

# Antarctic Marine Living Resources (AMLR) program

## The U.S. AMLR program: 1990–1991 field season activities

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The U.S. Antarctic Marine Living Resources (AMLR) program provides information needed to formulate U.S. policy on the conservation and international management of resources living in the oceans surrounding Antarctica. The program advises the U.S. delegation to the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), part of the Antarctic Treaty system. One of the principal tenets of the CCAMLR treaty is that the harvest of living resources shall be managed with the goal of preserving species diversity and stability of the entire marine ecosystem. Because antarctic krill (*Euphausia superba*) are the dominant prey in the pelagic marine ecosystem, the effects of krill harvest on dependent predators must be thoroughly understood in order to manage the fishery within the mandate of CCAMLR.

The AMLR program monitors fin fish and krill fisheries, projects sustainable yields where possible, and formulates management advice and options. In addition, the program conducts field research designed to describe the functional relationships between antarctic krill, their predators, and key environmental variables.

The field research program is designed to investigate and refine two hypotheses:

- Krill predators respond to changes in the availability of their food.
- The distribution of krill is determined by physical, chemical, and biological characteristics of the pelagic habitat.

As in past seasons, the 1990–1991 AMLR field season included two components: first, a research cruise aboard the National Oceanic and Atmospheric Administration (NOAA) ship *Surveyor* in the waters surrounding Elephant Island, at the tip of the Antarctic Peninsula; and second, land-based studies at Seal Island, a small island next to Elephant Island, and at Palmer Station, a U.S. scientific station further south on the Antarctic Peninsula (figure 1).

The specific objectives of the field season were to

- map the physical structure of the upper 750 meters, including the thermohaline structure, oceanic fronts, water-mass boundaries, surface currents, eddies, and turbulent mixing;
- map the spatial distribution of phytoplankton biomass and phytoplankton production;

- map the spatial distribution of estimated krill biomass, including the horizontal and vertical variations in krill demography and growth; and
- describe reproductive success, feeding ecology, and growth rates of land-based krill predators throughout the reproductive season on Seal Island.

The *Surveyor* departed Punta Arenas, Chile, on 16 January 1991 to begin the first of two 1-month legs of the AMLR research cruise in the vicinity of Elephant Island. On 21 January a survey (survey A, figure 2) of the physical oceanography, biomass and productivity of phytoplankton, and distribution and condition of krill in the waters around Elephant Island, Clarence Island, and the eastern end of King George Island was initiated. The survey consisted of 1,100 miles of acoustic transects between 50 conductivity-temperature-density and net sampling stations. The survey was completed north of Elephant Island and finer scale acoustic mapping was conducted in an area of higher krill densities along the shelf/slope break. Two sites were selected for intensive MOCNESS (Multiple-Opening-Closing-Environmental-Sampling-System) sampling. A second survey (survey B) was then conducted, focusing on the area

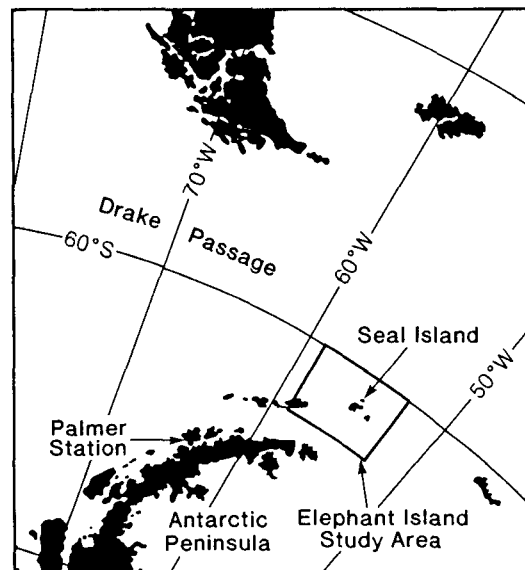


Figure 1. Antarctic Peninsula. Locations of Elephant Island study area, Seal Island, and Palmer Station shown.

north of Elephant Island. Two conductivity-temperature-depth transects were conducted to delineate the hydrography across

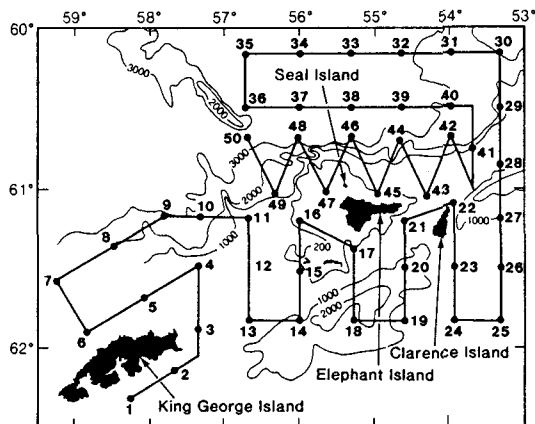


Figure 2. Large-area survey grid (surveys A and D) around Elephant Island, Clarence Island, and the eastern end of King George Island. The grid included 50 stations and approximately 100 nautical miles of transects and was occupied during the first half of leg I and the second half of leg II. Approximately 10 days were required to complete the grid.

the shelf/slope break. The *Surveyor* returned to Punta Arenas on 11 February 1991 for a mid-cruise port call.

Leg II of the AMLR cruise began on 16 February 1991. A third survey (survey C) was conducted north of Elephant Island; both bongo and IKMT (Issacs-Kidd Midwater Trawl) nets were used at each station. A final survey (survey D), which was similar in scale and scope to survey A (figure 2), was conducted from 26 February to 7 March 1991. Additional acoustic transects and stations were conducted in Bransfield Strait. The *Surveyor* returned to the north side of Elephant Island where MOCNESS sampling was directed at an area of high krill density along the shelf/slope break east of Seal Island. Two conductivity-temperature-depth transects were conducted across the shelf/slope break north of Elephant Island. The AMLR research cruise was completed on 17 March 1991 when the *Surveyor* returned to Punta Arenas, Chile.

A five-person field team arrived at Seal Island on 4 December 1990 to begin the land-based research of the 1990-1991 AMLR field program. In accordance with planned research objectives, the field team conducted extensive research on the reproductive and foraging behaviors of krill predators living on the island. Research on foraging behavior included tracking studies that were accomplished during cooperative research programs aboard the Japanese research vessel *Kaiyo Maru* in early January 1991, and aboard the Chilean research vessel *Alcazar* in mid-February 1991. The field team concluded their research activities on Seal Island on 11 March 1991.