

2.7 Water Quality of Patos Lake

- (1) Water samples were collected once a month, from February 1999 to January 2000, from the surface and bottom layers of the 12 stations shown in **Fig. 2.6-1**, and the concentration of substances related to eutrophication, heavy metals and agro-chemicals were analyzed. Bottom materials were also collected from the same 12 stations once both in summer and winter, to analyze the same items. Further, bottom mud elution tests, settling tests and primary production tests were also carried out at five of the stations in Patos Lake to determine the parameters necessary for water quality simulation.
- (2) The number of fecal coliform groups was $\log 1\sim 3$ MPN/100ml in the northern lake area, less than $\log 1$ MPN/100ml in the central lake area and $\log 1\sim 3$ MPN/100ml in the southern lake area (**Fig. 2.7-1**). FEPAM inspects the number of fecal coliform groups at several areas designated for swimming along the shore of Patos Lake every summer to grasp the sanitary condition. Based on the December 1999 and January 2000 results, the maximum number was counted as 2,400 MPN/100 ml in Arambare, 727 MPN/100 ml in San Lourenço do Sul and 13,000 MPN/100 ml in Pelotas.
- (3) The analysis of nutrient salts in the lake led to the following results: 0 to 0.1 mg/l for DP, 0.01 to 0.23 mg/l for TP, 0 to 0.27 mg/l for $\text{NH}_4\text{-N}$, 0 to 0.71 mg/l for $\text{NO}_3\text{-N}$, and 0.24 to 1.8 mg/l for TN. In terms of areal distribution, phosphorus was at its maximum in the northern area and comparatively high in the southern area as well as in São Gonçalo Channel, but low in the central area. The distribution of nitrogen was similar to phosphorus although the discrepancy in the values by area was not as distinct. TN/TP values were around 10 in summer in the Itapua Channel and in the northern and southern areas, suggesting that nitrogen can easily be a limiting factor to eutrophication (**Fig. 2.7-2**).
- (4) In general, organic contamination level in the whole Patos Lake area was low. Even in the northern area COD (Cr) was 12-38 mg/l, COD (Mn) 2 to 7 mg/l, TOC 3 to 16 mg/l, and BOD 0.2 to 1.9 mg/l. The levels were not found to vary by season. In spite of the huge runoff load inflow from Rio Guaíba basin, the northern area has low concentration of organic substances, a state assumed to be caused by the purifying effects of Guaíba Lake. The results of the analysis of the water in the northern lake area show the following correlation: 21.0 for COD (Cr)/BOD, 4.2 for

COD (Cr)/COD (Mn), 8.3 for TOC/BOD, and 2.5 for COD (Cr)/TOC.

- (5) Chl-a concentrations were high in the northern area at 8 to 49 $\mu\text{g}/\ell$, and low in the central and the southern areas at 0.7 to 4.3 $\mu\text{g}/\ell$. In the northern area, however, chl-a concentration decreases in winter because of lower water temperature and less sunlight (**Fig. 2.7-3**).
- (6) According to Vollenweider's (1984) classification of the lake based on TP, Chl-a, and transparency, eutrophication in Patos Lake is as follows: northern area; eutrophic; central and southern areas: mesotrophic.
- (7) Except for the windy months of July and November, SS levels ranged from 16 to 128mg/l in the northern area and from 1 to 29 mg/l in the central area. Low SS levels in the central area are assumed to be due to the sedimentation of suspended solids from the northern area and seawater dilution.
- (8) Heavy metals (Cr3, Cr6, Cu, Zn, Pb, Cd, Hg), CN and As levels in the water were extremely low, lower than the standards established by WHO and EPA for drinking water.
- (9) Of the heavy metals in the bottom mud, Zn showed high values followed by Cr, Cu, and Pb. But the fact that the concentration of Ni, Cu and Hg exceed the standard in the northern area is a cause for concern from the view point of toxicity. The concentration of TOC, N and P in the bottom mud is high in the northern area, low in the central area and intermediate in the southern area.
- (10) The 52 samples including bottom mud taken in February, March, November and December 1999 from the 7 stations in Patos Lake, 3 stations in the major rivers and the 5 stations in paddy drainage canals were analyzed to determine the levels of agricultural chemicals (7 types) and their by-products. All levels were below their respective allowable limits.
- (11) The identification of phytoplanktons showed that in the northern lake area, which also covers station R-1, diatoms predominate, although blue-green algae (*Cyanophyceae*) was also detected in summer.