Functional biology and ecological role of krill in Northern marine ecosystems

Krill is an understudied key group of zooplankton, which transfers energy through the food web by linking lower and higher trophic levels. Furthermore, krill play an important role in the biological pump by transporting carbon out of the euphotic zone to depth by diel vertical migration (DVM) and by production of fast sinking carbon-rich faecal pellets. Hence, the large schools of krill greatly influence the pelagic food web and the flux of organic matter in the sea. However, knowledge of the distribution and feeding biology in krill from northern areas is scarce, although of importance to get a better understanding of the marine ecosystems and food webs. This thesis aimed to gain more knowledge of krill in northern hemisphere and to study their trophic position and grazing impact in a sub-Arctic fjord. The project investigated i) species and population composition of krill in the area of Godthåbsfjord, SW Greenland, ii) trophic position and feeding rates of krill on different groups of plankton, and iii) in situ grazing impacts. The approach was a combination of field studies and controlled laboratory experiments. We found four krill species to coexist in Godthåbsfjord; Meganyctiphanes norvegica, Thysanoessa longicaudata, T. inermis and T. raschii. Species distribution was related to the oceanographic regimes, and different species dominated outside vs. inside the fjord. Temperature had an effect on the maturation of the krill. In regions with warmer temperatures, maturation occurred at an earlier life stage, than in regions with colder temperatures. Results from stable isotope analyses and feeding experiments show that there is an overlap in the diet of the species and that they are able to exploit several trophic levels. Trophic positions are related to available prey. However, the size of the krill seemed to be the key factor determining the trophic position of a species, where the largest species had the highest trophic position. The species were feeding on the same food items, which could lead to competition for food. However, there is a difference between the two functional groups, represented by M. norvegica and Thysanoessa spp., where the former feed on large copepods, whereas the latter feed on smaller cells such as flagellates. This difference in feeding could reduce interspecific competition if food is scarce, and thereby make coexistence possible. The in situ grazing impact in early summer was estimated for the two dominating species within the fjord, T. inermis and T. raschii. The krill grazed < 1% of the phytoplankton standing stock in Godthåbsfjord, and therefore did not control the phytoplankton community at this time of year. Yet, the grazing impact was similar to the copepods’, which are normally assumed to be the main grazers in marine ecosystems. This suggests that krill could be and are - in the case of Godthåbsfjord - important grazers that deserve more attention in future monitoring and research programs

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