

INFLUENCE OF POLLUTION ON LAKE MARIUT, EGYPT

II. NUTRIENTS

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SUMMARY: - *Lake Mariut, a coastal Egyptian lake, has suffered from intensive pollution. The remarkable high average value of each nutrient calculated for the whole lake indicates the high degree of eutrophication. The maximum regional average value of ammonia found in Qala Drain at its connection with the lake resulted from the increase in denitrification of nitrate through nitrite to ammonia, due to depletion of dissolved oxygen. The maximum regional averages of nitrite, phosphate and silicate were found in the northern side of the lake near waste water outfalls.*

A brief description of lake Mariut was given in Part I. The untreated sewage and industrial wastes discharged directly into lake Mariut caused the heavy enrichment of nutrients in this lake. The considerable amounts of fertilizers and pesticides entering into this lake via large amounts of drainage waters and the release of nutrients from decomposing phytoplankton, usually found in large quantities, also increase the nutrient content of the lake (SAAD, 1980). Consequently, lake Mariut has deteriorated and changed into a markedly eutrophic state. This condition caused the great decrease in the concentrations of dissolved oxygen to the extent of its complete depletion (SAAD, 1972, 1980). The present study, which is another part of a pilot project on pollution of lake Mariut supported by IAEA, deals with the effect of pollution on the concentrations and distribution of nutrients in this lake. Sampling of surface water was carried out seasonally at 8 selected stations during October 1979 - April 1981.

The regional average nitrate values ranged from 325.5 $\mu\text{g NO}_3/\text{l}$ in Qala Drain to 1348.9 $\mu\text{g NO}_3/\text{l}$ in Umum Drain at its connection with the lake. This maximum suggests that Umum Drain receives considerable amounts of nitrogenous fertilizers from the agricultural lands and supplies a part of them to lake Mariut. This evidence is supported by the remarkable high regional average nitrate values in the lake region near this drain. A remarkable high regional average value of 967.2 $\mu\text{g NO}_3/\text{l}$ was also found in the middle of the lake. The average value calculated for lake Mariut (840.9 $\mu\text{g NO}_3/\text{l}$) indicates the high degree of eutrophication.

The regional average nitrite values varied from 21.8 $\mu\text{g NO}_2/\text{l}$ in Qala Drain to 114.9 $\mu\text{g NO}_2/\text{l}$ in the northern side of the lake near the waste water outfalls. The nitrite values at the other localities of the lake were generally high. The average nitrite value for lake Mariut (81.3 $\mu\text{g NO}_2/\text{l}$) indicates the high effect of pollution on this lake.

The regional average values of ammonia fluctuated between 230.5 $\mu\text{g NH}_3/\text{l}$ in the southern region of the lake and 1038.4 $\mu\text{g NH}_3/\text{l}$ in Qala Drain at its connection with the lake. This maximum resulted from the increase in the rate of denitrification of nitrate through nitrite to ammonia (HUTCHINSON, 1957; HANNAN and YOUNG, 1974). This is due to depletion of dissolved oxygen in most seasons in the water of this drain. This evidence is supported by the minimum regional average of nitrate, nitrite and dissolved oxygen in Qala Drain. The average value of ammonia for lake Mariut (726.3 $\mu\text{g NH}_3/\text{l}$) indicates the high intensity of pollution on this lake.

The regional average phosphate values ranged from 1201.6 $\mu\text{g PO}_4/\text{l}$ in the southern region of the lake near Umum Drain to 4064.7 $\mu\text{g PO}_4/\text{l}$ in the northern side of the lake near waste water outfalls. This minimum, which is markedly high, resulted from the effect of Umum Drain in transporting to the lake some of its water containing relatively low phosphate values (SAAD, 1973). The phosphate concentrations in the different regions of the lake were considerably high, giving an average value of 2348.0 $\mu\text{g PO}_4/\text{l}$. This average for lake Mariut indicates the high degree of eutrophication. The phosphate values obtained from lake Mariut were never recorded from the other Egyptian lakes (SAAD, 1973).

The regional average silicate values varied from 546 $\mu\text{g SiO}_2/\text{l}$ in Umum Drain to 821 $\mu\text{g SiO}_2/\text{l}$ in the northern side of the lake near the waste water outfalls. The regional averages found in the other locations in the northern side of the lake were also noticeably high. The average value for the whole lake (653 $\mu\text{g SiO}_2/\text{l}$) indicates the relative enrichment of the lake water with silicate.

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