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## ABSTRACT

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K. Tönnesson, 2005, Zooplankton – their role in the pelagic food web and in structuring the pelagic ecosystem. Department of Marine Ecology, Göteborg University, Sweden.  
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The thesis focuses on how zooplankton function in the pelagic food web and their role in shaping the pelagic ecosystem. Zooplankton, both herbivores and carnivores, modify the prey community by grazing and predation. The trophic structure of the zooplankton community also determines what fraction of the primary production is transported out of the euphotic zone through sedimentation. The thesis is mainly based on field observations on organisms with different positions in the pelagic food web. The poorly studied appendicularian *Oikopleura dioica* was studied in some detail.

Traditionally, ecological studies of zooplankton have focused on copepods, which for a long time have been considered to be the major trophic link between large phytoplankton and fish. Together with the usually dominating copepods, appendicularians and protozooplankton are abundant grazers in the pelagic environment and their grazing impact can exceed that of copepods. Since they are important consumers of the pico- and nano-plankton they may serve as an important link between the microbial and classical food webs. The results of this thesis indicate that a large fraction of primary production is cycled through the protozooplankton to higher trophic levels. Despite the low biomass of the appendicularian *Oikopleura dioica*, the high removal rate of this species resulted in relatively high grazing impact. Results showed that *Oikopleura dioica* displayed non-selective feeding on bacteria, phytoplankton and protozooplankton in the size range 1-30  $\mu\text{m}$ , but did not remove dinoflagellates  $>25 \mu\text{m}$  or *Pseudo-nitzschia* sp.. The backflushing mechanism was apparently able to reject the larger dinoflagellates and *Pseudo-nitzschia* sp. at moderate concentrations. If large prey become too abundant, this may, however, not be the case and clogging of the house will result.

Previous studies have identified predation as an important factor in structuring prey communities. This thesis has focused on the three common zooplanktivores *Sagitta setosa*, *S. elegans* and *Pareuchaeta norvegica*. Results revealed that *Sagitta setosa* and *S. elegans* are important predators of copepods, appendicularians and, in the case of *Sagitta setosa*, of conspecifics in the Gullmar fjord. The predation impact in surface waters was among the highest recorded, and the cannibalism was substantial. In spring, the predation impact of *Pareuchaeta norvegica*, calculated from pellet production, was equivalent to 160% of the copepod population production in the Skagerrak. Such strong predation is likely to have effects on population dynamics of copepods and illustrate the importance of this species in the pelagic ecosystem.

The specific contribution to the vertical carbon flux of faecal material produced by different species of copepods and appendicularians is poorly documented. In addition, there are only a few studies that take into account both appendicularian faecal pellets and houses. Copepods dominated the biomass and their pellets dominated the faecal carbon flux in all seasons. We found that discarded appendicularian houses were full of phytodetritus and therefore served as a potential microhabitat and a food source for a variety of organisms including copepods. Accordingly, mesozooplankton grazing was responsible for the removal of 36-70% of the produced houses in the euphotic zone. Discarded appendicularian houses are therefore considered to be an important food source for copepods in both the Skagerrak and the Gullmar fjord.

**Key words:** *Oikopleura dioica*, *Sagitta setosa*, *Sagitta elegans*, *Pareuchaeta norvegica*, grazing impact, predation, selective feeding, carbon flux, Skagerrak, Gullmar fjord