Palmer LTER: Predominance of cryptomonads and diatoms in antarctic coastal waters

WENDY KOZLOWSKI *and* MARIA VERNET, *Marine Research Division, Scripps Institution of Oceanography, La Jolla, California 92093-0218*
STEWART K. LAMERDIN, *Moss Landing Marine Laboratories, San Jose State University, Moss Landing, California 95039*

Phytoplankton blooms observed in the Gerlache Strait in December 1991 constituted mostly cryptomonads and diatoms (Vernet 1992). Similar phytoplankton assemblages were sampled during the 1994–1995 growth season off Palmer Station, Anvers Island. During this period, three large productivity events were observed in mid-December, mid-January, and at the end of February in Arthur Harbor (Vernet, Kozlowski, and Ruel, *Antarctic Journal,* in this issue). In this article, we present the pigment composition of phytoplankton sampled during those events; this composition gives a first approximation of the taxa present. Although all algae contain chlorophyll-*a*, carotenoids such as peridinin and fucoxanthin are considered characteristic of dinoflagellates and diatoms, respectively, whereas fucoxanthin derivatives (i.e., 19'hexanoyl-oxy-fucoxanthin) are present in prymnesiophytes, crysophytes, and some dinoflagellates. In addition, alloxanthin characterizes cryptomonads. Chlorophyll-*b*-containing organisms most abundant in antarctic waters are the prasinophytes.

Water samples were obtained biweekly from a transect covering four stations [stations B, C, D, and E, standard Palmer Long-Term Ecological Research (LTER) program grid], starting off Bonaparte Point, Anvers Island, toward offshore (64°48.9'S 64°02.4'W). Samples were taken with a Niskin bottle at depths corresponding to surface (100 percent of incident radiation) and 55, 27, 11, 5, and 2 percent of incident radiation. Depths were established by measuring photosynthetic available radiation using a LICOR 193-SA Quantum Sensor. Water was stored in a cooler and transported back to station. Duplicate samples

Pigment concentrations (in milligrams per cubic meter) in marine phytoplankton sampled off Arthur Harbor (64°48.9'S 64°02.4'W) during the three main productivity events of the 1994–1995 growth season

Pigment	Pigment concentration		
	15 December 1994	20 January 1995	21 February 1995
Chlorophyll-c_3	No	Yes	No
Chlorophyll-c_1+c_2	Yes	Yes	Yes
Fucoxanthin	0.078	1.599	1.515
Diadinoxanthin	0.230	1.548	1.581
Alloxanthin	0.239	0.0	0.196
Chlorophyll-*b*	0.686	3.251	0.0
Chlorophyll-*a*	5.277	9.479	12.101
α-carotene	0.185	0.297	0.106
β-carotene	0.100	0.282	0.239

were filtered onto a Whatman GF/F filter, frozen at –80°C, and analyzed after extraction in a 90 percent acetone-to-water solution by high-performance liquid chromatography using a gradient system and a reverse-phase carbon-18 column. Pigments were detected at 440 nanometers and quantified by injection of standards of known concentration. Pigments were identified by their retention time and their absorption spectrum on the eluent.

The bloom in mid-December had abundant chlorophyll-c_1+c_2, alloxanthin, and α-carotene indicating a dominance of cryptomonads in the phytoplankton (table). Chlorophyll-c_1 is not present in cryptomonads but cannot be resolved from chlorophyll-c_2 in our chromatographic system. The second bloom in mid-January was dominated by diatoms, as shown by the abundant chlorophyll-c_1+c_2, fucoxanthin, diadinoxanthin, and β-carotene. A chlorophyll-*b*–containing alga, as yet unidentified (but see Bird and Karl 1991), was also abundant. The third bloom in late February was composed of a mixture of both diatoms and cryptomonads, and all pigments mentioned above were present, with the exception of the chlorophyll-*b*–containing alga.

An unusual feature this season was the low abundance of prymnesiophytes, such as *Phaeocystis pouchetii*, in Arthur Harbor. Prymnesiophytes are common components of antarctic phytoplankton, both inshore and offshore and can either predominate in the plankton assemblage or be mixed with diatoms (Vernet, Mitchell, and Holm-Hansen 1994). These three phytoplankton taxa, diatoms, cryptomonads, and prymnesiophytes are the major components of coastal antarctic phytoplankton and of ice-edge blooms. The dominance of either of these taxa has major implications for the antarctic food web. Diatoms are commonly considered to be the main food source for the krill, *Euphausia superba* (Haberman, Ross, and Quetin 1993). On the other hand, flagellates such as cryptomonads are believed to be the best food source for salps (Harbison and McAllister 1979) whereas *Phaeocystis pouchetii* is often rejected by zooplankton (Haberman et al. 1993). Future studies on the distribution of different phytoplankton taxa as well as their relationship to physical forcing and grazing will provide more insight into the variability of the production, accumulation, and fate of organic carbon in antarctic coastal waters.

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