

Commentary

WATER BEARS ARE SEGMENTED ANIMALS WITH A HAEMOCOEL

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INTRODUCTION

Tardigrades, often known as water bears or moss piglets, are a phylum of eight-legged segmented micro-animals. They are most commonly seen as a water film on lichens and mosses, as well as sand dunes, soil, sediments, and leaf litter. Tardigrades have survived space exposure. Tardigrada is a subphylum of the superphylum Ecdysozoa that includes creatures that grow by ecdysis such as arthropods and nematodes. They have four pairs of legs, each ending in claws and suction discs.

Tardigrades are missing multiple Hox genes as well as a huge intermediate section of the body axis. This refers to the complete thorax and abdomen of insects [1]. Except for the last pair of legs, the entire body is built up of segments that are comparable to the head area in arthropods. A haemocoel makes up the bodily cavity, however the only area where a real coelom can be found is around the gonad. There are no respiratory organs present, however gas exchange can occur throughout the body. The tubular mouth is armed with stylets that penetrate the plant cells, algae, or small invertebrates that tardigrades feed on, releasing bodily fluids or cell contents [2]. From the mouth emerges a triradiate, muscular, sucking pharynx, when the animal moults, the stylets are lost, and a new set is secreted from a pair of glands on either side of the mouth. The pharynx links to a small oesophagus, and then to the intestine, which runs the length of the body and is the primary site of digestion. The gut connects to an anus at the body's extremity via a short rectum. Some species only defecate when they moult, and the faeces are lost along with the cuticle.

The brain develops bilaterally symmetrically. Tardigrades have a dorsal brain that sits on top of a ventral nerve system. The brain is divided into lobes, which are generally made up of three bilaterally paired clusters of neurons. A huge ganglion below the oesophagus connects the brain to a double ventral nerve cord that runs the length of the body [3]. Each segment of the cord has one ganglion, which produces lateral nerve fibres that travel into the limbs. Although certain species are parthenogenic, both males and females are typically present, with females being larger and more abundant. A solitary gonad is found above the gut in both sexes. Tardigrades are oviparous, which means that fertilisation is mainly done externally [4]. Mating takes place during the moult, with the eggs being placed inside the female's shed cuticle and then covered with sperm. Internal fertilisation occurs in a few species, with mating occurring before the female

entirely sheds her cuticle. Young tardigrades do not undergo a larval stage and hatch out looking like little adults, however they usually have less claws and spines than fully-grown water bears. The juveniles grow in stages by moulting their external cuticle skin, and each moult might take five to ten days.

Water bears have a fully developed digestive system but no circulatory or respiratory systems. Instead, water-borne oxygen enters their bodies via their cuticle walls. They have muscles that contract to carry nutrients in their hydrostatic skeleton to improve circulation. The majority of plant-eating tardigrades feed by piercing individual plant cells with their stylets and sucking the contents out. A few tardigrades are carnivorous predators. Tardigrades can be destroyed by submerging themselves in hot water for an extended period of time. Even the amount of cells in each adult water bear is the same. Their cells divide constantly, but the water bear is protected by a non-growing and non-flexible sheath, or protective outer covering [5]. Tardigrades serve as pioneer species, inhabiting newly forming habitats. This movement attracts other invertebrates, as well as predators, to that region.

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