

BioMEDIA ASSOCIATES LLC

HIDDEN BIODIVERSITY Series

Water fleas

Study Guide Written and Photographed by Rubén Duro Pérez
Supplement to Video Program
All Text and Images ©2015 BioMEDIA ASSOCIATES LLC



Water fleas are crustaceans (relatives of crabs and prawns) belonging to the cladocerans suborder (Cladocera). About 700 species, mostly freshwater are known, although it is assumed that there are still a bigger number of undescribed species. Despite its common name "water fleas", these organisms are not related to the real blood sucking fleas (which are insects). That name comes from their way to move "jumping" through the movement of their antennae.

How are they?

Although the appearance of different species may vary slightly, all water fleas share some morphological characteristics that identify them as belonging to the same zoological group.



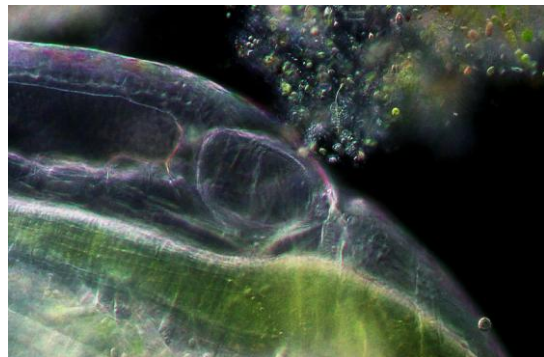
The head is relatively small, and on it a large compound eye (actually formed by the fusion of the two original eyes) appears.



Two pairs of antennae are located on each side. Antennae of the first pair are small and are provided with sensorial hairs (mainly olfactory), while the second pair of antennae are big, strong and branched. These antennae are used for locomotion and the arrangements of their branches allows us to differentiate among species.

The mouth is located in the anterior part of the head, and it is small in most species. A shell or carapace extends from behind the head. This carapace covers most of the body and is open at the ventral side. The five or six pairs of appendages are protected by the shell and are not used in locomotion but to create water streams that allow both respiration and food filtration. The rear portion of body can move freely and can go out of the carapace. At its end a pair of strong claws appears.

Because their transparency is possible to observe the intestine, usually full of food, and the heart located on the dorsal side.





An incubator chamber is located between the intestine and the dorsal carapace. The development of the eggs takes place inside this chamber.

Questions:

Why are they called water fleas if they are not related to true fleas? What are the large antennae of the second pair used for? If body appendages do not serve for locomotion, what is their function?

How do they feed?

Most species of water fleas are filter feeders. They mainly feed on microscopic algae and bacteria filtering water through the movement of their body appendages. The particles removed from the water pass to the mouth, where small jaws transformed into crusher plates chew them before enter the intestine. In the predator species (far fewer than the filtering ones) jaws possess sharp and chitinous teeth for chewing and tearing up the body of their prey.



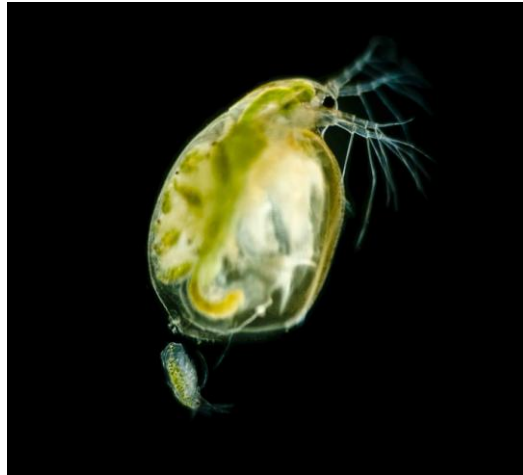
The contents of the intestine can be observed thanks to the transparency of their bodies, which allows knowing the type of food of each species.

Questions:

What do you think would be the main food of a water flea with a green intestine? Why do you think filtering species are more abundant than predatory species? Can you find any similarities with mammalian groups you know best? To which level of the food pyramid you would situate the various species of water fleas?

How do they reproduce?

Water fleas have developed a dual reproductive strategy: asexual reproduction by parthenogenesis and sexual reproduction. During most of the year parthenogenetic females lay eggs, i.e. eggs that have not been fertilized by the males. Identical to their mothers females, they hatch from these eggs. This allows these crustaceans rapidly to increase their populations.



The number of parthenogenetic eggs that a female can lay is between two and more than fifty, depending on the species, and their development takes place into the incubatory chamber located inside the shell. However, at certain times and when the environment is unfavorable, the eggs give origin to males. The presence of these males is essential for the survival of the species, since they are responsible for the fecundation of a third type of eggs called "latency eggs" or "resistance eggs."



These resistance eggs, once fertilized by males, are surrounded by a capsule called an "ephipium" that keeps them protected from dehydration. Eggs that resist both the complete drying of the pond and the low winter temperatures, and that, with the advent of better environmental conditions, give origin to new parthenogenetic females, reset the annual cycle.

Questions:

Could you explain what parthenogenesis is? Do you know any other animals using this same reproductive strategy? What advantage do you think has the reproduction by parthenogenesis? How do you think a population of water fleas can survive when the pond dries up completely?

Their role in the ecosystem

Water fleas are a very important component of freshwater ecosystems, especially ponds and lakes. Due to their small size and limited capacity of locomotion they are prey of a large number of other animals, most notably the larvae and nymphs of some aquatic insects like dragonflies or some mosquitos' species, fry of many fish species and larvae of many amphibians.



Moreover, the filtering species play an important role as purifiers because they eliminate particulate organic matter as well as bacteria.

Questions:

What do you think is the main role of water fleas in aquatic ecosystems, predator or prey? Do you know any aquatic animal that feeds mainly on water fleas?

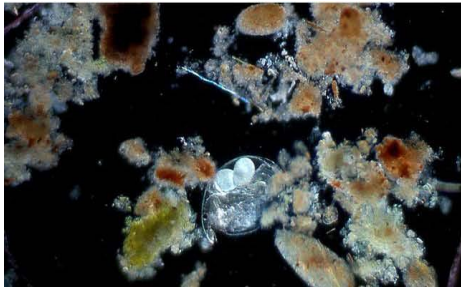
Species appearing in the video program



Water flea (*Daphnia* sp.)



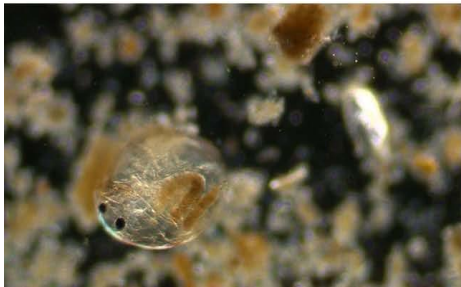
Water flea (*Simocephalus* sp.)



Water flea (*Alona* sp.)



Water flea (*Alona* sp.)



Water flea (*Chydorus sphaericus*)



Phantom midge (*Chaoborus* sp.)



Nymph (*Ephemeroptera* sp.)



Mosquito fish (*Gambusia affinis*)



Salamander (*Salamandra salamandra*)

Notes