Palmer LTER program: Biomass and community composition of Euphausiids within the peninsula grid, November 1991 cruise

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During the Palmer long-term ecological research program (LTER) cruise on the R/V *Polar Duke* in mid-November 1991, we investigated the distribution, abundance, and community composition of the zooplanktonic and nektonic community along three transects that each intersected the ice edge. Ice cover has been cited by various investigators as one of the primary determinants of the structure and function of the antarctic ecosystem. The data from the November 1991 cruise allowed us to investigate the validity of this presumption for larger, secondary producers during the austral spring west of the Antarctic Peninsula. This note is a preliminary look at some of this data. Abundance and community composition of two dominant euphausiids were compared to observations of ice cover and to measurements of phytoplankton standing-stock determined by high-pressure liquid chromatography techniques used at the same stations by other members of the Palmer LTER (see Prezelin et al. this issue). Measurements at 10-meter intervals were integrated over the top 100 meters of the water column to estimate food availability for grazers in milligrams of chlorophyll *a* per square meter.

At each station along the three transects surveyed (see Ross and Quetin), we did oblique tows with a 2-meter square trawl

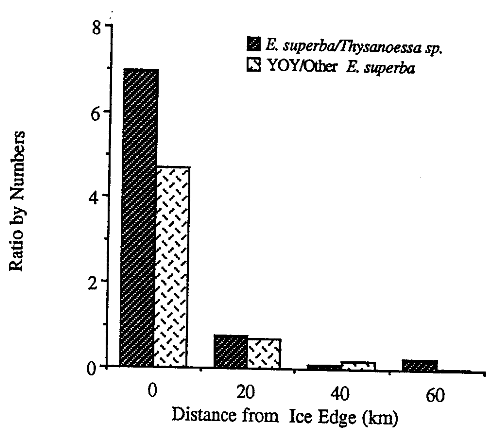

Figure 1. Catch volume (*solid black bars*) (milliliters per cubic meter times 300) at stations along the three transect lines sampled during the 7 to 21 November 1991 Palmer LTER cruise with phytoplankton standing stock integrated over the top 100 meters (*speckled bars*) (milligrams per meter squared). *Shaded area* was ice-covered during the cruise.

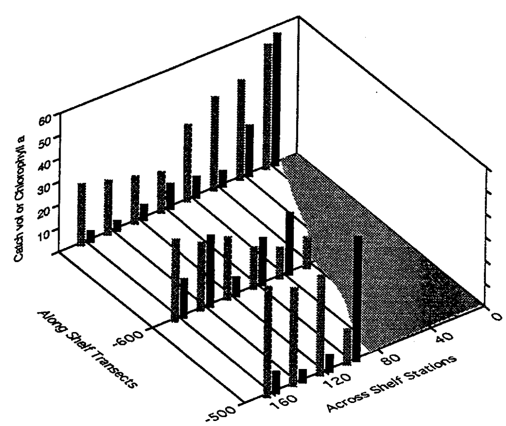

Figure 2. Catch composition in relation to distance from the ice edge: ratio of two euphausiid species (*E.superba* and *Thysanoessa* sp.) and ratio of young-of-the-year (YOY) to all older age groups of *E.superba*.

with 1,000 micrometer (μm) mesh. An Oceanics flowmeter monitored the volume of water passing through the net. Target depth was usually 300 meters, but varied somewhat with bottom depth. The volume of the cod end contents was measured with a graduated cylinder before the catch was preserved in 10 percent formalin. Catch per unit effort (catch volume) was calculated as milliliters of organisms per cubic meter of seawater filtered. Catch volume was greatest near the ice edge, and twice as high near the ice edges on the Renaud (500 line) and Dallmann Bay (700 line) transects than the Palmer Basin (600 line) transect (figure 1). Although large-volume catches were associated with high-standing stocks of phytoplankton on the Dallmann Bay line, this correlation was not consistent for the other two transects (figure 1). One difference in the two areas of highest phytoplankton biomass observed during this cruise is that diatoms dominated the phytoplankton assemblage near the ice edge on the Dallmann Bay transect, where antarctic krill were abundant, but prymnesiophytes dominated on the open ocean end of the Renaud transect (see Prezelin et al. this issue), where krill were in low abundance. Weber and El Sayed (1985) found high phytoplankton concentrations in areas with few schools of antarctic krill. In this preliminary analysis (during a transition period in the season) neither a positive nor a negative correlation between krill abundance and total phytoplankton biomass is clear.

Preserved samples from the Renaud transect have been examined: Two euphausiids, *Euphausia superba* and *Thysanoessa* sp., were identified and counted. Individual *E.superba* were categorized as to stage (Fraser 1936) or sex under a dissecting microscope, and were measured for total length with digital calipers from the tip of the rostrum to the end of the uropods. Furcilia larvae, juveniles, and subadults less than about 20 millimeters were young-of-the-year that survived the winter. Larger antarctic krill, called *others,* included both mature and immature individuals with secondary sex characteristics. The community composition was not homogeneous. Relative proportions of the two species and life stage within *E.superba* changed with distance from the ice edge (figure 2). At the ice edge *E.superba*, a herbivore, outnumbered the omnivore *Thysanoessa* sp. by a factor of seven and young-of-the-year *E.superba* dominated the community. A similar dominance of the ice-edge population of *E.superba* by young-of-the-year was found in the austral spring in the Weddell Sea (Daly and Macaulay 1988). As we moved away from the ice edge, the euphausiid community became equally divided between the herbivore and the omnivore by 20 kilometers, with *Thysanoessa* sp. increasingly outnumbering *E.superba* as we moved into open water. Mature antarctic krill far outnumbered young-of-the-year 40 to 60 kilometers seaward of the ice edge.

The patterns in both abundance, species composition, and life-stage distribution within a species all show definite associations with the ice edge, supporting the idea that ice has a role in the structure and function of communities of secondary producers, especially antarctic krill. The interaction of phytoplankton community composition and the major grazer awaits further investigation.

We gratefully acknowledge the assistance of all personnel on this antarctic cruise: Cathy Lascara, Mark Talkovic, and Vance Vredenberg 5-22 November 1991; Tom Moylan and Langdon Quetin, early October to mid-December 1991; and Tim Newberger, mid-October 1991 to mid-March 1992. This research was supported in part by National Science Foundation grant DPP 90-901127. This report is Palmer LTER publication number 7.

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