ABSTRACT

Euphausiids (krill) are shrimp-like planktonic crustaceans. They feed on the primary producers (phytoplankton) and smaller zooplankton, while they serve as a nutritional source for higher trophic levels like fish, birds, seals and whales. Their considerable abundance in most seas, together with their central position in the food web, make them important members in the pelagic ecosystem. They are key species in the Polar regions but are also common in temperate waters.

The ecology and behaviour of the krill in the Gullmarsfjord, western Sweden, have been investigated in field studies as well as in experimental studies. The major emphasis has been on the Northern krill, *Meganyctiphanes norvegica*. This is the most common and largest krill (total length around 43 mm) in the fjord. Three species of *Thysanoessa* have been found; *T. raschii*, *T. inermis* and *T. longicaudata*. The most common of these species is *T. raschii*, which is generally found but with varying abundance. A fifth species has also been reported from the fjord; *Nyctiphanes couchii*. These four species are all small in comparison with *M. norvegica*, < 25 mm long.

Most krill species perform diel vertical migration (DVM). They reside deep during the day and ascend towards the surface at night, mainly to feed. A major cue for the onset of DVM is light, and it was shown that during a solar eclipse, krill reacted to a very small difference in light intensity and started to ascend.

The DVM, of especially *M. norvegica*, has been studied at four different seasons. Since the water mass in the fjord always is stratified regarding salinity and temperature, krill can be exposed to varying abiotic conditions. The fjord also experiences annual oxygen deficiency in the deep-water before the water exchange, which normally occurs once a year. Experimental studies and field studies have revealed that even though there can be strong pycnoclines at intermediate depths, it is mostly low salinities and high temperatures in the surface water that affected the DVM of krill. Hypoxia in the deep water seemed to have a great impact on the DVM. Experiments showed that oxygen saturations below 30 % were critical for krill survival.

Since krill are highly motile and swim continuously to remain buoyant, their (*M. norvegica*) swimming capacity was examined with a new experimental technique. Their propulsive force was measured in relation to sex, size and moult stage. Their pleopod beat rate could also be calculated. Results showed that moult stage had a direct effect on swimming capacity, newly moulted krill were weaker and they also swam with lower pleopod beat frequency. Smaller individuals were shown to have a relatively higher swimming capacity than larger ones. Pleopod beat frequency decreased with increasing size of the animal.

Krill seemed to be affected by advective forces. The smaller *T. raschii* was probably more exposed to advection in and out of the fjord at intermediate depths than the larger *M. norvegica*. *Meganyctiphanes norvegica* also seemed to reside deeper than *T. raschii*, also during DVM. Generally, smaller specimens of *M. norvegica* resided shallower than larger specimens.

Key words: Euphausiacea, krill, *Meganyctiphanes norvegica*, diel vertical migration, ADCP, hypoxia, moulting, swimming capacity, solar eclipse, the Gullmarsfjord, Sweden

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