Daphnia: development of model organism in ecology and evolution

Winfried Lampert (2011)


ISSN: 0932-2205. xix + 250 pp. Hardcover, €44.

Few freshwater organisms are better recognised by aquatic biologists, or are more symbolically representative of freshwater habitats, than the cladoceran, *Daphnia*. Several species share the same general body-plan, featuring a short, segmented body and a compressed carapace that part-encloses several pairs of flattened limbs, called phyllpods. Co-ordinated rhythmic beating of the phyllpods generates a current within the carapace chamber, from which food particles are strained by the marginal filtering setae and then channelled back to the animal’s mouth. Partly because this turns out to be a highly efficient means of removing and concentrating appropriately-sized foods from the water and partly because the animals are able to grow rapidly and recruit subsequent generations, *Daphnia* can be a major consumer of phytoplankton (algae and bacteria). At the same time, however, individual animals are not inconspicuous to predatory young fish or, on occasions, to older fish of those species that remain planktivorous specialists for much of their lives. As a consequence, populations of *Daphnia* are frequently pivotal to energy transfer through aquatic food webs. In turn, the impacts on species selection in freshwaters, on system function and upon perceived water quality, are known to be far reaching.

These are reasons enough to want to study and better understand the dynamic sensitivities of daphniids. Indeed, many research findings have been published over the last forty years or so, referring to their life histories, reactions to temperature, foods, feeding and the efficiency of conversion to growing biomass, egg production and recruitment of subsequent generations. The fact that so many aspects of our knowledge of the physiology, food requirements, growth and fecundity of *Daphnia* spp., as well as of the adaptive behaviour of populations in response to the real or threatened presence of predators, have been contributed directly by Lampert and his co-workers, collaborators and students, at Freiburg, Konstanz and, especially, at the Max-Planck-Institute for Limnology in Plön, confirm that he is probably the most appropriate person in the world to have written this monograph.

The book is handsomely produced, following the now well-tested format devised by Otto Kinne in the 1980s. His vision was to sponsor internationally established ecologists, identified by nomination and resolved by a competition judged by peers, to receive his ECI (International Ecology Institute) Prize. In the much quoted words of the first such laureate, Tom Fenchel, the Prize comes with “strings attached” – to publish a topical monograph! This is then sold at cost price and is deliberately marketed in countries where published literature is prohibitively expensive. In recent times, the Internet may have eroded the differential of availability and accessibility but I am delighted that the notion of the Prize Publication persists and that it can continues to sponsor works as good as this one on *Daphnia*!

A glance at the Contents page gives a strong impression of the breadth, depth and the organisation of the topics covered. The second chapter, reviewing the physiological ecology of *Daphnia*, including the regulation and bounds of effective filter-feeding on potential foods in suspension, is strongly based on experiment; at the same time, it supports empirical amplification of fundamental processes of competition and predation. It explains the size-efficiency