaris* male x65**

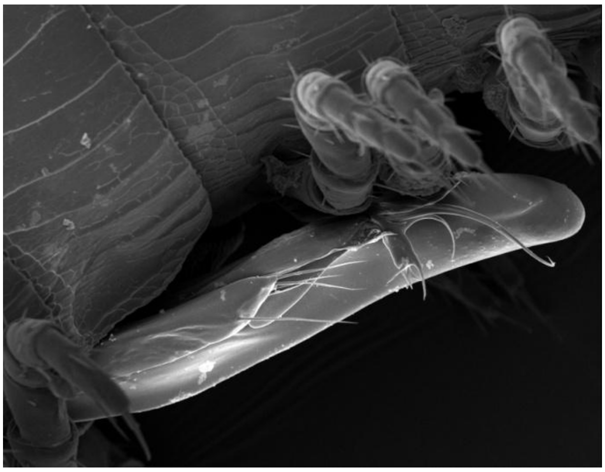
***Melogona scutellaris* gonopods x160**
(anterior upper left)



***Choneiulus palmatus* male x65**

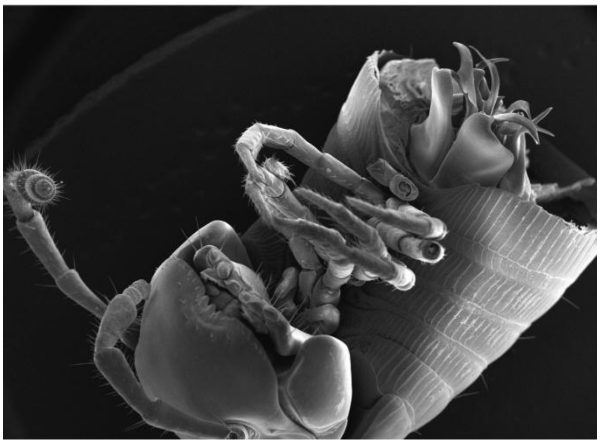


***Choneiulus palmatus* gonopods x350**



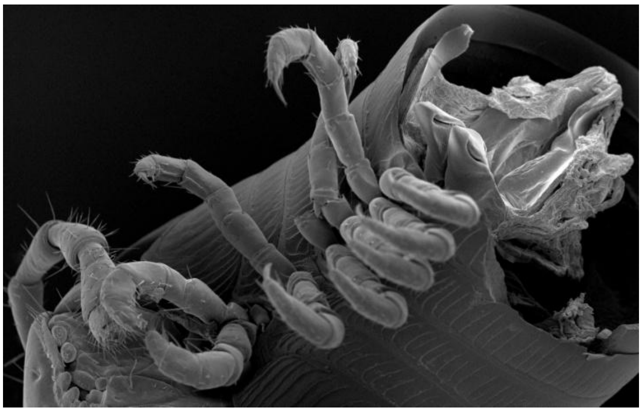
Blaniulus guttulatus **gonopods x180**

Archiboreoiulus pallidus **gonopods x60**

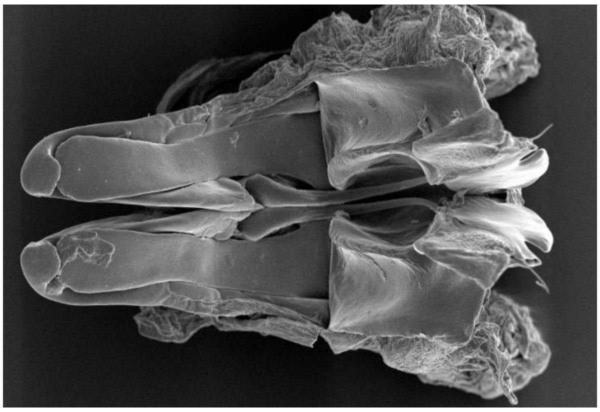


Ommatoiulus moreleti **gonopods x30**

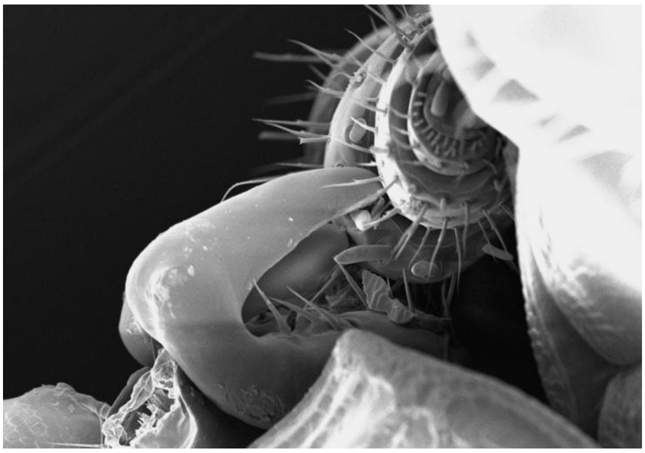
Tachypodoiulus niger **male x33**



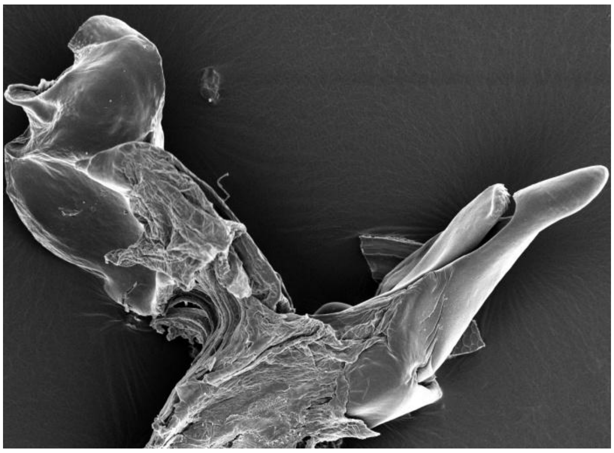
Cylindroiulus caeruleocinctus **gonopods x33**



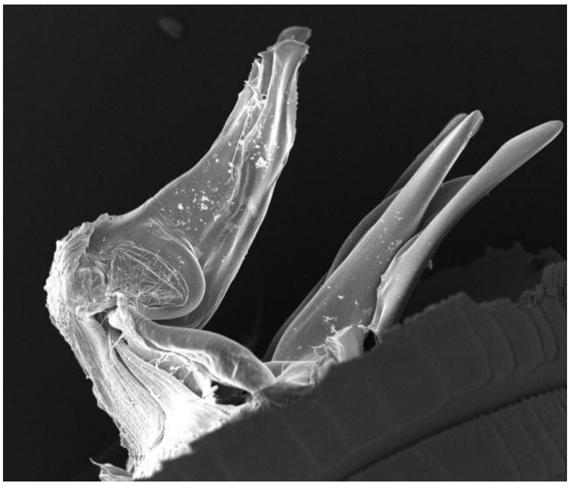
Cylindroiulus caeruleocinctus **gonopods x70**



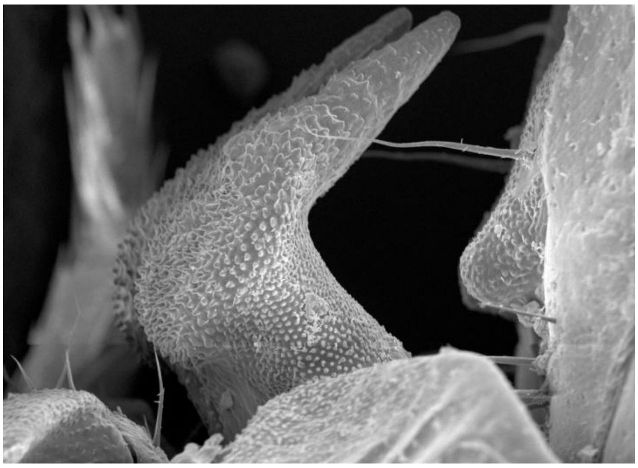
***Cylindroiulus vulnerarius* male 1st leg x270**



***Cylindroiulus vulnerarius* gonopods x150**

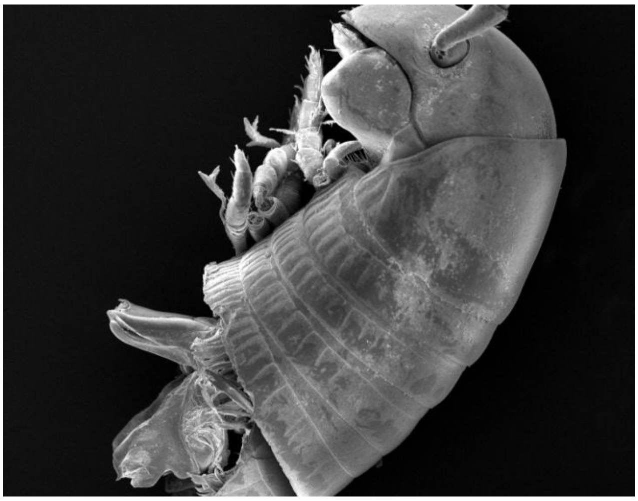


***Allajulus nitidus* gonopods x95**



***Allajulus nitidus* male 1st leg x300**

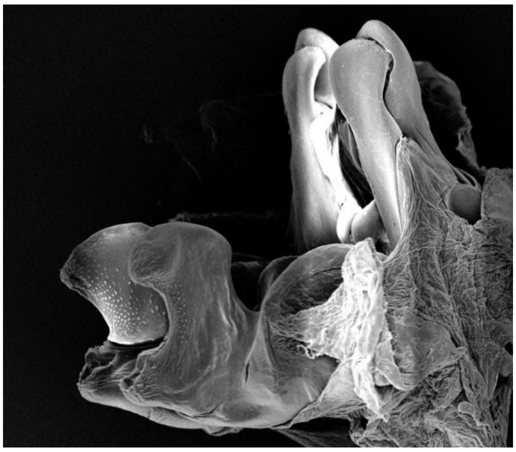
***Cylindroiulus latestriatus* gonopods x130**



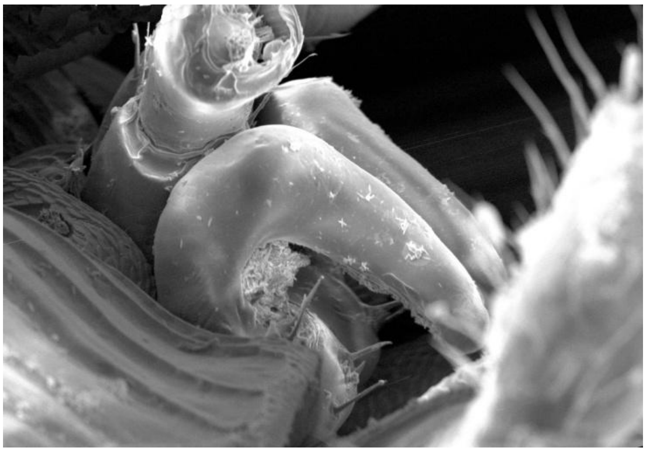
***Cylindroiulus latestriatus* male x40**
(with *Rickia* fungus on fore legs)

Cylindroiulus britannicus **male x75**

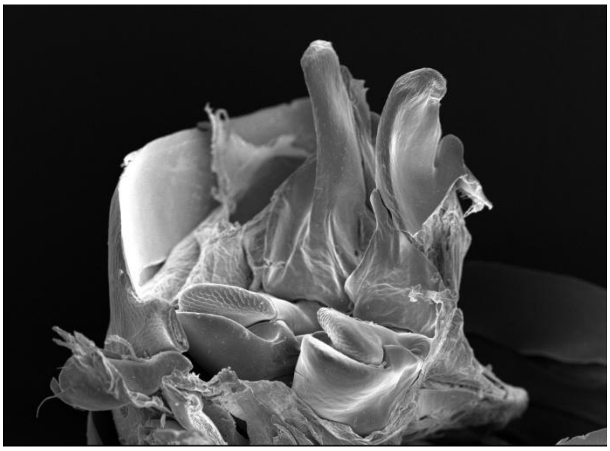
Cylindroiulus britannicus **gonopods x130**



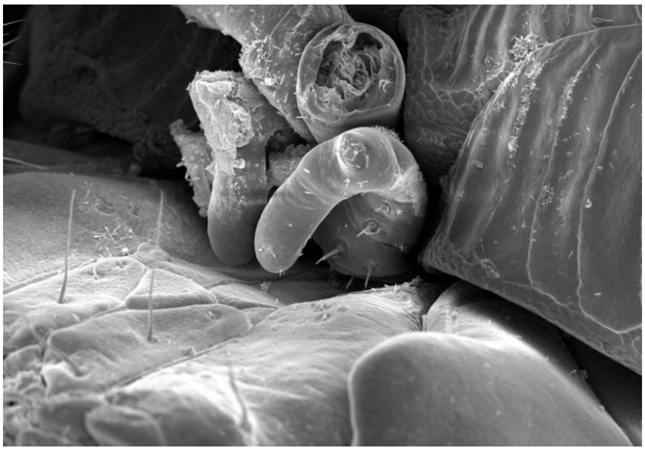
Cylindroiulus apenninorum **gonopods x120**



Cylindroiulus apenninorum **1st leg x270**

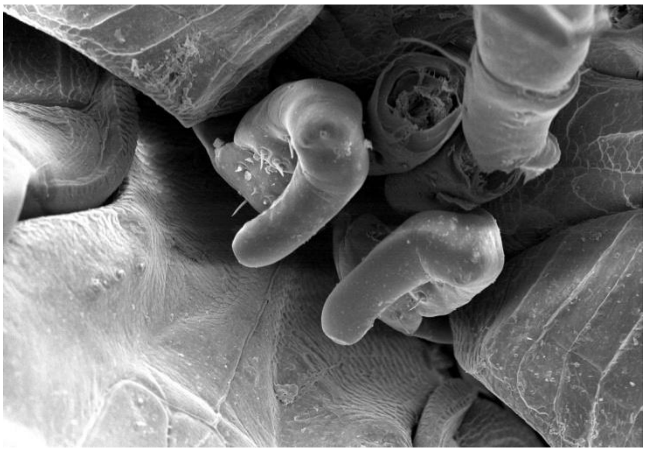


Cylindroiulus pyrenaicus **gonopods x140**

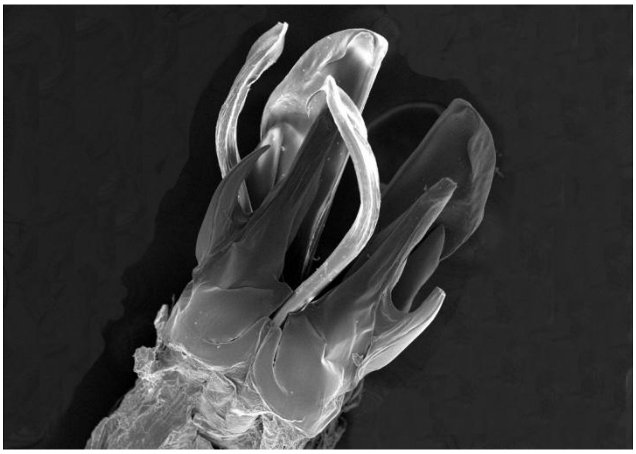


Cylindroiulus pyrenaicus **1st leg x190**

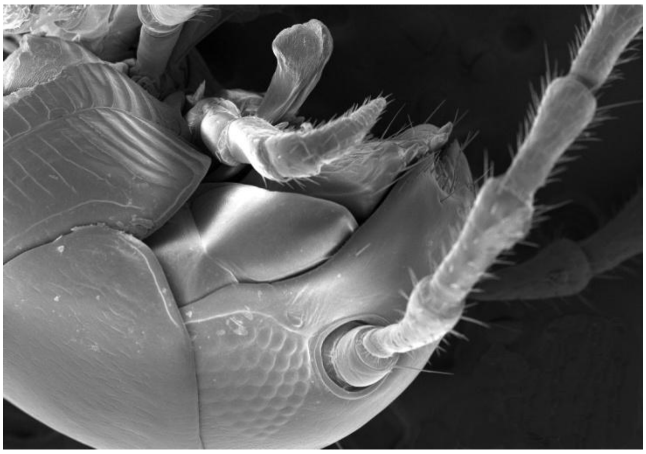
***Cylindroiulus sagittarius* gonopods x150**



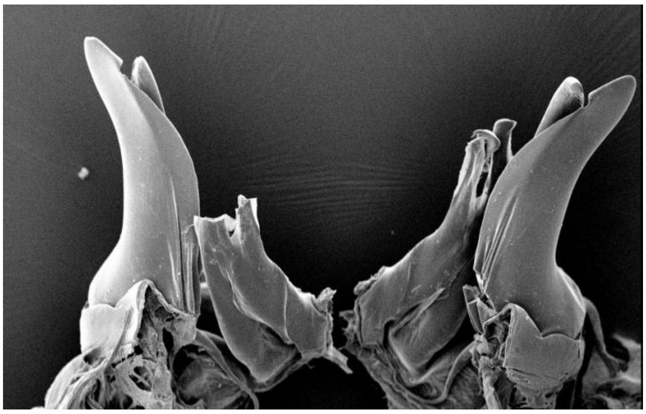
***Cylindroiulus sagittarius* 1st legs x190**



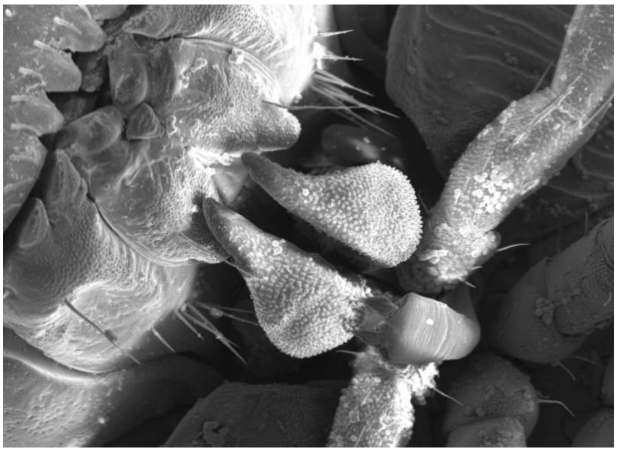
***Julus scandinavius* gonopods x70**
(posterior view)



***Julus scandinavius* male 2nd leg pair x55**

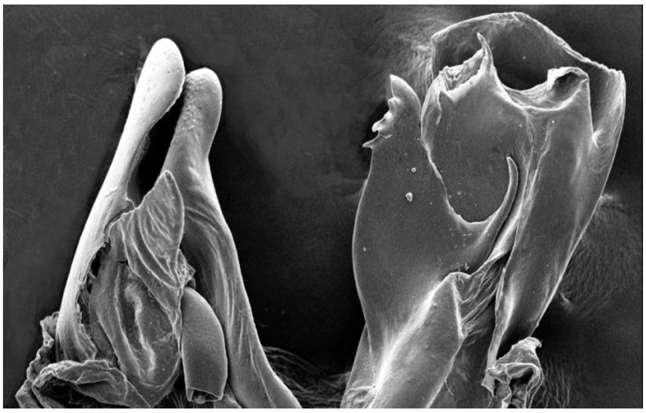


***Haplopodoiulus spathifer* gonopods x60**
(anterior view)

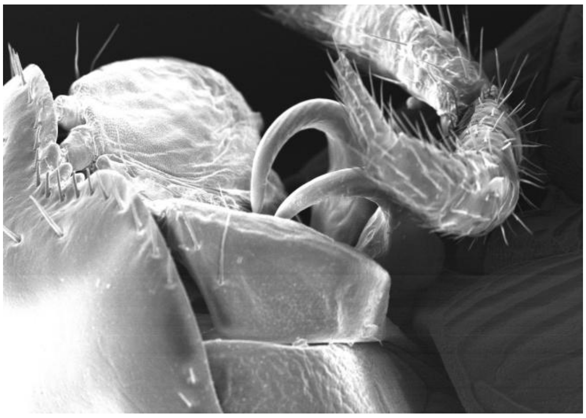


***Haplopodoiulus spathifer* male 2nd legs and penis x140**

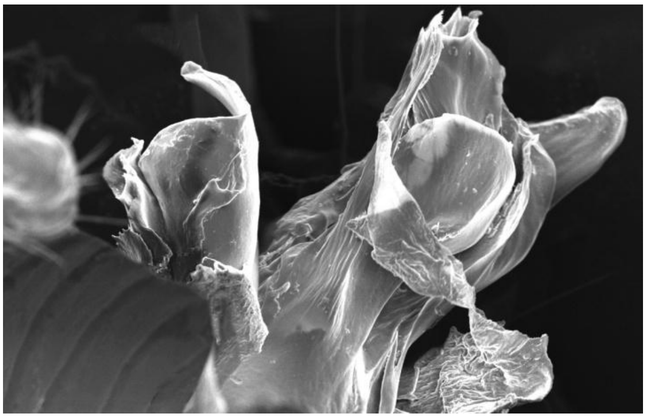
***Ophyiulus germanicus* male 1st leg x50**



***Ophyiulus germanicus* gonopods x130**



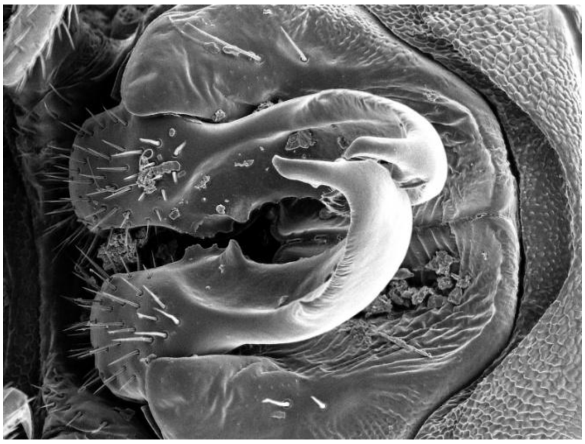
***Ophyiulus pilosus* male 1st leg x140**



***Ophyiulus pilosus* gonopods x230**

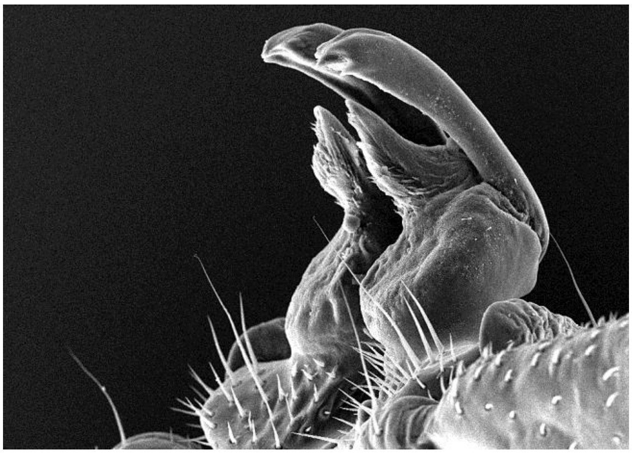
***Ophyiulus germanicus* male 2nd leg process x330**

***Leptoiulus belgicus* male x50**



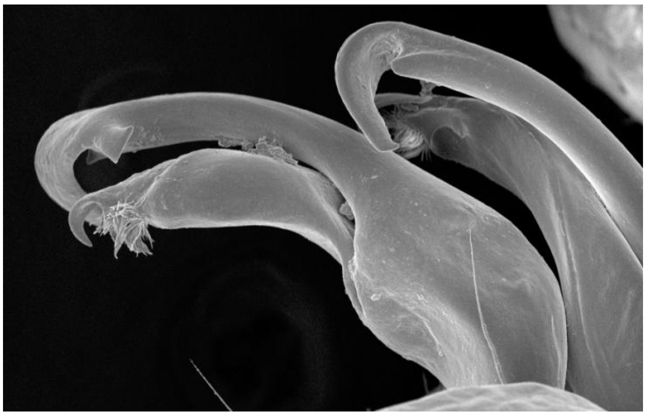
Brachydesmus superus **gonopods x120**

Polydesmus angustus **gonopods x95**

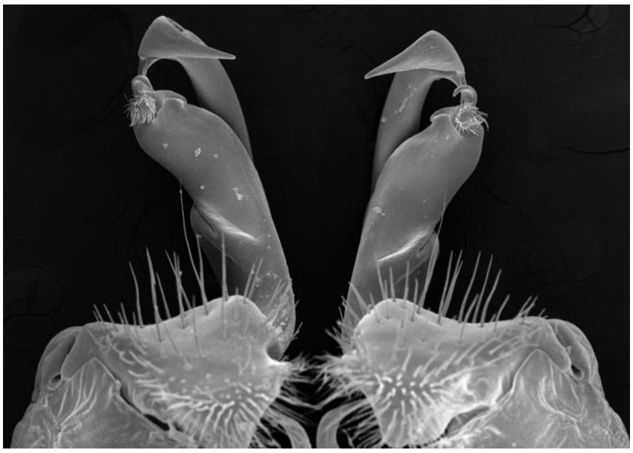


Polydesmus asthenestatus **gonopods x500**

Polydesmus denticulatus **gonopods x110**



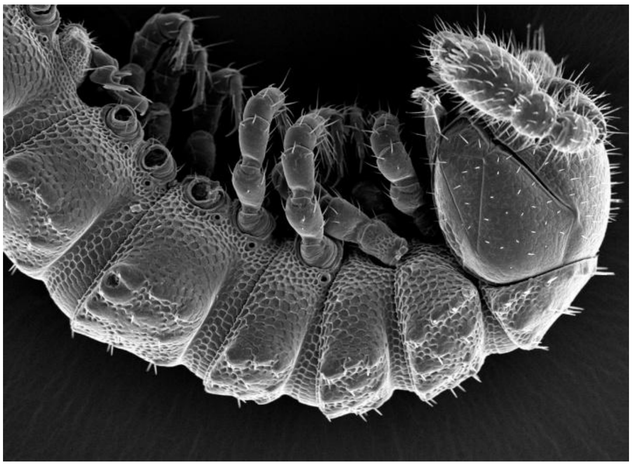
Polydesmus coriaceus **gonopods x110**



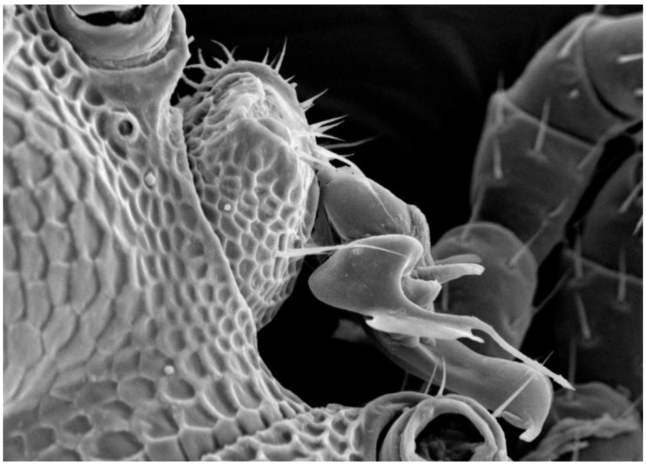
Polydesmus coriaceus **gonopods x85**
(posterior view)

***Polydesmus inconstans* gonopods x130**

***Turdulisoma helenreadae* gonopods x200**

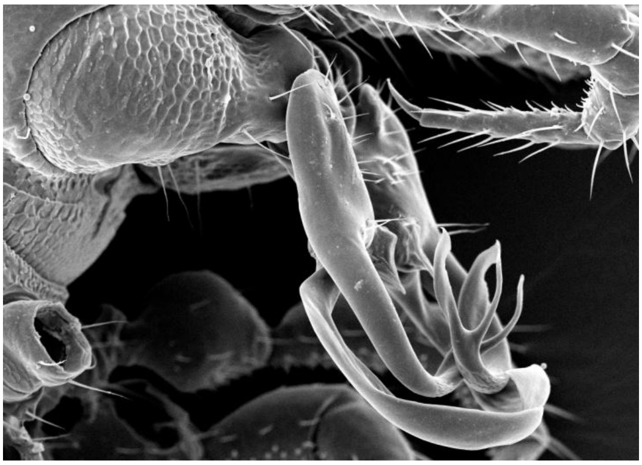


***Macrosternodesmus palicola* male x170**



***Macrosternodesmus palicola* gonopods x650**

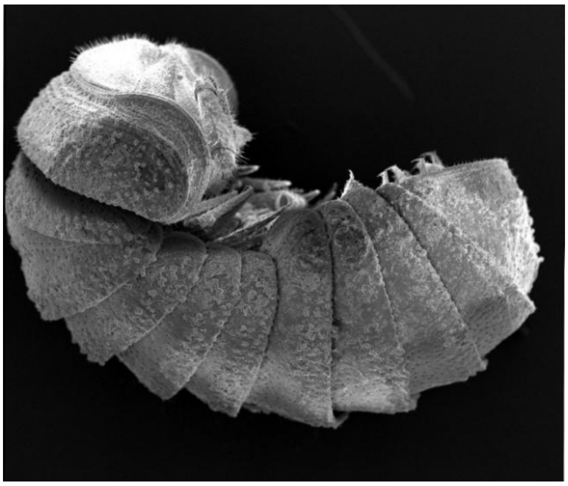
***Ophiodesmus albonanus* male x 70**



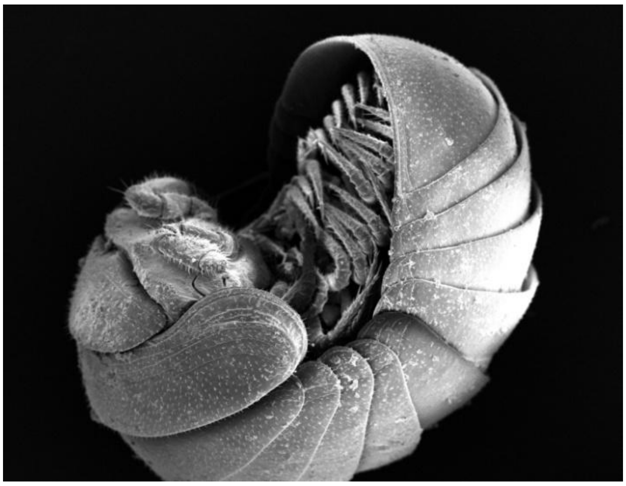
***Ophiodesmus albonanus* gonopods x270**

Gallery 2: Comparison of millipede tails/caudal projections on SEM

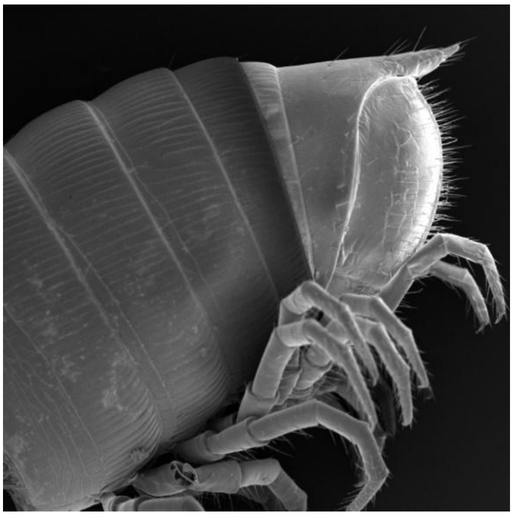
All captions indicate original microscope magnification



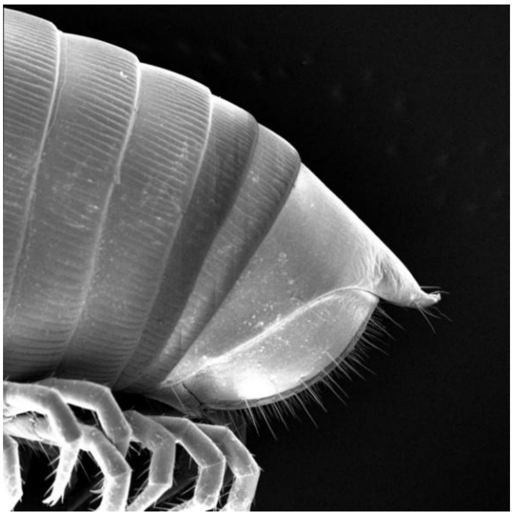
***Adenomeris gibbosa* x55**



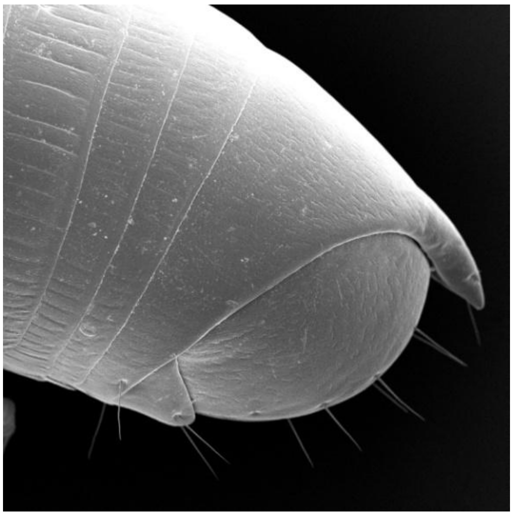
***Geoglomeris subterranea* x65**



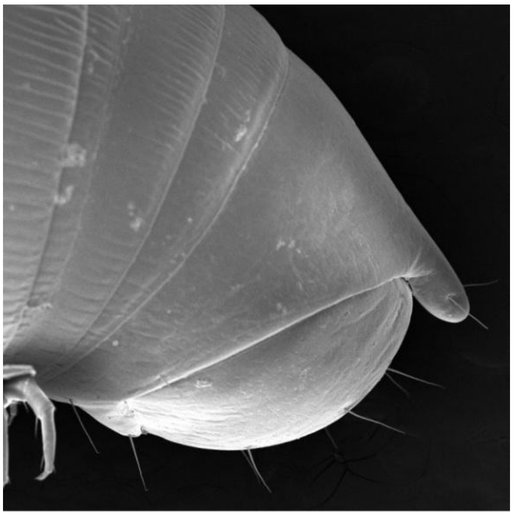
***Tachypodoiulus niger* x33**



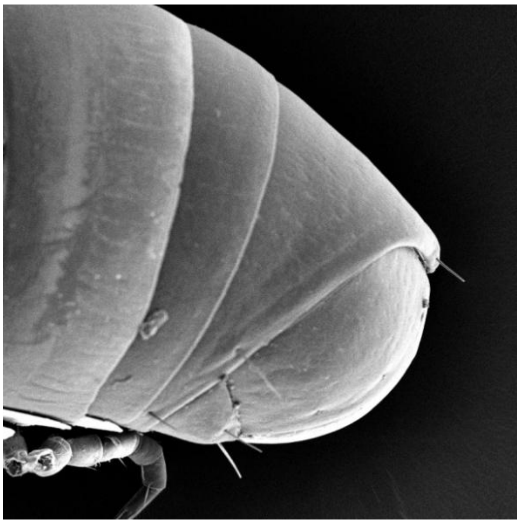
***Ommatoiulus moreleti* x37**



***Cylindroiulus vulnerarius* x80**



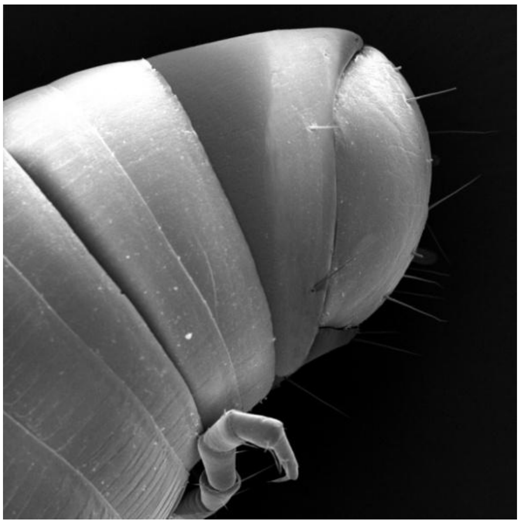
***Cylindroiulus punctatus* x75**



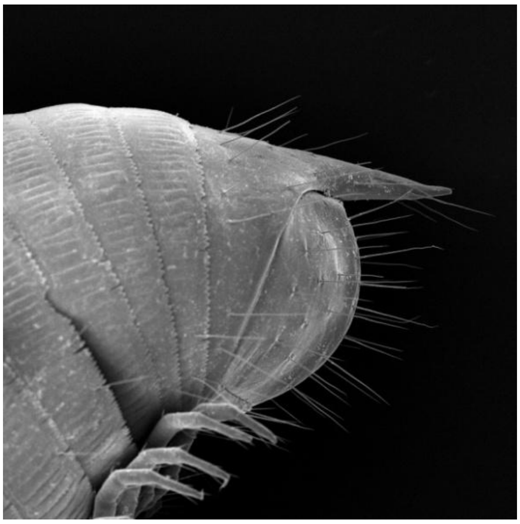
***Cylindroiulus latestriatus* x100**

(Anal spines absent)

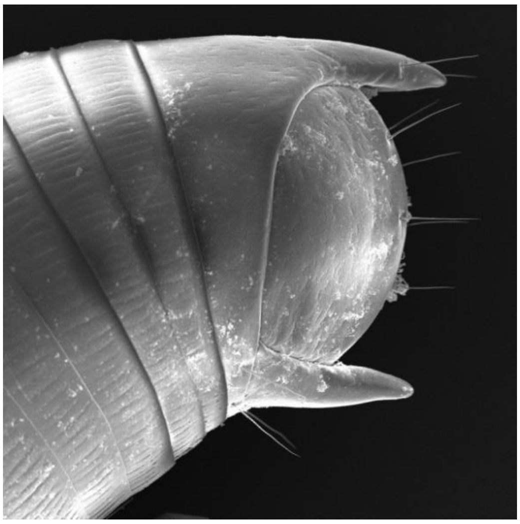
***Cylindroiulus caeruleocinctus* x55**



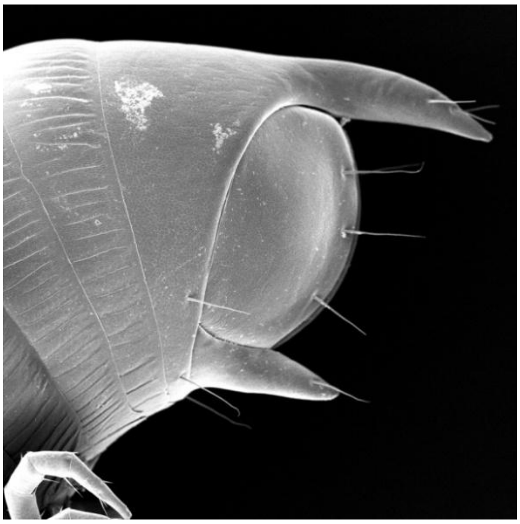
***Cylindroiulus parisiorum* x95**



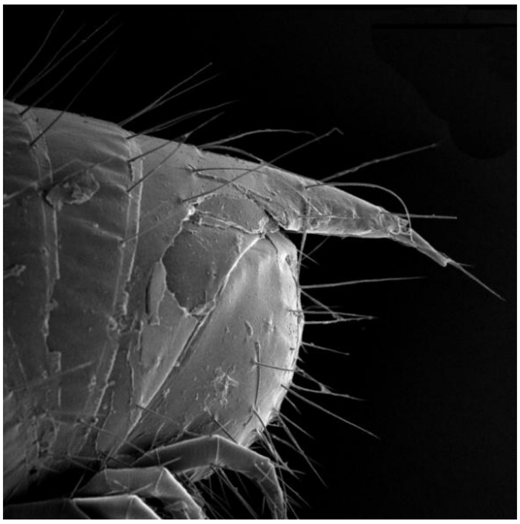
***Allajulus nitidus* x60**



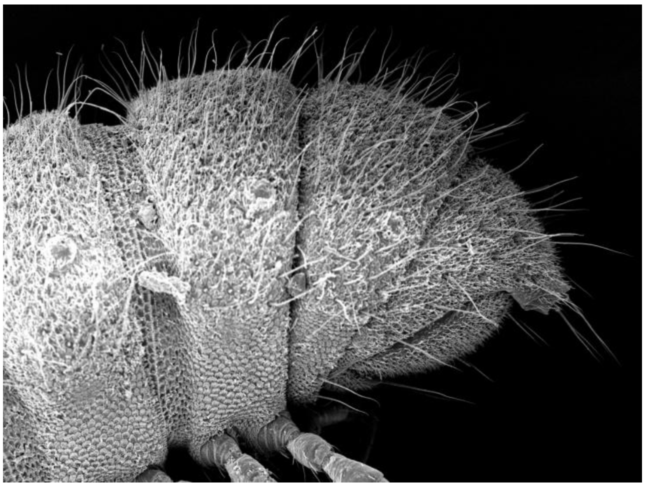
***Cylindroiulus apenninorum* x80**



***Cylindroiulus pyrenaicus* x85**

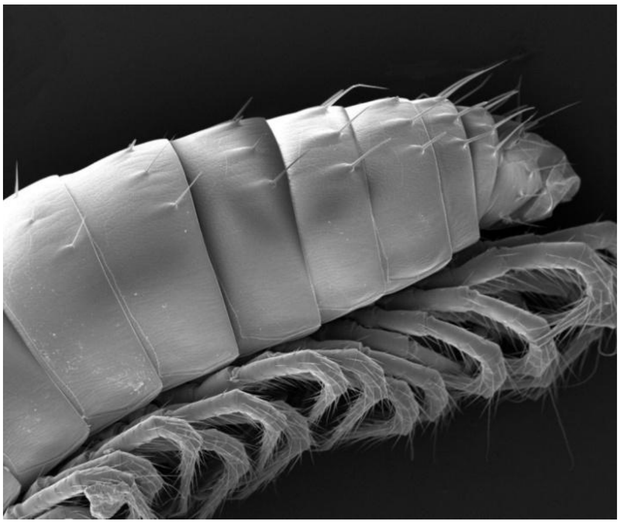


***Ophyiulus pilosus* x90**



***Cylindrodesmus hirsutus* x140**

***Haplopodoiulus spathifer* x65**



***Melogona gallica* male x60**

The distributions and habitat associations of *Hyloniscus riparius* (C. Koch) and *Trachelipus rathkii* (Brandt) at a floodplain meadow on the River Avon, Worcestershire

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Abstract

The distributions of the woodlouse *Hyloniscus riparius* (C. Koch) and associated species were surveyed at a floodplain meadow site in Worcestershire comprising hedgerows, and grasslands with varying amounts of rush tussocks. The most abundant associate was *Trachelipus rathkii* (Brandt). Both species were found in piles of flood debris immediately adjacent to the river, in debris beneath a hedgerow, and in the bases of rush tussocks within the meadow. *Hyloniscus riparius* was strongly associated with flood debris, both within discrete piles of debris immediately adjacent to the river and within debris deposited adjacent to, and within, a hedgerow. A small number of individuals were also found within rush tussocks in the floodplain meadow. Within piles of debris, numbers of *H. riparius* were positively related to the depth of material. In contrast, numbers of *T. rathkii* were unrelated to the depth of material and overall, the species was less strongly associated with flood debris; being equally frequent within rush tussocks. Contrasting the species' distributions indicates that *H. riparius* is more sensitive to moisture levels within its microhabitat. The survey also suggests that *H. riparius* may have the capacity to spread from its riparian stronghold to other habitats provided a suitably moist microhabitat comprising dead plant material is present at the soil surface. As part of the survey, a method using refugia made from rolled tubes of corrugated cardboard was found to have potential for detecting the presence of *H. riparius*, particularly when the refugia were dampened.

Introduction

The riparian woodlouse *Hyloniscus riparius* (C. Koch), is a small soil-surface dwelling Trichoniscid, or pygmy, woodlouse associated with moist, organic-rich microhabitats (Farmer, 2022). The species is native to Central and Eastern Europe but has been introduced to areas of Russia, Northwest Europe, and North America through anthropogenic activity (Gregory, 2024a). The species was recorded as new to the United Kingdom in 2022 (Farmer, 2022). Studies in Russia and the United States of America suggest that *H. riparius* has negative impacts on native and established terrestrial isopod species (Gongalsky *et al.*, 2013). Competitive interactions have not been reported from Western Europe, although the species appears to be expanding its range with new records from Belgium, Netherlands, and north-west France (reviewed in Gregory & Farmer, 2023).

The first record of *H. riparius* in the UK was at Haines Meadow, one of a series of floodplain meadows, known as Lower Moor River Meadows (LMRM) (Vale Landscape Heritage Trust, 2024), adjacent to the River Avon in Evesham, Worcestershire (Farmer, 2022). It was subsequently found at additional sites nearby and at Evesham Country Park about 8km upstream (Gregory, 2024a). In Europe, a frequent associate of *H. riparius* is *Trachelipus rathkii* (Brandt). Both species are tolerant of seasonal inundation (Farkas & Vilisics, 2008), and they co-occur at LMRM (Gregory, 2024a).

Trachelipus rathkii has a south-eastern distribution in the UK but is expanding its range and was discovered at LMRM two years prior to *H. riparius* (Farmer, 2021). The more widespread occurrence of *T. rathkii* suggests that *H. riparius* may be found elsewhere – especially as both species are thought to be spread through anthropogenic activity (Gregory, 2024a). Moreover, while at sites in Worcestershire, *Hyloniscus riparius* has, to date, been found only within riverside flood debris (Gregory, 2024a, b), it has been recorded more widely in Europe and the United States of America, for example in glasshouses, floodplain woodlands, and upland deciduous woodlots distant from water courses (Stoyenoff, 2001). The species' microhabitat is primarily the damp accumulations of dead plant material, moss or woody material at the soil surface (Farmer, 2022), hence a more widespread distribution might be anticipated within the UK with further searching.

The recent discovery of *H. riparius* at LMRM presents an opportunity to investigate its habitat requirements and associations with other woodlice in the UK, particularly *Trachelipus rathkii*. In this study, we report the results of a field survey conducted in 2025 at LMRM close to the original discovery site of *H. riparius*. Quantitative survey methods, involving timed searching by hand and cardboard tube refugia (Embry, 2020), were used to record the abundance of woodlice in flood debris, meadow grasslands, and hedgerows immediately adjacent to the River Avon.

Study site

The study site was at Lower Moor River Meadows (SO 975 467) adjacent to the River Avon in Worcestershire. *Hyloniscus riparius* was discovered in flood debris here and on the opposite bank, at Haines Meadows, in April 2022. At both locations, piles of flood debris had been deposited between the landward side of the raised riverbank and a post-and-wire fence separating the embankment from adjacent flood plain meadows (Farmer, 2022). At Lower Moor, the study site comprised the riverbank and the adjacent flood plain meadow bounded by hedgerows. Major habitats were mapped in the field and digitised using Arc GIS in November 2024 (Figure 1).

Figure 1: The study site at Lower Moor River Meadows adjacent to the River Avon. Habitats that were surveyed for woodlice are highlighted in colour.

The site comprised of three major habitats: a) rough grassland and scrub on the riverbank, b) hedgerows, and c) the flood plain meadow. The flood plain meadow was subdivided into three zones based on the frequency of tussocks of Hard rush *Juncus inflexus* and management. The zones within the meadow were a) a strip around three margins, mown annually, with no rushes (Figure 2), b) a central area, with an occasional hay crop being taken, and with more-or-less evenly scattered rush tussocks (approximately 25% cover) (Figure 3), and c) on the fourth side, an uncut margin dominated by rush (90% cover) (Figure 4). Hereafter, these zones within the meadow are referred to as grassland, sparse-tussock grassland, and dense-tussock grassland respectively (Figure 1). The meadow is grazed by cattle each summer, although the timing varies depending on the weather, extent of grass growth and the timing of any hay cut.

Figure 2: Floodplain meadow grassland lacking rush tussocks adjacent to the southern hedgerow (looking northeast in February 2025).

Figure 3: Floodplain sparse-tussock grassland
(looking northwest towards the northern hedgerow in October 2025).

Figure 4: Floodplain dense-tussock grassland (looking northwest in October 2025).

In addition to Hard Rush, frequent species within the floodplain meadow were Tufted Hair-grass, *Deschampsia cespitosa*, Common Couch *Elymus (Elytrigia) repens,* Crested Dog's-tail *Cynosurus cristatus*, Meadow Fescue *Schedonorus pratense*, Rye Grass *Lolium perenne*, Cock's-foot *Dactylis glomerata* and Meadow Barley *Hordeum secalinum*, along with Common Sorrel *Rumex acetosa*, Creeping Buttercup *Ranunculus repens*, Dandelion *Taraxacum* agg., White Clover *Trifolium repens*, Spear Thistle *Cirsium vulgare* and Creeping Cinquefoil *Potentilla reptans*. Other characteristic species include Tubular Water-dropwort *Oenanthe fistulosa*, Meadowsweet *Filipendula ulmaria*, and Lady's Smock *Cardamine pratensis* (Vale Landscape Heritage Trust, 2024).

There was no cutting or grazing within the meadow during the study period. When the floodplain grassland was surveyed, the rush tussocks were up to 50cm in height. The grass sward between tussocks was approximately 5-10cm in height and lacked a thatch of dead plant material that typically builds up in ungrazed pasture.

The rough grassland on the riverbank is largely unmanaged save for occasional targeted cutting to maintain access along a footpath. Frequent species were Common Couch *E. repens*, Rye Grass *Lolium perenne*, Cock's-foot *D. glomerata*, Yorkshire Fog *Holcus lanatus*, Cow Parsley *Anthriscus sylvestris*, Stinging Nettle *Urtica dioica*, Hogweed *Heracleum sphondylium*, Bramble *Rubus fruticosus* agg., Dandelion *Taraxacum* agg., Greater Plantain *Plantago major*, Spear-leaved Orache *Atriplex prostrata*, Spear Thistle *C. vulgare*, and Wild Teasel *Dipsacus fullonum*. Scattered scrub comprised Willow *Salix* sp. and occasional Alder *Alnus glutinosa*.

The two hedgerows were approximately 3m tall and 5m wide with a post-and-wire fence on either side. The canopies comprised Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa* with occasional Dog Rose *Rosa canina*. Brambles *R. fruticosus* agg. and Nettles *U. dioica* dominated the ground flora.

The meadow was flooded from the 5th - 18th January 2025 and in the following week the distribution of freshly deposited flood debris was recorded. Piles of debris were noted in three locations: a) on the riverbank more-or-less at the same location observed by Farmer (2022) when *H. riparius* was first discovered (Figure 5), b) trapped against the fence between the meadow and the northern hedgerow (Figure 6), and c) within the interior of northern hedgerow. Piles on the riverbank were mapped as a distinct habitat (Figure 1).

Figure 5: Piles of flood debris deposited between the River Avon and adjacent floodplain meadow at Lower Moor River Meadows (left, looking southeast; right, looking northwest) in January 2025. The southern hedgerow can be seen beyond the enclosed grassland in the left image.

Figure 6: Piles of flood debris trapped against the fence along the edge of the northern hedgerow (looking northeast) in January 2025.

Methods

Survey overview

The main survey was carried out from 22nd January to 19th February 2025, with a smaller follow-up survey in June of the same year. Quantitative sampling in January and February used two methods: timed hand-searching within quadrats as recommended by the British Myriapod and Isopod Group (2024) and use of refugia in the form of cylindrical rolls of corrugated cardboard (Embry, 2020).

In January and February, hand-searching in quadrats was used to sample the riverside piles of flood debris and each of three meadow zones. Due to difficulties in accessing the interior of the hedges, refugia were used to survey the two hedgerows with the refugia being placed beneath the fences separating each hedgerow from the adjacent meadow (Figure 7).

Figure 7: Cardboard tube refugium placed beneath leaf-litter and flood debris.

In June, the follow-up survey employed both refugia and semi-quantitative hand-searching in the interior of the northern hedgerow and riverside debris piles. The purpose of this more targeted survey was twofold: first, to assess the relative efficacy of the tube refugia versus hand-searching, and second, to confirm the presence of *H. riparius* within the interior of the northern hedge following discovery of a single specimen in February. The following sections provide more detail about the surveys.

Weather during the survey period

Weather leading up to, and during, each survey is potentially important because the target species are sensitive to moisture levels.

In January, flood water receded four days before surveying with quadrats and refugia began. During the four-week sampling period, rainfall, temperature and sunshine hours were close to the long-term seasonal average (Meteorological Office, 2025a) with only occasional light rain at the study site (Fleming, personal observation). Flood debris piles felt dry at the surface, but deeper debris and the soil beneath remained damp to the touch. The weather on each of the dates when quadrats were searched was cool and overcast. The bottom of rush tussocks were damp on each survey session. Humidity in Evesham ranged from 87% to 100% on the 22nd and 29th of January, and from 76% to 87% on the 5th and 12th of February (Meteorological Office, 2025a).

The weeks leading up to, and during, the follow-up survey in June were unusually warm, dry and sunny compared to long-term averages (Meteorological Office, 2025b, 2025c). On 20th June when hand-searching, and placement of refugia, took place the weather was warm and dry. Flood debris had dried noticeably, and only debris at the soil surface retained moisture.

Timed quadrat hand-searching in January and February

Sampling using quadrats utilised a stratified random design. Ten quadrats were placed in each of the three meadow zones and riverside debris at weekly intervals for four weeks starting on 22nd and then 29th January, 5th and 12th February. The location of quadrats was determined using co-ordinates from a random number generator with the precise locations being pinpointed with GPS in the field. Within the two meadow zones characterised by the presence of rush tussocks, co-ordinates were used only if the quadrat contained a rush tussock. If no tussock was present, new co-ordinates were selected. New co-ordinates were generated weekly.

The quadrat (0.5m by 0.5m) was placed at each sample location and carefully searched for five minutes. Living plant material, leaf litter and flood debris (where present) was carefully searched down to the soil surface. In quadrats containing a rush tussock both the tussock and surrounding grass sward were searched. In quadrats placed in piles of flood debris on the riverbank, the depth of debris was measured by inserting a metal rod at the centre of the quadrat until there was resistance at the soil surface. The location of woodlice within the vegetation/debris profile was noted, along with their association with specific types of material (such as reed fragments, natural logs and sawn timber). Woodlice were identified to species in the field and released where found.

Sampling with refugia in January and February

Refugia were made of corrugated cardboard sheets based on a method originally described for sampling invertebrates on tree trunks (Embry, 2020; Salman *et al*., 2020). Cardboard sheets, 20cm by 83cm, were rolled into tubes that measured 20cm in length and 6cm in diameter. Sticky tape was used to prevent tubes unravelling.

The two hedgerows were sampled in January and February using refugia. Ten refugia were placed along the fence line bordering each hedge at weekly intervals. Refugia were deployed on the same days that quadrat samples were taken in the meadow and riverside flood debris piles. Placement of refugia was determined using randomly selected numbers to represent distance along the hedge with new numbers being generated each week. Refugia were placed at the soil surface below leaf litter and flood debris (where present) (Figure 7). Refugia were left in place until collected the following week when they were placed in individual plastic bags for examination in the laboratory. Woodlice were identified to species and preserved in 70% ethanol. Freshly made tubes were used each week.

Follow-up survey in June

The follow up survey in June was prompted by the discovery of a single specimen of *H. riparius* in one of the refugia placed at the fenceline of the northern hedge in February. Limitations of the earlier survey were that refugia were placed only at the margin of the hedges and that refugia and hand-searching were never used in tandem at the same locations. It was therefore uncertain whether a) the two methods were equally effective, b) the single specimen from the hedge was an isolated individual or part of a large population, and c) *H. riparius* occurred deeper into the hedge. To address these questions refugia were deployed within the interior of the northern hedge and within riverside debris piles. Sample sites were also searched by hand for ten to fifteen minutes to confirm the presence of *H. riparius* immediately before refugia were deployed. Any woodlice found were counted and identified in the field before being released where they were found. Refugia were left in place for seven days starting 20th June.

Five locations within the northern hedge and five locations within riverside debris piles were selected subjectively. Those within the hedge were chosen based on ease of access (limited by hawthorn, blackthorn, brambles and stinging nettles) and the presence of leaf litter and/or flood debris thought likely to favour the presence of *H. riparius*. The depth and type of litter material present was recorded. Placement within riverside debris piles was based on where *H. riparius* had previously been located in January and February.

Design of the refugia, their placement at the litter-soil interface, and subsequent collection followed the previously established protocol with a minor amendment. Tubes were placed in pairs at each of the ten sample sites. The weather in May and June had been unusually dry and therefore one tube in each pair was dampened to encourage woodlice to enter. Contrast between numbers caught in 'dry' and 'wet' refugia was planned to indicate if wetting the refugia was a helpful modification of the method.

Developmental stage and sex of *Hyloniscus riparius*

Twenty specimens of *H. riparius* were collected from the riverside piles of flood debris during a preminary site visit on 7th January to determine their developmental stage and reproductive status using BMIG (2024). Additional observations were made on specimens recorded during the sampling in January, February and 18 further specimens were collected in June. The identification of juvenile *H. riparius* is challenging due to the incomplete development of some diagnostic features such as sexual characteristics and size of specimens. To minimise the risk of misidentification, only juvenile individuals which exhibited clear diagnostic features, as defined by BMIG (2024) and Gregory and Farmer (2023), were included in the dataset. Any specimens that lacked sufficiently developed or visible features to allow for confident identification were excluded from the dataset and analyses.

Statistical methods

Statistical analysis was undertaken using SPSS version 29. Preliminary testing showed that data deviated from a normal distribution and therefore non-parametric tests were used. Relationships between variables were tested using Spearman's Rank Correlation. Differences in abundance of woodlice across habitat types and weeks were analysed using the Mann-Whitney U test and Kruskal-Wallis Analysis of Variance by Ranks test for independent samples. Comparison of numbers of woodlice in wet and dry tube refugia used Wilcoxon's Signed rank test for paired data.

Results

Species inventory

In the main January and February survey, totals of 670 *H. riparius* and 84 *T. rathkii* were recorded. The follow-up survey in June recorded a further 90 *H. riparius* and 10 *T. rathkii*. Other species of woodlice were recorded less frequently. These species were: *Trichoniscus pusillus agg.* Brandt, *Philoscia muscorum* (Scopoli), *Oniscus asellus* (Linné), *Porcellio scaber* Latreille and *Armadillidium vulgare* (Latreille) (Table 1).

The numbers of each species recorded in the main survey during January and February are shown in Table 1. It is not possible to directly compare numbers of individuals in hedgerows to those found in other habitats because a different sampling method was used. However, based on the number of habitats occupied, *T. rathkii* was the most widespread species, followed by *H. riparius* and *P. muscorum*. Most specimens of *H. riparius, T. pusillus agg.*, *O. asellus* and *P. scaber* were recorded in flood debris piles. *Philoscia muscorum* was also recorded in flood debris piles, but more individuals were found in dense-tussock grassland (Table 1).

Table 1: Total numbers of woodlice recorded from each habitat during surveys in January and February. Each habitat was surveyed using a total of either quadrats or tube refugia at weekly intervals from 22nd January to 19th February 2025.

	Timed hand-searching				Refugia	
Species	**Flood debris piles**	**Meadow: no tussocks**	**Meadow: sparse-tussocks**	**Meadow: dense-tussocks**	**Hedgerow - north**	**Hedgerow - south**
H. riparius	670	0	1	2	1	0
T. rathkii	37	1	33	4	3	6
T. pusillus	5	0	0	0	0	0
P. muscorum	8	0	0	11	4	4
O. asellus	18	0	0	2	0	0
P. scaber	4	0	0	0	0	0
A. vulgare	0	1	0	0	0	4

The following sections focus primarily on the distributions of the two riparian species *H. riparius* and *T. rathkii* for which larger number of records were obtained (Figures 8 and 9). The former species was the most abundant and showed a strong affinity with piles of flood debris. *Trachelipus rathkii* was more widely distributed across the study site and showed an affinity with both debris piles and sparse-tussock grassland (Table 1).

Distribution of *Hyloniscus riparius* in January and February

In January and February, all but four specimens of *H. riparius* were recorded from the hand-searching of riverside flood debris (Table 1, Figure 8). Within the riverside flood debris piles, numbers per quadrat did not differ significantly between weeks ($H = 4.07$, d.f. = 3, $p = 0.25$). Numbers of individuals found per quadrat placed within the debris piles varied from 0 to 56 with a mean of 16.65 (Standard Deviation (SD) = 12.94) (N=40) equivalent to a density of 66.60 (SD = 51.76) per m^2.

Within flood debris piles, *H. riparius* were found mainly at the moist interface between the soil and bottom of the debris, but they were also associated with large pieces of wood. For example, thirty-eight individuals were found on a single log (length 37cm, diameter 26 cm) which had numerous cracks and crevices. No individuals were found within dense layers of tightly packed reed debris.

Of the four specimens found beyond the riverside flood debris piles, one was found in a refugium placed at the fenceline of the northern hedge and three were found by hand-searching in the bases of tussocks of *J. inflexus* in the meadow (Figure 8). All three 'tussock specimens' were found between the stems at the base of a tussock where moisture content was high. Two were in separate tussocks in the dense-tussock grassland, each with stems varying from 40 to 50cm, while the third specimen was within a tussock with stems varying from 10 to 40 cm tall, in the sparse-tussock grassland. No *T. rathkii* were found in these individual tussocks, although *T. rathkii* occurred in other tussocks within the meadow. The three tussocks and single hedgerow refugium which each yielded a single *H. riparius* were 125 m, 144 m, 194 m and 213 m from the main population located in the large piles of riverside flood debris (Figure 8).

Distribution of *Trachelipus rathkii* in January and February

In January and February, *T. rathkii* was found to be less abundant yet more widely distributed than *H. riparius* (Figure 9). The species was found by both sampling methods and within each of the habitats surveyed. The species showed a tendency to be more abundant in refugia than *H. riparius*, although numbers in tubes were low (Table 1). The majority of *T. rathkii* were found by hand-searching, with

Figure 8: The distribution of sample points where *Hyloniscus riparius* was recorded in January and February 2025. In total, 666 *H. riparius* were found in the riverside flood debris piles (shaded yellow) hence these locations are not shown individually. Four individuals found beyond the riverside debris piles are shown as dots according to the habitat in which they were found.

Figure 9: The distribution of sample points where woodlice species, other than *Hyloniscus riparius*, were recorded in January and February 2025.

only 9 out of 84 specimens being found in refugia. Moreover, of the total of 75 specimens recorded by hand-searching, 37 and 33 were found in flood debris piles and sparse-tussock grassland respectively (Table 1). The species was more abundant than *H. riparius* in sparse-tussock grassland, but less abundant in flood debris.

Within the riverside debris piles and sparse-tussock grassland average numbers of *T. rathkii* per quadrat did not differ between weeks (debris, H = 4.82, d.f. = 3, p = 0.19; sparse-tussock grassland, H = 5.21, d.f. = 3, p = 0.16). Average numbers per quadrat also did not differ significantly between flood debris and sparse-tussock grassland (Mann-Whitney test, U = 707.0, p = 0.30). Overall, across these two habitats, the maximum number of *T. rathkii* per quadrat was 8 with a mean of 0.88 (SD = 1.56) (N = 80) equivalent to a density of 3.52 (SD = 6.24) per m^2.

The distribution of *T. rathkii* within piles of flood debris mirrored that of *H. riparius* with most individuals being found at the moist interface between the soil and debris. As with *H. riparius*, they were also found on large pieces of wood.

Associations between depth of flood debris, *H. riparius* and *T. rathkii*

Within the riverside flood debris piles, *H. riparius* and *T. rathkii* tended to be more abundant in moister layers close to the soil, but there was no correlation between their numbers within samples (r_s = -0.04, p = 0.80, N = 40). The abundance of *H. riparius* was strongly positively correlated with the depth of the debris (r_s = 0.71, p <0.001, N = 40) (Figure 10) whereas this was not the case for *T. rathkii* (r_s = 0.17, p = 0.30, N = 40). For *H. riparius* the significant positive correlation between numbers and depth of debris was seen in three out of the four weeks (week 1, r_s = 0.26, p = 0.46; week 2, r_s = 0.83, p = 0.003; week 3, r_s = 0.83, p = 0.003; week 4, r_s = 0.86, p = 0.002; N = 10 for each week) (Figure 10).

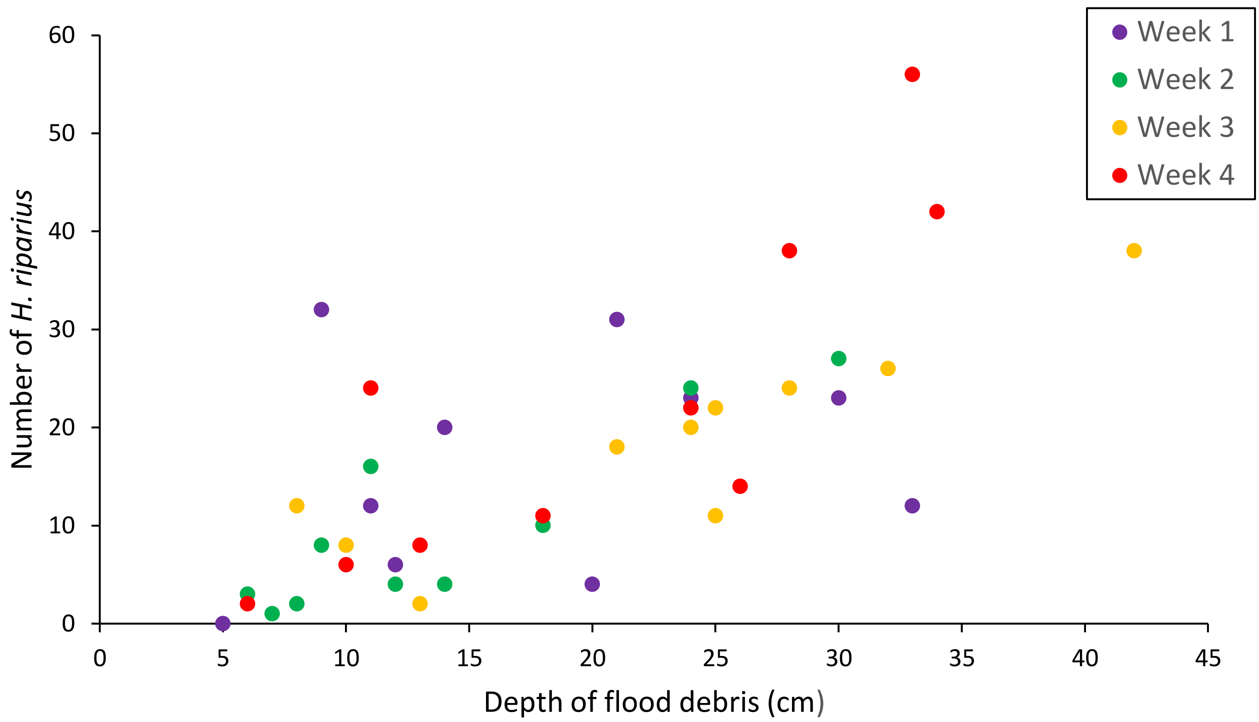

Figure 10: The relationship between numbers of *Hyloniscus riparius* recorded by hand-searching within quadrats placed on riverside flood debris piles and the depth of the debris. Weeks refer to sampling dates at seven-day intervals starting 22nd January 2025 (N=10 quadrats per week).

Follow up survey in June

Six species were recorded in the hand-searches of debris piles and the hedgerow (Table 2). Compared to January and February the debris was drier, and woodlice were more closely associated with the soil-debris interface. Hand-searching within leaf litter and flood debris in the hedgerow drew similar observations with woodlice only being found in patches of moisture and typically at the soil-leaf litter/flood debris interface. An exception was at sample point H2 within the hedgerow where all *H. ripariu*s were found within crevices of a rotten log (20cm diameter) which was partly embedded in the ground. At sample point H5, *H. riparius* were found at a depth of several centimetres in the soil beneath a partly embedded, rotting hawthorn branch. Counting *H. riparius* was difficult because they were fast moving and rapidly disappeared into gaps in the soil surface.

Sample sizes were too low to draw firm conclusions about the relative abundance of the species between habitats but *H. riparius* was the most frequently encountered species being found at nine out of ten sample points. It was also the only species recovered from the refugia (Table 2) with specimens in all five refugia placed in riverside debris piles and one refugium placed in the hedgerow. Seventeen *H. riparius* were found in the refugia which had been wetted compared to a single specimen in the dry refugia. The difference in numbers of *H. riparius* found in damp and dry refugia was statistically significant (Wilcoxon Signed Rank test, $W = 6.00$, $p = 0.031$).

Table 2: Numbers of woodlice found by hand-searching and in dry and wet refugia at five points in riverside debris piles (D1-D5) and northern hedgerow (H1-H5). The presence of flood debris (Y=yes, N=No) and depth of dead plant material is shown for each sample point.

	Flood debris pile					**Hedgerow**				
	D1	**D2**	**D3**	**D4**	**D5**	**H1**	**H2**	**H3**	**H4**	**H5**
Flood debris	Y	Y	Y	Y	Y	Y	N	Y	N	Y
Depth of leaf litter/debris (cm)	20	20	25	15	20	25	3	35	3	35
Hand-search										
H. riparius	1	8	3	1	30	8	6	7	0	8
T. rathkii	0	0	2	0	0	8	0	0	0	0
T. pusillus	0	0	1	25	0	1	0	0	0	0
P. muscorum	0	0	0	0	0	0	1	1	0	0
P. scaber	0	0	0	0	0	2	1	0	0	0
A. vulgare	0	0	0	0	0	1	0	0	0	0
Dry refugia										
H. riparius	0	0	0	0	1	0	0	0	0	0
Damp refugia										
H. riparius	1	1	5	2	2	6	0	0	0	0

Developmental status and sex of *Hyloniscus riparius*

In each month, *H. riparius* individuals recorded during hand-searches included both adults and juveniles, which differed greatly in size. Of the 20 specimens collected from the riverside flood debris on 7th January, 12 were adult females and two were adult males. The remaining six individuals measured < 1mm in length and were considered juveniles. Juveniles from this sample were examined under a laboratory microscope and were assigned to *H. riparius* due to the diagnostic features, including the characteristic antennal flagellum which has a tapered terminal article and the presence of a single ommatidium. Secondary sexual characteristics were not developed, which meant sex determination was not possible. Three additional juveniles were observed in the field had a single ommatidium, viewed using a high magnification hand lens (Opticron x15 magnifier hand lens), and were also recorded as *H. riparius*.

One individual which was collected in January was initially suspected to be gravid based on the appearance of the marsupium and retained for laboratory examination; although no young were present within the marsupium it was confirmed as an adult female due to a rounded projection on the base of the merus.

Specimens recorded during the hand searches were not sexed. Individuals recorded in the hedge refugia and tussocks in January and February included one adult female and three juveniles.

A total of 18 specimens collected from refugia in June were identified under laboratory conditions. There were six adults and six juveniles from flood debris piles, and five adults and one juvenile from the hedgerow. The juveniles had diagnostic features consistent with *H. riparius* but lacked fully developed secondary sexual features (such as hooked projection). One hedgerow specimen was confirmed as a breeding female with young in the marsupium.

Overall, these observations indicate the presence of breeding populations within both the flood debris and the interior of the northern hedgerow.

Discussion

Hyloniscus riparius exhibited a strong association with flood debris (Tables 1 and 2). Exceptions were three individuals found within rush tussocks in the floodplain meadow in January/February and six found within leaf-litter beneath the hedge canopy in June (Tables 1 and 2).

Overall, the results suggest an association between the occurrence of *H. riparius* and microhabitat factors, such as damp, decaying organic matter, rather than broad habitat types. The results are consistent with ecological preferences described in the literature, emphasising the species' association with damp, high organic matter habitats (Berg *et al.*, 2008; Gregory & Farmer, 2023). Observations at LMRM also suggest that flood borne dispersal maybe a significant factor in the distribution of *H. riparius*. An interesting question is whether records of *H. riparius* at LMRM represent dynamic colonies that are maintained by replenishment of individuals carried by regular flooding or represent a permanent population in the floodplain landscape. The meadows flood annually, and deposition of debris is associated with depressions, fence lines and hedgerows that serve to trap floating material in a more-or-less predictable manner. It is therefore unclear whether *H. riparius* observed within flood debris are primarily carried anew with the floating material, colonise the debris from the surrounding habitat, or a combination of both. The present study began immediately after flood waters receded, suggesting that individuals were carried with the debris, however, debris tends to be deposited in the same location each year, hence a definitive conclusion cannot be reached. Larger pieces of debris, such as rotting logs, may be particularly important for both maintaining numbers between floods, and as a source of colonists, since these supported large numbers within debris piles and the hedgerow.

The few records of *H. riparius* from rush tussocks hint at flood borne dispersal being important for the species colonising new habitat. Individuals within tussocks were found in moist conditions at the base of the stems but the tussocks, and grassland in general, lacked a build-up of dead plant material suggesting the floodplain meadow is a 'sink' habitat unable to support a viable population. Records from rush tussocks were distant from the main population in riverside debris piles (Figure 8), suggesting that these individuals were deposited in the recent flooding. A further question that awaits investigation is whether the records at LMRM preface colonisation of the wider countryside away from the River Avon. Observations from Europe, Russia and the United States suggest *H. riparius* may be able to expand its range beyond riparian habitats where suitable microhabitat exists, but that its distribution may be dynamic, with local extinctions and recolonisations, as moisture levels fluctuate in more marginal habitats (Stoyenoff, 2001). To date, *H. riparius* has only been recorded from riparian habitat in the UK (Farmer, 2022; Gregory, 2024a).

Insights into species' habitat requirements can often be obtained via interspecific comparisons, although questions about the relative importance of environmental tolerance and competitive interactions inevitably arise. Comparisons between *H. riparius* and *T. rathkii* are informative. Unlike *T. rathkii, H. riparius* lacks pseudotracheae on the abdominal pleopods. These assist in reducing water loss in terrestrial woodlice (Gregory, 2019, p. 21). Combined with its small size, the absence of pseudotracheae makes *H. riparius* particularly prone to desiccation. This difference may explain the wider distribution of *T. rathkii* across habitats at LMRM (Table 1) with *H. riparius* more dependent on moist conditions beneath accumulations of dead plant material. A greater dependence on moisture may also explain why the abundance of *H. riparius* within piles of flood debris is related to the depth of material (Figure 10), while this was not the case for *T. rathkii*. The ability of *T. rathkii* to tolerate drier conditions and a wider range of riparian microhabitats than *H. riparius* has previously been documented in continental Europe (Farkas & Vilisics, 2008; Šatkauskienė, 2021). The two species may compete, although evidently any interspecific competition is insufficient to cause competitive exclusion since they frequently co-occur throughout their ranges in Europe (Gongalsky *et al.*, 2013; Gregory & Farmer, 2023). Both species have recently colonised LMRM, although *T. rathkii* was first documented two years prior to *H. riparius*. Earlier establishment may have enabled *T. rathkii* to disperse more widely within the floodplain meadow, hence further survey work to monitor these species distributions would be informative.

The abundance and distribution of other woodlouse species recorded across the floodplain meadow are indicative of their generalist habitat preferences (Richmond *et al.*, 2005). Following *H. riparius* and *T. rathkii*, *P. muscorum* was the most widespread species in terms of the range of habitats occupied (Table 1, Figure 9). Species, other than *T. rathkii*, previously recorded with *H. riparius* in 2022 were *T. pusillus* agg, *P. muscorum*, *O. asellus*, and *P. scaber* (Gregory & Farmer, 2023; Gregory, 2024b). In the present study, these species were confirmed as co-occurring with *H. riparius*, while a single *A. vulgare* was also found with *H. riparius* in a refuge trap (Table 2). Comparison of hand-searching and use of refuge traps indicates that hand-searching is more efficient at producing an inventory of species (Table 2). The efficacy of the refugia can be enhanced by wetting the cardboard prior to deployment, although, for reasons unknown, the refugia appeared to less effective when placed within the hedgerow compared to placement within riverside piles of flood debris (Table 2). Deployment of refuge traps may be a useful approach when many sites need to be sampled, and time constraints prevent hand-searching. However, time devoted to construction, placement, collection and subsequent sorting of material must also be factored into the use of refuge traps.

The true extent of *H. riparius* distribution across the UK remains unknown, however it is likely that anthropogenic activity contributes to its dispersal (Gregory *et al.*, 2023). As Gregory *et al.* (2023) highlights, Evesham is known for its market gardening history, with the landscape now home to many glasshouses for food production. The movement of horticultural material from Europe could be a possible route for the arrival of *H. riparius* into the UK with flooding subsequently assisting its dispersal in the region. *Hyloniscus riparius* has been recorded upstream along the River Avon at the Valley Country Park, Evesham (SP049470) (Farmer, 2023), at Gore Meadows (SO98914540) (Farmer, personal communication, 2025) and Haines Meadows, adjacent to LMRM (SO96764705) (Farmer, 2022). The populations at LMRM and Haines Meadows may have originated from the Valley Country Park potentially having been transported downstream with debris during flooding.

Future surveying will help elucidate the origins of the *H. riparius* in the West Midlands and assist in monitoring its potential spread. The species occupies damp stream sides, lakeshores and woodlands in its European range (Gongalsky *et al.*, 2013) so the species may yet be found beyond its current riparian distribution.

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References

Berg, M.P., Soesbergen, M., Templeman, D. & Wijihowven, H. (2008) *Versreidingsatlas Nederlandse landpissebedden, duizendpoten en miljoenpoten.* EIS-Nederland, Leiden.

British Myriapod and Isopod Group (BMIG) (2024) *Finding woodlice (also millipedes and centipedes).* Available at: https://bmig.org.uk/page/collecting-woodlice (Accessed 27th November 2024).

Embry, P. (2020) Rolled Cardboard Makes a Handy Insect-Sampling Tool. *Entomology Today*. 1 April. Available at: https://entomologytoday.org/2020/04/01/rolled-cardboard-makes-handy-insect-sampling-tool/ (Accessed 27th November 2024).

Farkas, S. & Vilisics, F. (2008) Results of the field surveys on terrestrial isopods (Isopoda, Oniscidea) in the Drava basin, Croatia. In: Purger, J. (ed.) *Biodiversity studies along the Drava River*. University of Pecs, Hungary. 328 pp.

Farmer, G. (2021) The discovery of the woodlouse *Trachelipus rathkii* during 2020 in the Vale of Evesham and surrounding area. *Worcestershire Record* **48**: 43-45.

Farmer, G. (2022) An initial, brief note on the discovery of *Hyloniscus riparius* (C. Koch, 1838) in VC37 Worcestershire, a new species of woodlouse in the UK. *Worcestershire Record* **50**: 39-40.

Farmer, G. (2023) The discovery of *Hyloniscus riparius* at a new site near the river Avon, Worcestershire. *Worcestershire Record* **51**: 13.

Gongalsky, K.B., Kuznetsova, D.M., Filimonova, Zh.V. & Shakhab, S.V. (2013) Distribution and Ecology of the Invasive Species of Woolice *Hyloniscus riparius* (C. Koch, 1838) (Isopoda, Oniscidea, Trichnoiscidae) in Russia. *Russian Journal of Biological Invasions* **4**(2): 116-119.

Gregory, S. (2019) An Introduction to the Identification of the Woodlice (Isopoda: Oniscidea) occurring in Berkshire, Buckinghamshire and Oxfordshire. *Fritillary* **8**: 20-47. Available online: https://anhso.org.uk/wp-content/uploads/Fritillary/frit8-woodlice.pdf

Gregory, S. & Farmer, G. (2023) *Hyloniscus riparius* (C. Koch, 1838); a pygmy woodlouse new for the UK from the Worcestershire Avon (Isopoda: Oniscidea: Trichoniscidae). *Bulletin of the British Myriapod and Isopod Group* **35**: 2-11.

Gregory, S. (2024a) 15 years on: An update to Woodlice and Waterlice in Britain and Ireland, part 1 ~ Native and Naturalised Species. *Bulletin of the British Myriapod and Isopod Group* **36**: 20-58.

Gregory, S (2024b) Report on the BMIG field meeting in Preston Montford 2022. *Bulletin of the British Myriapod and Isopod Group* **36**: 79-93.

Meteorological Office (2025a) UK seasonal weather summary Winter 2025. *Weather* **80**(4): *doi:10.1002/wea.7702*.

Meteorological Office (2025b) UK seasonal weather summary Spring 2025. *Weather* **80**(4): *doi: 10.1002/wea.7745.*

Meteorological Office (2025c) UK seasonal weather summary Summer 2025. *Weather* **80**(4): *doi: 10.1002/wea.7769.*

Richmond, C.E., Breitburg, D.L. & Rose, K.A. (2005) The role of environmental generalist species in ecosystem function. *Ecological Modelling* **188**: 279-295.

Salman, I., Ferrante, M., Möller, D. M., Gavish-Regev, E. & Lubin, Y. (2010) Trunk refugia: A simple, inexpensive method for sampling tree trunk arthropods. *Journal of Insect Science* **20(2)**: 5; 1-6. https://doi.org/10.1093/jisesa/ieaa012

Šatkauskienė, I. (2021) Contribution to the knowledge of the terrestrial isopod fauna of Lithuania. *Biologija* **67**: 74-87.

Stoyenoff (2001) Distribution of Terrestrial Isopods (Crustacea: Isopoda) Throughout Michigan: Early Results. *The Great Lakes Entomologist* **24**(2): 29-49.

Vale Landscape Heritage Trust (2024) *Lower Moor River Meadows.* Available at: https://valetrust.weebly.com/lower-moor.html (Accessed: 15th December 2024).

First record of *Philoscia muscorum* (Scopoli, 1763) (Isopoda: Oniscidea: Philosciidae) in the Central Iberian Plateau: discovery of a population in the Province of Guadalajara (Castilla-La Mancha, Spain)

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Abstract

Philoscia muscorum (Scopoli, 1763) is a terrestrial isopod of the family Philosciidae widely distributed across Europe. In the Iberian Peninsula, *P. muscorum* has previously been reported only in the northern part of Spain and in western Portugal. The present record extends its known distribution range towards the Iberian Central Plateau and constitutes the first record of this species in the Province of Guadalajara and in Castilla-La Mancha.

Key words: Woodlice, Iberian fauna, distribution, riparian habitats, new records.

Resumen

Philoscia muscorum (Scopoli, 1763) es un isópodo terrestre de la familia Philosciidae con una amplia distribución a nivel europeo. En la Península Ibérica, *P. muscorum* ha sido citada previamente solo en el norte de España y en el oeste de Portugal. Este registro amplía su rango de distribución conocido hacia la Meseta Central Ibérica y constituye, además, la primera cita de esta especie en la provincia de Guadalajara y en Castilla-La Mancha.

Palabras clave: Cochinillas de la humedad, fauna ibérica, distribución, hábitats riparios, nuevas citas.

Introduction

Terrestrial isopods (Crustacea: Isopoda: Oniscidea) of the family Philosciidae represent one of the most speciose and widely distributed groups, mainly in tropical regions around the world (Schmalfuss, 2003). These isopods are typically associated with moist environments, showing a preference for soils rich in organic matter, leaf litter, and riparian microhabitats, where they play a significant role in decomposition processes and nutrient recycling (Garcia *et al*., 2021). They are also very diverse in subterranean environments (Taiti, 2004).

Currently, the genus *Philoscia* includes 10 species and several subspecies, although only *P. muscorum muscorum* (Scopoli, 1763) and *P. affinis affinis* Verhoeff, 1908 (both preferentially, and in this article, represented as *P. muscorum* and *P. affinis,* respectively) have a wide distribution in Western Europe, even reaching North Africa (Algeria) in the case of *P. affinis* (Schmalfuss, 2003).

Philoscia muscorum (Scopoli, 1763) is one of the most widely distributed species in Europe, occurring from Atlantic and central European regions to more northerly areas of the continent (Schmalfuss, 2003). However, on the Iberian Peninsula its known distribution is markedly more restricted, with records concentrated primarily in the northern and western parts of the peninsula, especially in regions under Atlantic influence and in mountainous areas characterized by high ambient humidity (Garcia *et al*., 2021).

To date, *P. muscorum* had not been recorded in the province of Guadalajara nor within the territorial scope of Castilla-La Mancha, which placed the southernmost known limit of its distribution in Spain, considerably further north. The present study reports a new locality for the species in central Iberia, constituting the only known record in an area far removed from Atlantic influence. This suggests that it could be a disjunct population associated with a riparian habitat in the Henares River valley.

This new record substantially expands the known distributional range of *P. muscorum* on the Iberian Peninsula and underscores the importance of detailed faunal surveys in apparently well-known habitats, particularly in biogeographical transition zones where relict or isolated populations of species with more northerly affinities may persist.

We also updated the map presented by Garcia *et al*. (2021), which depicted all records of *P. muscorum* in Spain, by incorporating the new record from Guadalajara.

Material & methods

Sampling of *P. muscorum* was carried out on 16-17 January 2026 in Moratilla de Henares (Municipality of Sigüenza, Guadalajara), within a 421 m² plot located adjacent to the Henares River.

The plot exhibits high faunal (Oniscidea, Araneae, Opiliones, Pseudoscorpionida, Trombidiformes, Ixodida, Chilopoda, Diplopoda, Symphyla, Collembola, Psocoptera, Coleoptera, Hemiptera, Hymenoptera, Mantodea, Lepidoptera, Diptera, Orthoptera, Gastropoda, Olygochaeta) and floral diversity (Asteraceae, Poaceae, *Malus*, *Cydonia*, *Prunus*, *Laurus*, *Rubus*, *Ulmus*). Fungi and Cyanobacteria (such as *Nostoc*) are also present.

Specimens were collected manually from beneath wood debris, stones, and within leaf litter. Additional individuals were obtained using pitfall traps. Once captured, all specimens were preserved in 70% ethanol.

Figure 1 was taken in the plot with an EOS 2000D camera equipped with a Tamron SP 90mm F/2.8 Di MACRO 1:1 VC USD macro lens. Figure 2 was taken with a digital microscope (Dino-Lite AM4113T). Drawings were made with the aid of a *camera lucida* (Olympus DA) mounted on an Olympus CH30 compound microscope. Map was generated with QGIS LTR 3.40.

Results

Systematics

Crustacea: Oniscidea Latreille, 1802
Family Philosciidae Kinahan, 1857
Genus *Philoscia* Latreille, 1804
***Philoscia muscorum* (Scopoli, 1763)**

Material examined: Spain, Guadalajara, Sigüenza, Moratilla de Henares; 16-I-2026; 1 male, 6 females; collected under stones and wood; leg. Jaime Gálvez-Barrado and Lucía Gallardo-Madrigal. Same locality; 17-I-2026; 8 males, 9 females, under wood. Same locality and date as the preceding, 1 male, 1 female; collected in leaf litter; leg. Jaime Gálvez-Barrado and Lucía Gallardo-Madrigal.

Identification remarks: In addition to the typical coloration pattern (Figure 1 and Figure 2) (Vandel, 1962; Sutton, 1972), our identification has been based on the male secondary sexual characteristics (Vandel, 1962; Boreave *et al*., 2017; Garcia *et al*., 2021) (Figure 3). The shape of male first pleopods, widely used in the systematics of Oniscidea (Shultz, 2018), are very similar to those of *P. affinis*, also present in the Ibero-Balearic fauna, although there are differences in the distal armature of the endopod of the first pleopod and in the genital papilla (see Vandel, 1962). To facilitate future identifications, habitus and sexual characters of studied specimens have been illustrated again (Figure 3).

Figure 1: Photograph of *P. muscorum* taken in the plot. Photography by Javier Sánchez Álvarez.

Figure 2: *Philoscia muscorum*, Spain, Guadalajara, Moratilla de Henares. Habitus of two female specimens (preserved).

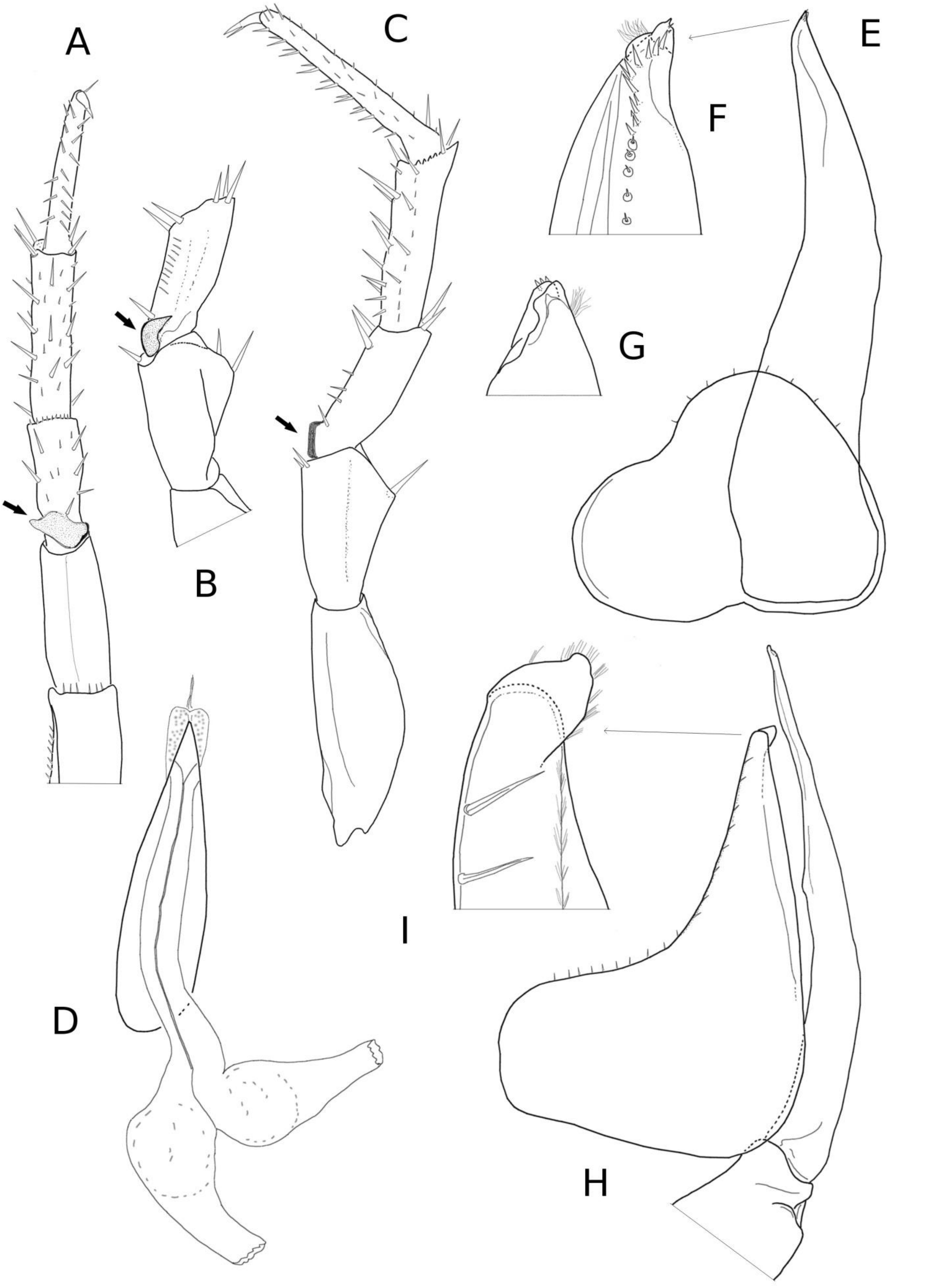

Figure 3: *Philoscia muscorum*, Spain, Guadalajara, Moratilla de Henares. Male sexual characteristics. A-C, pereopod-7 (A, sternal view; B, lateral view, posterior; C, lateral view, anterior. Merus ventral protrusion arrowed). D, genital papilla. E, pleopod-1. F-G, apical portion of pleopod-1 endopod (F, posterior, G, anterior). H, pleopod-2. I, apical portion of pleopod-2 exopod.

Comparison remarks: *P. muscorum* and *P. affinis*, which may be sympatric in some areas (Garcia *et al*., 2021), have been confused in the past, both in the Iberian Peninsula and in other parts of Western Europe (Boerave *et al*., 2017; Segers *et al*., 2018; Gregory, 2020).

Although the morphological differences between the two species are well established in the literature (see Vandel, 1962; Gruner, 1965), identifications based only on habitus (coloration) are unreliable, since there are populations of *P. muscorum* with a pattern very similar to that of *P. affinis* (Vandel, 1962). Therefore, accurate identifications must be based on adult male specimens, which are not always available.

The main characteristic that allows these two species to be distinguished is the shape and orientation of the ventral protrusion of the merus of the seventh male pereopods. Viewed from an anterior lateral perspective, this protrusion is perpendicular to the longitudinal axis of the appendage in *P. affinis*, while in *P. muscorum* it is bent towards the sternal and posterior part of the appendage (Figure 3A and 3B). Therefore, in anterior lateral view (Figure 3C), only a flattened protuberance is visible instead of a prominent triangular tooth (see Vandel 1962; Boreave *et al*., 2017; Garcia *et al*., 2021).

Accompanying woodlice fauna: In the study area, four other species of terrestrial isopods have been collected, all of them common and previously recorded in Guadalajara (see Pollo-Zorita, 1985): *Chaetophiloscia elongata*, *Oniscus asellus*, *Armadillidium vulgare* and *Armadillo officinalis*. *C. elongata* is the most abundant, representing 55.42% of the total number of specimens collected. The second most abundant species was *P. muscorum* (31.32%).

Distribution: Points plotted on the map (Figure 4) indicate recorded occurrences of *P. muscorum* in Spain, after Garcia *et al*. (2021) and updated with the new record from Guadalajara. *P. muscorum* has been recorded in Lugo, Asturias, Álava, Navarra, and Guadalajara. The latter representing its southernmost record in Spain.

Conclusions

The discovery of *Philoscia muscorum* in Moratilla de Henares constitutes the first record of the species for the province of Guadalajara and for Castilla-La Mancha, thereby substantially extending the southernmost known limit of its distribution on the Iberian Peninsula. This apparently disjunct population suggests the existence of local refugia capable of sustaining species typically associated with more northerly, humid regions, underscoring the importance of riparian microhabitats and soils rich in organic matter for the persistence of epigean terrestrial isopods. However, given that Moratilla de Henares and the surrounding villages encompassed extensive areas for cultivation and the transport of goods, it cannot be ruled out that it isn't a native population but the result of an involuntary human-caused introduction. Favourable local conditions would have allowed the establishment of this population far removed from others known on the Iberian Peninsula.

Moreover, this record demonstrates that faunal surveys in seemingly well-studied areas can reveal previously unrecorded populations, underscoring the importance of detailed sampling in biogeographical transition zones. Regarding Castilla-La Mancha, and specifically in the province of Guadalajara, there is little prior data on the terrestrial isopod fauna compared to other regions of Spain. One of the few existing faunistic surveys (Pollo-Zorita, 1983; 1985) includes numerous locations in the province of Guadalajara, even with description of new species (Pollo-Zorita & Dalens, 1984), but did not record the presence of *P. muscorum*. Another study carried out in the central plateau (Garcia & Cabanillas, 2021) focused solely on a seminatural area around Madrid and failed to record this species. The presence of *P. muscorum* in a riparian environment of the Henares River valley expands our knowledge of the species' ecology and biogeography, providing valuable data for future studies on dispersal, conservation, and the distribution of terrestrial isopods on the Iberian Peninsula.

Figure 4: Iberian Peninsula map with recorded occurrences of *Philoscia muscorum* in Spain. Red points indicate old occurrences, and the red star, the new one from Guadalajara.

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Bibliography

Boeraeve, P., De Smedt, P., Arijs, G., & Segers, S. (2017). *Philoscia affinis* Verhoeff, 1908 new to Belgium (Isopoda: Philosciidae). *Bulletin de la Société royale belge d'Entomologie/Bulletin van de Koninklijke Belgische Vereniging voor Entomologie*, **153**(3): 183-188.

Garcia, L. & Cabanillas, D. (2021). Los isópodos terrestres (Crustacea, Isopoda, Oniscidea) del entorno de las Lagunas de Ambroz: una zona urbana en proceso de renaturalización en el municipio de Madrid (España). *Boletín de la Asociación española de Entomología*, **45**(3-4): 161-175.

Garcia, L., Robla, J., & Cabanillas, D. (2021). Confirmation of the presence of *Philoscia muscorum* (Scopoli, 1763) (Isopoda: Oniscidea: Philosciidae) in the Iberian Peninsula. *Bulletin of the British Myriapod & Isopod Group*, **33**: 79-87.

Gregory, S. (2020). Further observations of *Philoscia affinis* Verhoeff, 1908 (Isopoda, Oniscidea, Philosciidae) in Britain and Ireland: Distribution, Habitat and Identification. *Bulletin of the British Myriapod and Isopod Group*, **32**: 2-14.

Gruner, H.E. (1965). Krebstiere oder Crustacea, V. Isopoda. *Die Tierwelt Deutschlands* **51**. VEB Gustav Fischer Verlag, Jena. 380 pp.

Pollo-Zorita, A.M. (1983). *Estudio taxonómico y ecológico de los Isópodos terrestres de la cuenca alta del río Tajo*. Universidad Complutense de Madrid. Tesis doctorales nº 131. 241 pp. Madrid (published online 2015 https://eprints.ucm.es/52882/).

Pollo-Zorita, A. M. (1985). Oníscidos de la cuenca alta del río Tajo (Isopoda, Crustacea). *Graellsia* (Madrid), **41**: 173-189.

Pollo-Zorita, A.M. & Dalens, H. (1984). Descripción de una nueva especie de isópodo terrestre: *Proporcellio guadalajarensis* (Isopoda, Porcellionidae). *Bulletin de la Société d'Histoire naturelle de Toulouse*, **119** (1983): 13-15.

Schmalfuss, H. (2003). World catalog of terrestrial isopods (Isopoda: Oniscidea). *Stuttgarter Beiträge zur Naturkunde, Serie A*, **654**: 1–341.

Segers, S., Boeraeve, P., & De Smedt, P. (2018). *Philoscia affinis* Verhoeff, 1908 new to the UK (Isopoda: Philosciidae). *Bulletin of the British Myriapod & Isopod Group*, **30**: 21-15.

Shultz, J.W. (2018). A guide to the identification of the terrestrial Isopoda of Maryland, U.S.A. (Crustacea). *ZooKeys*, **801**: 207-228. https://doi.org/10.3897/zookeys.801.24146

Sutton, S. (1972). *Woodlice*. Ginn & Co. Ltd. London. 144 p.

Taiti, S. (2004). *Crustacea: Isopoda: Oniscidea (Woodlice).* In Gunn, J. (Ed.). (2004). Encyclopedia of Caves and Karst Science (1st ed.), p. 547-551. https://doi.org/10.4324/9780203483855

Vandel, A. (1962). Faune de France, **66**. *Isopodes terrestres* (deuxième partie), Paris. pp. 417-931.

Report on the BMIG field meeting in Cannington in 2023

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Introduction and background

The 2023 BMIG field meeting, held from 13th to 16th April, was based Cannington Campus about three miles northwest of Bridgwater in Somerset. Cannington is ideally placed for easy access to areas of varied geology and topography. This includes the Somerset coast, the limestone of the Mendip Hills and Quantock Hills, and the wetlands of the Somerset Levels. And within the village is situated the Walled Garden of Cannington, which includes temperate and tropical glasshouses.

BMIG last visited the area over 35 years ago back in 1986 (the 5th joint BMG and BISG meeting) based on the edge of the Mendip hills in the rural village of Langford (Langford Campus) some 14 miles south of Bristol. Observations of millipedes and centipedes were summarised in the *BMG Newsletter* by Doug Richardson and Tony Barber (1987). Back then over 30 sites were visited in North Somerset (VC6) and in North and South Wiltshire (VC7 & VC8) with 28 species of millipede and 25 species of centipede recorded. This included many new vice-county records including the millipedes *Geoglomeris subterranea*, *Brachychaeteuma melanops*, *Chordeuma proximum* (then mainly known from Wales), *Choneiulus palmatus* and *Stosatea italica* (then mainly known from south east England), and the centipedes *Henia brevis* and *Lithobius muticus* (a predominantly south eastern species). The woodlice recorded are summarised in the *BISG Newsletter* by Steve Hopkin (1987), which lists 18 species. Of particular note are *Ligidium hypnorum* (a predominantly south eastern species), *Haplophthalmus montivagus* (then known as the yet to be identified *Haplophthalmus* NTB) and *Armadillidium album*.

Methods and Sites

For the 2023 field meeting a list of sites with permission to survey and collect specimens was provided to all participants (over 30 were present) who were free to undertake field work whenever and wherever they chose to record. 31 sites were visited during the course of the field meeting, 19 in South Somerset (VC5), 11 in North Somerset (VC6) and a riverside meadow in Worcestershire (VC35). These included outcrops of limestone in the Mendip Hills, broadleaved woodlands and coastal habitats in Bridgwater Bay. A summary of the sites visited and the sub-locations within these sites is shown in Table 1.

Species recorded

Species records have been collated from those submitted directly to the various scheme organisers or via iRecord and iNaturalist. During the 2023 field meeting a total of 82 species of BMIG taxa were recorded. This comprises 19 species of centipede (Table 2), 27 of millipede (Table 3), 25 of woodlice (Table 4), five of intertidal isopods (Table 5), four of pauropods and two symphylans (Table 6).

Three species recorded are listed in the Natural England species status review (Lee, 2015) as being Nationally Rare: the centipede *Lithobius lapidicola*, the millipede *Enantiulus armatus* and the woodlouse *Buddelundiella cataractae*. Three additional species are listed as Nationally Scarce: the millipede *Brachychaeteuma melanops*; and the woodlice *Armadillidium album* and *Miktoniscus patience*. These six species are highlighted in the accounts below.

Table 1: List of sites visited.

Recorders: GB – Gino Brignoli, NG – Nicola Garnham, SG – Steve Gregory, SH – Sue Harvey, TH – Thomas Hughes, HR – Helen Read, PR – Paul Richards, DS – Duncan Sivell, AL – Angela Lidgett, WM – Warren Maguire, DM – Dawid Martyniuk, MV – Matthew Vosper, DW – Derek Whiteley, W – 'wychelm'

Site code	Location	Grid Ref.	VC	Dates	Recorders
1	Leigh Woods NT	ST5573 ST5673	6	13/04/2023	DW
2	Aisholt Wood	ST1935 ST1936	5	14/04/2023	MV
3	Berrow, St Mary's Church	ST2952	6	14/04/2023	AL, DM
4	Blue Anchor Bay	ST0044 ST0143	5	14/04/2023	DW
5	Bossington Beach NT	SS8948	5	14/04/2023	DW
6	Cannington Campus, Bridgewater College	ST2539	5	13, 14 & 15/04/2023	GB, NG, DM
7	Cannington Walled Garden Outdoors, Temperate and Tropical	ST2539	5	14 & 16/04/2023	SH, PR SG, SH
8	Combwich, shore	ST2642	5	14/04/2023	NG, SG, WM
9	Gunter's Grove, Stogursey	ST2144	5	14/04/2023	W
10	Highbridge	ST3247	6	14/04/2023	W
11	Steart Marshes, beach, salt marsh and Steart Point	ST2745 ST2645 ST2746 ST2846	5	14, 15 & 17/04/2023	NG, SG, WM, MV, DW & PR
12	Tropiquaria, Watchet	ST0540	5	14/04/2023	TH, SH, PR
13	Watchet	ST0643	5	14/04/2023	PR
14	Ubley Warren, Cheddar Complex	ST5055	6	14/04/2023	AL, DM
15	Velvet Bottom, Cheddar Complex	ST5055 ST4955	6	14 & 15/04/2023	AL, DM, W
16	Bridgwater, meadow	ST2936	5	15/04/2023	MV
17	Cannington Park/Quarry	ST2440	5	15/04/2023	NG, SH, WM
18	Otterhampton, All Saints Church	ST2443	5	15/04/2023	PR
19	Combwich, St Peter's church	ST2542	5	15/04/2023	PR
20	Fyne Court NT, Broomfield	ST2232	5	15 & 16/04/2023	SG, DW PL
21	Great Breach Woods	ST5032	6	15/04/2023	AL, DM
22	Great wood	ST1737	5	15/04/2023	NG, WM
23	Kilve Beach Kilve Pill (wood above)	ST1444	5	14, 15 & 16/04/2023	NG, SG, WM, HR, MV & PL
24	Seven Wells Wood	ST1638	5	15/04/2023	MV
25	Berrow Dunes	ST2953	6	16/04/2023	AL, DW
26	Brean Beach	ST2958	6	16/04/2023	DW
27	Ebbor gorge	ST5248	6	16/04/2023	NG
28	Sandford Wood	ST4259	6	16/04/2023	DW
29	Sedgemoor services, Somerset	ST3552	6	16/04/2023	PR
30	Evesham Country Park	SP0446 SP0447	37	16/04/2023	PR
31	Woodlands Hill NT	ST1540	5	14/04/2023	DW

The most prolific site proved to be Kilve Beach (site 23) which provided a mixture of intertidal and shoreline habitats with adjacent wetland and woodland above. Here 24 species were recorded; four centipedes, seven millipedes, nine woodlice and four intertidal isopods. Interestingly another coastal site, Steart Marshes (site 11), which included sandy beach, salt marsh and other habitats came a close second with 22 species. Cannington Walled Garden (site 7) despite all the unusual species recorded both outdoors and inside the temperate and tropical glasshouses managed only 21 species.

Centipedes

In total 19 species of centipede were recorded from 22 sites (see Table 2). The most frequently recorded were *Haplophilus subterraneus* from 11 sites and *Lithobius variegatus* from 9 sites. This perhaps reflects the western bias of these species British distribution, or perhaps their large size and conspicuous appearance. The ubiquitous *Lithobius forficatus* and *Lithobius microps* were both recorded from seven sites, with other centipedes noted from five or less. The most prolific site proved to be National Trust's Fyne Court (site 20) with eight species recorded including the only record of *Geophilus electricus*.

The only species of note was *Lithobius lapidicola* which as collected from the tropical glasshouse at Cannington Walled Garden (site 7, see image below). Puzzlingly, in Britain this centipede occupies two distinct habitats. Since its first discovery at Royal Botanic Garden Edinburgh in 1986 it has been recorded from several heated glasshouses across Britain, but it is also known outdoors from several coastal sites in southern-eastern England. Because of the latter occurrences it is listed by Lee (2015) as Nationally Rare and Near Threatened. However, this status is perhaps not relevant to populations that are established as the result of an accidental introduction inside heated glasshouses. Also inside the tropical glasshouse at Cannington Walled Gardens *Tygarrup javanicus* was also found (see image below); a species native to the tropics, but widely recorded from heated glasshouse across Europe.

Excursions to the Somerset coast also turned up two sites for *Strigamia maritima* (sites 4 & 11). Of the two inland *Strigamia* species, only *S. crassipes* was recorded during the field meeting, just once at Cannington (site 6). Although both this and *S. acuminata* can be elusive and typically found as solitary specimens, both are quite widespread across southern England and both species were found at several sites during the 1986 field meeting.


Lithobius lapidicola (left, image © Steve Gregory) **and *Tygarrup javanicus* anterior** (right, image © Sue Harvey). **Both were found inside the heated glasshouse at Cannington Walled Gardens.**

Table 2: Centipedes recorded during the Cannington 2023 field meeting.

X = species recorded from site. National status: NR = Nationally Rare, NT = Near Threatened.

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

Site number:	**1**	**2**	**3**	**4**	**6**	**7**	**8**	**9**	**11**	**13**	**14**	**15**	**17**	**20**	**21**	**22**	**23**	**24**	**26**	**27**	**28**	**31**	**No. sites**
Geophilus carpophagus s.str.					X	X			X														3
Geophilus easoni															X			X					2
Geophilus electricus														X									1
Geophilus flavus											X	X	X		X		X						5
Geophilus impressus																				X			1
Geophilus truncorum		X												X	X								3
Haplophilus subterraneus	X		X		X	X				X				X		X	X		X	X	X		11
Schendyla nemorensis			X		X	X					X	X			X								3
Strigamia crassipes					X																		1
Strigamia maritima				X					X														2
Tygarrup javanicus						X																	1
Cryptops hortensis			X		X	X						X		X									5
Cryptops parisi	X													X						X	X		4
Lithobius calcaratus												X											1
Lithobius forficatus			X				X						X	X	X					X		X	7
Lithobius lapidicola NR, NT						X																	1
Lithobius melanops			X						X					X			X						4
Lithobius microps			X						X		X	X		X	X					X			7
Lithobius variegatus		X						X			X	X			X	X	X	X				X	9
Total 19 species / No. per site:	2	2	6	1	5	6	1	1	4	1	4	6	2	8	7	2	4	2	1	5	2	2	

Surprisingly the ubiquitous and typically conspicuous *Geophilus flavus* was only recorded from five sites. By comparison two smaller and inconspicuous geophilomorphs, *Geophilus truncorum* and *Schendyla nemorensis*, were found at three sites and six sites respectively. *Geophilus carpophagus s.str.* was found in its characteristic 'above ground' habitats at three sites: under tree bark (at Cannington, sites 6 & 7, see image below) and on a mortared wall (on the coast, site 11).

Both *Cryptops hortensis* and *Cryptops parisi* were recorded from a mixture of synanthropic and semi-natural sites; five and four sites, respectively. The small dark *Lithobius calcaratus* was recorded from Velvet Bottom, Cheddar Complex (site 15). This is a local species favouring grassland and heathland.

***Geophilus carpophagus s.str.* found at Cannington Campus** (image © Nicola Garnham)

Millipedes

27 species of millipede were recorded from 25 sites (Table 3). By far the most frequently recorded species was the Pill Millipede *Glomeris marginata* with 13 sites, with *Brachydesmus superus* recorded from nine sites and *Tachypodoiulus niger* from eight.

Among the millipede highlights was the discovery of *Enantiulus armatus* from a churchyard at Berrow (site 3) by Angela Lidgett and Dawid Martyniuk (see image below). This millipede is designated Nationally Rare, Least Concern (Lee, 2015) and this is the first record for Somerset. However, almost all previous British records are from the adjacent county of Devon so this is perhaps not unexpected.

Brachychaeteuma melanops is designated Nationally Scarce and was only recorded from a single site, a woodland at Kilve Pill (site 23). However, this millipede has proved to be widespread across southern England, and perhaps overlooked as it's only active in the winter months. It was also recorded from a single site during the 1986 field meeting. The only other Chordematidan recorded was *Nanogona polydesmoides* from two rural sites.

Two uncommon, but introduced and synanthropic millipedes, *Stosatea italica* and *Cylindroiulus vulnerarius,* were recorded from Leigh Woods (site 1) by Derek Whiteley. Both species are well known from this site, which is also known to harbour other introduced synanthropic species. Indeed, *S. italica* was recorded at this same site during the 1986 field meeting, when it was described as one of "the 'gems' of the weekend".

Cannington Walled Gardens (site 7) produced a number of interesting millipede records. *Haplopodo-iulus spathifer* was found in a flower bed by Helen read and Paul Lee (see image below). Originally known in the UK from a few ornamental gardens in south east England, more recently it has been found in ornamental gardens in Cornwall and now in Somerset. Inside the adjacent heated glasshouse *Oxidus gracilis* proved to be numerous (no surprise!), but *Cylindroiulus truncorum* was also found inside Temperate House. A visit to the tropical glasshouse at Tropiquaria (site 11) turned up *Amphitomeus attemsi*, a ball rolling ‘flat-back’ Polydesmida (see image below) otherwise only known in the UK from Kew Gardens and Eden Project.

The Bristly Millipede *Polyxenus lagurus* was found at four sites. Of these, two sites were churchyards (sites 18 & 19) and one was from a wall on the coast (site 11).

***Enantiulus armatus* from Berrow churchyard showing the projecting anal scale** (image © Angela Lidgett) **and an enrolled *Amphitomeus attemsi* from Tropiquaria** (image © Paul Richards)**.**

***Haplopodoiulus spathifer* male from Cannington Walled Garden** (image © Steve Gregory)**.**

Table 3: Millipedes recorded during the Cannington 2023 field meeting.

X = species recorded from site. National status: NR = Nationally Rare, LC = Least Concern, NS = Nationally Scarce.

Site number:	1	2	3	4	6	7	9	10	11	12	14	15	16	17	18	19	20	21	22	23	24	25	27	28	30	No. sites
Polyxenus lagurus								X	X						X	X										4
Glomeris marginata	X	X					X				X	X		X			X	X	X	X	X		X	X		13
Amphitomeus attemsi										X																1
Brachydesmus superus	X	X					X		X		X	X					X	X		X						9
Ophiodesmus albonanus					X										X											2
Polydesmus angustus	X																X						X	X		4
Polydesmus inconstans														X												1
Oxidus gracilis						X																				1
Macrosternodesmus palicola					X																					1
Stosatea italica	X																									1
Brachychaeteuma melanops NS																				X						1
Nanogona polydesmoides												X								X						2
Blaniulus guttulatus	X																							X		2
Brachyiulus pusillus				X					X				X													3
Cylindroiulus britannicus			X			X				X	X						X									5
Cylindroiulus caeruleocinctus					X																					1
Cylindroiulus latestriatus			X						X		X											X				4
Cylindroiulus punctatus																		X	X	X	X		X	X		6
Cylindroiulus truncorum						X																				1
Cylindroiulus vulnerarius	X																									1
Enantiulus armatus NR, LC			X																							1
Haplopodoiulus spathifer						X																				1
Julus scandinavius																				X						1
Ommatoiulus sabulosus			X																							1
Ophyiulus pilosus	X				X	X												X								4
Proteroiulus fuscus										X									X		X					3
Tachypodoiulus niger	X		X						X					X					X	X			X		X	8
Total 27 species / No. per site:	8	2	5	1	4	5	2	1	5	3	4	3	1	3	2	1	4	4	4	7	3	1	4	4	1	

Woodlice

25 species of woodlouse were recorded from 25 sites (Table 4). Perhaps predictably the most frequently recorded species were the ubiquitous (at least down south) 'Famous Five': *Armadillidium vulgare*, *Philoscia muscorum* (both 17 sites), *Oniscus asellus* (16 sites), *Porcellio scaber* (15 sites) and *Trichoniscus pusillus agg.* (10 sites). Other woodlouse species were found at seven sites or less.

The most prolific site for woodlice was Cannington Park/Quarry (site 17) with 12 species recorded. This includes the trichoniscids *Haplophthalmus danicus, H. mengii agg*. and *Trichoniscus pygmaeus*; three species of pill woodlouse *Armadillidium depressum, A. nasatum* and *A. vulgare*, the Ant Woodlouse *Platyarthrus hoffmannseggii* and the south-western *Porcellionides cingendus*.

The discovery of the Pygmy Pill-woodlouse *Buddelundiella cataractae* inside the tropical glasshouse at Tropiquaria (site 12) is perhaps unexpected. This tiny species, designated Nationally Rare, Least Concern (Lee, 2015), is usually found outdoors and has proved to be relatively widespread in south Wales. Recently (2024 & 2025) three sites have been discovered across 'the river' in England: two in Bristol city and a third near Chippenham (verified records on iRecord). At Tropiquaria *B. cataractae* was associated with typical tropical glasshouse species, including *Trichorhina tomentosa* (Budde-Lund) and a single specimen of *Reductoniscus costulatus* Kesselyák. This latter species has been widely recorded from inside tropical glasshouses across Britain and is of very similar appearance to *B. cataractae* (see images below), thus highlighting potential confusion in the field between these two species.

Comparison of *Buddelundiella cataractae* (left) and *Reductoniscus* costulatus (right), both recorded from Tropiquaria. Note shape of 1st epimera (images © Thomas Hughes)**.**

Other woodlouse highlights were the discovery of two Nationally Scarce coastal species, *Armadillidium album* and *Miktoniscus patience* (see images below). The former was found in good numbers under drift wood along the sandy beach at Steart Marshes (site 11) and *M. patience* was also found in good numbers under flood debris on rank grass beside the Parrett estuary at Combwich (site 8). Continuing the coastal theme, the Sea Slater *Ligia oceanica*, a species often numerous when found, was only recorded from a single site at Kilve Bay (site 23).

Philoscia affinis was found at a single site, Ubley Warren (site 14), by Angela Lidgett. Although just a single female specimen was collected (with no males for confirmation) the head and epimera pigment patterns (and habitat) are typical of this species (see image below). This is the first record for Somerset, but subsequently in 2025 three additional sites were recorded: two near the coast by Weston-super-Mare and one from woodland in the Quantock Hills (records verified on iRecord). It is thought that *P. affinis* has been long present, but overlooked, in Britain and Ireland. In contrast its congener *P. muscorum* was the most frequently recorded woodlouse during the field meeting.

***Armadillidium album* from the sandy beach at Steart Marshes** (image © Nicola Garnham) **and *Miktoniscus patience* from beside the Parrett estuary** (image © Warren Maguire)**.**

***Philoscia affinis* female of typical habitus recorded from Ubley Warren** (image © Angela Lidgett)**.**

Cannington Walled Gardens (site 7) also proved productive for woodlice, with two species that were found nowhere else during the weekend: *Styloniscus mauritiensis* found inside the Tropical Glasshouse and *Porcellionides pruinosus* found in the outdoor garden.

Paul Richards clearly got distracted on the way home and ended up beside the river Avon in Worcestershire (site 30). Here he recorded *Hyloniscus riparius* and its usual associate *Trachelipus rathkii*. The central European *H. riparius* was discovered new to Britain here in April 2022 (Farmer, 2022) and was conveniently timed and placed for an unplanned excursion by BMIG during the 2022 Shropshire based field meeting (Gregory, 2024). It seems to be established along a several kilometre length of the Avon where it is thought to be a 'horticultural' escape.

Table 4: Woodlice recorded during the Cannington 2023field meeting.

X = species recorded from site. National status: NR = Nationally Rare, NS = Nationally Scarce.

Site number:	1	2	3	4	5	6	7	8	11	12	13	14	15	16	17	19	20	21	22	23	25	27	28	29	30	No. Sites
Asellus aquaticus							X		X																	2
Ligia oceanica																				X						1
Androniscus dentiger	X								X											X					X	4
Buddelundiella cataractae NR										X																1
Haplophthalmus danicus		X					X			X					X		X						X			6
Haplophthalmus mengii agg.															X											1
Hyloniscus riparius																									X	1
Miktoniscus patience NS								X																		1
Trichoniscus pusillus agg.							X	X	X			X	X		X		X	X	X	X		X				11
Trichoniscus pygmaeus															X							X				2
Styloniscus mauritiensis							X																			1
Armadillidium album NS									X												X					2
Armadillidium depressum	X						X	X	X						X		X			X						7
Armadillidium nasatum	X								X						X							X				4
Armadillidium vulgare			X	X	X	X	X	X	X		X				X	X	X		X	X	X	X	X	X		17
Oniscus asellus	X					X	X	X	X		X		X	X	X		X	X	X	X		X	X		X	16
Platyarthrus hoffmannseggii	X		X					X							X					X						5
Philoscia affinis												X														1
Philoscia muscorum	X		X	X		X	X	X	X		X		X		X		X	X		X	X	X	X		X	17
Porcellio scaber			X	X	X	X	X	X	X		X				X		X		X	X	X	X	X			15
Porcellionides cingendus									X						X											2
Porcellionides pruinosus							X																			1
Reductoniscus costulatus										X																1
Trichorhina tomentosa										X																1
Trachelipus rathkii																									X	1
Total 25 sp. / No. per site:	6	1	4	3	2	4	10	8	11	4	4	2	3	1	12	1	7	3	4	9	4	7	5	1	5	

Intertidal Isopods

Excursions to four coastal sites resulted in the discovery of five species of intertidal isopod (Table 5). This relatively low number of species reflected both the ‘soft’ nature of much of the north Somerset coast, which limits the number of species that occur and makes access difficult, as well as the state of the tide during the dates of the field-meeting, which was fairly weak and which only fell to just below mid-tidal level during recording hours.

Table 5: Intertidal Isopods recorded during the Cannington 2023field meeting.

X = species recorded from site.

Site number:	**5**	**8**	**11**	**23**	**No. sites**
Idotea granulosa			X	X	2
Jaera albifrons s.str.				X	1
Jaera praehirsuta				X	1
Lekanesphaera levii				X	1
Lekanesphaera rugicauda	X	X	X		3
Total 5 species / No. per site:	**1**	**1**	**2**	**4**	

The most frequently recorded species was *Lekanesphaera rugicauda*, found at 3 sites. Samples were taken from all of these locations for microscopic confirmation of specific ID. At Steart (site 11) it was abundant, with thousands being seen in the saltmarsh pools and mud banks. Despite searches being made in these mud banks, no evidence of *Paragnathia formica* was uncovered, though access to much suitable habitat was impossible due to the height of the banks and the softness of the mud. The beach at Steart was mostly soft mud and sand and the water edge was inaccessible, but a single sub-adult *Idotea granulosa* was found amongst seaweed (*Ulva* and *Fucus*) under a muddy stone above mid-tidal level.

At Kilve Beach (site 23), *Fucus serratus* from just below mid-tide was ‘washed’, producing good numbers of *Idotea granulosa* and some *Jaera* though no other species (including the hoped for *Dynamene bidentata*). Nevertheless, it was a good opportunity for Warren Maguire to demonstrate this useful technique to other attendees, most of whom had little or no experience of intertidal isopoding. *Jaera* were abundant under stones across the intertidal range as expected, and two species were found amongst the samples taken at various points in the intertidal range, the ubiquitous *J. albifrons* and the much less commonly recorded *J. praehirsuta*. A single *Lekanesphaera* individual was collected from under a mid-tidal stone on sandy rock by Helen Read and this was identified later under the microscope by Warren Maguire as *L. levii*, a species which appears to be characteristic of precisely this habitat in western Britain, though it is poorly recorded (perhaps partly because it was not included in Naylor (1972) and Naylor & Brandt (2015).

Lekanesphaera levii **found at Kilve Beach**
Image © Warren Maguire

Pauropods and Symphylans

Four species of pauropod and two of symphyla were recorded from four sites (Table 6). The most frequently recorded pauropod was *Decapauropus gracilis* from 3 sites.

Table 6: Pauropods and Symphylans recorded during the Cannington 2023 field meeting.

X = species recorded from site.

Site number:	**3**	**6**	**14**	**15**	**No. sites**
Pauropds					
Decapauropus broelemanni				X	1
Decapauropus distinctus				X	1
Decapauropus gracilis	X	X	X		3
Pauropus lanceolatus		X			1
Symphylans					
Symphylella elongata				X	1
Scutigerella causeyae			X		1
Total 6 species / No. per site:	1	2	2	3	

The first Pauropods of the Field Meeting were found at Cannington College (site 6) where our accommodations were situated. Behind some of the buildings was a lightly wooded area with a pile of decaying wood and sticks which was where many *Decapauropus gracilis* were found on the decaying sticks buried in the pile. A nearby fallen log also yielded some specimens of *Pauropus lanceolatus*. More *Decapauropus gracilis* were found on similar rotten sticks buried under the leaf litter at St. Mary's Church, Berrow (site 3). *Decapauropus gracilis* was once again found under rocks sitting on grassy hills near a rocky valley at Ubley Warren, Mendip Hills (site 14). Another Pauropod likely to be *Decapauropus milotti* was also found under these rocks, but more specimens of this species need to be examined to be sure this was not just a mutated *D. gracilis*. One species of Symphylan, *Scutigerella causeyae*, was also found under the rocks. The next day, another area of Ubley Warren (site 15) was searched, this time a flatter, more wooded area but also littered with rocks. From under these rocks, *Decapauropus broelemanni*, and *Decapauropus distinctus* were collected. A small Symphylan, *Symphylella elongata* was also collected. Despite targeted surveys no Pauropods or Symphylans were collected from Great Breachwood (site 21).

***Pauropus lanceolatus* (left) found at Cannington Campus and *Symphylella elongata* (right) from Ubley Warren** (images © Dawid Martyniuk)**.**

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References

Farmer, Gary (2022). An initial, brief note on the discovery of *Hyloniscus riparius* (C. Koch, 1838) in VC37 Worcestershire, a new species of woodlouse to the UK. *Worcestershire Record*. **50**: 39.

Hopkin, S.P. (1987) Woodlouse species collected at BISG/BMG meeting at Langford House. *Isopod Survey Scheme Newsletter* **22**: 2. https://bmig.org.uk/sites/default/files/news_bisg/BISGnews22-1987.pdf

Gregory, S.J. (2024) Report on the BMIG field meeting in Preston Montford in 2022. *Bulletin of the British Myriapod & Isopod Group* **36**: 79-93.

Lee, P. (2015) *A review of the millipedes (Diplopoda), centipedes (Chilopoda) and woodlice (Isopoda) of Great Britain*. Natural England Commissioned Report NECR186. Species Status No.**23**. Natural England.

Naylor E. (1972) *British Marine Isopods*. The Linnean Society of London. London & New York: Academic Press.

Naylor E. & Brandt, A. (2015) *Intertidal Marine Isopods, Synopsis of the British Fauna (New Series), No. 3*. The Linnean Society of London: FSC.

Richardson, D.T. & Barber, A.D. (1987) BMG at Langford 23-26 April 1986. *British Myriapod Newsletter* **7**: 1-5. https://bmig.org.uk/sites/default/files/news_bmg/BMGnews07-1987.pdf