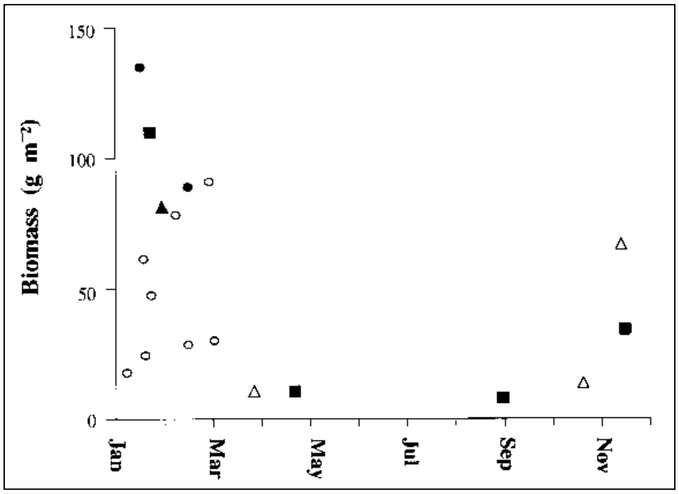

Figure 2. Comparison of acoustically derived, spatially averaged estimates of krill biomass by month. Datasets are denoted as the following: filled box—this study; open circle—AMLR study region near Elephant Island (1190–1992) (Hewitt and Demer 1993a): filled circle—AMLR study region in 1993 (Hewitt and Demer 1993b); open triangle—Elephant Island (Klindt 1986 as adjusted by Hewitt and Demer 1993a); and filled triangle—southwest Atlantic Survey region during FIBEX (Trathan et al. 1995). (FIBEX is the First International BIOMASS Experiment. BIOMASS is Biological Investigations of Marine Antarctic Systems and Stock.)

Old Dominion University. Thanks are extended to the many individuals involved in field collection and the crews of the R/V *Polar Duke* and R/V *Nathaniel B. Palmer*.

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Palmer LTER: Interannual variability in near-surface hydrography

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As part of the annual January cruise undertaken by the Palmer Long-Term Ecological Research (LTER) program, hydrographic surveys are made of the offshore waters west of the Antarctic Peninsula. To date, January cruises have been made in 1993, 1994, 1995, and 1996. This report focuses on the interannual differences observed in the horizontal distributions of the near-surface temperature and salinity fields in January 1993 and January 1994.

Vertical profiles of temperature and salinity were obtained at 52 stations during January 1993 (figure 1*A*) and at 49 stations during January 1994 (figure 1*B*) with a Sea-Bird conductivity-temperature-depth (CTD) system. On all casts, observations were made to within a few meters of the bottom or to 500 meters (m) at deep locations. In both years, the horizontal spacing between hydrographic stations was about 20 kilometers (km). In January 1994, the southernmost transect was not occupied; otherwise, the sampling regime was similar in both years.

The CTD measurements for both cruises were processed as described in Lascara et al. (1993). The near-surface temperature and salinity were obtained by averaging the CTD measurements over the upper 40 m of the water column. This part of the water column is Antarctic Surface Water (Hofmann et al. 1993; Hofmann et al. in press) and is strongly influenced by surface heating and cooling and by buoyancy fluxes. During the austral summer, this region is typically stratified, and the use of an average value was considered to be more representative of the mesoscale hydrographic conditions than observations from a specific depth.

The near-surface temperature in January 1993 (figure 1*A*) shows an onshore-offshore gradient; the inner shelf waters are cooler. Temperatures over the shelf are everywhere positive, and maximum temperatures of 1.5°C occurred at the outer edge of the sampling region. Along the northernmost transect, a lens of water warmer than 0.5°C occurred near Anvers Island and extended southward along the inner shelf. Water warmer than 0.5°C was found throughout the inner shelf in the southern portion of the sampling region. Also, water warmer than 1°C was found over the outer shelf in the southern portion of the sampling region.

In January 1994, the inner and middle shelf near-surface waters were generally warmer than observed in 1993 particularly in the southern portion of the study region and near Anvers Island (figure 1*B*), where temperatures exceeded 1°C. In contrast, the outer shelf waters in 1994 were cooler than observed in 1993 and were generally less than 0.75°C.

The near-surface salinity distribution in January 1993 (figure 2*A*) shows an offshore-onshore gradient with lower salinities present on the inner shelf. An across-shelf salinity gradient occurred along the inner shelf region; however, most of the shelf stations showed salinity values ranging from 33.6 to 33.8. In January 1994 (figure 2*B*), lower salinity water was present in the inner shelf, and water less than 33.7 extended

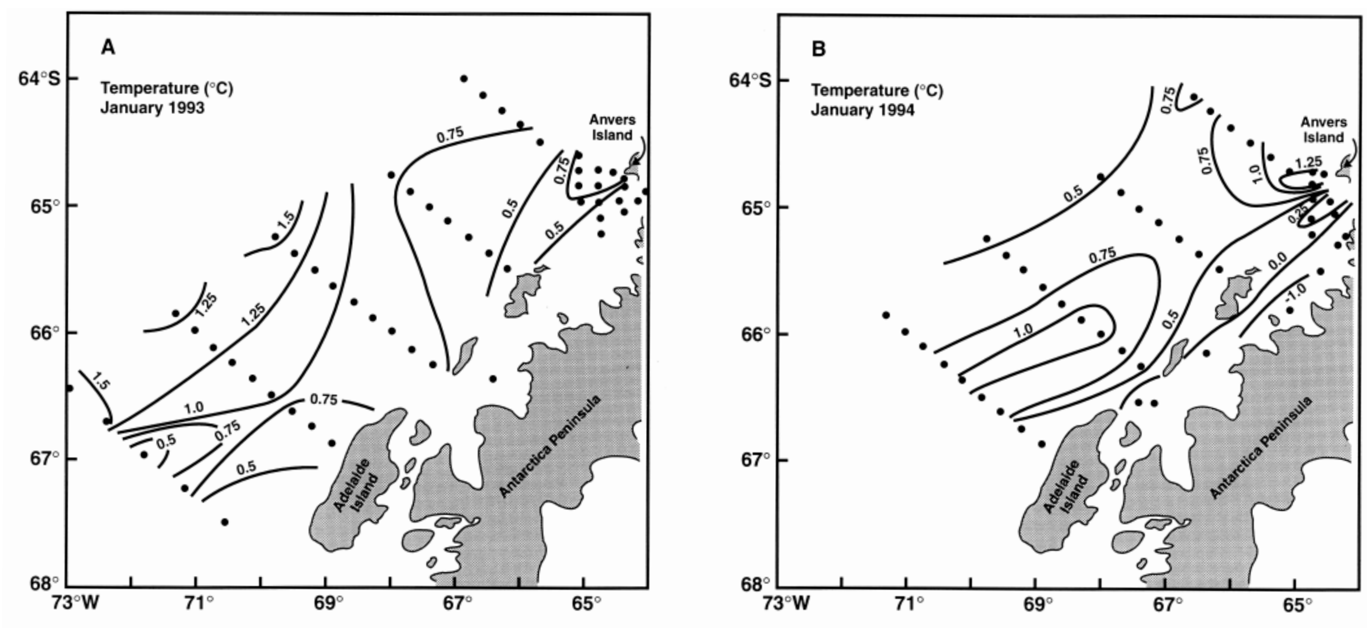

Figure 1. Surface temperature distribution observed in (*A*) January 1993 and (*B*) January 1994. Contour interval is 0.25°C. The hydrographic station distribution is indicated by the dots.

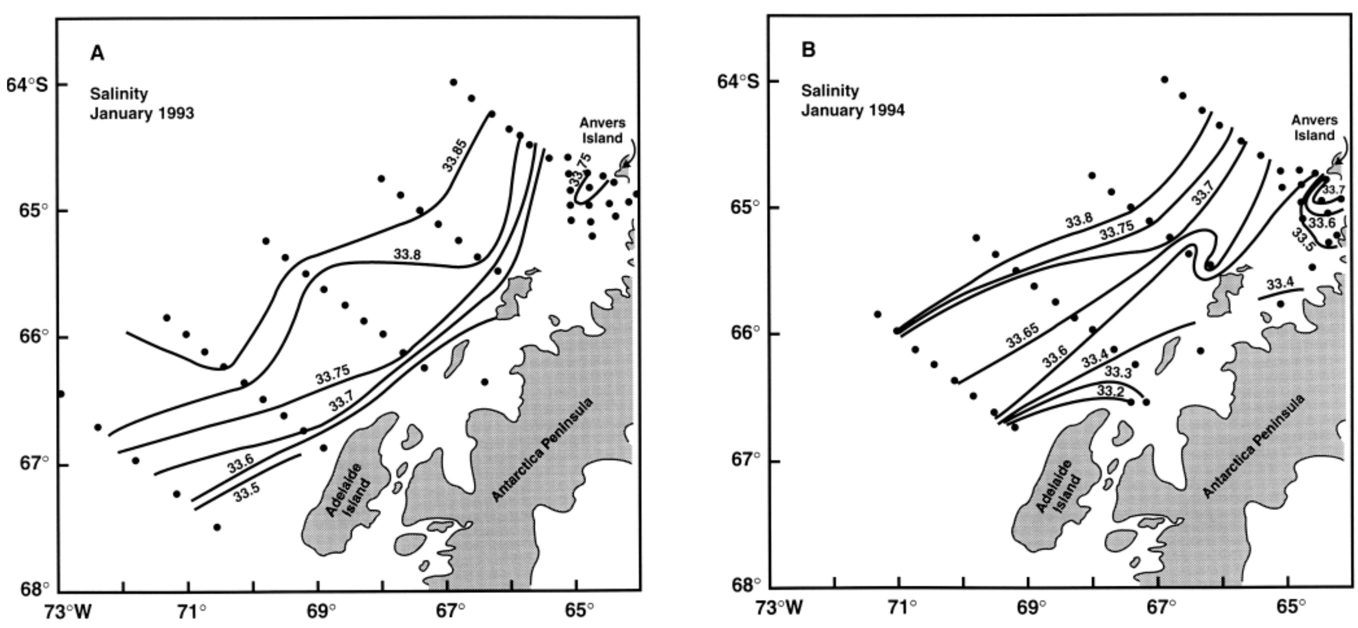

Figure 2. Surface salinity distribution observed in (*A*) January 1993 and (*B*) January 1994. Contour interval is variable. The hydrographic station distribution is indicated by the dots.

farther offshore than in 1993. As a result, the 33.7 and 33.8 isohalines were farther offshore (20–50 km) in 1994. The strongest salinity gradients occurred along the inner shelf region in 1993 and in the region near Anvers Island in 1994. In both years, a region of higher salinity water was found near Anvers Island but was more pronounced in 1994.

The decreased offshore temperature and decreased salinity in 1994 suggest that this year may have been characterized by a larger influx of fresh water from the regions to south or inner shelf or by increased local ice melt. For example, it is possible that the wind patterns and inner shelf circulation in 1994 were such that more of the fresh water near the coast was allowed to spread out onto the shelf. The LTER data, however, are not adequate to evaluate the influx of fresh water from the south or inner shelf. The contribution from local ice melt may be estimated by considering the duration and extent of the ice cover in the preceding austral winter. During the 1992 austral winter, the sea-ice duration around Palmer Station was about 18 weeks and the maximum sea-ice extent in September was to 60°50'S. These values compare to a sea-ice duration around Palmer Station of 15 weeks and a maximum September extent of 62°20'S during austral winter 1993. Thus, in 1993, the sea ice was of greater extent and disappeared faster than in 1992. It may be that more rapid melting of more sea ice in 1993–1994 introduced fresh water faster than it was mixed or advected away.

The source of the high-salinity water around Anvers Island is unknown, but this water may derive from outflow from the Bransfield Strait through the Gerlache Strait. It is, however, more likely that this may be a region of upwelling of the saltier and warmer Circumpolar Deep Water that is found throughout the continental shelf west of the Antarctic Peninsula (Hofmann et al. in press; Smith et al. 1995), which would then mix with the Antarctic Surface Water. Irrespective of the source of this water, however, the near-surface temperature and salinity distributions indicate that the region near Anvers Island differs from the rest of the west Antarctic Peninsula shelf region.

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Palmer LTER: Temporal variability in the location of the Antarctic Circumpolar Current along the west Antarctic Peninsula continental shelf

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As part of the Palmer Long-Term Ecological Research (LTER) program, a series of cruises was completed during which physical and biological properties of the continental shelf west of the Antarctic Peninsula were measured. In particular, between January 1993 and January 1994, four cruises, covering the same region, provide observations adequate to describe seasonal variability of hydrographic properties. These cruises occurred in January 1993 (Lascara et al. 1993), March to May 1993 (Hofmann et al. 1993), August to September 1993 (Klinck, Smith, and Smith 1995), and January 1994 (Hofmann et al. 1996).

The Antarctic Circumpolar Current (ACC) flows northeastward through Drake Passage; its southern boundary is near the continental shelf break west of the Antarctic Peninsula (Orsi, Whitworth, and Nowlin 1995). Associated with the southern boundary of the ACC is a distinctive water mass, Upper Circumpolar Deep Water (UCDW), which is characterized by relatively warm temperatures (above 1.5°C) and high salinity (34.7) (Orsi et al. 1995). Because of the elevated temperatures, the location of the ACC is easy to identify along this shelf. Thus, the objective of this article is to use the Palmer LTER hydrographic observations to describe changes in hydrography that occurred between January 1993 and January 1994 at the outer continental shelf.

The area covered by the four LTER cruises is shown in figure 1, where locations are determined by the LTER grid system (Waters and Smith 1992). This system is based on distances in kilometers along the shelf and across the shelf from a base point on the peninsula far to the southwest (on Alexander Island).