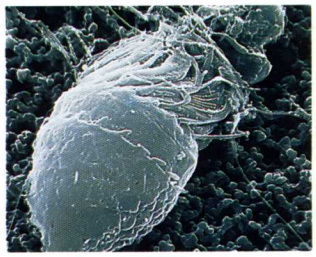


Scanning electron micrograph (SEM) of Strombidium, *a common species off the West Coast* (Photo: Hoe Chang, NIWA)

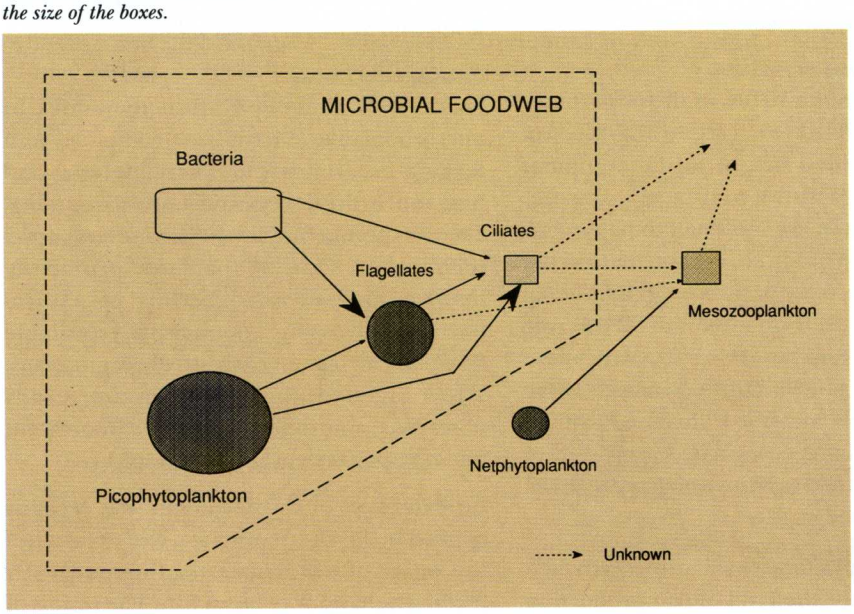
experiments off the west coast of the South Island showed that many microzooplankton taxa seemed able to discriminate not only on the basis of size but also on "palatability" (taste). They fed on labelled natural particles at higher rates than on artificial ones. Only small microzooplankton taxa (<30 µm) were able to feed on bacteria-sized particles, but they preferred larger picophytoplankton-sized particles. Microzooplankton >30 µm were generally not capable of feeding on these very small cells and relied on larger phytoplankton. Some larger ciliates are carnivorous, feeding on other ciliates. Clearly, even within each group there is a complex trophic structure. The diverse array of resource utilisation by these groups has no doubt led to their success and ubiquitous presence in aquatic environments.

Realistic complexity for modelling

Clearly pelagic food webs are very complex and we need to be careful not to simplify them too much when applying models. An example of the major pathways in the pelagic ecosystem off the west coast of the South Island is shown in the diagram. The size of each energy pool is indicated by the size of the boxes or arrows. The data on which this diagram was based was collected as part of the NIWA multi-disciplinary programme, Marine Environment of the West Coast (a project funded by the Foundation for Research, Science and Technology).

The diagram shows that microzooplankton appear to be an important potential link to higher trophic levels in that ecosystem, without which a large component of primary production would not be available to higher trophic levels and fish.

Revised food web for the marine environment off the West Coast in winter, showing major carbon pathways. Pool sizes are shown by the size of the boxes.



A further improved understanding of the structure and functioning of aquatic food webs, particularly the micro-organisms, is required if we are to answer questions such as: why can some toxic algae bloom with little "top-down" control? and, why is secondary production low relative to the nutrient levels and primary producers in some of our freshwater and marine ecosystems? Continuing NIWA research is addressing these issues. ■

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Microbial food webs: the importance of algae that graze

Julie Hall

THE STRUCTURE and dynamics of the food web in the open ocean are extremely complex. In studies which aim to enhance our understanding of the processes involved, it is often easiest to focus on just a small section. One such section is the microbial food web which involves organisms less than 200 µm in size. The main food sources are bacteria and picophytoplankton. *Bacteria* are generally in the size range 0.2-1.0 µm. They gain energy from organic compounds such as glycolate which are released from larger organisms. *Picophytoplankton* are algae in the size range 0.2-2.0 µm. They gain energy from photosynthesis.

In the open ocean off the West Coast of the South Island, the microbial food web is a very important part of the overall food web. In fact, picophytoplankton account for 40-80% of plant production. They may be small but there are lots of them - up to 60 million cells per litre of water. These organisms are generally too small to be grazed by the larger zooplankton. So, if their production is to contribute to that of the region as a whole, they must be "packaged" into larger parcels that can be grazed on by the microzooplankton.

Such "packaging" is done by intermediate organisms which are small enough to be able to graze on the bacteria and picophytoplankton. The main group to gain energy from this source comprises the heterotrophic flagellates, which have a size range of 2-20 µm.