ABSTRACT

The goal of the study was to determine how the distribution and biochemical speciation of planktonic production is controlled by abiotic parameters of the environment, like ice-melting, pack-ice retreat, vertical stratification and various mesoscale frontal system.

The factors affecting planktonic spring blooms at the level of the ice edge and of the adjacent open waters were particularly emphasized, both in the Weddell Sea and in the Ross Sea. Lipids and liposoluble pigments of plankton and krill have been especially used as biotracers.

The interpretation of the whole set of data collected during EPOS leg 1 in the Weddell Sea showed that in early spring (October-November 1988), the vertical stratification and horizontal distribution of water masses control the main development of phytoplankton blooms, restricted to the ice edge. However, the paucity of zooplankton abundance and its minimal lipid content, probably due to the overwintering and complete exhaustion of lipid reserves, contradicted the idea of general lipid richness in Antarctic zooplankton.

Observations on samples performed from November 1989 to February 1990 during the Vth ITALIANTARTIDE expedition in the Pacific sector of the Southern Ocean and in the Ross Sea confirmed that the most important factors regulating the Antarctic pelagic food chain are physical processes operating within the circumpolar marginal ice zone during the ice melting period. In the southern Ross Sea, during the spring, the waters diluted by the melting of the Ross ice shelf develop an extensive diatom bloom, characterized by very high chlorophyll levels, reaching maximum values of 187.64 mg/m^2 when integrated from the surface to 150 meters. Because nutrients depletion indicates a long and intense period of production, such blooms might be expected to contribute substantially to the global productivity of the Ross Sea. As a typical characteristic of the Ross Sea, the ice free surface is propagating from South to North, with an increase of the water surface exposed to the sunlight. The diversity of water column characteristics seems due to specific local constraints more than to diversity of ecosystems.

The most original results obtained during these cruises are that fatty acids composition and liposoluble pigments of phytoplankton detected by HPLC seem to depend essentially on the time after the waters become ice free. Moreover, phaeophorbids and ammonia concentrations in the water column, which are reliable tracers of zooplankton activity, follow a similar distribution pattern as that of zooplankton nutritional activity. In addition, the vertical distribution of zooplankton and krill influence highly the

distribution of all planktonic organic material in the water column and the recycling mechanisms, occurring in euphotic zone or in the deeper layers.