# Freshwater Crustaceans

**1.** Fairy shrimp *(Chirocephalus diaphanus)* 20mm-lives only in temporary pools **2.** Meniscus seed shrimp *(Notodromas monacha)* 1.1mm **3.** Meniscus water flea *(Scapholeberis mucronata)* 1mm **4.** Gill gripper *(Ergasilus sieboldi)* 2mm **5.** Fish louse *(Argulus foliaceus)* 7mm **6.** Long-nosed water flea *(Bosmina longirostris)* 0.6mm **7.** Tadpole shrimp *(Triops cancriformis)* 50mm-lives only in temporary pools **8.** Gliding water flea *(Graptoleberis testudinaria)* 0.7mm **9.** Common freshwater shrimp *(Gammarus pulex)* 16mm **10.** Small-headed water flea *(Simocephalus vetulus)* 3mm **11.** Crawling water flea *(Peracantha truncata)* 0.6mm **12.** Scrambling water flea *(Alona quadrangularis)* 0.9mm **13.** Greater green seed shrimp *(Herpetocypris reptans)* 2.5mm **14.** Giant crawling water flea *(Eurycercus lamellatus)* 3mm **15.** Green cyclops *(Acanthocyclops viridis)* 3mm **16.** A harpacticoid copepod *Canthocamptus staphylinus* 1mm **17.** Two-spotted hoglouse *(Asellus aquaticus)* 20mm **18.** Common water flea *(Daphnia pulex)* 2.5mm **19.** Invisible water flea *(Leptodora kindti)* 16mm **20.** White-clawed crayfish *(Austropotamobius pallipes)* 150mm

## What are Crustaceans?

Crustaceans make up one of the great groups of the Arthropoda - animals with jointed limbs. Most crustaceans are marine: they include the familiar crabs, lobsters, prawns, sandhoppers and barnacles. There are also many freshwater species and while most are less than a couple of millimetres long, a few are large like the White-clawed crayfish (Austropotamobius pallipes) that grows up to 15 cm long.

Ivy odemerid beetle *(Oncomera femorata)* © Roger Key

Crustaceans have skin made from chitin. Their bodies have a variable number of segments and each segment may or may not have a pair of legs or other appendages attached, hence they are very diverse in form. Many begin life as a unique larva known as a nauplius, although many others bypass this stage.

## Conventional Shrimps and Confrontational Crayfish

The most commonly encountered of our larger crustaceans are the amphipod shrimps and the hog-lice (Asellus spp). Amphipod shrimps are flattened side to side, while hog-lice are isopods, related to woodlice, and are flattened from top to bottom.

The Common freshwater shrimp (Gammarus pulex) (c. 1.6 cm) is an amphipod that lives in both standing and flowing water, and has a broad diet. They are often seen swimming in pairs, the male 'carrying' the female. While the Common freshwater shrimp is widespread in Britain, the Lake shrimp (Gammarus lacustris) is predominantly northern. Another amphipod the North American freshwater shrimp (Crangonyx pseudogracilis) was accidentally introduced into Britain and is now common in many places. Smaller and more slender than Gammarus, they can easily be recognised as they 'stand up' while Gammarus move on their sides. Four species of cave shrimps inhabit subterranean waters in the southern part of England and Wales. The British cave shrimp (Niphargellus glenniei), found in ground water in caves and mines, is known from a handful of sites in the world, all of which are in Devon and Cornwall.

The Common hog-louse (Asellus aquaticus) (to c.2 cm) is an adaptable isopod that lives among bottom detritus and vegetation and is tolerant of poor water quality. The Cave hog-louse (Proasellus cavaticus) is a rare inhabitant of caves.

The White-clawed crayfish is our largest native freshwater crustacean. They are omnivorous and are widely distributed in both flowing and standing hard, calcareous waters and even in some relatively soft-water canals. The female carries her eggs for several months under her abdomen, where the young also remain attached for some time. The White-clawed crayfish is dying out in many areas due to a fungal plague transmitted by the invasive, alien North American signal crayfish (Pacifasticus leniusculus) that is also larger and more aggressive.

## Fairies, Fleas and the Tadpole Shrimp

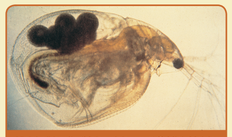
The 2 cm long Fairy shrimp (Chirocephalus diaphanus) inhabits temporary pools in southern England. The delicate, beautiful adults swim upside-down by beating 11 pairs of legs in a graceful rhythm. The swimming sets up currents from which rows of close-set, fine bristles on the legs filter out tiny particles of dead vegetable material and algae that are then channelled into the shrimp's mouth. Females carry their eggs in a large pouch before shedding them on to the bottom of the pond. The eggs can withstand intense drying of the pond and hatch when it fills with water again. A tiny nauplius larva with three pairs of limbs hatches and grows very rapidly, adding body segments and pairs of limbs by a series of moults.

The Tadpole shrimp (Triops cancriformis) has a prehistoric appearance, superficially like a 5 cm long King crab, and is very rare in Britain. For many years they were found only in one temporary pond in Hampshire, but they have recently been found at another pond nearby, and have been rediscovered in Scotland near the Solway Firth. They rummage about on the bottom, collecting detritus and small animals and also seizing large prey. They too survive drought as a resting egg and hatch as a nauplius.

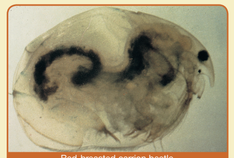
Waterfleas (Cladocerans) are abundant throughout still waters. There are about 87 species in Britain, of which Daphnia species are the most familiar. Daphnia sit in the water vertically and use their large branched antennae as oars. As they swim they filter minute particles with bristles on two of their five pairs of legs, within their body shell or carapace. Daphnia species in poorly oxygenated ('stagnant') water are often reddish because their blood contains haemoglobin, a chemical that locks on to oxygen. Species of Daphnia that live in open water, where oxygen is abundant, have no need of haemoglobin and are beautifully transparent. This is also a form of camouflage - they are not easily seen by predators.

Simocephalus vetulus is very common attached to submerged plants. Scapholeberis mucronata lives suspended beneath the surface film by means of specialised straight-edged flanges of its carapace. Eurycercus lamellatus, a robust species about 4 mm long, has short antennae and crawls on the bottom or among vegetation collecting food by scraping surfaces and filtering. Graptoleberis testudinaria is one of the most specialised crawlers. They are less than 1mm long and behave like minute snails, gliding over surfaces on the edges of their carapace that act like the runners of a sledge.

All these waterfleas have remarkable reproductive habits; they can reproduce by parthenogenesis (without the presence of a male). Some species carry only two eggs at a time inside the carapace, but Daphnia can carry more than 100. The parthenogenic broods mature in a few days and the population quickly builds up in the summer. At the onset of cold weather males appear and mate with the females, that then produce a few fertilised eggs. When the mother next moults, these are enclosed in a special part of her carapace, and fall to the bottom. The eggs can dry out and be blown or carried to new ponds.



Violet oil beetle *(Meloe violaceus)* © Mick Melvin



Red-breasted carrion beetle *(Oiceoptoma thoracicum)*

A few waterfleas have become predators. Leptodora kindti, for example, has a 1.8 cm long body and its carapace is reduced to a small brood chamber on its back. These delicate, transparent waterfleas hang in the open water of large lakes and ambush their prey, which they catch with powerful grasping limbs

## Adaptable Copepods

Copepods are a very varied in body form and life style.

Cyclopoid copepods are familiar water inhabitants. They have cylindrical bodies, no carapace and four pairs of strong oar-like legs. Some species feed mostly on algae, while others, such as Acanthocyclops viridis (c. 3 mm) and Macrocyclops albidus (c. 2.5 mm) will kill small invertebrates larger than themselves and even tiny fishes. The female carries fertilised eggs in two egg sacs, one on each side of her abdomen. Cyclopoid copepods live in ponds and similar water bodies, a few are planktonic in lakes; others live among mosses and other vegetation.

Crawling harpacticoid copepods have elongate bodies and creep about among mosses and in similar situations, some are very small and slender and live in sediments. The largest British species, Canthocamptus staphylinus (c. 1 mm) is common. Unlike cyclopoids, females carry a single egg sac.

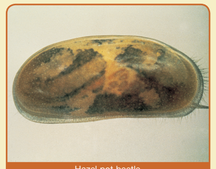
Calanoid copepods carry a single egg mass or release their eggs. Of these Eudiaptomus gracilis (c. 1.5 mm) is very common in still, open water. Although they swim well, they spend much time hanging suspended in the water using their long antennae to detect suspended food particles, that they then capture with their mouthparts.

## Hangers On

Some freshwater copepods are parasitic, mostly on fishes. Of the few species in Britain the Salmon gill maggot (Salmincola salmoneus) is the most familiar. Members of a very different group, the fish lice (Branchiura) are also parasitic. The Common fish louse (Argulus foliaceus) parasitizes various fishes, while the Trout louse (Argulus coregoni) favours whitefish, salmon and trout. Once settled parasitic copepods are anchored for life, but fish lice can swim away and settle on a new victim.

## Seed Shrimps – the Ostracods

Ostracods have a shell-like carapace reinforced by calcium carbonate (lime) and look like miniature mussels. Despite their heavy armour some freshwater ostracods, such as Cypria ophtalmica, swim quite well using their antennae, but most crawl on the bottom or in vegetation. One of these is the striking Herpetocypris reptans (2.5 mm) that is very common in lime rich (hard) waters. Their handsome carapaces have green blotches on a yellowish background. Some bottom living ostracods eat dead vegetable matter or, like Herpetocypris, can rasp tissues from plants, but some gather in huge numbers to feed on the carcass of any dead animal.



Hazel pot beetle *(Cryptocephalus coryli)* © Roger Key

One common ostracod Notodromas monacha (c. 1.2 mm) swims upside-down beneath the water surface film like the waterflea Scapholeberis mucronata. In both species their undersides - that are uppermost as they swim - are darkly pigmented. This makes them harder to see from above and protects them from damaging ultra-violet light.

Glow-worm *(Lampyris noctiluca)* © Jon Mold

Unlike other crustaceans most freshwater ostracods attach their eggs to surfaces. Perhaps the best place to look for these is in a horse trough, where the Horse trough ostracod (Heterocypris incongruens) sometimes lays vast numbers of bright orange eggs on the walls of the trough, and although minute, there can be so many that there is a visible crust.

Tessellated rove *(Ontholestes tessellatus)* © Roger Key

Two banded longhorn beetle *(Rhagium bifasciatum)* © Roger Key

Spangled water beetle *(Graphoderus zonatus)* © Roger Key

Toothed reed-beetle *(Donacia dentata)* © Ben Hamers

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Twin-spotted false darkling beetle *(Osphya bipunctata)* © Roger Key

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## Habitat Management

The total loss of their habitats is a major threat to freshwater crustaceans. Crustacean habitats that survive are often damaged by nutrient enrichment (from agricultural fertilizers and burning fossil fuels); pesticides, especially synthetic pyrethroids; or other pollution. 'Acid rain' causing the acidification of rivers, lakes and ponds has been a big problem, especially in waters not buffered by chalk or limestone. Crustaceans like the ostracods that need lime to build their carapaces are particularly vulnerable. While acid rain is now rarer, many water bodies are not recovering biologically.

Invasive alien species can be a significant threat to native crustaceans. The Signal crayfish was introduced as a commercial food source, but brought with it a fungus, the crayfish plague. The Signal crayfish is immune to the effects of the plague, but our native White-clawed crayfish, which is endangered across Europe, is being rapidly wiped out in many places across Britain.

The release of Signal crayfish into the wild is now illegal, but, despite the fact that new invasions keep occurring, no-one has been prosecuted. Research is underway to solve the problem, but in the meantime everyone should be careful to clean and sterilise boots, fishing equipment and nets after they have been used as the fungus can be easily spread from one water body to another. In some areas the only unaffected populations of White clawed crayfish are those in ponds and small lakes isolated from the river system. The introduction of native crayfish to more such water bodies, if done carefully, may conserve some of the genetic diversity until a solution is found.

### Ponds

Small water bodies are the most threatened. Many old ponds have been lost as a result of changing farming methods, including the disappearance of horses; water abstraction; and urbanisation. Even many village ponds have gone.

Ponds may not have the variety of habitats found in lakes, but fish in lakes can remove populations of some crustaceans. Some highly threatened crustacean species are only found in temporary ponds that dry out in the summer. In these ponds crustaceans are completely free from fish predation. However, temporary ponds are particularly vulnerable, both to draining and to well-meaning, but highly damaging, excavation to create permanent ponds. Temporary water bodies should be encouraged and the temptation to turn them into something else should be resisted.

To create a pond in which crustaceans will flourish follow the three golden rules for pond creation: clean water, a diverse edge (lots of shallows, bays and inlets) and a situation near other water bodies. They need cover for protection, hunting and laying eggs, so the more plants and underwater structure the better. Plant shallow areas with Watercress, Water forget-me-not and Water mint, and deeper water with Curled pondweed, Rigid hornwort and Water crowfoot. Some people think it's important to have lots of open water in a pond, but relatively few species live there, so to encourage crustaceans do not dredge regularly or remove water plants. If you must clear out vegetation, then remove only part of the vegetation at one time, and don't eliminate any habitat completely.

### Saline Lagoons

These are isolated coastal water bodies that have both a fresh and a sea water input. They are rare and very delicate habitats, but the animals in them have to be extremely tolerant of fluctuating conditions. The Brine shrimp (Artemia salina) is a relative of the Fairy shrimp that can tolerate extremely high salinity. It was associated with salt pans around the Solent but is now extinct in Britain. There are still five crustaceans found only in lagoons, including the Lagoon pill-slater (Lekanosphaera hookeri) and the Lagoon sand shrimp (Gammarus insensibilis). The hydrology of the lagoon is the key management issue. Salinity should fluctuate between 15 and 40 parts per thousand and some exchange of water with the sea is essential. The best lagoons are big, a metre or less deep, with a varied substrate, a convoluted margin and aquatic vegetation. Management to emphasise these characteristics will benefit endangered crustaceans.

### Lakes

While less likely than ponds and lagoons to be totally destroyed, nutrient enrichment and pollution are a threat to large water bodies and the waterflea Holopedium gibberum has disappeared from several Cumbrian lakes. Large reservoirs provide habitat for a number of lake crustaceans, although drawdown robs the many littoral species of suitable homes. Large ornamental water bodies often present a wide range of habitats and deserve special care.

The Relict opossum shrimp (Mysis relicta) and the copepod Limnocalanus macrurus were formerly found in Ennerdale water in the Lake District and nowhere else in Britain. Despite being easily found 50 years ago they have not been found again for many years. Their apparent extinction is a mystery. There may have been changes to the water quality that caused them to disappear, alternatively, perhaps somewhere in the lake they survive in small numbers?

### Ground Water

Aquatic crustaceans are the flagship of groundwater fauna conservation. Species like the British cave shrimp and the copepod Speocyclops demetiensis can be very sensitive to water chemistry changes and have restricted global distributions. Groundwater is threatened by abstraction for agriculture and drinking water that can both dry out the rocks and, near the coast, can draw in salty water. Groundwater is also at risk of pollution from a wide variety of sources, including agricultural pesticides, organic nutrients and industrial chemicals.

## Further habitat management information


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