The striking peculiarities in the invertebrate animals on the example of Tardigrade spp. (phylum: Tardigrada)

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Tardigrades are hydrophilic microscopic invertebrate animals belonging to the phylum Tardigrada and are more commonly known as ,,water bears". They were first discovered in 1773 by German zoologist Gauze and since this time many species have been described. Currently approximately 1,200 species are known (Vicente and Bertolani 2013). Water bears are small, cylindrical invertebrates up to 2.5 mm length. Tardigrades are cosmopolitan, and are found in almost around the world and number of different niches in terrestrial, marine and freshwater ecosystems from Arctic to the Antarctic (Nelson, 2002). The majority of tardigrades species inhabit terrestrial ecosystems and can be found in mosses, lichens, bark, leaf-litter and soil. Scientists have morphological and molecular studies to understand the pathway of the tardigrades's lineage. Study the evolutionary history of tardigrades shown that tardigrades are most closely related to Arthropoda (a result of morphological studies) at the same time to the tardigrades are mostly related to nematodes (found in some molecular analysis). Tardigrades are extremophile animals and have ability to survive extreme conditions that would be rapidly fatal to all other known multicellular forms of life. For example, such extreme conditions are exposure radiation, extreme pressures (both low and high), air (oxygen) deprivation, dehydration, freezing, starvation, etc. Tardigrades can survive a few minutes +151^{0}C, 30 years -20^{0}C, a few year at -200^{0}C, and eight hour -272^{0}C. Tardigrades can withstand the extremely low pressure of a vacuum and also high pressure. They can survive the vacuum of open space and solar radiation for at least 10 days. Some species can withstand of 6.000 atmospheres pressure, which is nearly six times the pressure of water in the deepest ocean trench. Researches today are still puzzled and amazed at the extreme survival ability of tardigrades. Tardigrades's oldest fossils found came from half a billion years ago. Considering that tardigrades survived and thrived during these time when the primordial earth looked very different what it is today. Therefore, it is not surprising that they are so resilient and can survive a variety of environments. Extreme survivorship applies only to some species of terrestrial tardigrades. Marine and freshwater tardigrades did not evolve these characteristic because their environments are more or less stable. It appears that the extravagant survival adaptations have been selected in direct response to rapidly changing terrestrial environments. All species of tardigrades are aquatic and semi-aquatic as they require a liquid water to be active, but many species are able to enter a latent – cryptobiotic state when environmental conditions become unfavourable (Kinchin, 2008). They are detritivore, mycophage, phytophage, carnivore and even canibal.

Reference

[1] Kinchin, I.M. 2008. Tardigrades and anhydrobiosis water bears and water loss. Biochem 30(4):18–20

[2] Nelson, D. R., 2002. Current status of the Tardigrada: evolution and ecology. Integrative and Comparative Biology 42: 652–659.

[3] Vicente, F., Bertolani, R. 2013 Integrative taxonomy allows the identification of synonymous species and the erection of a new genus of Echiniscidae (Tardigrada, Heterotardigrada). Zootaxa, 3613(6), 557–572