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PHYTOPLANKTON COMMUNITY IN THE SUBTROPICAL CONVERGENCE AT 150°E DURING THE AUSTRAL SUMMER OF 1983–84 (EXTENDED ABSTRACT)*

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In the austral summer of 1983–84, phytoplankton community structure and primary productivity in the Subtropical Convergence (STC) at 150°E were investigated in relation to hydrographic structure during the R. V. HAKUHO MARU KH-83-4 cruise (BIOMASS SIBEX).

The STC was located at 46.5–47°S, which was well marked by a distinct temperature and salinity front over a distance of 65 km. Using water samples collected from various depths in the midst of the front (Stn. C), and southern (Stn. S) and northern fringes (Stn. N), phytoplankton organic carbon content, diatom species composition, chlorophyll *a*, macronutrients and simulated *in-situ* uptake rate of $H^{14}CO_3^-$ were measured.

Warm and saline water with a temperature in excess of 12°C extended poleward into the subsurface layer between 34- and 75-m depth at Stn. C, and cold and less saline subantarctic water overlay, producing a temperature inversion (Fig. 1), although the water column was hydrostatically stable. Between the overlying layer and the inversion, there was a sharp pycnocline at 27- to ≈30-m depth. Thus, the upper mixed layer was down to 27 m at Stn. C where underwater irradiance was 15% level of that at the surface. At Stn. S there was a thermocline around 20 to 30 m and the mixed layer was down to 23 m, while in the area south of Stn. S, the top mixing layer was more than twice as thick as that at Stns. C and S. At Stn. N the thickness of the upper mixed layer was variable during the 3-hour observation there, and it was down to 50 m in the water sampling.

Relative importance of major taxonomic groups was different between Stns. N and S. At Stn. S, diatoms comprised a major part of phytoplankton carbon, more than 90% of the total throughout the upper 100-m water column, whereas at Stn. N, diatoms were less dominant, their carbon content ranging from 30 to 53%, and dinoflagellate carbon was 23 to 51%. At Stn. C diatoms accounted for more than 90% of the total carbon in the upper 20 m and below 80 m layers, but the carbon content dropped down to around 50% in the inversion layer where dinoflagellates occupied 19 to 32% of the total. The cluster analysis for percent similarity of diatom species assemblages among the samples revealed that there were two distinctly different assemblages in the STC. One assemblage was distributed in the upper 100-m water column at Stn. S and in the upper 20 m and below 80 m at Stn. C. The other was found in all layers of Stn. N and in the inversion layer. These observations on the relative abundance of phyto-

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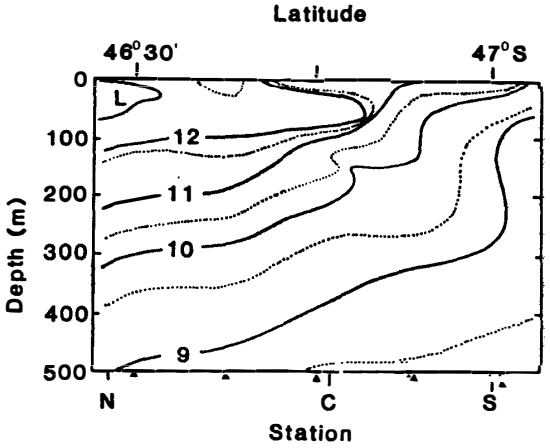

Fig. 1. Vertical section of temperature (°C) in the Subtropical Convergence at 150° E as determined with CTDO and XBT casts. These hydrocasts were done within 13 hours. Triangles denote XBT stations. Note a temperature inversion around Stn. C. "L" indicates temperature below 12° C.

plankton carbon and the diatom species assemblages, together with the temperature profile (Fig. 1), indicate (1) existence of two different communities, southern (*i.e.*, subantarctic) and northern ones, and (2) their spatial distribution is closely related to hydrography, and (3) vertical mixing of the two communities across the pycnocline (27- to $\approx$30-m depth) is little at Stn. C.

Nitrate and phosphate exceeded 7.0 μM and 0.6 μM, respectively, within the euphotic zone at all three stations, suggesting that ambient supplies of these nutrients were sufficient. Chlorophyll *a* was highest in the surface water at Stn. C, ranging from 0.46 to 0.63 $\mu g \cdot l^{-1}$, and it was 0.11 to 0.23 at Stn. S and 0.21 to 0.29 at Stn. N. At Stn. C chlorophyll *a* decreased rapidly below the upper mixing layer with an increase of depth. The surface primary production was highest at Stn. C (1.48 $mgC \cdot m^{-3} \cdot h^{-1}$), followed by 0.86 and 0.25 at Stns. S and N, respectively. The subsurface population around 30 to 40 m was of little consequence of the water column productivity at all stations. Photosynthetic activity of the surface population was higher at Stns. C and S ($>$3.2 $mgC \cdot mg\ chl.\ a^{-1} \cdot h^{-1}$) than that at Stn. N (1.08). The rates obtained at Stns. C and S were relatively high, as compared with the values obtained in the subantarctic region during the same cruise (FURUYA, unpublished).

Bottle incubations were conducted to examine effects of mixing of different water masses in the STC on primary productivity. A surface water sample from each station was mixed with same volume of GF/F-filtered surface water from a different station, and then incubated on deck. Chlorophyll-*a*-base-^{14}C uptake was monitored after one day. The incubation yielded no significant difference in the uptake rate for any mixing combinations of water samples, as compared with the controls (mixed with the filtrate of the same water), suggesting that the higher phytoplankton biomass and photosynthetic activity at Stn. C are unlikely to be associated with a suitable nutrient environment where adjacent water masses (*i.e.*, subantarctic water and northern water) complement each other's nutrient deficiencies.

It was discussed that the elevated photosynthetic activity of the subantarctic population at Stns. C and S was probably attributable to the shallow mixing layer which confined the population in a favorable light condition. The northward surface current transported the subantarctic population to Stn. C, and might have resulted in higher chlorophyll *a* and primary production at Stn. C than those at Stn. S.

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