Polar Biol (1991) 11:157-167

Polar Biology

Oceanic micronektonic/macrozooplanktonic community structure and feeding in ice covered Antarctic waters during the winter (AMERIEZ 1988)

Thomas M. Lancraft, Thomas L. Hopkins, Joseph J. Torres and Joseph Donnelly

Department of Marine Science, University of South Florida, 140 7th Avenue South, St. Petersburg, FL 33701-5016, USA

Received 22 January 1990; accepted 4 October 1990

Summary. Fifty-seven species of oceanic micronekton and macrozooplankton were collected under pack ice during the winter in the vicinity of the Weddell–Scotia Confluence with a modified opening-closing Tucker trawl. The majority of the 57 species did not vertically migrate and lived deeper during the winter than during the spring or fall. However, despite the short day length, several of the most common mesopelagic fish and crustaceans did migrate. Fish moved into shallower depths at night but apparently most did not continue into the near-freezing upper mixed layer, leaving that zone to the migratory crustaceans. In the upper 1000 m, the dominant species were, in order of decreasing biomass, *Euphausia superba*, the cnidarian *Atolla wyvillei*, the ctenophore *Beroe* sp., and the mesopelagic fish *Electrona antarctica*, *Bathylagus antarcticus* and *Gymnoscopelus braueri*. *Thysanoessa macrura* and *Salpa thompsoni* were biomass subdominants. The majority of the dominant species showed little seasonal differences in biomass. However, the biomass of gelatinous species varied considerably with *A. wyvillei* and *Beroe* sp. being most abundant and *S. thompsoni* least abundant during the winter. Incidence of food in the stomachs in several important species was low, suggesting a low impact on their zooplankton prey. Specimens of *S. thompsoni* had high quantities of food in their guts but this species was uncommon so its net impact would also have been low. *Euphausia superba* and the three common mesopelagic fish had significantly lower stomach fullness ratings during the winter than during the fall, suggesting an overall decrease in feeding activity of dominant species during the winter.

Introduction

The winter season is a critical period in the life histories of much of the Antarctic pelagic fauna. Long nights, severely curtailed primary production and the ubiquitous presence of sea-ice act in concert to influence the daily activities of species at every trophic level. Two activities that are particularly susceptible to the influence of the winter season are diel patterns of vertical migration, which are light cued, and visually mediated predation.

Data are scarce on distribution patterns in Antarctic pelagic fauna during the winter. A deeper winter distribution of important species among the Antarctic zooplankton (Foxton 1956; Hopkins 1971; Voronina 1973) changes the structure of the water column for secondary consumers; the biomass maximum is deeper and the probability of encounters with prey increases below 500 m.

This paper describes the diel vertical distribution, abundance and biomass of Antarctic macrozooplankton and micronekton in the Weddell–Scotia Confluence region during the winter season. Diet and gut fullness have been analyzed in the dominant species and compared with that of the austral fall in an attempt to discern the influence of the winter season on pelagic secondary consumers.

Methods

Sampling and treatment of specimens

Micronekton and macrozooplankton were collected in the southern Scotia Sea from the *RV Polar Duke* during the austral winter (20 June–14 August 1988) as part of the Antarctic Marine Ecosystem Research in the Ice Edge Zone (AMERIEZ) program (Fig. 1, study area C). Most of the samples were taken from below partially consolidated pack ice (8/10–10/10 coverage, up to 1 m thick floes); the resultant data are generally representative of a wintertime oceanic ice pack system. Hydrographic information was obtained and analyzed by Husby et al. (1989) using CTD and XBT casts on or near the stations we sampled.

Micronekton and macrozooplankton (> 20 mm in greatest dimension) were sampled using a modified opening-closing Tucker trawl with a 1.8 m^2 effective mouth opening towed at an average speed of 2 knots. The trawl mouth was opened and closed using a clock-actuated release device (Davies and Barham 1969). The main net was constructed of 4 mm mesh, tapering down to a 1 mm mesh cod-end net enclosed by a PVC jug-type cod-end (Lancraft et al. 1989). Volume of water filtered was measured only when the trawl was fishing by using dial type flowmeters mounted on the trawl frame (Hopkins and Baird 1975). Depth of tow was recorded by time