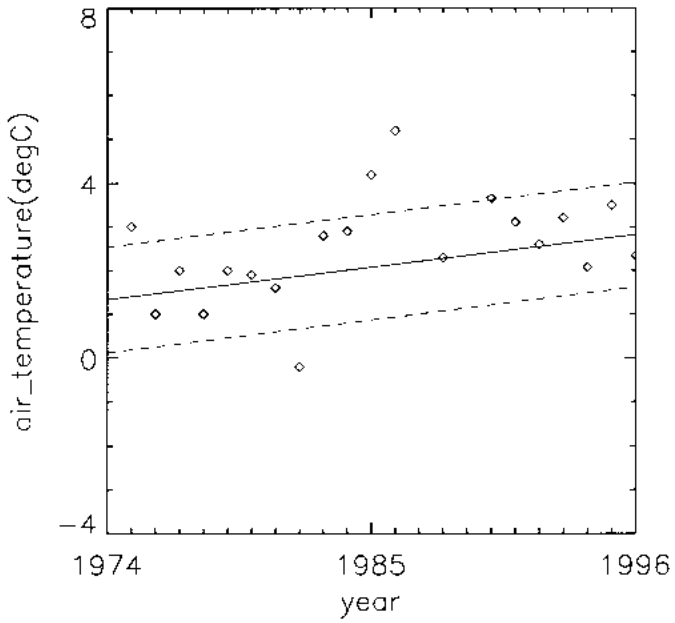

Figure 3. The Palmer Station January monthly average air temperatures versus year from 1975 to 1996 (*N*=20). The solid line is the least-squares regression line with a gradient of 0.071°C per year, and the dashed lines indicate ±1 standard deviation from this line.

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Palmer LTER: Annual season sampling on station

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The seasonal sampling program for the Palmer Long-Term Ecological Research (LTER) site (Smith et al. 1995) has developed over the past five seasons. Weekly observations from October through March at Palmer Station provide a time series that is enabling us

- to understand interannual variability in the seasonal timing and rates of lower trophic processes, which are reflected spatially and temporally in higher trophic levels,
- to place results from the regional scale annual cruises within a year's seasonal progression, and
- to place short-term experiments by LTER and other Palmer Station principal investigators in a seasonal/interannual context.

Observations include the seasonal progression of hydrography, nutrients, pigment biomass, and primary productivity; the near-shore abundance and distribution of antarctic krill and their larvae; and timing and success of the reproductive cycle of a major predator, Adélie penguins. The marine water column and seabird sampling schedule, summarized in the table, accommodates variability in weather.

The seasonal progression of seabird measurements follows the Adélie penguin breeding cycle. The seabird methods follow those developed and standardized by the Commission and Scientific Committee of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR 1992). Studies typically begin on Humble Island with censuses to determine the peak arrival periods of breeding adults (October) and end with chick weights at fledging (February). Additional measurements include censuses of breeding population size and the number of chicks creched per colony. These censuses encompass all colonies on each of the five island rookeries (figure; Humble, Torgersen, Litchfield, Christine, and Cormorant). Other information obtained includes data on adult Adélie breeding chronology and success (chicks creched per pair based on monitoring 300–500 nests annually) and foraging ecology (foraging trip durations and diet composition).

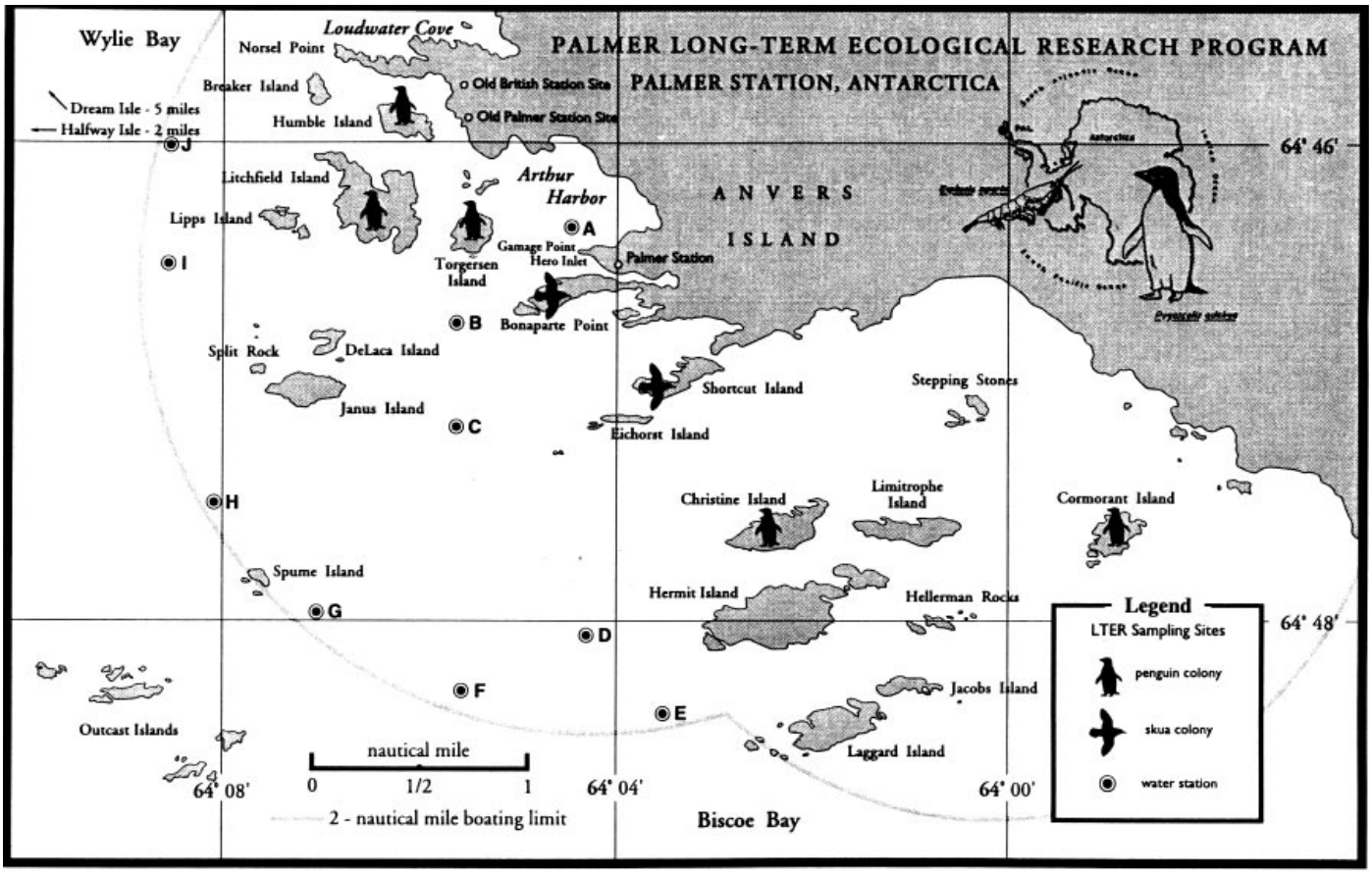
For marine water column sampling, each station activity is given a sequential event number. Transects from station A to E and from F to J (figure) each cover a few kilometers and are

Palmer LTER 1995–1996 standard sampling events

NOTE: Abbreviations used in the table are as follows: acoustics (bio-ac, Biosonics 120 kilohertz), discrete sample for chlorophyll analysis (chl), conductivity-temperature-depth (ctd, Seabird), scuba krill collection (dive), high-performance liquid chromotography of phytoplankton pigments (hplc), instantaneous growth rate (igr), targeted tow for krill (krilltarg, Furuno 50 kilohertz), microscopic analysis of net plankton (net, >5 mm), inorganic nutrient analysis (nuts), photosynthetically active radiation (par), physiological condition of larvae (phyconl), microscopic analysis of picoplankton (pico, 0.5–5.0 µm), particulate organic carbon (poc), production photosynthesis vs irradiance (Ppi), primary production simulated-in-situ (Psis), profiling radiometer (prr, BSI), discrete sample for salinity analysis (sal), transparent exopolymer particles (tep), and standard zooplankton tows (trwl).

Date	Frequency	Location	Activity
October to March	Weekly	Palmer Basin	Zodiac: water column sampling
	Day 1	Stations A to E	ROZE: bio-ac
	Day 1	Stations E to B	ROZE: profile ctd, prr, chlsurf, salsurf
	Day 1	Stations E to B	LEGEND: profile par, hplc, nuts, poc, Ppi, Psis, tep, net, pico
	Day 1	Bonaparte and Gamage Points	LEGEND: chlsurf, salsurf
	Day 2	Stations J to F	ROZE: bio-ac
	Day 2	Stations F to J	ROZE: profile ctd, prr, chlsurf, salsurf
	Day 2	Laboratory	LAB: conclude 24-hour experiments
	Day 3	Palmer Basin	RDUKE: krilltarg (50 kilohertz) for igr, phyconl
	Day 3	Laboratory	LAB: igr experiments
	Day 3	Station B	LEGEND: water for prod, c/chl experiments
	Day 4	Stations E and B	LEGEND: profile par, hplc, nuts, poc, Ppi, Psis, tep, net, pico
	Day 4	Stations D and C	LEGEND: chlsurf, salsurf
	Day 4	Bonaparte and Gamage Points	LEGEND: chlsurf, salsurf
	Day 4	Palmer Basin	RDUKE: weather and/or krilltarg
	Day 4	Laboratory	LAB: conclude 24-hour experiments
	Day 5	Stations A to J	RDUKE: trwl AB, DE, FG, JI
	Day 5	Laboratory	LAB: conclude 24-hour experiments
	Day 6	Laboratory	LAB: analysis
	Day 7	Laboratory	LAB: conclude igr experiments
1 October to 15 November	Once/2 days	Humble rookery	Arrival chronology of breeding adults
1 October to 15 March	Daily	Humble and Torgersen rookeries	Adult overwinter Age-specific survival/recruitment
1 October to 15 March	Weekly	Litchfield, Christine, and Cormorant rookeries	Adult overwinter Age-specific survival/recruitment
15 to 30 November	Once/colony	Humble, Torgersen, Litchfield, Christine and Cormorant rookeries	Breeding population size
15 November to 30 January	Daily	Humble and Torgersen rookeries	Adult breeding chronology and success (chicks creched per pair)
5 January to 25 February	Once/5 days	Torgersen rookery	Chick diet composition and meal size
5 January to 25 February	Daily	Humble rookery	Adult foraging trip duration
15 to 30 January	Once/colony	Humble, Torgersen, Litchfield, Christine, and Cormorant rookeries	Chicks creched per colony
1 to 25 February	Once/2 days	Humble rookery	Chick weights at fledging
15 February to 25 March	Weekly/colony	Humble, Torgersen, Litchfield, Christine, and Cormorant rookeries	Colony-specific breeding chronology

sampled with three specially outfitted zodiacs (Roze, Legend, and Rubber Duke). A standard water column week begins with the Roze completing an acoustic transect for water column biomass from station A to E. The Roze and Legend rendezvous at station E and sample stations E to A simultaneously. An electric winch with conducting cable aboard the Roze permits deployment of the profiling conductivity-temperature-depth (CTD) followed by the profiling radiometer (PRR). The Legend is outfitted with a winch to permit water sampling throughout the water-column. Photosynthetically available radiation (PAR) is measured, and water samples are used for determination of photosynthesis rates (simulated *in situ* and photosynthesis versus irradiance curves at the depth of 50 percent irradiance), analysis of photosynthetic pigments by high-performance liquid chromotography (HPLC), determination of major inorganic nutrients (nitrate, silicate, phosphate), and analysis of particulate organic carbon (POC) and nitrogen. At stations E and B, samples are also taken for picoplankton and netplankton analysis. At station B, samples are taken for transparent exopolymer particle analysis. Sample concentration and analysis as well as incubations for photosynthesis experiments start immediately upon return to station.



Palmer station basin where the grid extent is constrained by the zodiac sampling platforms available and a 3.7-kilometer (2-nautical-mile) safe boating limit. Penguin colonies sampled are denoted by a penguin.

On the second day, the Roze completes an acoustic transect and follows the same routine as for day 1 for stations J through F. If the wind is from the northeast and greater than 5 meters per second, the sampling is done from F to J to avoid being south of Bonaparte Point in bad weather.

On day 3, the Rubber Duke is used to target tow for krill. Krill aggregation searches begin where krill were seen on the previous days followed by searches in other areas within the 3.7-kilometer boating limit. Krill are collected with a 1-meter ring net (500-micron mesh). Instantaneous growth rate (IGR) experiments are conducted over a 4-day period with the krill (Ross and Quetin 1991), and krill are analyzed for length frequency distribution and physiological condition. The Legend samples at station B for phytoplankton experiments on photosynthesis.

On day 4, the Legend samples the water-column at stations B and E for phytoplankton experiments on photosynthesis while surface samples are taken from stations C and D. Samples for chlorophyll analysis are taken at all stations. Day 4 is used on station for sample analysis and data analysis. If poor weather conditions have prevented sampling on prior days, zodiac work is resumed.

On day 5, standard tows are from Rubber Duke done with a 1-meter net from stations A to B, D to E, F to G, and I to J. In the lab, 24-hour photosynthetic rate experiments are terminated, and sample analyses from the previous day are completed.

When ice in Arthur Harbor prevents zodiac operations, water samples are taken from land at Bonaparte and Gamage Points. When possible, these stations are also sampled from the zodiac during the first day and fourth day of the sampling routine on the E to B transect. In addition, during iced periods prior to boating, scuba divers collect krill from under the ice for use in growth rate experiments and for analysis of physiological condition.

Although a season may vary, the basic structure remains in order to define the long-term measurements.

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