The grand monthly means of oxygen saturation in the vicinity of Calliope Dock during 1959–63 inclusive are presented in Fig. 5 (upper curve). The original data were derived according to the procedure outlined in the American Public Health Association (1955) publication (Bell, pers. comm.). The general picture is similar to that off Prince's Wharf, although the actual saturation values are lower. However, surface samples collected from a boat in this part of the harbour (see Table V) did not reveal any great variation in oxygen saturation, so it is possible that the difference may be due to the somewhat different procedure and calculation. It should be noted that the position regarding the accuracy of published figures of oxygen saturation in natural waters is at present uncertain (Montgomery *et al,* 1964).

Nutrients were, in general, low in summer and high in winter. All showed a rise in autumn. Phosphate and nitrite, however, declined after an April peak to a minimum in November. Silicate, although showing an autumnal peak, did not reach maximum values until July. It is possible that some high silicate values may be related to fresh water run-off (*cf.* Fig. 3 F with Fig. 4 A and B). Nitrate also reached a peak in April, remained high in May and June (although maximum values were not as high as in Otago Harbour, see below), and fell off in July, minimum values were recorded in November.

Turning now to data collected in other localities, Table IV presents surface and bottom temperature, salinity and oxygen at stations in the harbour between Bean Rock and Herald Island. Two series of results were obtained, one in winter (June 25, 1963) and the other in summer (December 19, 1963). On these particular days the salinity recorded at Princes Wharf was close to the monthly mean, so the picture provided by the transects is probably typical for the time of year. In summer there was virtually no vertical stratification throughout the greater part of the harbour, and only at the station furthest upstream (off Herald Island) was there a slight difference (about $0.4^0/_{00}$) between surface and bottom salinity. In winter, however, rather more vertical stratification was apparent. The outermost station (Bean Rock) was still well mixed, but progressively increasing vertical stratification was found upstream; off Herald Island the difference between surface and bottom salinity amounted to $1.5^0/_{00}$. It will be noted that on both transects sampling proceeded up-harbour against the ebb stream, the outermost station being worked at approximately high water and the innermost at low water.

As one might expect, there are horizontal differences in temperature and salinity. Temperatures tend to fall up-harbour in winter and rise in summer, consistent with the cooling and warming brought about by intertidal flats. The fall in salinity as one proceeds up-harbour is much greater in winter than in summer, a reflection of the much greater run-off at that time of the year. Rainfall in the Auckland area is, on average, heavier during the winter months (Table III). Furthermore, such processes as evaporation and plant transpiration are at a minimum in the winter, thus tending to increase the proportion of rainfall which appears as run-off. These processes are collectively summarised by the term potential evapotranspiration (see Garnier, 1958, who gives monthly values for Auckland and Dunedin).

Small differences in salinity exist across the outer part of the harbour (see Table V), but the means of several series of such observations are needed to reveal any definite pattern.

From the results of the harbour transects it is clear that much of Auckland Harbour is vertically well mixed. There is little doubt that this is due to the strong tidal currents, 2 knots (*ca* 100cm/sec) or more at springs, which are found throughout its length. Tidal currents of 2 knots in parts of the English Channel, for example, maintain sufficient turbulence to make the water column vertically homogeneous and prevent the formation of a thermocline in summer (Dietrich, 1950). It