



Welcome to the Weird and Wonderful World of Woodlice!



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The woodlouse is a familiar creature to most people, various species appear all over the world, here in the British Isles we all live close to at least a couple of species. This familiarity with the woodlice has led to some many local names for them - tiggy-hogs, parsons-pigs, sow-bugs, grammer sows. Although many people are rather fond of woodlice (some of us more so!), a great deal of people see them as destructive pests - which they certainly are not! Woodlice have learned to live with humans, making the most of our environment and the food and protection that it offers. They are an important part of our biological community - helping to recycle decaying material and add essential nutrients to the soil. This web site has been produced to help people understand the woodlice and hopefully stimulate more interest in them. You will find lots of information on their history, predators, physiology, behaviour, reproduction, colour variations, recommended reading and even information on how to keep them as pets! Lots of things you wanted to know about woodlice, but were far too embarrassed to ask!

animals like newts, frogs, toads and small mammals also use these habitats for shelter and they are also predators - consuming large quantities of woodlice.

It is thought that woodlice evolved from ancestors that lived on the sea bed. Intermediate forms developed the ability to survive out of water for longer periods. Some forms of woodlice, for example *Ligia oceanica* (Sea Slater), have evolved very little from the intermediate stage. Several species are still restricted to life on the seashore, living amongst crevices in the rocks and under rotting sea-weed, seldom leaving the splash zone and with the ability to withstand immersion in the salty water for long periods.

The earliest woodlice appear in the fossil record from the Eocene period, deposits laid down around 50 million years ago. However, it is thought that the woodlice must have evolved much earlier. The main families of woodlice have worldwide distribution and therefore must have evolved before the continents drifted apart in the Mesozoic period (c.160 million years ago). The



Ligia Oceanica - The Sea Slater



A Trilobite - ancestor of the woodlouse

Many people assume that woodlice are related to other terrestrial arthropods such as millipedes, centipedes and pseudoscorpions, but they are not. Their closest relatives are in fact crabs, lobsters and water fleas. Woodlice belong to the order Isopoda, this includes creatures that live in the sea and fresh water as well as on land. Woodlice are one of the few land dwelling groups of the class Crustacea. They are an interesting group, several common species exhibit varying degrees of adaptation to life on land, largely depending on their body structure and number of lungs (some have none, some two pairs and two species have five pairs of lungs). As crustaceans they do need to remain where there is moisture, especially during the day. All species tend to spend most of their life under logs, stones, bark, decaying leaves and in other damp, dark places, emerging at night to feed and socialise. The woodlice share their habitat with other creatures such as centipedes, millipedes, spiders, slugs, snails, pseudoscorpions, beetles, springtails and earwigs. Other

order Isopoda contains more than 10,000 species worldwide (most of which are marine). Around 3,500 species of woodlice (sub order *Oniscidea*) have been described, new species are still being discovered. There are currently around 47 species known in the British Isles, some of these have only been recorded breeding in glass houses (introduced with house plants?) around 37 species are native or naturalised and are known to be breeding in a variety of habitats outdoors. Of this main 37 species there are five very common species that have country-wide distribution. There are 3 of these common species, *Oniscus asellus* and *Porcellio scaber* (Common shiny woodlouse and Common rough woodlouse) and *Armadillidium vulgare* (Common pill bug) that are particularly common around homes and gardens - often entering the house when it is too wet and cold outside!

The habit of wandering into our homes has sadly meant that many people label them as pests, wrongly assuming that the woodlice are seeking out their antique



Dysdera Crocata capturing a woodlouse © Stephen Hopkin

furniture and intending to feast on such items until the furniture is reduced to a pile of dust - not so! The beneficial effects of these creatures certainly outweighs any damage that they do. Woodlice belong to a group of animals known as decomposers, they chew dead wood and plants and deposit these as faecal pellets which decompose rapidly, speeding up the decomposition process and quickly adding essential nutrients to the earth. They are a useful addition to any garden, helping to recycle waste and improve your garden soil!

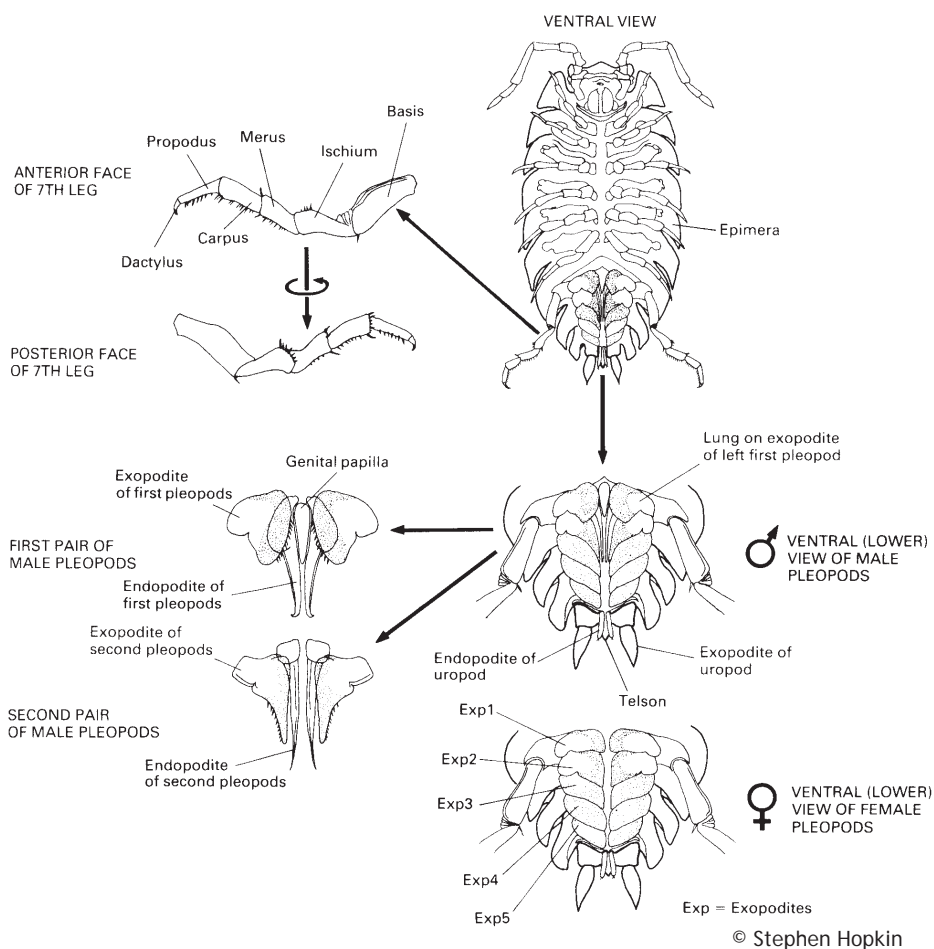
Predators

Woodlice have many natural predators, forming a large part of the diet to some creatures and an occasional snack to others. Common shrews are known to consume vast numbers of woodlice. Other animals also eat them (along with snails, slugs and worms) including hedgehogs, toads, frogs, newts and lizards. Little Owls and foxes are also known to include them in their diets. Other creatures that share the woodlouse's habitat will also prey on them, none more so than *Dysdera crocata*, the main woodlouse-eating spider (another spider in this genus also exists and also eats woodlice). This spider is quite common in the south of England, seizing woodlice in its pincer-like jaws and injecting them with a poison that kills the woodlouse in a few seconds. Less of a threat, but still woodlice predators, are centipedes, harvestmen and some beetles. The woodlice is even in danger of attack by its own kind, occasionally during the moulting period. During this moult the woodlice's body is very soft and vulnerable and, especially in cultures, other woodlice will eat them.

Body Structure

As with all Arthropoda, the woodlouse is a segmented animal with a rigid exoskeleton and jointed limbs. The first segment is the head, the second is the pereon (thorax), the third is the pleon (abdomen). The head shape, eyes and antennae vary from one species to another, all useful for identification purposes (see Hopkins 'Key to woodlice'). The eyes can vary from compound eyes to groups of up to three ocelli (simple eyes). There are two pairs of antennae, the first pair are vestigial and difficult to see, these are positioned

between the second pair which are large and with numerous joints. It appears to anyone who has ever watched a woodlouse wandering around that the antennae are sensory organs, although it is difficult to provide physiological evidence that this is so. I have observed woodlice not only tapping the ground and surrounding objects with their antennae but also each other, and it does seem that they are used as sensory organs. The mouthparts lie on the underside of the head, these are actually modified limbs of the head segments. The pereon has 7 segments, each consisting of tergite (dorsal plate) and a sternite (ventral plate). There are 7 pairs of pereopods (legs), although when the young woodlouse emerges it has only 6 pairs, the 7th pair appear after the first moult. In females there is also a brood-pouch on the underside of the pereon, this is a fluid filled sac that holds the young for the early



© Stephen Hopkin

part of their life. The pleon is always much shorter than the pereon and ends with the telson and the uropods. The uropods are positioned either side of the telson at the posterior end of the woodlouse. They can be held together to form a capillary channel down which excess water (eg: a raindrop) can be lost into the ground. On the underside of the pleon there are the genitalia and, if present, the pleopodal lungs. In some species there are no lungs, some have two pairs of lungs and some have five pairs. These lungs appear as white patches on the underside and can be seen with the naked eye. The number of lungs helps to determine the amount of time that the woodlouse can spend away from its damp shelter. For much more information on the body structure I would recommend reading 'Woodlice' by S.L.Sutton.



Woodlouse showing two pairs of lungs. © Stephen Hopkin

Physiology

Woodlice absorb water in several ways, 1) with food; 2) by drinking through the mouthparts; 3) by capillary action through the uropods. It is possible that they also take in water by absorption through the cuticle. When woodlice have become saturated (eg: after heavy rain), they can be seen to climb up walls and vegetation to find drier areas. Any excess water can be removed from the body by pressing the uropods together to form a tube which is pressed against a dry, absorbent surface and the water is lost through reverse capillary action. Water also leaves the body by transpiration through the cuticle and with the faeces. The temperatures that individual species can tolerate vary, generally it is between -5C and 42C, species from damper habitats can tolerate less of a change. Most woodlice, except the very old, are nearly always in some active stage of moulting. This continues throughout the life of the woodlouse whilst it is actively growing. The whole skin is shed, half at a time. Before the skin is lost it loosens, making the animal appear whitish over half of the body. The rear half is lost first, the skin splits and they pull themselves free with the front limbs. A few days later the process is repeated with the head end. The cast is often eaten, probably to replace the calcium carbonate. Woodlice are very vulnerable during moulting and are often attacked and eaten by other woodlice, particularly in cultures.

Behaviour

Many behavioural responses are well known, their normal reactions to predators (running away or rolling into a ball), to light (hiding in a dark place) and to water and moulting have been covered well in other literature or elsewhere in this text. Reproductive behaviour is difficult to observe as it usually takes place when it is totally dark. The behaviour has been studied by Dr H.E. Gruner of Berlin and is explained, with diagrams, in Suttons book - 'Woodlice'. The woodlouse does not have any lengthy courtship. When the male woodlouse finds a receptive female he stops, waves his antennae at her, eventually resting them on the female. If she hasn't left by this stage he then crawls on to her back. He spends a few minutes licking her head and tapping on her back with his front legs. The male then moves into a diagonal position to either the left or right side (both have been observed), he bends his body under her so that his genitalia reach her genital opening on the opposite side. Sperm transfer takes place in about

5 minutes, the performance is then reversed and the male then approaches from the other side (she has genital openings on the left and right side). It is also interesting to mention here that some species (possibly all?) can reproduce without the males, this is known as parthenogenesis. *Trichoniscus pusillus* are definitely known to do this, my own experiments have also shown that *Porcellio scaber* and *Oniscus asellus* are also able to produce offspring when they have not mated with a male.

One area of woodlice behaviour that is not covered in other literature is social behaviour. This is a difficult and time consuming area to research. Woodlice are often inhibited or upset by observers and normally restrict such behaviour to the hours of darkness! However, woodlice kept in cultures at home do seem to develop a tolerance to artificial light and to curious human observers, continuing to feed and even mate in full light and while being watched! I have made some interesting observations while studying my numerous cultures at home. Many woodlice in my cultures have been seen to stop when they meet another woodlouse and appear to 'tap out' what seem to be complicated 'messages' with their antennae on to the antennae of the other woodlouse. In most cases the other woodlouse appears to 'respond' with similar tapping with the antennae. Could these actually be messages for the location of food, shelter or receptive females or are they just checking the identity of the other creature?

Feeding behaviour is also difficult to observe as this also usually takes place in the dark. Although woodlice are basically plant eaters, they do occasionally eat flesh. With one exception, they do not catch and kill their prey (the exception being *Tylos lateralei* - a mediterranean coastal isopod). They will consume flesh if they come across dead and decaying animals. They will also eat other woodlice that have died or those going through the moult - a time when their bodies are very soft. In cultures this is particularly common, probably due to overcrowding or the lack of suitable hiding places for protection during the moult.

I have observed what could be described as 'fighting' over moulting woodlice, where up to four woodlice have come across the moulting individual and proceeded to pull and tug at it and push each other away until one eventually picks up the moulting woodlouse and runs (or rather staggers!) away with it. I have seen similar



Woodlouse after moulting. © Stephen Hopkin

behaviour with other food, if small pieces of a different vegetable have been placed in their tank. Within a few minutes a 'fight' has broken out with a couple of woodlice pushing each other away from the food, one woodlice (and not always the smallest) giving up and trying later.



Colour variation, orange with white, *Porcellio Scaber*

Colour variations

This is one area of woodlice genetics that has attracted a great deal of attention and is then main area of woodlice research that I am interested in. But like other woodlice research, it is a difficult and time consuming task. Many woodlouse species produce colour variations, especially with the more common varieties - *Porcellio scaber*; *Oniscus asellus*; *Philoscia muscorum* and *Armadillidium vulgare*. The usual colour for most of these species is a slate grey, *P.muscorum* is normally a mottled green/brown, more common variations in colour are reds and mottled individuals. So far in my searches, and breeding woodlice at home, I have come across a wider range of colours in three species, as well as other interesting observations:

Porcellio scaber: reds; red/grey mottled; orange; brown; brown mottled; yellow/grey mottled; cream/white.

Oniscus asellus: browns; brown with grey midline stripe; orange; yellow.

Armadillidium vulgare: mottled green/brown/grey; mottled cream/pale brown; orange; brown/red.

So far I have found more variation with juveniles (the young are usually born white with all species and develop colour within a couple of weeks) who exhibit a wide range of colours for the first few months, developing the standard slate-grey later in life. One rather odd variation with *Oniscus asellus* that I have noticed in several locations around Norfolk (is it known elsewhere?) is that many of the young are a brown colour, with the 7th pereon and the 1st and 2nd pleon a reddish/orange. This colouring gives the appearance, at a glance, of an orange stripe across the back. So far, with these variations that I have at home, this colouring has disappeared by the time they are around 10-12 months old. I also currently have a group of *Oniscus asellus* from Bawdeswell Heath in Norfolk, who have produced young that are almost totally white (with a faint grey midline stripe). The other young from the same brood are yellows, oranges and greys. Another observation is that the majority of colour variations in adult woodlice are females, also I have found that these females are much more likely to produce offspring with variations in colour.

Cultures

Although woodlice are not the most exciting of pets to some people (I cannot understand why!), they are easy to keep at home and in schools. They are particularly good for children living in the city, giving them a contact with nature and providing an interesting and inexpensive collection of pets. Woodlice can be kept in fairly small containers (sandwich boxes) for short periods, but if they are to be kept for any length of time then a larger container would be best. An old fish tank is ideal, or the large plastic storage boxes available in DIY shops are good and can accommodate a large collection of woodlice. The woodlouse cannot climb smooth surfaces - so there is no chance of them escaping! Put a layer of old compost, about 4-6 inches deep in the container, as they do like to dig down quite deep, especially the pill bugs. If you can, it is best to add a layer of woodland leaf litter next, this not only provides food for them, but also the chances are there will be lots of other creatures to add to the collection. On top you can put pieces of wood, bark, slate and stones. Things like clay flowerpots, cardboard tubes, fir cones and shells can all be included if there is room, all providing the woodlice with places to live. The woodlice can be fed on all sorts of foods - vegetable peelings and pieces of fruit are all suitable. I have found that the following are particularly appreciated by most woodlice: Carrot, potato, tomato, courgette, pumpkin, parsnip and mushrooms. The culture will need to be kept quite moist (but NOT soaked), this is easily done by spraying water on with a household plant sprayer. They are interesting to study, and very good if you have an allergy to the usual fluffy pets. and they can be left for long periods without suffering (ideal over holidays), they don't bark at the neighbours and friends, don't scratch the furniture and don't poo on the carpet - what more could you want....

Julie Curl



Colour variation, grey and white, *Porcellio Scaber*

Recommended reading:

Sutton, S.L. (1972) *Woodlice*. Ginn & Co, London. (Republished by Pergamon Press, Oxford in 1980.)

Hopkin, S. (1991) *A Key To The Woodlice Of Britain & Ireland*. An AIDGAP key. Richmond Publishing, Slough.

Harding, P.T. & Sutton, S.L. (1985) *Woodlice In Britain & Ireland; Distribution And Habitat*. Institute of Terrestrial Ecology, Huntingdon.

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I would like to thank Stephen Hopkin for allowing me to reproduce images from 'A Key to The Woodlice of Britain and Ireland'