# An Introduction to Myriapods and Centipedes

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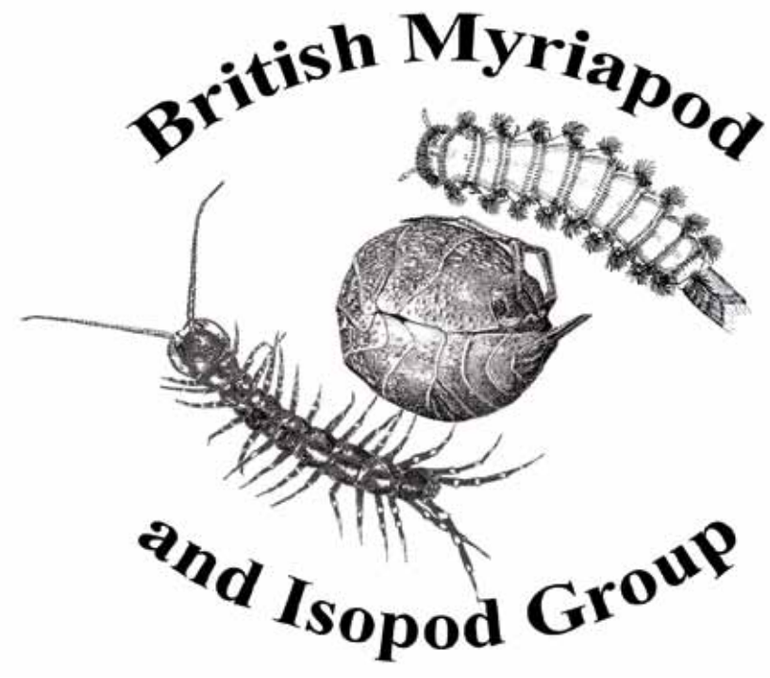


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# Introduction

- This publication is designed as part of a series of stand-alone introductions to the study of ground invertebrates. It can be used as a taught presentation or as a self-study guide.
- Further ebooks are available giving more details on Millipedes and Woodlice.
- These publications can be used for self study by simply proceeding through the presentation at your own pace. The full text is included within the slides.
- They are also designed as a text and image resource for group training. Numerous images are included, to offer as comprehensive a selection of species and features as possible.

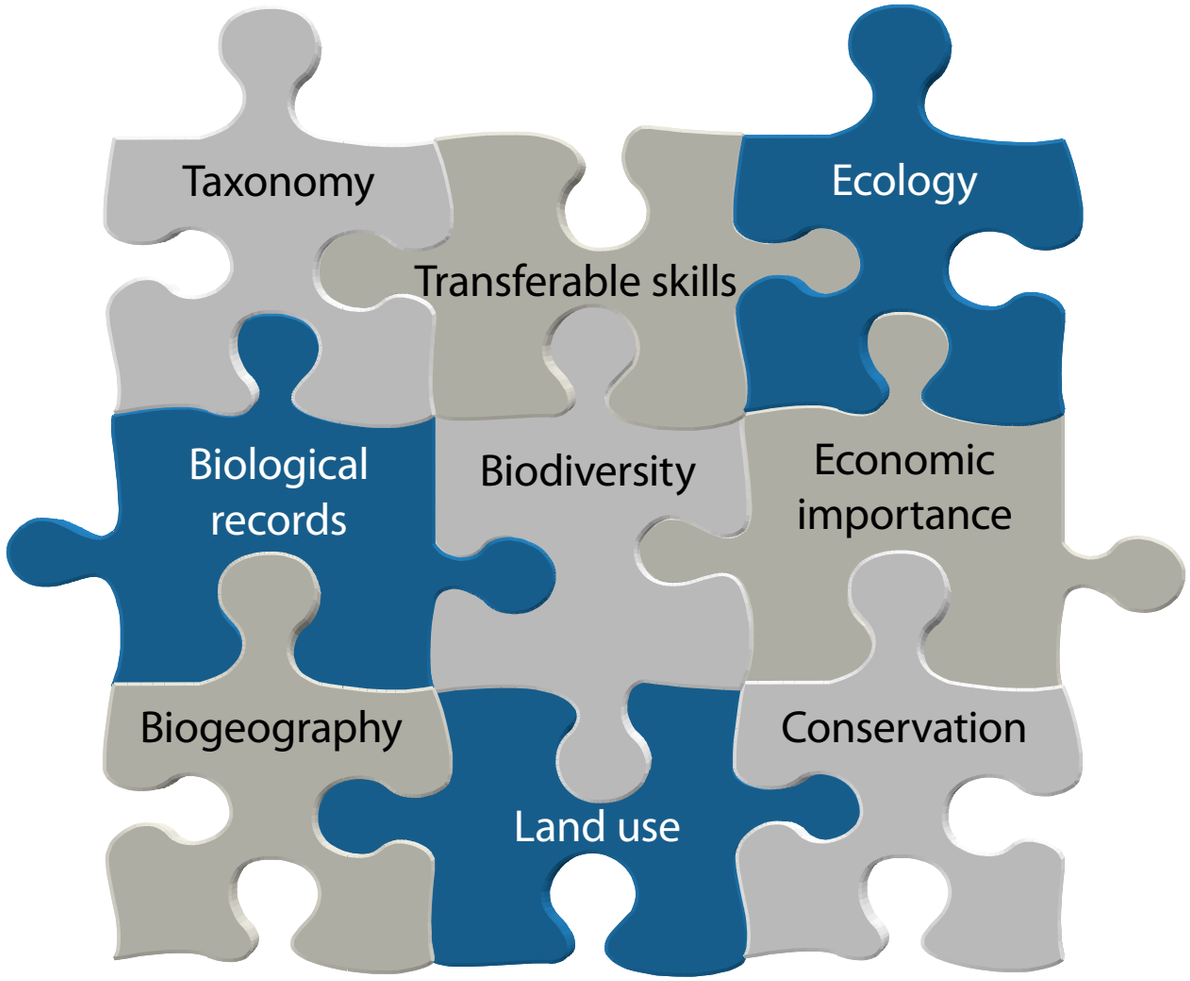
# Outline

This presentation provides:

- A basic introduction to studying myriapods, with specific reference to centipedes.
- An introduction to the classification, ecology, collection and recording of these animals.
- An illustrated summary of some of the main identification features of these animals.
- A gallery of some British centipede species.
- How to find out more

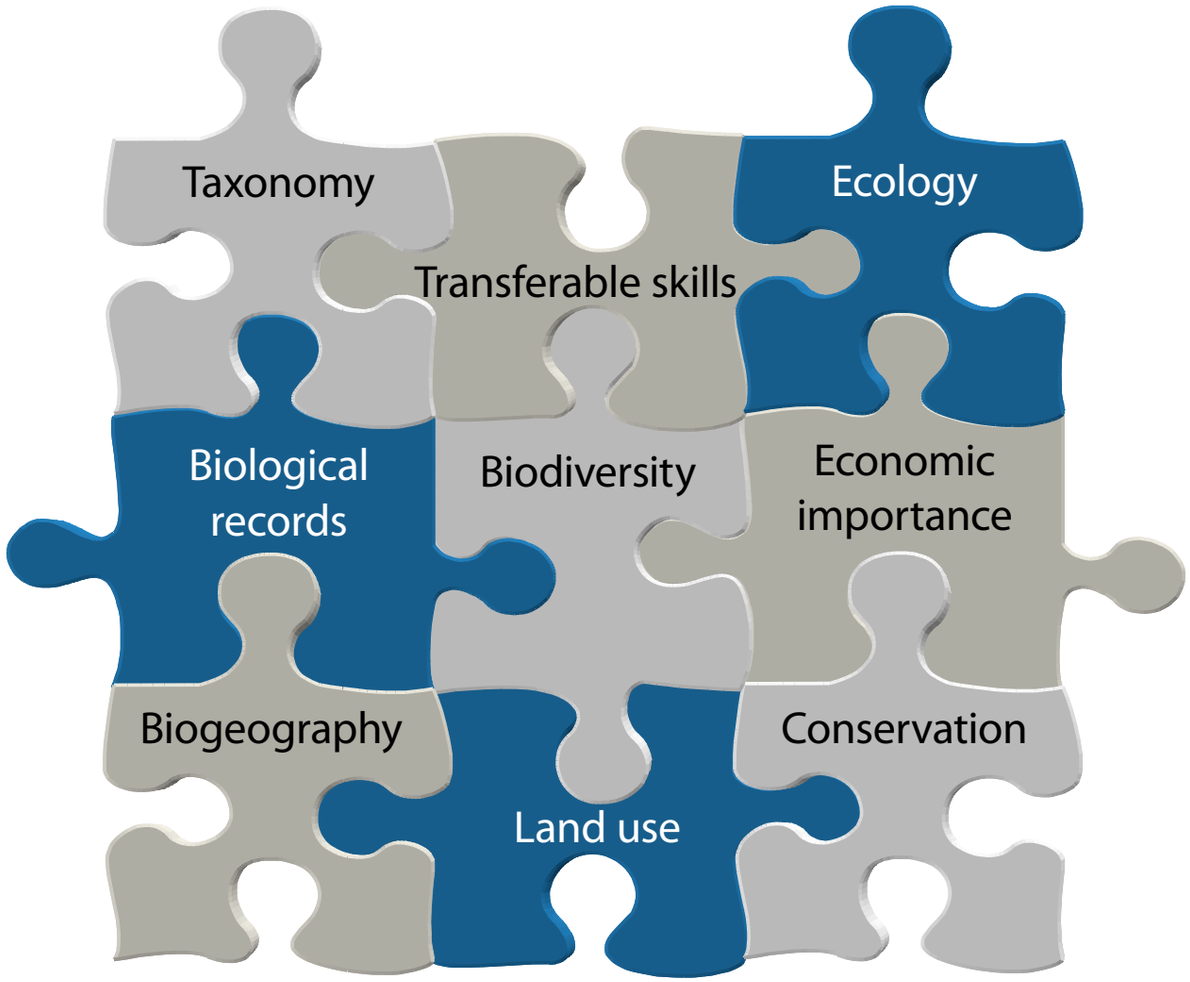
# Why look at Myriapods? (1)

- Millipedes and centipedes are ecologically important species.
- They are readily found throughout the year.
- There are relatively few species, so a beginner can quickly become familiar with the native fauna.
- Skills used in identification of myriapods can be used for other invertebrate groups.



# Why look at Myriapods? (2)

- They are well studied in Britain and therefore there are good resources to help the beginner get to grips with them.
- Despite this there are many discoveries to be made regarding their lifestyles and distribution.
- New species are regularly found, not only regionally but also nationally.
- There is a good deal of scope for finding species completely new to science.

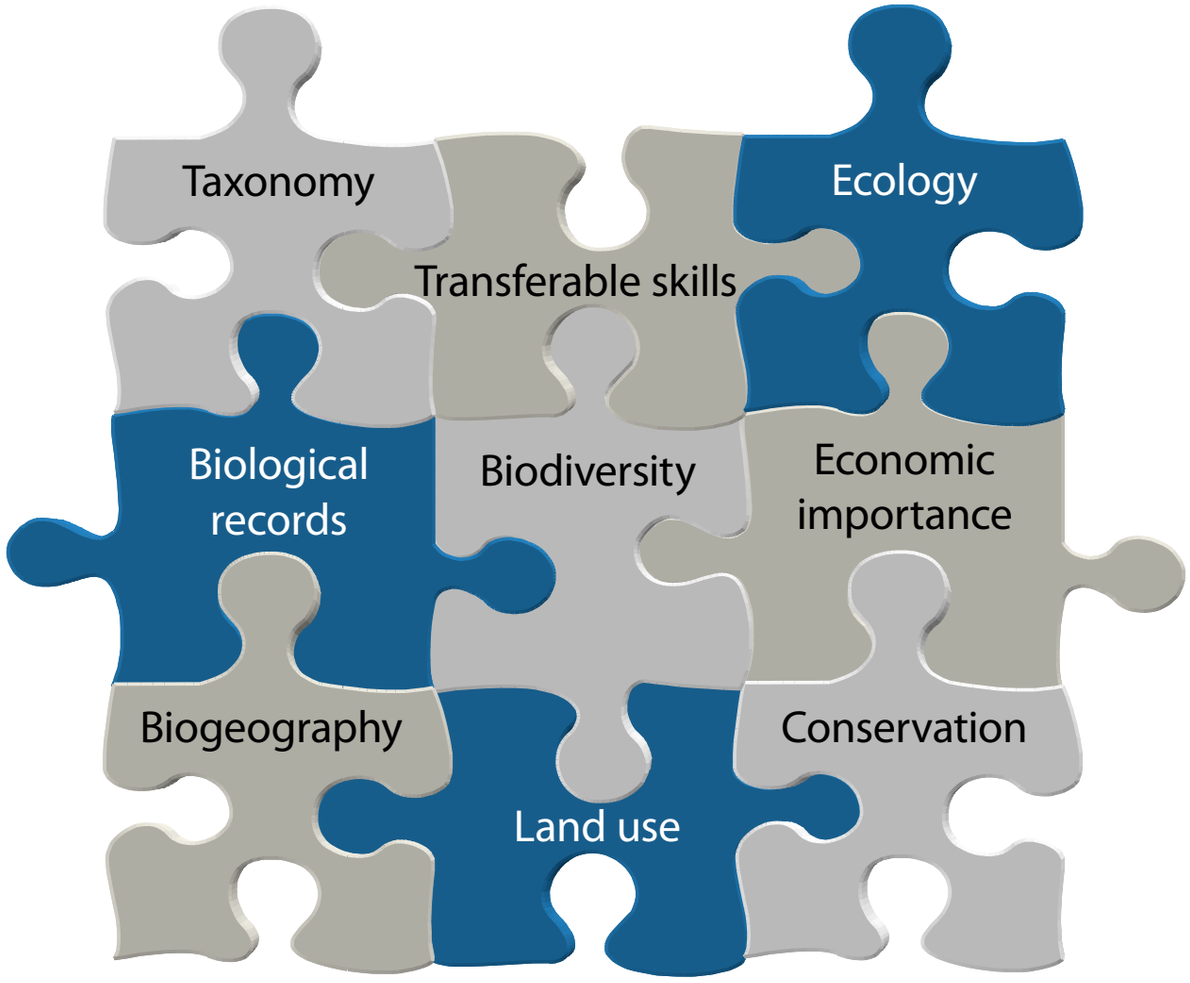


# Why look at Myriapods? (3)

- There is an active recording scheme looking at species distributions of myriapods in Britain. Any recording you can do will feed directly into scientific and conservation studies.

- Conservation considerations for myriapods are relevant to other groups of animals and offer valuable extra data and perspectives in site conservation.

- An understanding of the ecology of soil invertebrates is economically important.



# Pause for thought…

## Why are you interested in learning more about these creatures?

## Do you think it is important to have a better understanding of these animals?

# What is a Myriapod? (1)

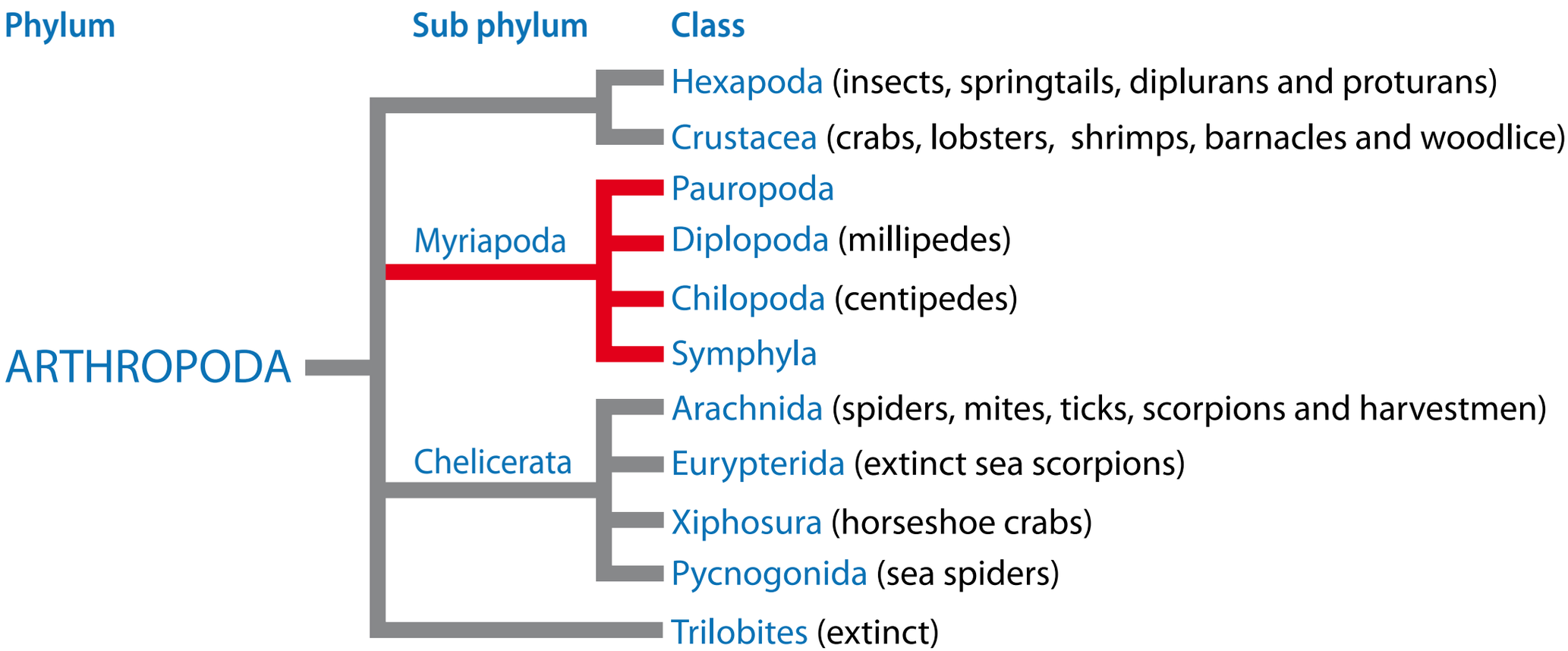
- Myriapods belong to the invertebrate Phylum ARTHROPODA.

- They have calcified exoskeletons, jointed legs and a segmented body. Like insects and other 'uniramian' arthropods, myriapods have appendages (legs and reproductive or feeding structures) with only one branch, or **ramus**.

- However, it is here that any relationship between the various myriapod groups ends. It is generally considered that these common characteristics arose independently along different evolutionary lines (Richards and Davies 1978, Edgecombe & Giribet 2002).

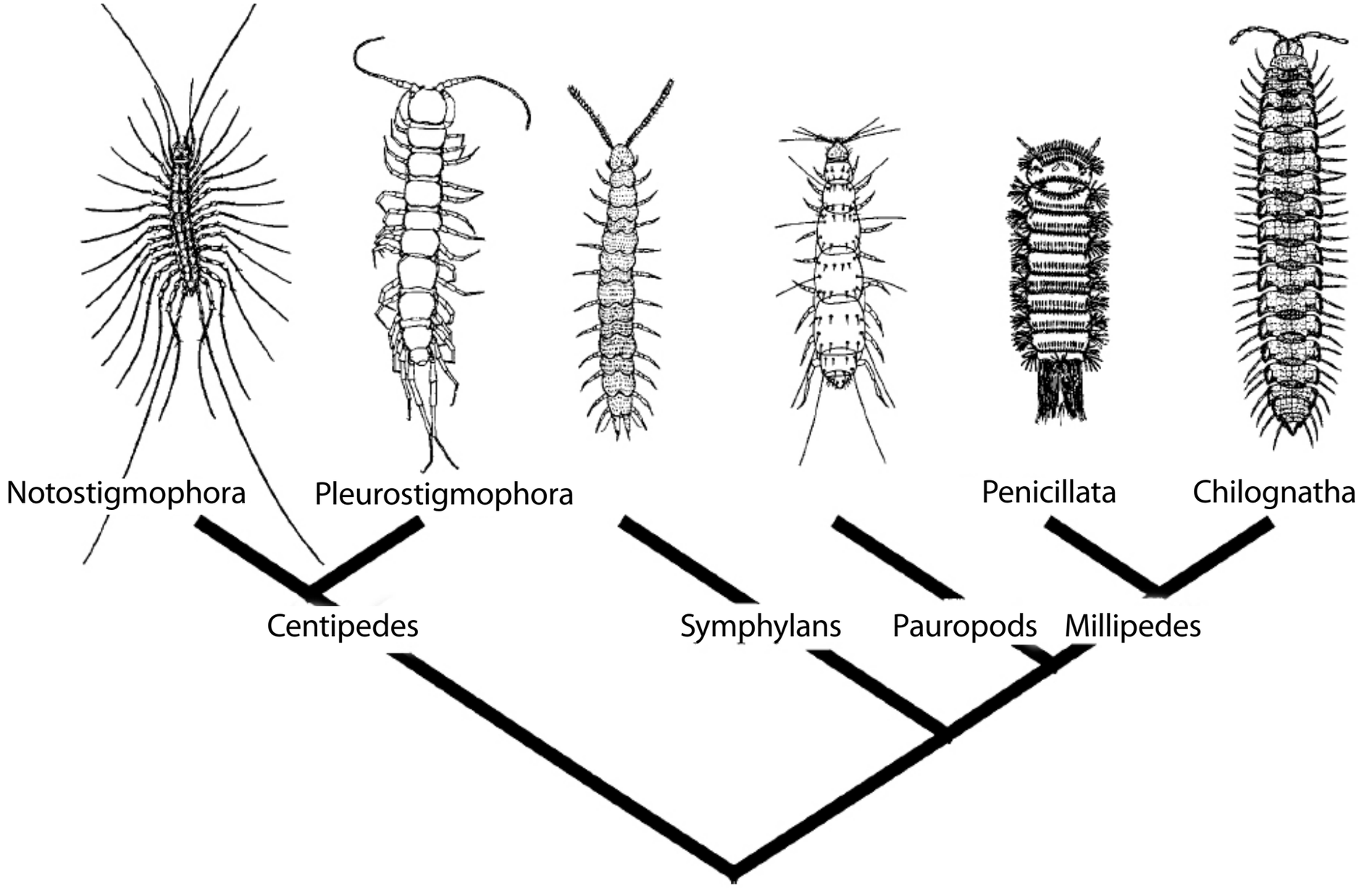
# What is a Myriapod? (2)

The relationship of Myriapods to other Arthropods:



# What is a Myriapod? (3)

Evolutionary relationships between Myriapod groups




From Edgecombe & Giribet (2002)

# What is a Myriapod? (4)

- Millipedes, centipedes, woodlice and some other crustacea were separated as a taxonomic group in their own right originally by Fabricius in 1793. The name MYRIAPODA was coined by Latreille (1810) who later removed the crustaceans from this taxon (Eason 1964).

- The term myriapoda is now usually used as a general term for multi-legged arthropods belonging to the four Classes, Diplopoda, Chilopoda, Symphyla and Pauropoda (the scheme employed here).

# What is a Myriapod? (5)

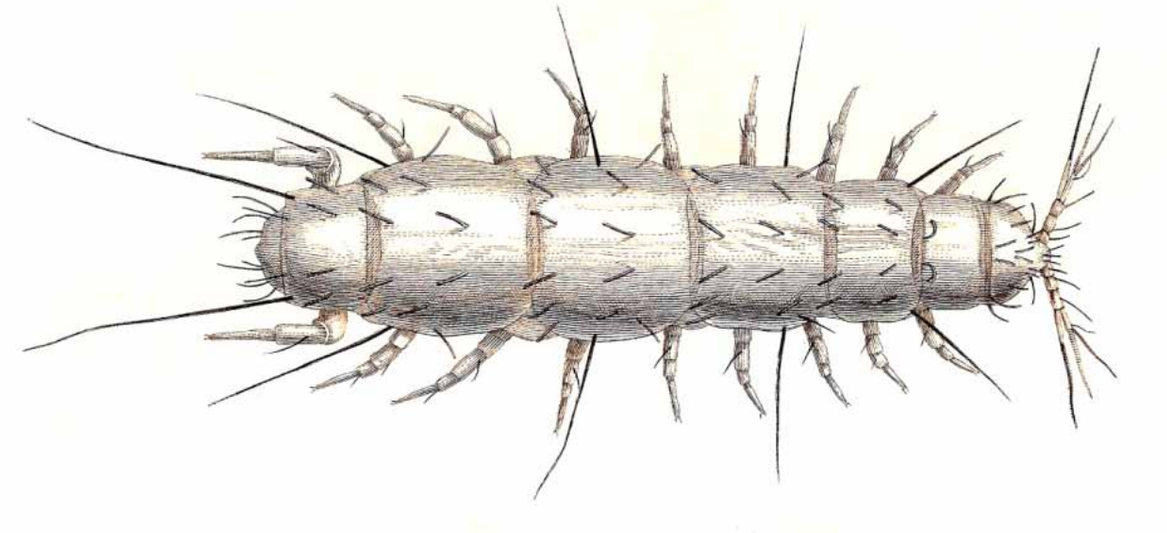
All are entirely terrestrial and breathe by means of tracheae. The body is not divided into thorax and abdomen but consists of numerous leg-bearing segments. The number of legs may be anything between six (in some newly hatched individuals) and 750 (in the millipede *Illacme plenipes*).

# What is a Myriapod? (6)

- The *DIPLOPODA* or millipedes and *CHILOPODA* or centipedes will be discussed in detail shortly.

- The *SYMPHYLA* and *PAUROPODA* are small, rather difficult to identify and very under-recorded. In general appearance they look like pale juvenile centipedes or small springtails. For further information on these neglected Classes see Edwards (1959), Hopkin and Roberts (1988) and Barber, Blower and Scheller (1992).

Symphylan, *Scutigerella immaculata*



Pauropod, *Pauropus huxleyi* (Lubbock 1866)

# Millipedes (1)

- As the name suggests, all ‘DIPLO’ - ‘PODA’ have generally two pairs of legs per body segment. Certain segments may appear to support only one leg pair where the others have become modified into other structures, such as genitalia.

- They have robust mandibles for chewing dead vegetation.

# Millipedes (2)

In Britain there are six Orders within the Class Diplopoda. This makes for a huge variety of forms, within which it is hard to generalise.

*POLYDESMIDA*

*POLYXENIDA*

*POLYZONIIDA*

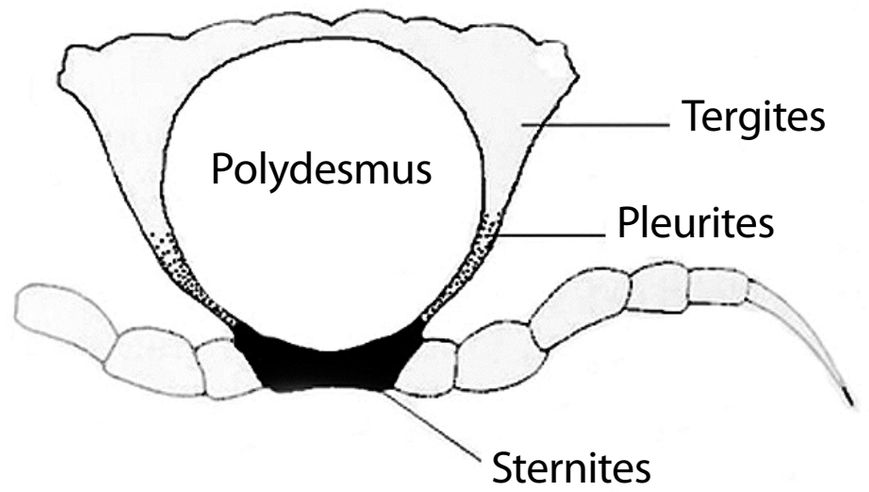
*GLOMERIDA*

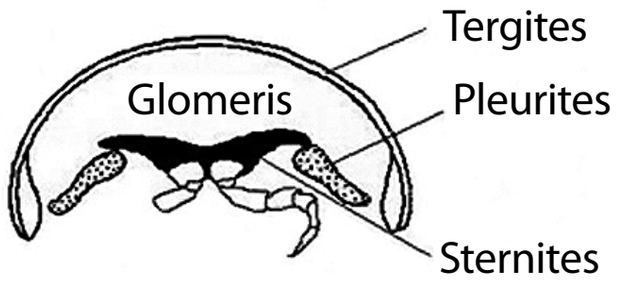
*CHORDEUMATIDA*

*JULIDA*

# Millipedes (3)

- From a taxonomic point of view, millipede families can be arranged according to the degree of fusion there is between the various parts of the exoskeleton.

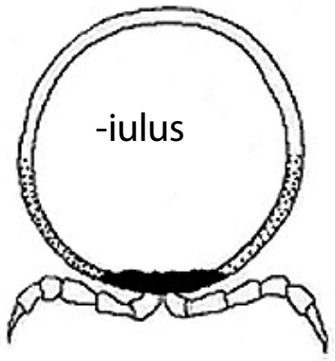


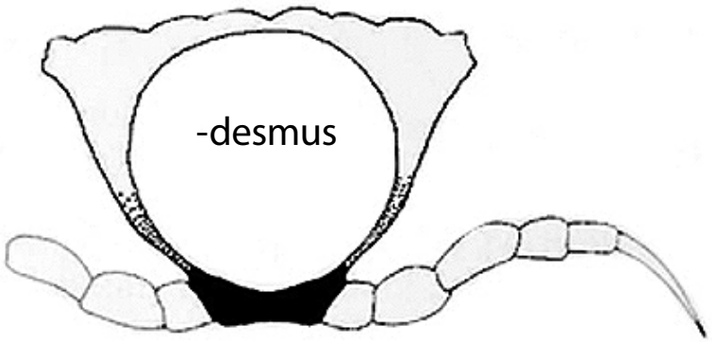



# Millipedes (4)

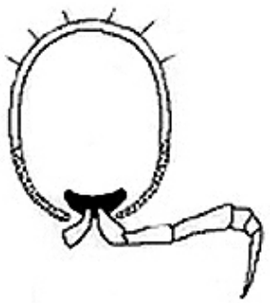
- The STERNITES, PLEURITES and TERGITES are fused to form a single ring in MONOZONIAN families while there is progressively more articulation between these units in the TRIZONIA and PENTAZONIA.

MONOZONIA

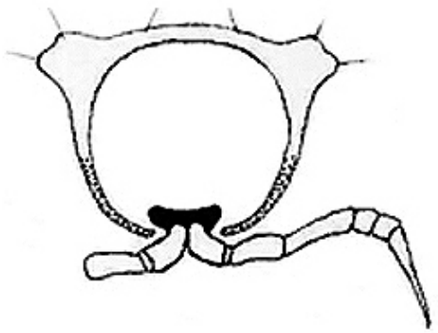



TRIZONIA



Melogona



Nanogona

Brachychaeteuma

PENTAZONIA

Glomeris

Polyzonium

After Blower 1985

# Millipedes (5)

- For simplicity the millipedes are often roughly divided according to shape into ‘bristly, pill, snake and flat-backed’ forms. While other variations between these forms occur, these categories serve as good generalisations.

Bristly

Snake

Pill

Flat-backed

# Millipedes (6)

- The bristly millipede, *Polyxenus lagurus* is uniquely covered in hollow, serrated bristles called TRICHOMES and unlike other millipedes, has a soft exoskeleton.

- "Pill" millipedes are capable of rolling into a tight sub-spherical ball, like an armadillo.

- Snake millipedes have a more or less cylindrical cross-section and may roll into a planar or helical spiral to protect the underside and head.

- The remaining species have lateral projections (or PARANOTA) and a generally flattened dorsal surface giving a flat-backed appearance.

# Millipedes (7)

- All millipedes are primarily designed for pushing. The large number of legs enables them to give greater force to the push. The large first tergite or COLLUM in many species is used as a wedge to deliver the full force of the push between soil particles and leaf litter layers.

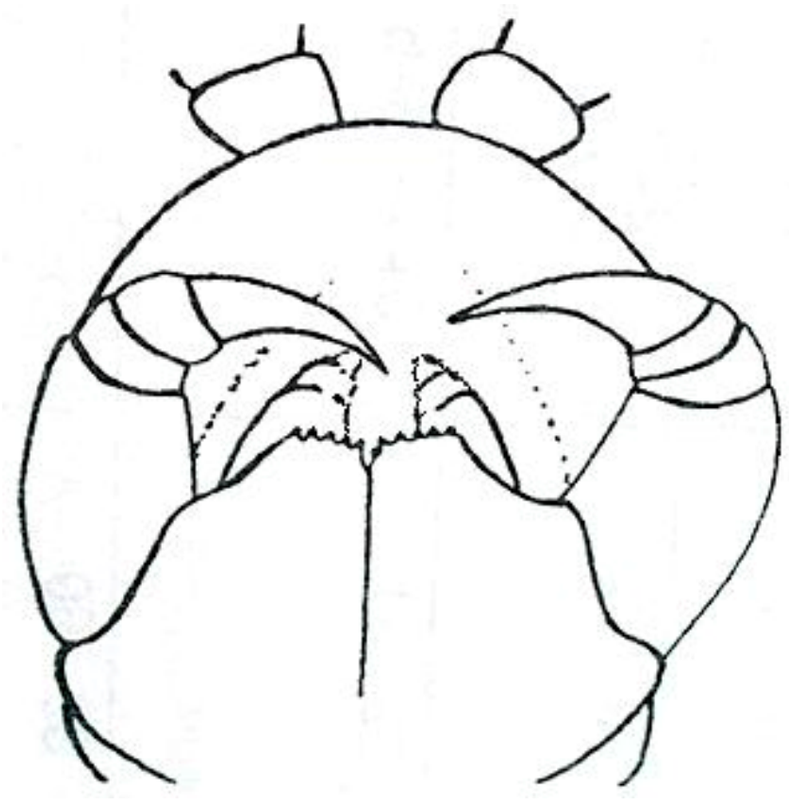
- The whole of the back is used in the same way in the flat-backed species, while the rigid interlocking segments prevent the body from shortening or buckling under stress (Manton 1954).

# Pause for thought...

## Describe four of the simple morphological types of British millipede.

# Centipedes (1)

- The Class CHILOPODA or centipedes are as distinct from the Diplopoda as they are from any insect order. Their carnivorous lifestyle has ensured that any morphological adaptations are quite unlike those of the herbivorous millipedes.



- In millipedes the second pair of jaws are fused to form a lower lip; in centipedes this lip is formed from the base of the modified first pair of limbs (poison claws), hence the name chilopoda = 'lip-leg'.

# Centipedes (2)

- Whereas millipedes have two pairs of legs per body segment, centipedes have only one.

- Further modifications of the head as an offensive weapon with large poison claws with small mandibles clearly indicate the centipedes' carnivorous lifestyle.

# Centipedes (3)

- The morphology of British centipedes is a little less diverse than that of the millipedes, although four distinct Orders are recognised.

- The **SCUTIGEROMORPHA** are highly distinctive long-legged animals. The house centipedes *Scutigera coleoptrata* and *Thereuonema tuberculata* are only rarely found in the British isles, although *Scutigera coleoptrata* is common in the Channel Islands.

# Centipedes (4)

- The **SCOLOPENDROMORPHA** have 21 pairs of legs and include the large poisonous tropical species of *Scolopendra*.

- They are represented in Britain by a single Genus, *Cryptops*.

# Centipedes (5)

- The **LITHOBIOMORPHA** or 'stone centipedes' are stout species with 15 pairs of legs.

# Centipedes (6)

- The thread-like **GEOPHILOMORPHA**, 'earth' or 'wire' centipedes may have over one hundred pairs of legs, but this is very variable between species. No adults in British species have fewer than thirty-five pairs.

- They are generally soil-dwelling predators with extensive articulation between body segments allowing for tremendous flexibility in confined spaces. They are even able to walk backwards guided by the sensitive 'antennae-like' hind legs. This flexibility enables them to chase prey through tiny crevices in soil or rotten wood.

# Centipedes (7)

- The more robust lithobiomorpha are much more rigid to allow for fast running without unwanted sideways flexion. This reflects their much greater surface activity as they hunt at speed for small invertebrates. Their greater body mass to surface area also reduces the risk of desiccation.

- The locomotion in scolopendromorpha not surprisingly falls somewhere between these two styles. They are blind like the geophilids and somewhat flexible, yet able to run at speeds equal to the lithobiids.

# Pause for thought...

## Can you think of three distinctions between millipedes and centipedes?

# Ecology (1)

- It is difficult to generalise between so many different animal orders, but there are some common similarities which aid in finding these animals.

- Myriapods are basically soil dwelling creatures. They vary in the degree of their subterranean habits. Some are almost always found well into the soil layer, though most may be encountered at the soil/leaf litter interface. Several inhabit the sub-cortical zone, under the bark of living or dead wood.

- The common requirement is a food supply and a good degree of humidity. The detritivore millipedes break down dead wood, leaf litter, rotting vegetation and occasionally dead animal matter. The carnivorous centipedes are in search of other small invertebrates, particularly woodlice and springtails.

# Ecology (2)

- Other than the house centipede, most centipedes are reclusive, generally encountered under bark, stones and other debris. The Geophilomorpha are particularly subterranean, while the Lithobiomorpha and Scolopendromorpha are much more surface active.

- Only the larger, more robust millipedes are likely to be encountered on the surface, with some of the large snake-like species (e.g. *Tachypodoiulus niger*) being seen walking across open paths in warm weather.

# Ecology (3)

- Reproduction requires a damp place to lay vulnerable eggs, so many species of millipede exhibit a variation in their distribution within the soil according to the egg-laying period. Of course, seasonal variations in distribution also reflect the dryness of the soil.

- It is difficult to generalise regarding rates of maturity across the whole myriapoda, as some may live short annual lives, while others live for several years, passing through various growth, maturity and post-reproductive stages. There are always mature individuals to be found at any time of year of one species or another.

# Ecology (4)

- The majority of myriapods are tropical in distribution, and diversity declines towards the north, with its lower winter temperatures. Nonetheless there are some species which can be more readily found as adults in the autumn and winter months.

- Geology plays a strong part in distribution patterns. Calcium required for exoskeletons is more readily obtained in lime-rich areas. Equally, the artificially alkaline areas of disturbed human habitation (from brick mortar etc.) produce a wider diversity of species than would otherwise be expected. The limestone component of sand, among other factors also produces a wide range of species in coastal areas.

# Collecting techniques (1)

- The ecological requirements of myriapoda clearly identify the kinds of locations in which to look for them. Damp spots in soil, in leaf litter, under bark and dead wood, in rocky crevices, in moss and in plant roots are the likeliest habitats.

# Collecting techniques (2)

- Turning over embedded, moss-covered pieces of limestone will usually reveal a wealth of interesting species, many of which would escape detection when roaming within the soil. The higher concentration of calcium could be one reason, though the animals are likely to be found there more because their passage was impaired by an immovable object. The higher humidity from condensation on a cold rock in warm soil could also be an attraction and the consequent aggregation of other species may attract the predatory centipedes.

# Collecting techniques (3)

For field collecting you will usually need:

- Tubes of 70% alcohol (labelled externally on the tube)
- Paper and waterproof pen for internal labelling
- Fine storks-bill forceps or paintbrush
- Field note book and pen or dictaphone
- GPS or map for referencing the locality
- Knife, trowel, spatula or other tool for digging or lifting bark
- Hand lens of x10 – x20 for examination of specimens
- Optionally, cling film, collecting dishes or trays, plastic bags for soil sampling, dry pots for live samples, sieves, or pitfall trapping materials
- And don't forget some waterproof clothing!

# Collecting techniques (4)

- Simple lifting and searching are all that is required to find them. The most difficult part of collecting is the actual picking up of the specimen. Some centipedes are incredibly quick and will escape the second a stone is turned. The rapid extension of a wetted finger is probably the only way to catch them. Flimsy, storks-bill forceps or a wetted paint brush are also good ways of picking up small specimens unharmed.

# Collecting techniques (5)

- For serious surveying, more quantitative methods may be required.

- The use of progressively finer sieves is very effective for separating animals from their habitat, as is the sorting of habitat samples in plastic trays (black or white backgrounds show up different species).

# Collecting techniques (6)

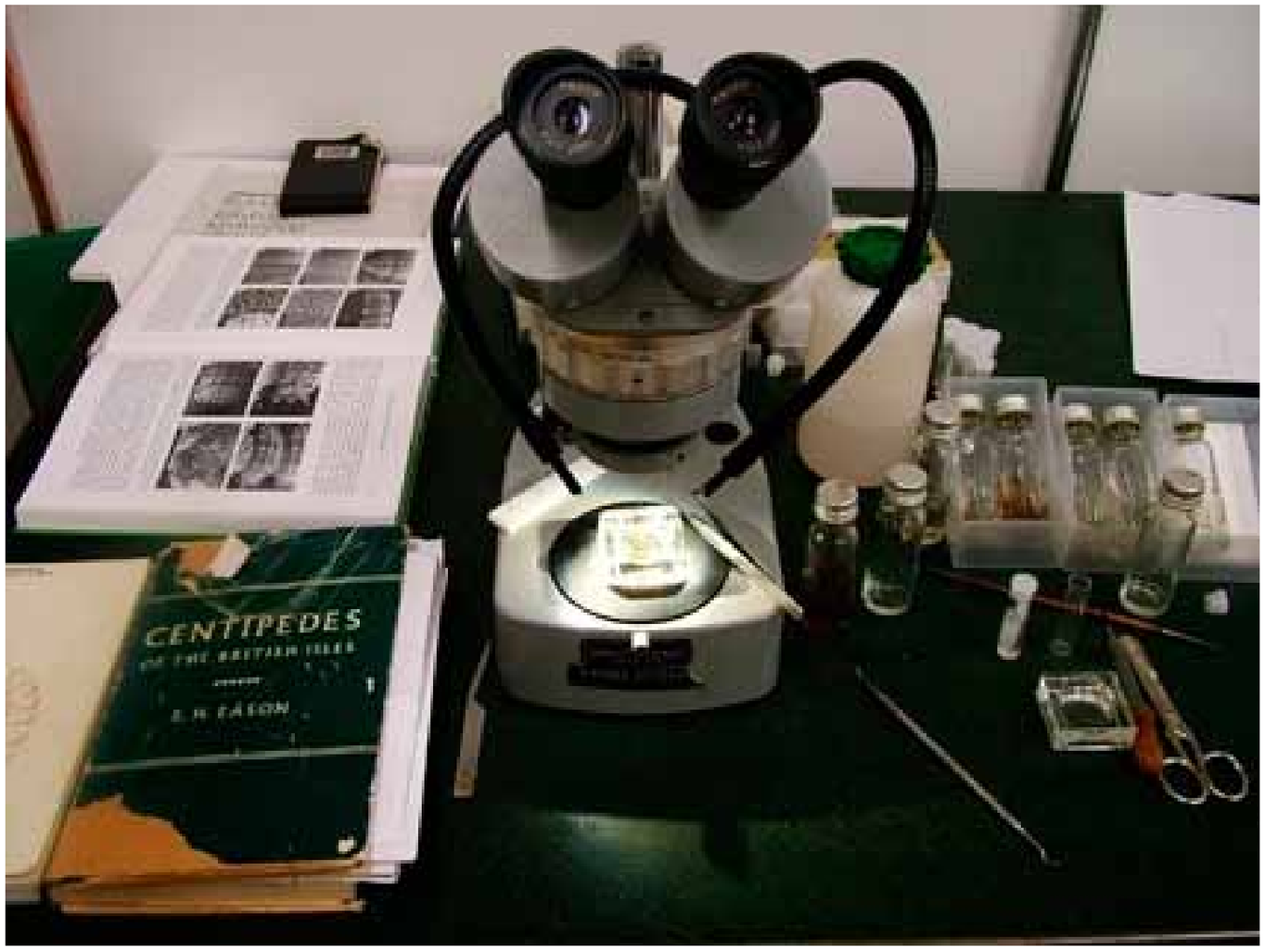
- For smaller, or faster species, traps or funnels can be employed. The simplest form is the pitfall trap, whereby a plastic cup or similar is placed in the ground with the lip flush to the surface. Passing animals fall in to be collected later. If traps are left dry, trapped carnivores are liable to eat everything caught with them. A liquid preservative (such as a propylene glycol based antifreeze) will ensure that all specimens remain intact. Plain water can be used, with a drop of detergent to break the surface tension, but it needs to be emptied daily before specimens decompose. A wire mesh over the trap will prevent any unnecessary vertebrate deaths, but may stop larger invertebrates from falling in.

# Collecting techniques (7)

- Berlese or Tullgren funnels are used for extracting a high proportion of invertebrates from a sample by their natural aversion to light and heat. A lamp is placed over a funnel containing a layer of leaf litter etc. The livestock then works its way into a collecting vessel at the bottom, away from the light source. These can be manufactured easily from funnels or drinks bottles, jars and a desk lamp.

# Collecting – preservation(1)

- Despite the exoskeleton, myriapods are fairly soft-bodied animals and do not preserve well as dried specimens. Since many identification features require microscopic examination or 'clearing' to be certain of a species, many species need to be collected for confirmation. With experience a great many can be identified in the field. Nonetheless, 'voucher' specimens should ideally be retained for future reference when perhaps research has shown that a single species has been found to consist of two closely related but distinct species (e.g. *Geophilus carpophagus/easoni*).




# Collecting – preservation(2)

- Collection and preservation are usually undertaken simultaneously by dropping specimens into 70–80% industrial denatured alcohol/ethanol (sometimes with a drop of glycerine to retain flexibility of the specimen).

- In the field this is usually achieved using small tubes or the sturdy glass 'McCartney' or 'Bijou' bottles, labelled to associate the specimen to its original location data.

# Collecting – preservation(3)

A label must be associated with a specimen and should include:

- The location name (preferably also indicated by a national grid map reference or other GPS locator)
- The date
- The collector
- If different, this should also include the name of the person that may have identified the species
- Any habitat information should also ideally be noted in a field notebook, recording database or on a recording card. This may include microhabitat type, altitude, incline or aspect, geology, temperature, weather, Watsonian vice-county number etc.

# Pause for thought…

## Can you think of five microhabitats, within which you might find myriapods?

## What techniques might you employ to capture specimens at these sites?

# Recording (1)

- There has been active recording of millipedes and centipedes nationally since the early 1970s. The British Myriapod and Isopod Group (BMIG) produce regular newsletters and a journal ('*Bulletin of the British Myriapod Group*') devoted to furthering knowledge and interest in these animals.

# Recording (2)

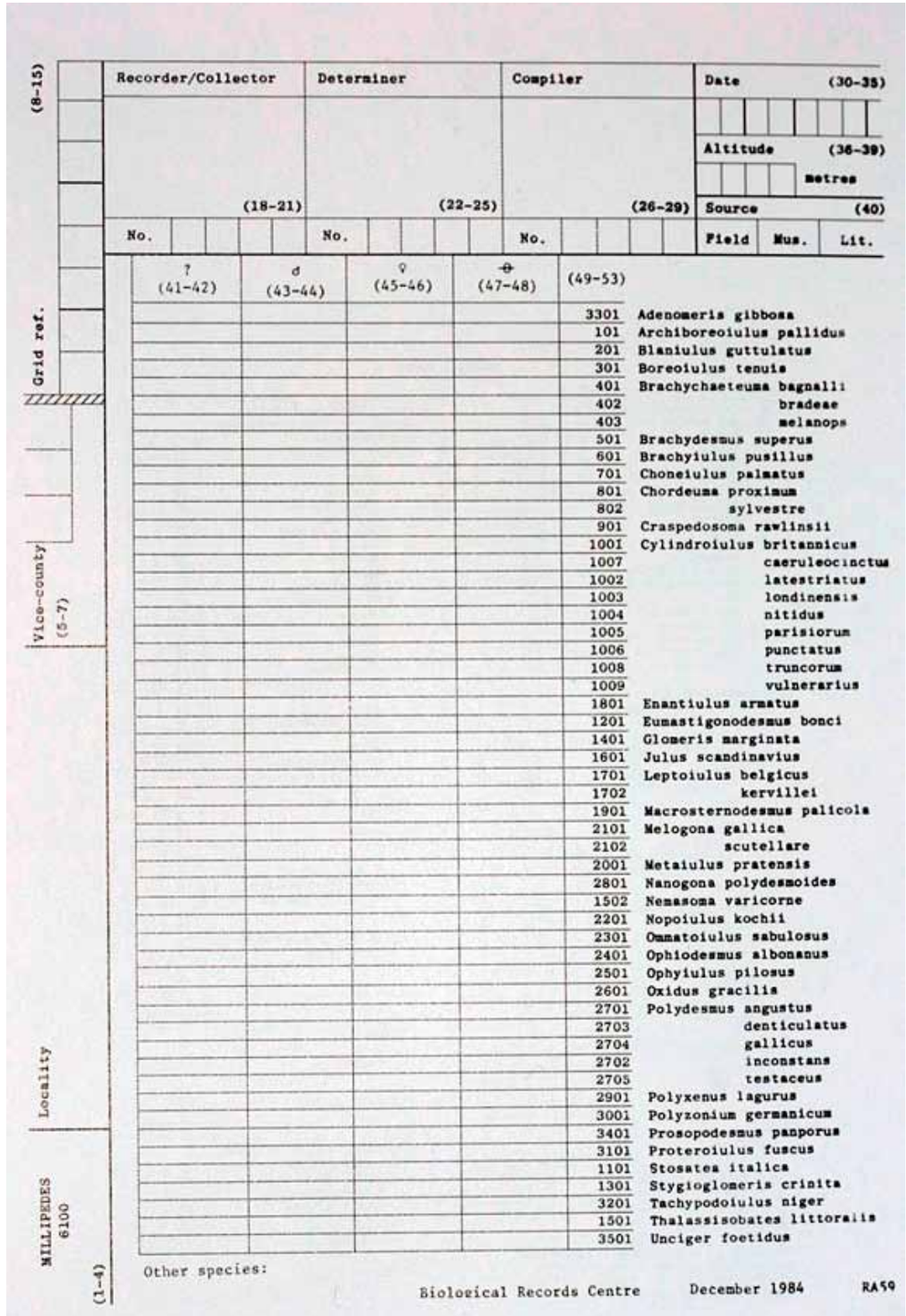
- Through the Biological Records Centre at the Institute of Terrestrial Ecology, Wallingford, Oxford, provisional atlases have been produced giving species distribution maps for the British Isles. Standard recording cards have been used to gather both site and habitat data for species. This has allowed statistical analysis informing both the ecology and distribution parameters for the British species. (British Myriapod Group, 1988; Barber and Keay, 1988; Lee, 2009).

# Recording (3)

The minimum information required for each record is similar to that on a specimen label:

- Name of species (plus sex or age if known)
- Where found (including a grid reference if possible)
- Date found
- Name of collector (and name of determiner/identifier if different).

- Additional data, such as type of habitat/microhabitat, altitude, type of soil, abundance, behaviour etc., is always useful.



# Recording (4)

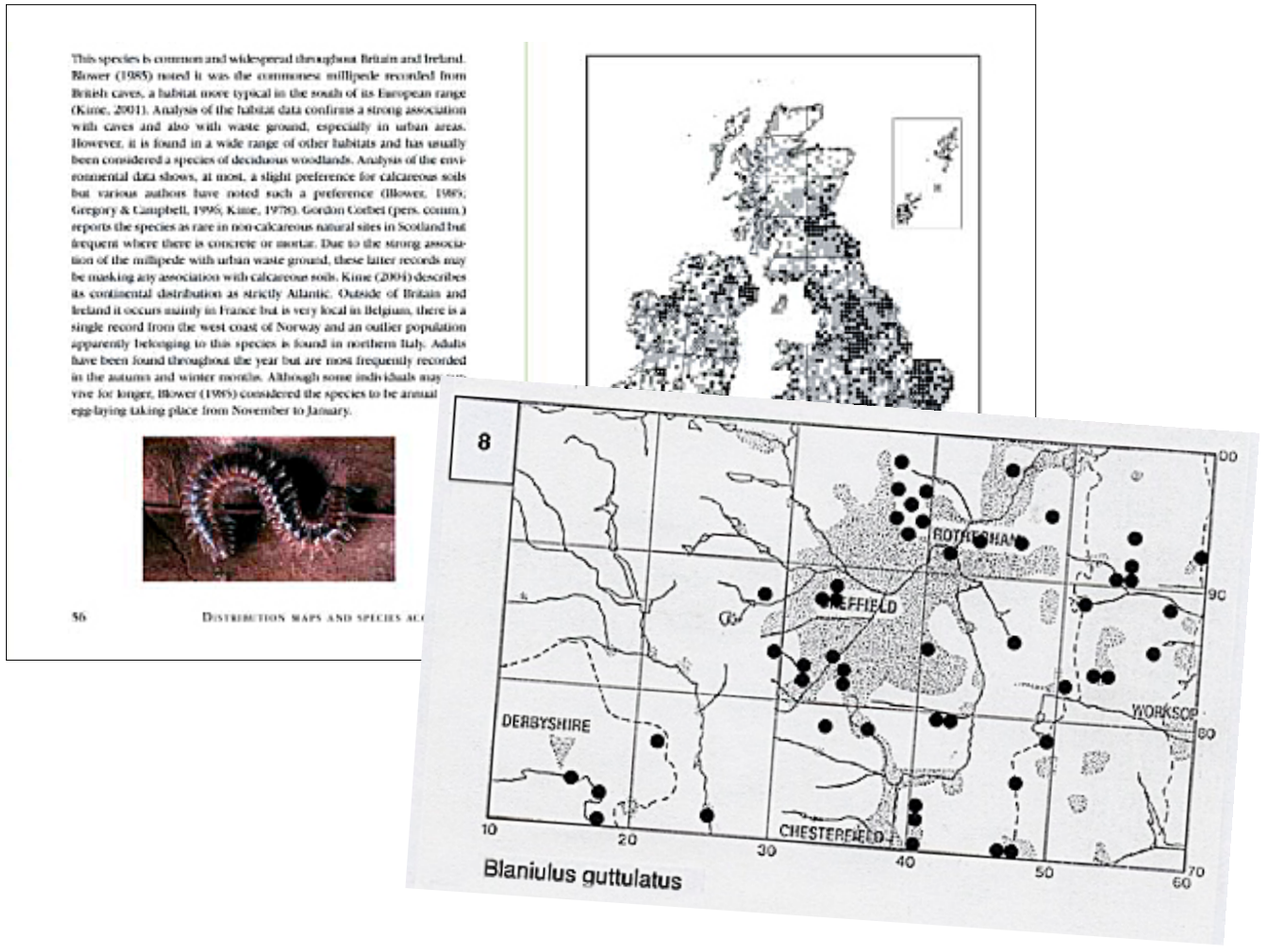
- Records of millipedes and centipedes should initially be sent to your local biological records centre or local recorder for that group (who will also be able to offer help with identifications).

- Records are then forwarded to the appropriate national schemes. (Please check that this will happen).

For record cards contact:

**Biological Records Centre**
**Centre for Ecology & Hydrology**
**MacLean Building**
**Crowmarsh Gifford**
**Wallingford**
**Oxfordshire OX10 8BB**

**www.ceh.ac.uk**



# Centipede natural history (1)

- The remainder of this introduction focuses on the centipedes.

- For identification guidance on British millipedes, see the next publication in this series, '*An Introduction to Millipedes*'

# Centipede natural history (2)

- Centipede reproduction is only partially understood.
- All the reproductive organs are situated at the hindmost end of the body.
- Males are generally thought to place a capsule of sperm on a web of silk from which the female retrieves it with her gonopods (modified limbs).
- This may take place throughout the spring, summer or autumn but the sperm may be held by the female over winter before fertilising her eggs the following spring (Eason 1964).

# Centipede natural history (3)

- Both the geophilomorphs and scolopendromorphs lay their eggs in an excavated ‘brood cavity’ and the mother tends them until the young are able to fend for themselves.
- She remains coiled round her offspring for several weeks as they hatch and mature, protecting them from fungal attack and desiccation.
- In these groups, the full adult complement of limbs is present at birth.
- Other useful identification characters are also present, but the number of glandular pores on the coxae of the last legs increases as the animal grows, so can be misleading in immature specimens.
- Maturity comes after around three years and an individual may die subsequent to breeding. Others may survive reproduction and continue to live for a year or more.

# Centipede natural history (4)

- The Lithobiomorphs, in contrast, lay and abandon eggs singly.
- The egg's only protection is a coating placed on it by the parent, to which soil particles adhere forming a disguise.
- On hatching there are four larval stages which last for several weeks, during which time it posesses fewer than the adult complement of legs.

*Lithobius melanops* cleaning 15th pair of legs

# Centipede natural history (5)

- Once the full 15 pairs of legs have been achieved there are a further four or more stages to pass through before maturity is reached.
- This may take two years or more, during which time other characters such as the number of ocelli (eyes) or antennal segments are still reduced.
- When finally mature two further moults may occur, allowing the centipede to live for another three years or more.
- After each moult the centipede will often look quite violet for a few hours.

# Centipede natural history (6)

- Centipedes are efficient predators. They will feed on a variety of small invertebrates such as springtails, earthworms, woodlice, spiders, flies and molluscs. The larger tropical *Scolopendra* species also feed on vertebrates such as frogs, lizards, birds and mice.

- Some studies show plant material in centipede guts, which may be eaten when live animal food is scarce.

- They can run quickly or chase through confined spaces, but there is some evidence that some species may simply wait until prey encounters them (Lewis 1981).

# Centipede natural history (7)

- The poison claws enable centipedes to quickly subdue their prey once caught. Small invertebrates may die immediately, and even vertebrates bitten by large scolopendrids will die within minutes.

- Bücherl (1971) suggested that scolopendrids often catch their prey with their hind-most legs before bringing the head round to bite with the poison claws.

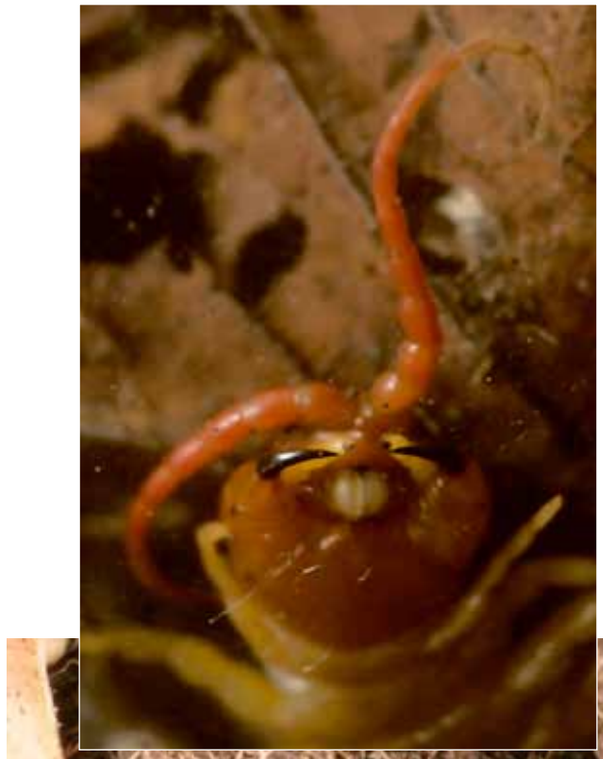
# Centipede natural history (8)

- The poison of centipedes is only of concern to humans where the species in question has poison claws large enough to puncture skin.

- The largest species of (non-British) *Scolopendra* can inflict a very painful bite. This may produce symptoms similar to a wasp sting, with additional inflammation, numbness, chest or head pains, vomiting and even blistering of the skin.

- The severity and period of recovery seem to vary depending on the species involved, how recently it has eaten and the time of year (Lewis, 1981). The tropical *Scolopendra subspinipes* seems to inflict one of the more unpleasant bites.

- There are very few reliable reports of centipede bites actually killing people.



# Centipede natural history (9)

- Despite their predatory lifestyle, centipedes are themselves subject to wide predation, especially in their younger and more vulnerable stages.

- Carabid beetles, snakes, salamanders, lizards, wild cats, meerkats, pygmy and common shrews, moles, domestic poultry and other larger centipedes are all reported to feed on centipedes.

- Large scolopendrids in Australia are often taken by foxes. Some West African ants prey exclusively on geophilids. Other ants are likely to scavenge on dead or incapacitated centipedes.

# Centipede identification (1)

- Immature Lithobids can prove difficult to identify because of the development of key diagnostic features as they grow.

- The Geophilids have more adult characters when young, but their small size may hinder identification.

- These key features are described in the following section. Many can be observed with a 10x hand lens, but some require close examination under a microscope.

- To hold live specimens still for examination, cling film or a melamine wallet can be used to restrict their movements. Preserved specimens are best examined immersed in alcohol or held in place between two microscope slides.

- If characters (such as coxal pores) are difficult to see, it may be necessary to treat them with a clearing agent (such as clove oil).

# Centipede identification (2)

The following guide offers a summary of the main characteristics to look for when identifying centipedes. See the image gallery for more detail.

The first thing to note is the number of leg pairs:

- Scutigeromorpha all have 15 pairs
- Lithobiomorpha all have 15 pairs
- Scolopendromorpha all have 21 pairs
- Geophilomorpha have 35 to 101 pairs




# Centipede identification (3)

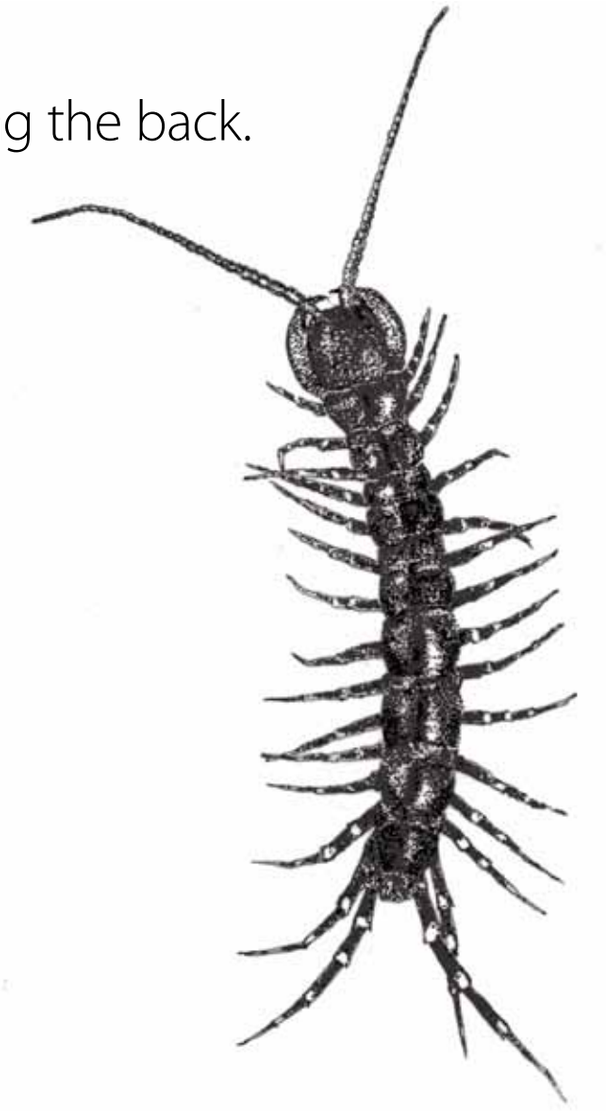
**Scutigeromorpha**

- Fifteen pairs of legs
- Seven ‘shield-like’ plates (TERGITES) along the back, covering the almost cylindrical body segments
- Very long legs (which readily detach and are regrown)

# Centipede identification (4)

**Lithobiomorpha**

- Fifteen pairs of legs
- Fifteen plates (TERGITES) covering the body segments along the back.



# Centipede identification (5)

**Lithobiomorpha**

- *Lithobius* species have a variable number of antennal segments, somewhere between 19 and 54. This number can vary, but there are a few species with a consistent number. (e.g. 20 in *Lithobius crassipes*).

- The closely related *Lamyctes emarginatus* has a consistent 25 antennal segments.

- Young *Lithobius* add segments to their antennae, ocelli to the eyes and teeth to the forcipular coxosternite as they grow, so can give misleading characteristics if not fully adult (see below).

# Identification characters (1)

**Lithobiomorpha**

- The eyes of centipedes are composed of small individual OCELLI.
- The number of ocelli varies between species, from one (in Lamyctes) to 40.
- The arrangement of the ocelli can also be indicative. Often there may be one or two larger ocelli at one end of the group, with smaller ones arranged in rows of varying numbers or other patterns (e.g. in *Lithobius curtipes* the smaller ocelli form a 'rosette-like' pattern).
- The number of ocelli increases as the animal matures, so caution needs to be exercised with young individuals. Descriptions will refer to the normal range of ocelli in adult specimens.

L. melanops

L. microps

L. variegatus

# Identification characters (2)

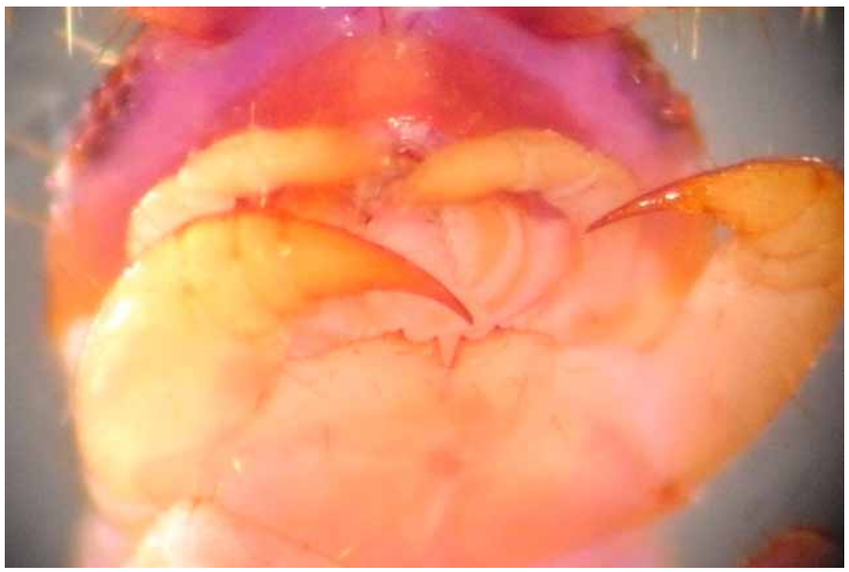
**Lithobiomorpha**

- The poison claws of centipedes are situated at the end of a modified limb which is referred to as the FORCIPULE. At the base where these limbs join, are the plates known as FORCIPULAR COXOSTERNITES.

- At the front edge of the forcipular coxosternites there are prominent teeth, often referred to as FORCIPULAR TEETH. There may be two to seven of these teeth on each side.

- The number on each side may differ slightly. Therefore the formula 2+2 or 4+5, etc. is used to describe the arrangement in each species. In keys a range may be given such as 3–5 where there is some variation.

- The area to the side of the teeth may drop away or form a wide ‘shoulder’, depending on species.



# Identification characters (3)

**Lithobiomorpha**

- Along the back there are alternate short and long tergites, with the exception of tergites seven and eight, which are both large.

- The back corner of tergites 7, 9, 11, or 13 may be rounded or extended as pointed projections.

- The presence or absence of these projections is a helpful character, but it can sometimes be difficult to distinguish a right-angled corner from a projection.

# Identification characters (4)

**Lithobiomorpha**

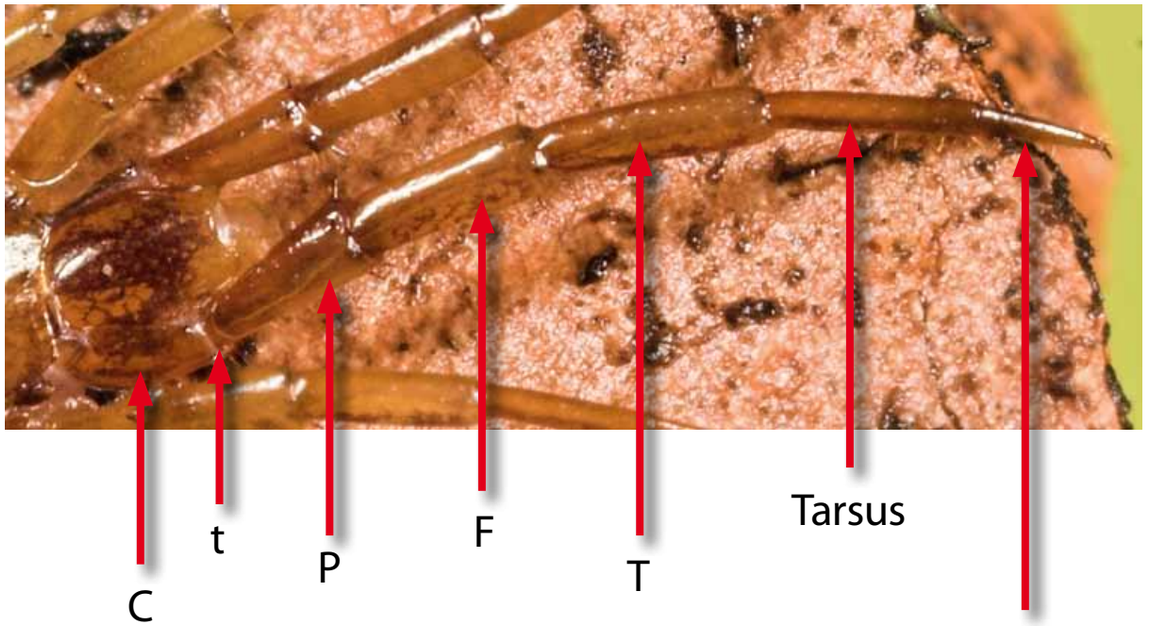
- The antennae are made up of a series of smaller antennal segments or ANTENNAL ARTICLES.
- The number of these is a useful diagnostic feature, but will vary with age.

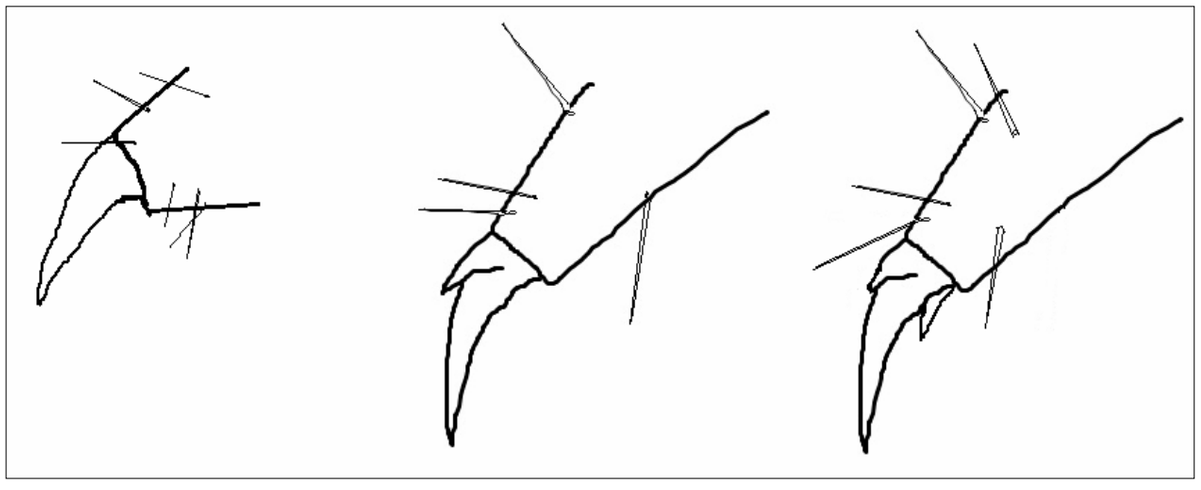
# Identification characters (5)

## Lithobiomorpha

- Each leg arises from an articulation point on the body segment, called a COXA (C). The leg then comprises six articles: the TROCANTER (t), PREFEMUR (P), FEMUR (F), TIBIA (T), TARSUS and METATARSUS.

- The claw at the end of the leg, may also have one or two further smaller claws alongside. These single, double or triple claws can offer useful identification clues.



# Identification characters (6)

**Lithobiomorpha**

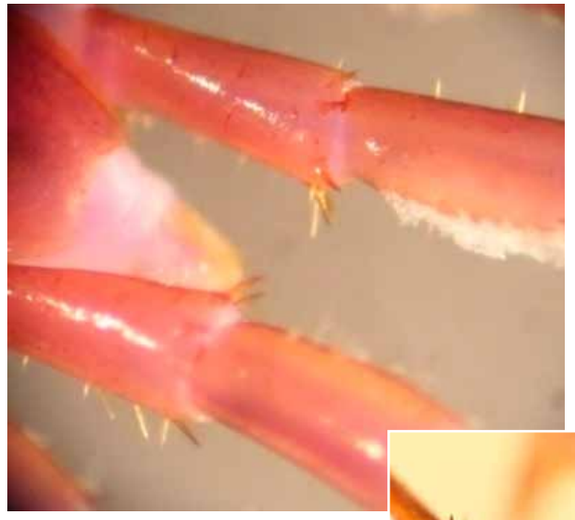
- All *Lithobius* species (not *Lamyctes*) have a series of spines on the leg joints which are helpful for identification. These are mapped in detail in Eason (1964).

- Descriptions of the spinulation is beyond the scope of this publication, but it is helpful to recognise the kind of terminology that is used.

- One of the most useful spines to note is the so called '15VaC', which occurs on the 15th leg, ventrally (below), anteriorly (to the front) on the Coxa of some of the larger species.

- The terms anterior (to the front) or posterior (to the rear) refer to the position if the leg is held out sideways. For example, on the rear facing 15th legs, posterior spines are facing inwards, towards the other 15th leg.

- Species in the genus *Lamyctes* have no spines on the legs.



# Identification characters (7)

**Geophilomorpha**

- British Geophilids have 35 to 101 pairs of legs. They always have an odd number of pairs.
- The number of legs is a key character which does not change through the life of the animal.
- Females tend to have more legs than males.

# Identification characters (8)

**Geophilomorpha**

- The last leg pair may or may not have a small claw.

- In some species this is replaced by a small peg-like article, which, when using a key, is considered as being without a claw.

*S. maritima*

*G. flavus*

*G. insculptus*

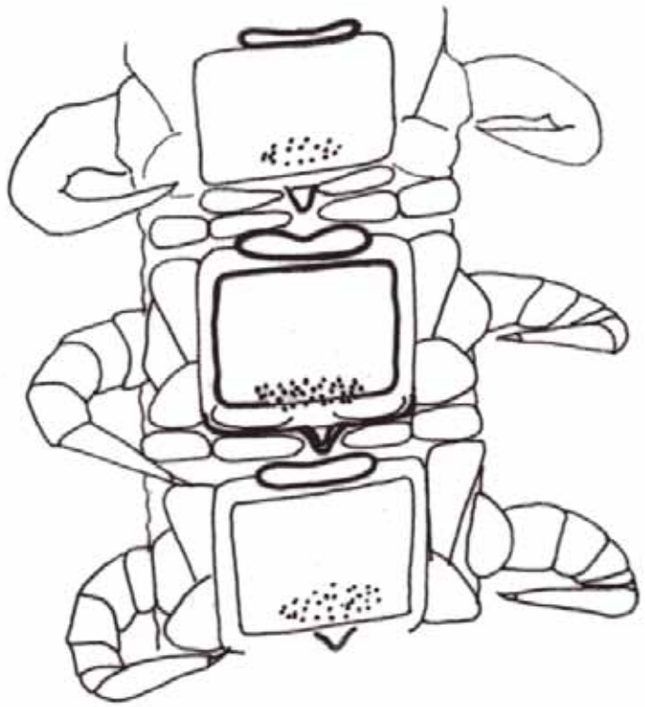
*S. nemorensis*

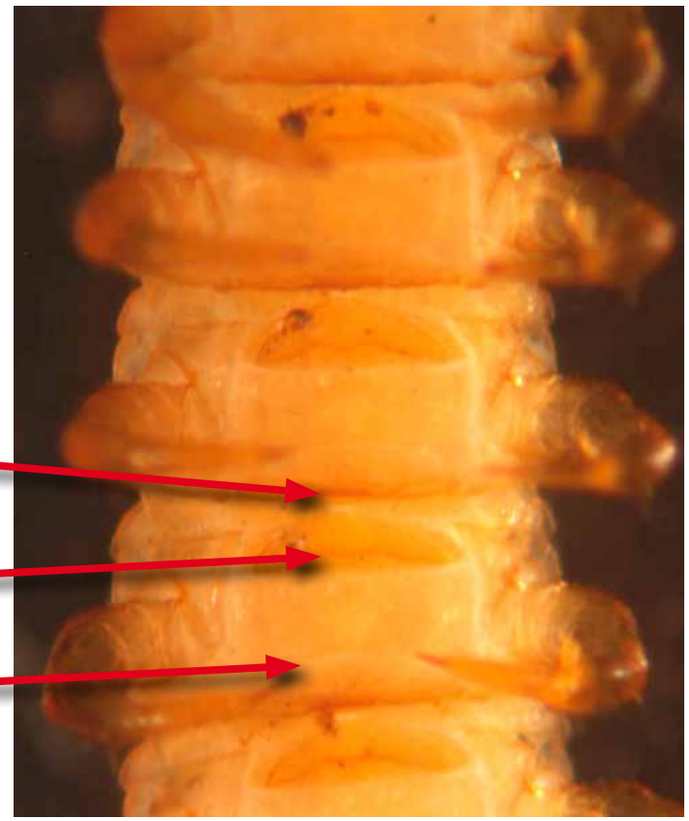
# Identification characters (9)

## Geophilomorpha

- On the underside of segments towards the front of the body (most noticeably segments 9 to 12) some species show CARPOPHAGUS STRUCTURES. Most easily seen in 'cleared' specimens.

- These appear as a combination of a pit along the front edge of the segment and a small peg at the rear of the preceding segment. Combined with a distinctive triangular or diamond-shaped patch of pores in front of the peg, the whole pattern of the structure is quite diagnostic of the species.





# Identification characters (10)

**Geophilomorpha**

- The coxae of the last legs support a variable number of pores above (dorsally) or more often below (ventrally).

- They are quite diagnostic but can be difficult to see without 'clearing' the specimen or squeezing it slightly between glass microscope slides.

- COXAL PORES may be reduced or absent in young individuals, so numbers of pores refer to those found in adult specimens.

*Strigamia acuminata*

*Geophilus insculptus*

*Stigmatogaster subterraneus* (dorsal)

# Identification characters (11)

**Scolopendromorpha**

- All British scolopendromorphs are eyeless.
- For the three species of Cryptops found outdoors in Britain adult size alone is a useful indication of identity (see species gallery).

*C. parisi*

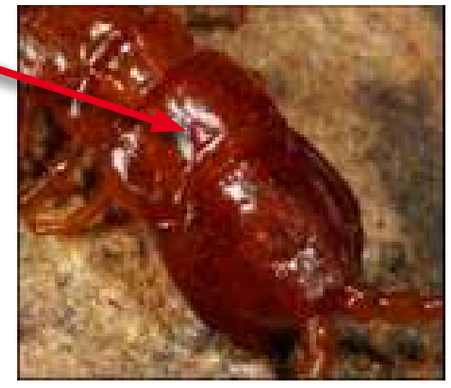
*C. hortensis*

*C. anomalans*

# Identification characters (12)

**Scolopendromorpha**

- Cryptops species vary in the extent of the fine SUTURES, or lightly engraved lines on the head.
- The sutures run from the base of the antennae towards the centre of the rear edge of the head. These may be complete or only show a trace at the front or rear.
- In one species (*C. anomalans*) there is also an X-shaped suture on the first body segment (best seen in dry specimens).



*C. anomalans*

*C. hortensis*

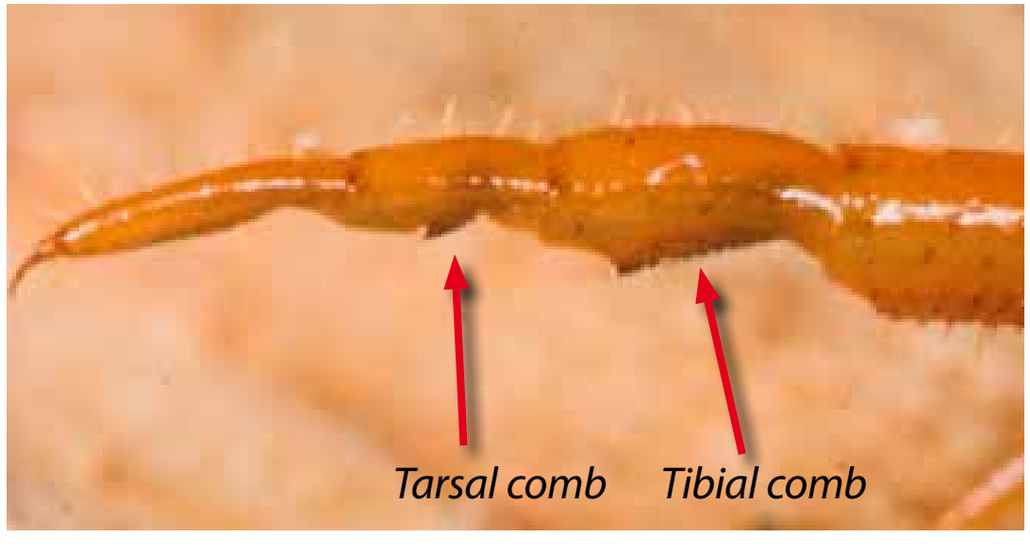
*C. parisi*

# Identification characters (13)

**Scolopendromorpha**

- The last pair of legs are larger than the preceding ones.
- The underside of the tibia and tarsus have small teeth which form 'combs'.
- The number of teeth and how they are spaced out offer a useful identification feature.
- These last legs are readily shed by a captured specimen and often the only thing to be retained from an escaping individual. They should be kept, even if the rest has escaped, as they provide an important means of identification.

*C. hortensis*




*C. parisi*

# Species gallery of some British centipedes

The following pages present images of a selection of the commonest or more distinctive species known from Britain, with notes on some of their key identification features.

There are more than twice this many species to be found in Britain so this can only offer a rough guide to identification.

Use the gallery to familiarise yourself with the general appearance of these species and as illustrations alongside a more complete identification key, such as Barber (2009).

# Species gallery (1)

## *Stigmatogaster subterranea*

Very long (up to 70mm) • 77–83 pairs of legs • No carpophagus structure • Coxae of last legs with a great many pores on both dorsal and ventral surfaces • No claw on last leg • Orange-yellow in colour

# Species gallery (2)

## *Schendyla nemorensis*

Small (up to 20mm) • 37–43 pairs of legs • No carpophagus structure • Coxae of last legs with two pores ventrally • Has no claw on last legs, which are slightly swollen • Virtually colourless to pale yellow

# Species gallery (3)

## *Henia vesuviana*

Very long (50mm, but up to 95mm abroad) • 63–75 pairs of legs • No carpophagus structure • Coxae of last legs swollen, with a single indistinct pore and a 'pit' • Usually no claw on last leg • A robust animal • Green-grey with more orange ends and a pale stripe along the back

# Species gallery (4)

## *Strigamia acuminata*

Long (up to 30mm) • 37–41 pairs of legs • No carpophagus structure • Coxae of last legs with 10–15 pores underneath • Has a claw on last leg • Red-brown in colour with stout body tapering slightly towards the head • Has an additional very prominent tooth at the base of the poison claw

# Species gallery (5)

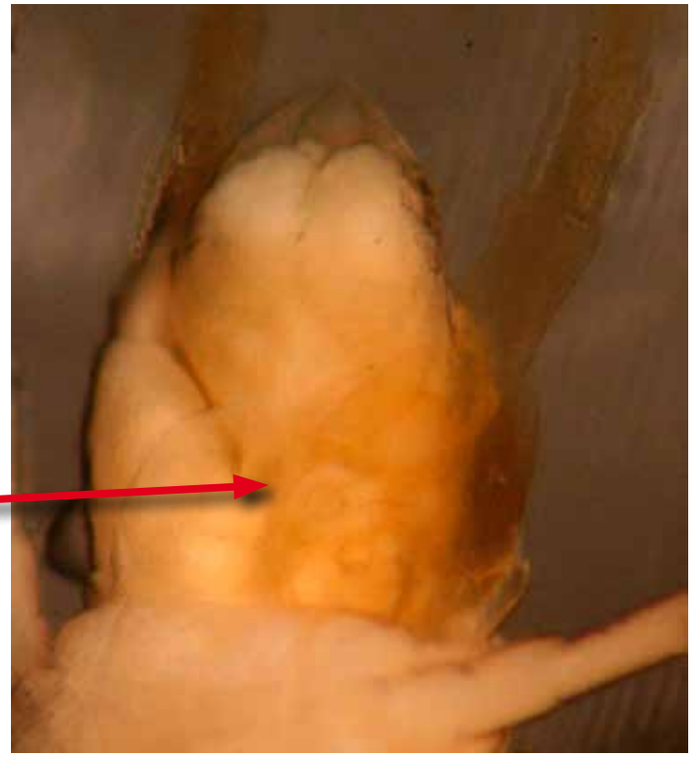
## *Strigamia maritima*

Long (up to 40mm) • 47–51 pairs of legs • Only found on seashores and estuaries • No carpophagus structure • Red in colour • More slender than other *Strigamia* species • Coxae of last legs with 10–15 pores • Has an additional tooth at the base of the poison claw • Has a claw on last leg

# Species gallery (6)

## *Geophilus carpophagus*

Very long (up to 60mm) • 51–57 pairs of legs • Head brown, body green-grey, sometimes purple • Coxae of the last legs with 4–8 pores barely visible ventrally. (This specimen has been 'cleared' to show the hidden pores) • Has a distinct carpophagus structure • Has a claw on last leg • Associated with buildings or coastal areas • Climbs trees



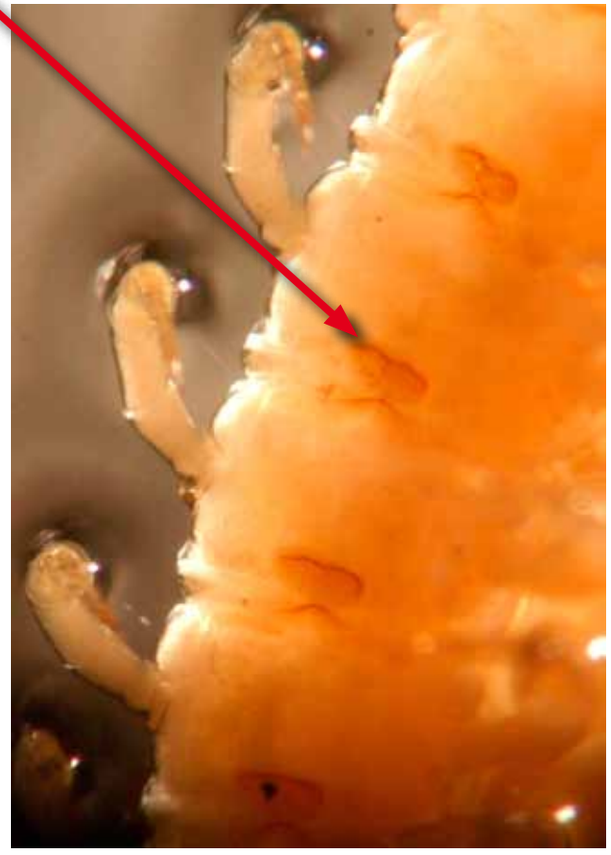




Image courtesy S.J.Gregory

# Species gallery (7)

## *Geophilus easoni*

Long (up to 40mm) • 47–51 pairs of legs • All over chestnut brown colour • Has a distinct carpophagus structure • Coxae of the last legs with 6–12 pores clearly visible ventrally • Has a claw on last leg • Commonest on heathland • Rarely in gardens

# Species gallery (8)

## *Geophilus flavus*

Long (up to 45mm) • 49–57 legs • Has no carpophagus structure • Coxae of last legs with 6–10 pores • Has a claw on last leg • Bright yellow with much darker red-brown head • Has noticeably long antennae with elongate articles

# Species gallery (9)

## *Geophilus insculptus*

Long (up to 40mm) • 45–53 pairs of legs • Has a distinctive carpophagus structure • Has a claw on last leg • Pale yellow in colour, with a darker head • Coxae of last legs with 4–7 pores ventrally, with an isolated extra pore towards the end of the coxa (also in *G. electricus*)

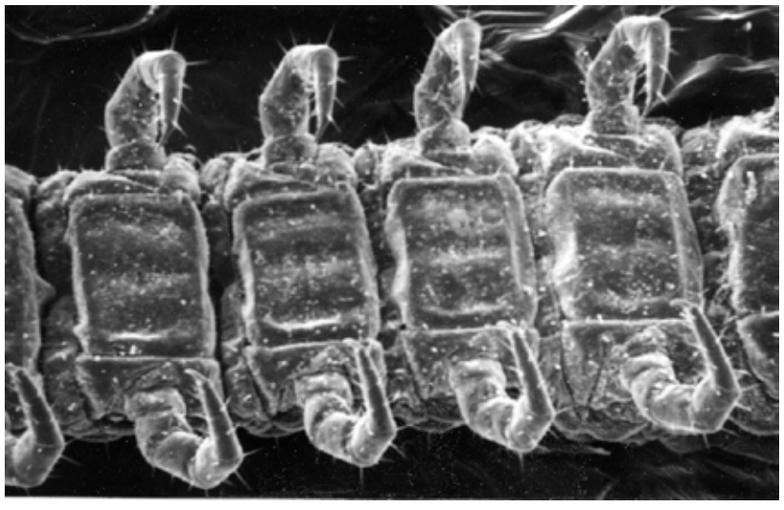

*Stigmatogaster subterraneus* (L) and *Geophilus insculptus* (R)

*Carpophagus structure*

# Species gallery (10)

## *Geophilus truncorum*

Small (up to 14mm, rarely 20mm) • 37–41 pairs of legs • Has a carpophagus structure • Front segments have three depressions ventrally • Coxae of last legs with two pores ventrally • Has a claw on last leg • Pale yellow with slightly darker head



*Three ventral depressions*

# Species gallery (11)

## *Cryptops anomalans*

21 pairs of legs • Very large (up to 50mm) • Suture is continuous from front to back of the head. A further X-shaped suture is present on the first tergite • Comb on last leg has 7–10 teeth on the tibia and 3–5 raised teeth on the tarsus

# Species gallery (12)

## *Cryptops hortensis*

21 pairs of legs • Small (less than 30mm) • Short head-suture at front • Comb on last leg has 5–8 teeth on tibia and 2–4 on tarsus. The prefemur has a groove along its length ventrally

# Species gallery (13)

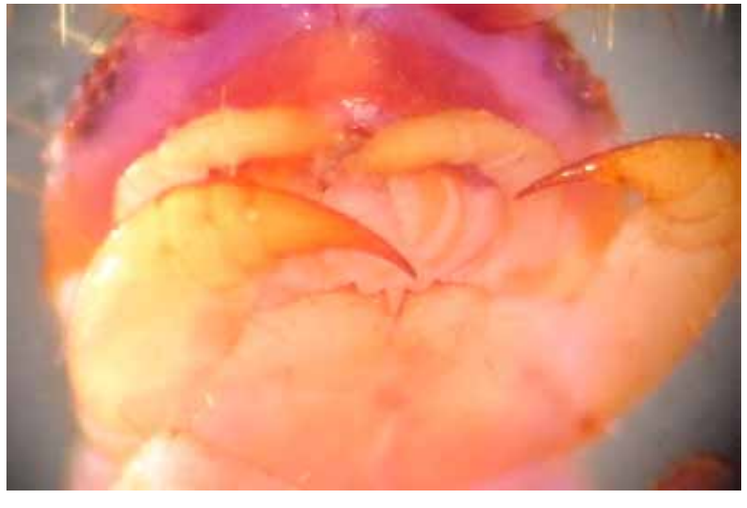
## *Cryptops parisi*

21 pairs of legs • Large (more than 30mm) • Suture at both front and back of head • Comb on last leg has 6–14 closely grouped teeth on the tibia and 4–9 tightly grouped teeth on the tarsus

# Species gallery (14)

## *Lithobius borealis*

Small (up to 12mm) • 28–34 Antennal articles • Eyes of up to 12 ocelli • Two Forcipular teeth on each side • Projections on tergite 11 and 13 (occasionally nine) • Two claws on 15th leg • Has a characteristic extra spine on the inside of the last legs [between the 15VpP and the 15DpP: 15th leg, Ventral (below) and Dorsal (above) posterior (to the rear), Prefemur (second joint)]



# Species gallery (15)

## *Lithobius calcaratus*

Medium sized (up to 15mm) • Almost black in colour • 39–50 Antennal articles • Eyes of up to nine ocelli • Two Forcipular teeth on each side • No projections on tergites • Two claws on 15th leg • Males have a distinctive projection (calcar) on the last leg

# Species gallery (16)

## *Lithobius forficatus*

Large (up to 30mm) • 35–43 Antennal articles • Eyes of up to 30 ocelli • 5–7 Forcipular teeth per side • Projections on tergite 9, 11 and 13 • A single claw on 15th leg

# Species gallery (17)

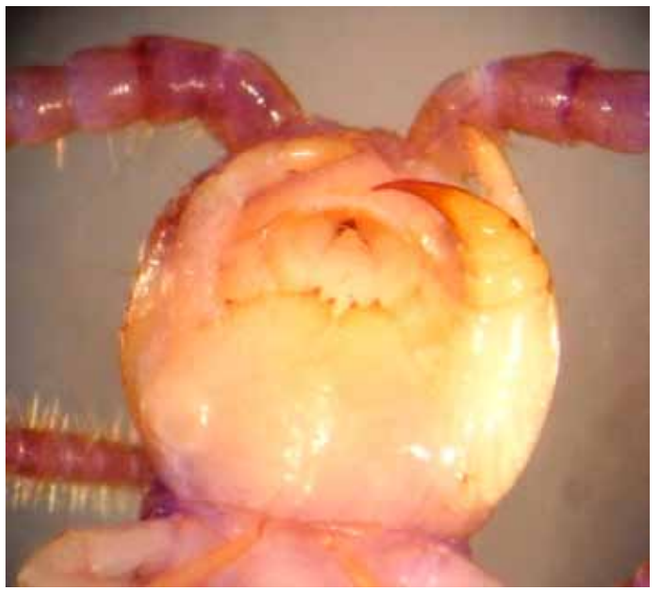
## *Lithobius macilentus*

Medium sized (up to 14mm) • 39–45 Antennal articles • Eyes of up to nine ocelli • Two Forcipular teeth on each side with inner teeth further forward • Distinct projections on tergites 9, 11 & 13 • Two claws on 15th leg • All female

# Species gallery (18)

## *Lithobius melanops*

Medium sized (up to 17mm) • Light coloured with a darker central stripe (no stripes on legs) • Projections on tergites 9, 11 & 13 • 32–42 Antennal articles • Two (or three) Forcipular teeth on each side with broad 'shoulders' • Eyes of up to 13 ocelli • Two claws on 15th leg



# Species gallery (19)

## *Lithobius muticus*

Medium sized (up to 15mm) • 34–43 Antennal articles • Eyes of up to 14 ocelli • Two (three) Forcipular teeth on each side (with sloping ‘shoulders’) • Tergites 9, 11 & 13 with blunt lobes • A single claw on 15th leg • Males have broad, forward-facing head and a unique hair-tipped swelling on tibia of leg 14

*Male*

*Female*

# Species gallery (20)

## *Lithobius pilicornis*

Very large (up to 35mm) • Often quite red • 29–34 Antennal articles • Eyes of up to 40 ocelli • 3–5 Forcipular teeth on each side • Projections on tergites 11 and 13 only • A single claw on 15th leg

# Species gallery (21)

## *Lithobius variegatus*

Large (up to 24mm) • Noticeably variegated with lilac stripes on the legs • 35–46 Antennal articles • Up to 18 ocelli in each eye • 6–7 Forcipular teeth on each side • Projections on tergites 7, 9, 11 and 13 • A single claw on 15th leg • Unusually tends to remain motionless when found

# Species gallery (22)

## *Lithobius crassipes*

Small (up to 13mm) • 20 Antennal articles • Eyes of 9–13 ocelli. One large and two or three rows of smaller ones • Two Forcipular teeth on each side • No projections on tergites • A single claw on 15th leg • Does not curl up when disturbed

# Species gallery (23)

## *Lithobius curtipes*

Small (up to 11mm) • 19 or 20 Antennal articles • Eyes of 6–9 ocelli. Two large and a ring of smaller ones • Two Forcipular teeth on each side • No projections on tergites • A single claw on 15th leg. Male has an extended lobe at the end of the tibia on the 15th leg • Often curls up when disturbed

# Species gallery (24)

## *Lithobius microps*

Very small (up to 9.5mm) • Often curls up when disturbed • 23–28 Antennal articles • Eyes of just three (rarely four) ocelli • Two Forcipular teeth on each side • No projections on tergites • Usually two claws on 15th leg

# Species gallery (25)

## *Lamyctes emarginatus*

Small (up to 11mm) • Dark grey in colour • 25 Antennal articles • Eyes of a single ocellus • Three Forcipular teeth on each side • No projections on the tergites • Three claws on 15th leg • No spines on the legs • All female

# Species gallery (26)

## *Scutigera coleoptrata*

15 pairs of very long legs • Very large (body 30mm plus legs) • Last legs with over 500 segments • Compound eyes of many ocelli • Up to 500 antennal segments • Violet grey in colour with darker lilac bands • Indoors only (except Channel Islands)

# Next steps

- The detailed identification of all British myriapods to species is not within the scope of this publication. Please refer to the other publications in this series if you wish to learn more about millipedes or woodlice.

- These offer an in-depth look at each group leading to an understanding of the main features used for identification to species.

- The best way to become familiar with myriapods and confident in their identification is to join the British Myriapod and Isopod Group (BMIG). There is no charge and you will receive a bi-annual newsletter with updates, notices and news about myriapods and woodlice.

# Next steps

- BMIG holds an annual field meeting around Easter time which changes venue to record invertebrates in the more under-recorded areas of Britain and Ireland. The meetings consist of field recording days, formal presentations, training workshops and informal displays. These events are very welcoming and friendly social gatherings where everyone is always happy to share their experience and knowledge with newcomers.

- The bulletin of the BMIG is available annually at a small charge. This is a refereed journal containing more formal papers and field reports relating to the British Myriapod fauna.

# More information

For more information contact the
British Myriapod and Isopod Group:
**BMIG Secretary,**
**2 Egypt Wood Cottages,**
**Farnham Common,**
**Bucks.,**
**UK**

or via the website at **www.bmig.org.uk**


For worldwide coverage of Myriapod groups, including the Onychophora (velvet worms, *Peripatus*), see:
**The Centre International de Myriapodologie,**
**Museum National d'Histoire Naturelle,**
**Laboratoire de Zoologie-Arthropodes,**
**61 rue Buffon F-75231 Paris,**
**Cedex 05**

**http://www.mnhn.fr/assoc/myriapoda/INDEX.HTM**

Centre International de Myriapodologie

# Centipedes of Britain and Ireland

The following species have been recorded outdoors in the British Isles (after Barber, A.D. (2008) *Key to the Identification of British Centipedes*.)

Class CHILOPODA

Order GEOPHILOMORPHA

*Stigmatogaster subterranea* (Shaw, 1789)
*Stigmatogaster souletina* (Brolemann, 1907)
*Hydroschendyla submarina* (Grube, 1869)
*Schendyla nemorensis* (C.L. Koch, 1837)
*Schendyla peyerimhoffi* Brolemann & Ribaut, 1911
*Schendyla dentata* (Brolemann & Ribaut, 1911)
*Henia vesuviana* (Newport, 1844)
*Henia brevis* Silvestri, 1896
*Strigamia crassipes* (C.L. Koch, 1835)
*Strigamia acuminata* (Leach, 1814)
*Strigamia maritima* (Leach, 1817)
*Pachymerium ferrugineum* (C.L. Koch, 1835)
*Nothogeophilus turki* Lewis, Jones & Keay, 1988
*Stenotaenia linearis* (C.L. Koch, 1835)
*Geophilus carpophagus* Leach, 1814
*Geophilus easoni* Arthur *et al*., 2001
*Geophilus electricus* (Linné, 1758)
*Geophilus osquidatum* Brolemann, 1909
*Geophilus gracilis* Meinert, 1870
*Geophilus pusillifrater* Verhoeff, 1898
*Geophilus insculptus* Attems, 1895
*Geophilus proximus* C.L. Koch, 1847
*Geophilus flavus* (De Geer, 1778)
*Geophilus truncorum* Bergsoë & Meinert, 1886
*Eurygeophilus pinguis* (Brolemann, 1898)
*Arenophilus peregrinus* Jones, 1989

Order SCOLOPENDROMORPHA

*Cryptops anomalans* Newport, 1844
*Cryptops hortensis* (Donovan, 1810)
*Cryptops parisi* Brölemann, 1920

Order LITHOBIOMORPHA

*Lithobius variegatus* Leach, 1813
*Lithobius peregrinus* Latzel, 1880
*Lithobius forficatus* (Linné, 1758)
*Lithobius piceus* L. Koch, 1862
*Lithobius melanops* Newport, 1845
*Lithobius macilentus* L. Koch, 1862
*Lithobius tricuspis* Meinert, 1872
*Lithobius tenebrosus* Meinert, 1872
*Lithobius borealis* Meinert, 1868
*Lithobius lapidicola* Meinert, 1872
*Lithobius pilicornis* Newport, 1844
*Lithobius calcaratus* C.L. Koch, 1844
*Lithobius muticus* C.L. Koch, 1862
*Lithobius lucifugus* L. Koch, 1862
*Lithobius crassipes* L. Koch, 1862
*Lithobius curtipes* C.L. Koch, 1847
*Lithobius microps* Meinert, 1868
*Lamyctes emarginatus* (Newport, 1844)

Order SCUTIGEROMORPHA

*Scutigera coleoptrata* (Linné, 1789)

# References and Bibliography

A full list of the major reference works for identification of British myriapods is given in the following bibliography:


Barber, A.D. (2008) *Key to the identification of British Centipedes*. AIDGAP guides 130. Field Studies Council, Shrewsbury.

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# Pause for thought…

In order to improve this training package, we would appreciate any feedback you can give us:

- Did you find the information useful?
- Do you feel that you now have a better understanding of myriapods?
- Was this training undertaken individually by reading the e-book or was it presented as a PowerPoint presentation by a local coordinator?
- Was this method of training effective for you?
- Do you intend to progress onto the more specialised literature?
- Have you collected myriapods subsequently and passed on your records?
- Any general comments about content or presentation?
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Thank you for your time

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