

Manganese, Iron, Cobalt, Nickel and Zinc in the Eastern Harbour and El-Mex Bay waters of Alexandria

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The concentrations of manganese, iron, cobalt, nickel and zinc have been determined by atomic absorption spectrophotometry on 970 sea-water samples from 8 stations in the Eastern Harbour and 7 stations from El-Mex Bay (Fig. 1) of Alexandria during the period from November 1987 to January 1989. Trace metals concentrations are scattered in the ranges (0.14-30.7), (1.39-148.0), (nd-0.32), (0.09-1.43) and (2.02-320.7) $\mu\text{g.l}^{-1}$ respectively.

The concentrations of trace metals in both areas are in the order $\text{Zn} > \text{Fe} > \text{Mn} > \text{Ni} > \text{Co}$ at the surface and near the bottom water. El-Mex Bay, the most industrialized area in Alexandria, showed higher levels of Mn, Co, Ni and Zn in the bottom water than in the surface water. On the other hand, with the exception of Zn, the surface water of the Eastern Harbour reflects higher values in comparison with the bottom water.

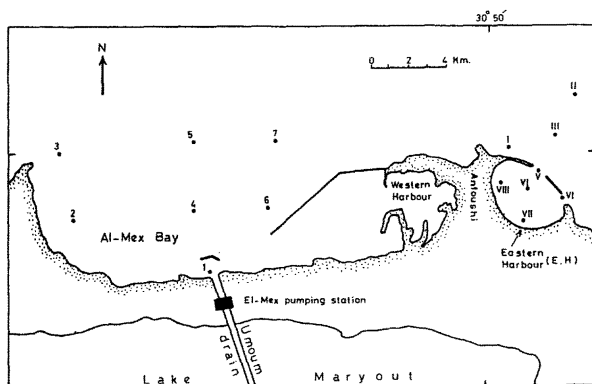


Fig. 1 - Area of investigation

Generally, the Eastern Harbour reveals slightly higher levels of Fe, Co, Ni and Zn than El-Mex Bay water.

Trace metals Mn, Fe and Zn distribution suggests a clockwise circulation pattern of fresh water discharging from Umoum drain to El-Mex Bay. The Eastern Harbour which is polluted by sewage, showed a tendency to concentrate Fe and Zn inside the harbour by 14 and 39% more than outside the harbour, while Mn, Co and Ni showed nearly the same level.

The distribution of Zn showed a rate of decrease of $15.9 \mu\text{g.l}^{-1} \cdot \text{km}^{-1}$ in the Eastern Harbour and can be used as a good tracer for fresh water or sewage discharge.

The appearance of local high concentration for one metal by possible contamination does not necessarily correlate with high values for other metals, however the relationships Fe-Mn ($r=0.80$) Fe-Zn ($r=0.80$), Mn-Zn ($r=0.85$) showed good correlation for the bottom water as well as for the surface water (Mn-Ni, $r=0.80$) of El-Mex Bay. The Western harbour also showed good correlation between Fe and Co ($r=0.83$), Mn and Co ($r=0.60$) for the surface and bottom water respectively.

The present data show that the concentrations of trace metals compared to other regions in the world are higher, probably due to the increasing pollution from industrial waste and domestic sewage.