



BRITISH NATURALISTS' ASSOCIATION

An Introduction to Tardigrades or "Water Bears"

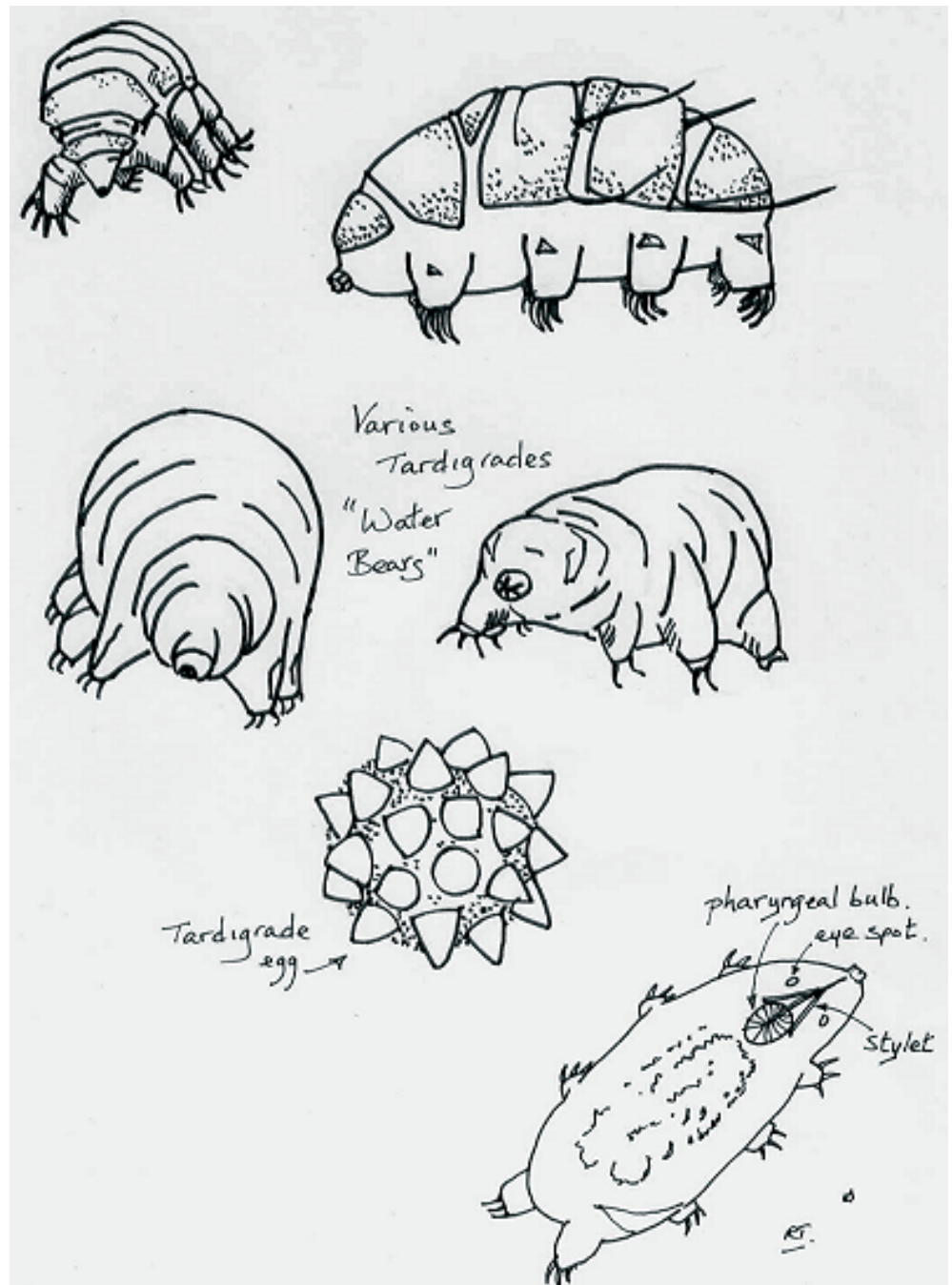
by Roger Tabor

With the English name of 'Water Bears' how can we not be drawn to these minute but unusual animals, the tardigrades. Despite that, and their amazing abundance, they are rarely looked for so we have only a sketchy idea of their true distribution in the British Isles.

The first publication about tardigrades was by Pastor J.A.E. Goeze in Germany in 1773, and he said that as "it closely resembles a bear *en*

miniature" so he called it "Little Water Bear". Tardigrade itself just means "slow-walker".

They gain their aquatic common name from living in wet films. Some species can reach 1mm long, but most are less than half that, so to see them in any detail a microscope is required, and view at x50 (try both dark ground and bright field illuminations).



Sketch by Roger Tabor

They are most likely to be found in damp habitats, and are usually to be found in moss. The standard way of being able to examine them is to soak the moss in water for 24 hours. Tardigrades have a remarkable ability to overcome a lack of water by becoming dormant (then called a “tun”) until water appears again. Tardigrades will leave this cryptobiotic state when soaked in water for 24 hours.

Morgan & King recommend using 4% acetic acid or 20% ethyl alcohol to narcotise them sufficiently so they relax and fall off the moss. They recommend wringing the moss dry and re-soaking, and repeating several times into a dish to ensure the tardigrades are dislodged into the dish. (Detailed species determination may depend on the use of an oil immersion lens with fixed specimens; however the locomotion movements of non-asphyxiated animals can be sufficient to indicate identification.

However Mach’s procedure is simpler, to just stand a cushion moss upside down in water alone in a dish. After leaving overnight take the moss out then carefully examine with a x10 hand lens (where they will be visible but very small) or use a binocular dissection-style microscope at x25 with top to side light which can even be provided with a torch. They are easier to see if the dish is on a black base. Once having found one transfer it by glass-pipette to a microscope slide. To see them does not require costly equipment, for they can be seen reasonably well even under a child’s “toy” or beginner’s microscope. It is fine to start off with a low magnification of just x40-50. Martin Mach recommends that to avoid damaging the water bears and to be able to watch their movements that a spacing device between slide and coverslip is used, which can be as simple as placing 2 cover slips on a slide either side of the viewing area, such that they then support a third coverslip placed over them. An appropriate sized thickness of water is kept.

Due to a tardigrade’s survival trick of turning into a tun on drying, from which it can be readily revived, those studying tardigrades commonly make a collection of dry mosses holding particular tardigrade populations.

Not all species of moss are equally laden with tardigrades, and sphagnum species have relatively few. Although found virtually anywhere, fewer live in woodland moss as it tends to stay damp whilst water bears ironically prefer wet moss that regularly dries out! You can find tardigrades very close to home including in such damp habitats as household gutters.

Although they are found on mosses they are also common in the surface water film of lichens and liverworts, also in aquatic mud. They are also found in the soil, and marine tardigrades are also encountered in the water in between sand grains.

In Britain over 70 species of tardigrade have been identified (over 10x that worldwide). Some have a certain resemblance to tiny tail-less armadillos in those that have plates on their dorsal cuticle. Others lack the cuticle plates.

Macrobiotidae family species are devoid of plates, while in the species of the Echiniscidae family plates are present. If there is an additional pseudosegmental plate then the animal is in the genus pseudoechiniscus. (For more detailed species level identification consult the key of Morgan & King).

They all have 4 pairs of stumpy legs (although depending on how viewed they will not all be visible) and each of the legs have claws on the end. (A number of marine species have suckers rather than claws). The form of the claws can be diagnostic in some species and some genus identification.

Tardigrades have a mouth at their front end, with a pair of stylets that are normally sheathed, but emerge from the mouth to pierce the cells of plants or animals. They have a brain and eye spots. The Phylum Tardigrade is formed from the order Heterotardigrada (which consists of the sub-orders Arthrotardigrada and Echiniscoides), and the Order Eutardigrada.

References

- Kinchin, I. 1994.** *The Biology of Tardigrades*, 1–186, London: Portland Press.
- Morgan, C. & King, P. 1976.** *British Tardigrades, Synopses of the British Fauna (New Series) No. 9.* London: Linnean Society.

www.tardigrades.com Martin Mach. A tremendous website just about Tardigrades, with a stunning video clip of a Tardigrade walking.