

2 Daphnid Grazing Ecology

2.1 Daphnids and Their Ecological Role

Daphnids play a central role in the food webs of aquatic ecosystems. They often fulfil a key role in making primary production (algae) available for higher trophic levels, including vertebrates (fish) and invertebrate species. Since daphnids and other species within zooplankton communities have high reproduction rates, they are capable of responding to varying levels of algal production. This rapid response enables them to substantially affect the density of algae, which results in low algal densities during part of the season (e.g. the 'clear water phase' often observed in lakes during early summer).

Daphnids Within the Zooplankton

Daphnids form part of the zooplankton. By definition, zooplankton communities are built up of animal species (zoo = animal) that float in the water column (plankton = floating). These species belong to several taxonomic groups (Lehman 1991), but in fresh waters the zooplankton is often dominated by protozoa, rotifers and crustaceans. Protozoa are small animals that feed on bacteria. They usually spend only part of their lives in the water column. The Rotifera (rota = wheel; ferre = to carry) form a separate phylum of generally small, non-segmented animals that filter water with one or two wheel-like ciliary organs (corona). Crustaceans belong to the phylum Arthropoda and have two major representatives in the zooplankton; the class Copepoda, and the sub-order Cladocera of the class Branchiopoda. The ecological differences between the major groups that feed on algae are briefly characterised by Allan (1976, Table 2.1). Some common zooplankton species in European temperate water bodies are presented in Fig. 2.1.

Compared with copepods and rotifers, cladocerans exhibit strong grazing impacts which is related to relatively high growth rates in combination with their relatively large size. A more recent compilation of literature data shows that the variability of the intrinsic rate of increase (r_{\max}) within these three groups is much higher than predicted by Allan (Andersen 1997). Rotifers tend to have the highest r_{\max} , and copepods the lowest.

Table 2.1. Summary of key ecological characteristics of the major zooplankton taxa (from Allan 1976)

Feature	Rotifera	Cladocera	Copepoda
r_{\max} (day ⁻¹)	0.2 – 1.5	0.2 – 0.6	0.1 – 0.4
Typical adult body size (mm)	0.2 – 0.6	0.3 – 3.0	0.5 – 5.0
Largest species (mm)	1.5	5.0	14.0
Food size range (µm)	1 – 20	1 – 50	5 – 100
Mode of feeding	Suspension feeding via coronal cilia	Filter feeding via thoracic appendages	Filter and/or raptorial
Filtering rate	Very low	High	Low
Susceptibility to vertebrate predators	Very low	High	Low
Susceptibility to invertebrate predators	High	Moderate	Moderate to high
Abundance pattern	Vernal peak	Vernal peak	Variable
Biogeography (large lake distribution)	Surface and inshore	Surface and inshore	Deep, open water
Biogeography (global)	Freshwater and estuarine	Freshwater and estuarine	Freshwater, estuarine, and marine

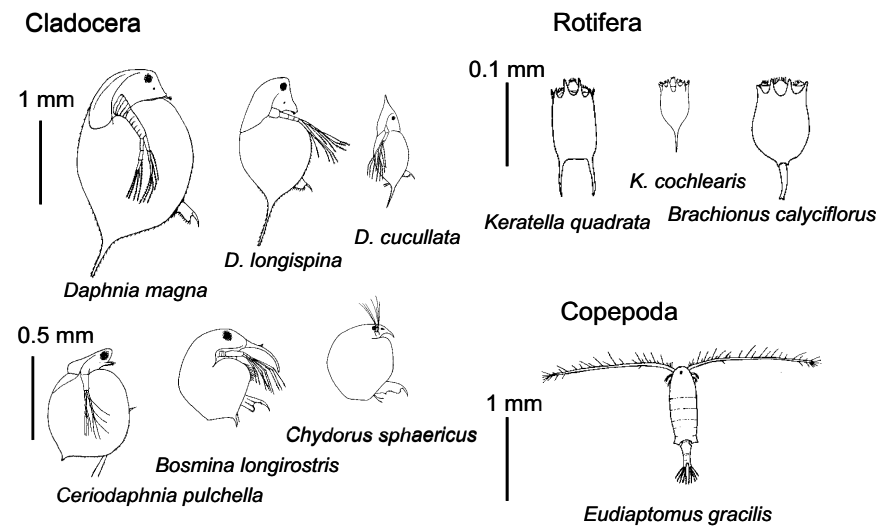


Fig. 2.1. Common zooplankton species in European temperate water bodies (redrawn from Streble and Krauter 1988)