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Editorial

An overview of the Southern Ocean Global Ocean Ecosystems Dynamics program

1. Introduction

The Southern Ocean Global Ocean Ecosystems Dynamics (SO GLOBEC) program is an international multidisciplinary effort focused on understanding the physical and biological factors that influence growth, reproduction, recruitment, and survival of Antarctic krill (*Euphausia superba*). The program uses a multi-trophic level approach that includes the predators and competitors of Antarctic krill, represented by other zooplankton, fishes, penguins, seals, and cetaceans. Extensive studies describing the ecology and physiology of important species at all trophic levels contributed to the ecosystem approach that is GLOBEC's trademark.

During the planning of SO GLOBEC, it became obvious that the processes allowing Antarctic krill and other species to survive the austral winter were poorly understood. Thus, an extensive field program was developed that would provide observations and measurements during the transition from austral summer to fall, during the austral winter, and during the winter to spring transition at several sites around the Antarctic. The first series of SO GLOBEC field studies were centered on Marguerite Bay along the west Antarctic Peninsula (Fig. 1).

This special volume of *Deep-Sea Research* is comprised of papers representing the initial results of the SO GLOBEC field program, most of which are from studies that took place during the field seasons in April–June 2001 and July–September 2001 along the west Antarctic Peninsula. The field season began with a cruise in March–April that was done as part of the German SO GLOBEC program aboard the F.S. *Polarstern*. Following this cruise, a process cruise aboard the A.R.S.V. *Laurence M. Gould* and a survey cruise aboard the R.V.I.B. *Nathaniel B. Palmer* took place in April–June 2001 as part of the U.S. SO GLOBEC field program. The process and survey cruises were repeated about six weeks later in July–September 2001. The five cruises in 2001 provided coverage from the late fall, through the winter, and into the beginning of spring, which is the first time for such observations in Antarctic continental shelf waters. In 2002, the U.S. SO GLOBEC program once again went to sea on survey and process cruises in Marguerite Bay during April–May and in July–September.

During the U.S. SO GLOBEC survey cruises bottom mapping was done using the Sea-Beam system aboard the R.V.I.B. *Nathaniel B. Palmer.* These bathymetry data were combined with historical data from the region and with high-resolution bathymetry measurements made during British Antarctic Survey cruises aboard the R.R.S. *James Clark Ross* in February and March of 2001 and 2002 (Pudsey and Morris, 2001; Pudsey, 2002), as described in Bolmer et al. (2004). The resulting high-resolution bathymetry for the Marguerite Bay region of the west Antarctic Peninsula (Fig. 2) shows deep channels and troughs that connect the outer and inner continental shelf. As reported in several papers in this volume, these

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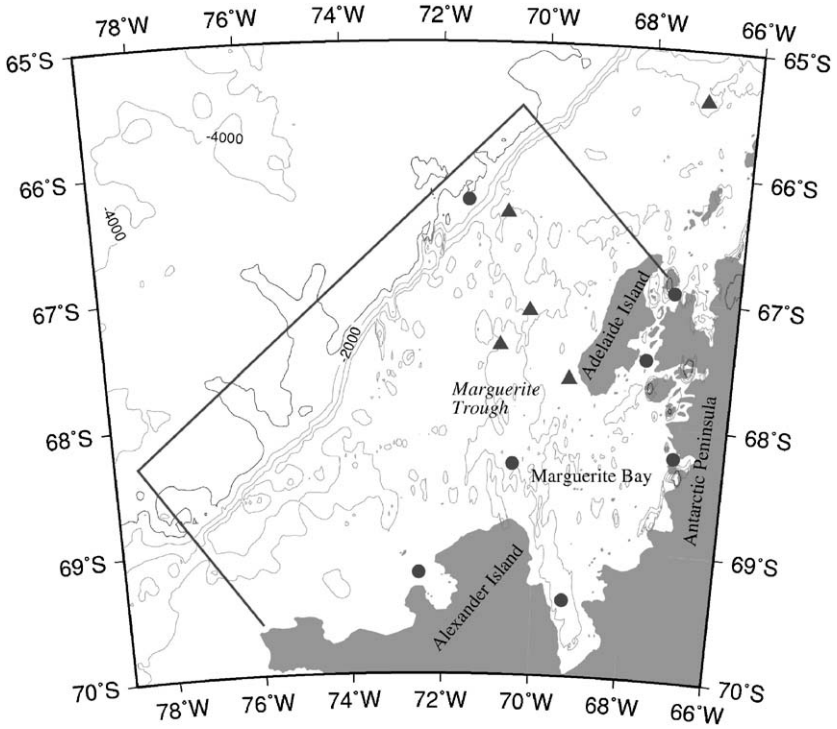

Fig. 1. Map showing the SO GLOBEC study region (solid line box) along the western Antarctic Peninsula. The process station sites occupied as part of the U.S. SO GLOBEC field program during April–June 2001 (●) and July–September 2001 (▲) are indicated. The 500, 1000, 2000, 3000, and 4000-m bathymetry contours are shown.

connections, especially Marguerite Trough, are important in determining physical and biological structure and dynamics in this region.

Our understanding of structure and function in the winter Antarctic marine food web is considerably enhanced by the papers in this volume. In keeping with the GLOBEC philosophy of understanding effects of environmental variability on marine populations, the first nine papers in the volume provide the physical and biological setting of the west Antarctic Peninsula continental shelf. The results reported in these papers highlight the contribution of a particular water mass, Circumpolar Deep Water, to the hydrography, circulation, sea ice, and biological environments of this region. The next seven papers present results from different seasons and areas of the Antarctic that advance understanding of marine zooplankton processes. The first five papers in this group focus on behavior, growth, feeding, nutrition, and overwintering strategies of Antarctic krill. The sixth paper in this group provides comparisons of winter processes for another krill species from a different area of the Antarctic. The final paper in this section provides a summer counterpoint to winter data via measurements of metabolism, composition, and enzymic activity in krill and other Antarctic micronekton. The SO GLOBEC program has a large component studying top predators, reflected in the last six papers of the volume that are centered on fish, seabirds, seals, and cetaceans. Cetacean observations were the result of a partnership with the International Whaling Commission. The SO GLOBEC field program provided some of the first austral winter measurements of the distribution and abundance of seabirds and marine mammals. This field effort was the first to obtain data on the diving behavior and movement patterns of crabeater seals (*Lobodon carcinophagus*) and reports the first use of a

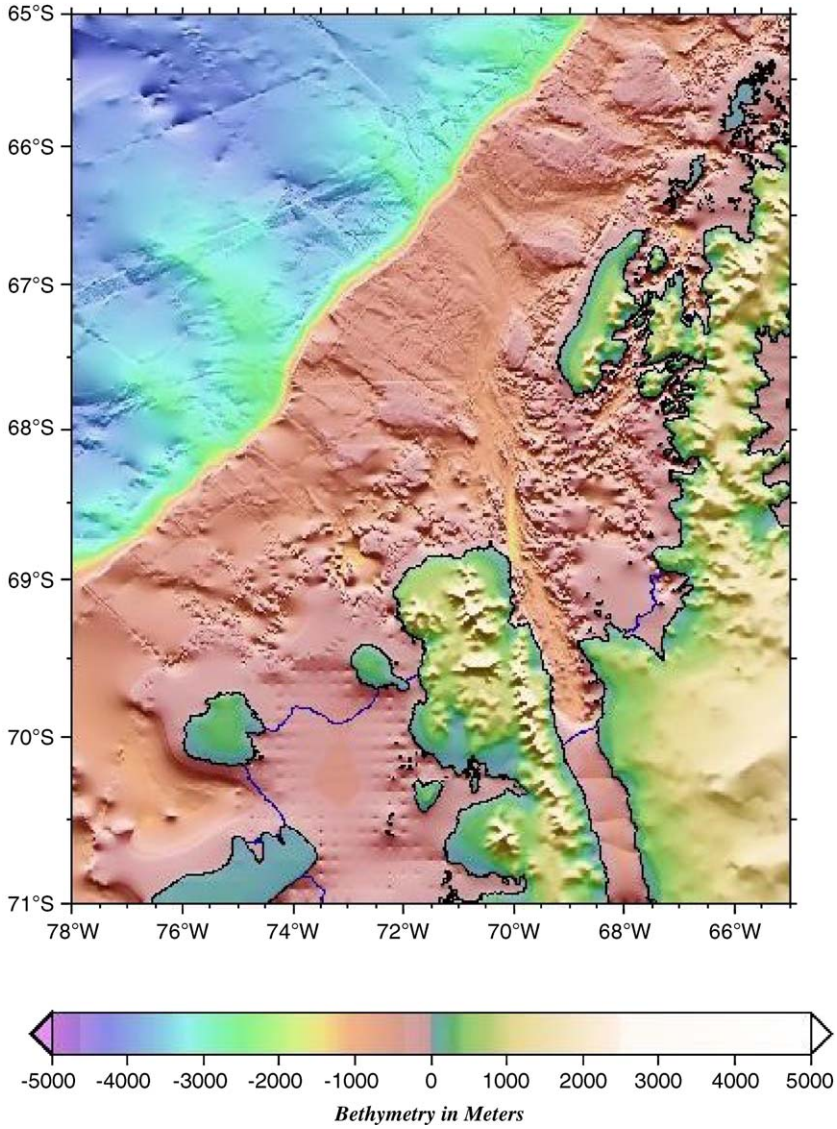

Fig. 2. High-resolution bathymetry of the SO GLOBEC study region. The blue lines indicate permanent ice shelves. Geographic names are given in Fig. 1. The data used to construct the bathymetry are available at: http://globec.whoi.edu/jg/serv/globec/soglobec/bathy.html0. Bathymetry figure provided by T. Bolmer, Woods Hole Oceanographic Institution.

bottom-mounted acoustic observatory to record marine mammal calls. The acoustic records confirm a year-round presence of minke whales (*Balaenoptera acutorostrata*) in the west Antarctic Peninsula region.

This is the first of several anticipated volumes dedicated to results of the SO GLOBEC effort. The continued synthesis and integration of the many data sets collected during SO GLOBEC will provide a basis for planning future efforts directed at studying the physics and biology of the Antarctic marine food web. Additional information about the SO GLOBEC and U.S. National GLOBEC programs is available at: http://www.

usglobec.org. Information on the International GLOBEC program is found at http://www.pml.ac.uk/globec.

Acknowledgments

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