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WATER QUALITY OF THE MEDITERRANEAN COASTAL MARINE ENVIRONMENT IN FRONT OF ALEXANDIRA, EGYPT.

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ABSTRACT

Water quality was assessed in the coastal marine environment in front of Alexandria, Egypt. The study area is affected by the discharge of agricultural and industrial wastes to El-Mex Bay as indicated by the high measured values of BOD (>7 mg O_2 /l), suspended mater (>30 mg /l), organic matter (>5 mg /L), chlorophyll-a (>30 ug /l), total phosphorus (>6 uM) and total nitrogen (>90 uM). The presence of fresh water genera of blue green and green algae is an indication of the mixing effects of agricultural water and seawater, leading to eutrophication condition in this area. The offshore waters show characteristics of the Mediterranean Sea water.

INTRODUCTION

The area of study is located at the west of Alexandria, around Longtude 30° 50' East and Latitude 31° 10' North (Fig. 1).

El-Mex Bay receives a heavy load of waste water both directly from industrial outfalls and indirectly from Lake Maryut via the Mex Pumping Station. An amount of 2.5 x 10^9 of brackish water was discharged through this pumping station during 1990. These waters are loaded with industrial, agricultural and domestic wastes. In its western side, El-Mex Bay receives directly industrial wastes from chlore-alkali plant and other wastes from tanneries and slaughterhouse (Mahmoud, 1985).

The present work is a part of a more comprehensive investigation of the environmental condition in the Mediterranean coastal waters in front of Alexandria to find out the effect of the discharge on water quality of the area.

MATERIALS AND METHODS

Sampling stations (Fig. 1) were chosen to cover the area of investigation in a way that wastes from the different sources could be followed from the point of its discharge into the sea. A reference station was sampled at El-Agamy to represent pure sea water which is not affected by land discharge.

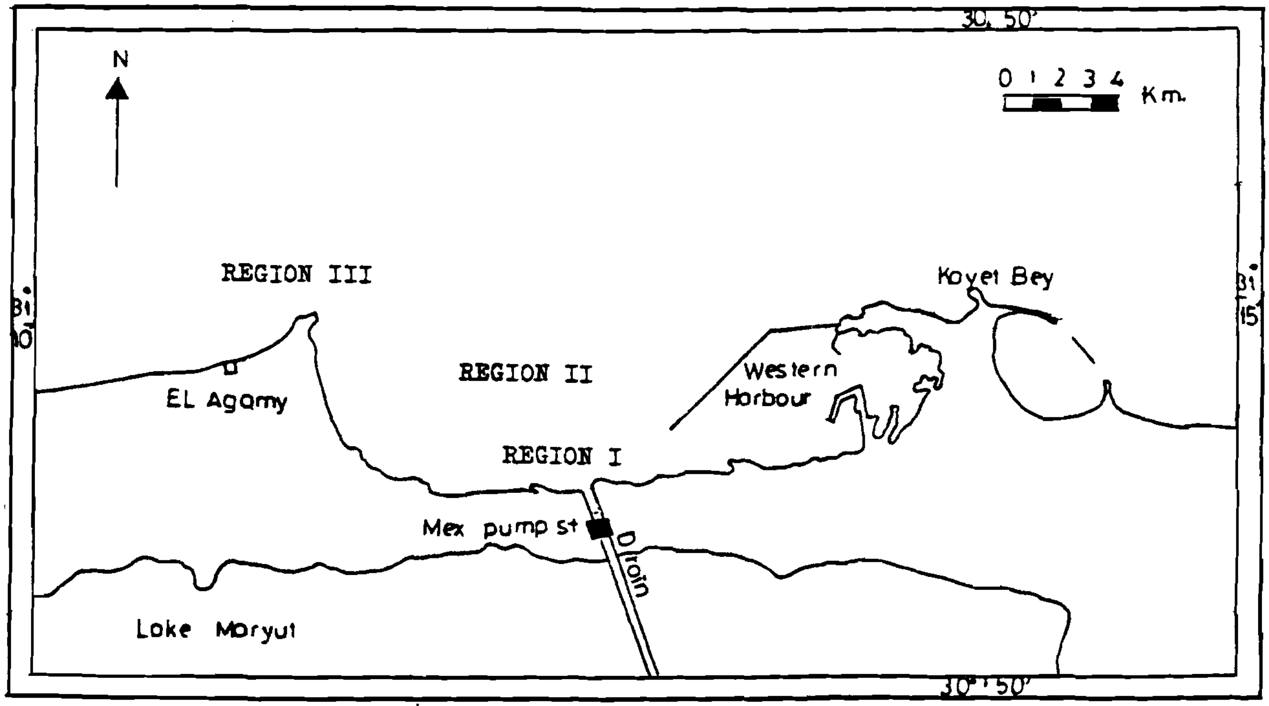


Fig. 1

Area of investigation and sampling sites.

Surface and bottom water samples were collected during April and july, 1990 by using Niskin bottles. The water samples were placed in one liter bottles and deep-frozen at -20° C. The parameters measured are: salinity, temperature, pH, dissolved oxygen (DO), biological oxygen demand (BOD), oxidizable organic matter, nitrogen and phosphorus compounds (inorganic, organic and total), transparency and suspended matter. Methods of measurements were made according to Strickland and Parsons (1968) and according to standard Methods for Examination of water and waste water (Anon., 1982). Salinity was measured by an induction Salinometer Beckman model No. R S7C. A pocket pH-meter, Orion (research model 201 / digital) was used to measure pH on board.

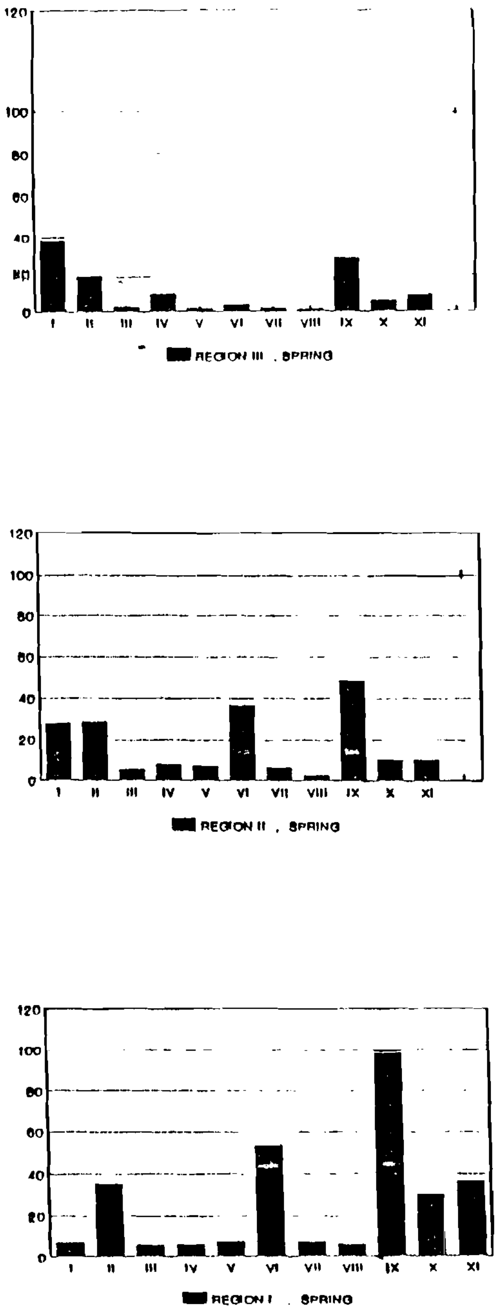
RESULTS AND DISCUSSION

Water quality in the area of investigation is largely dependent on the mixing of inflowing Mediterranean water with the outflowing runoff discharged into the area from the land sources. The extent of mixing could be identified by a conservative of seawater which in the present case is salinity. Surface salinity in the area varied regionally within a wide range, from proper sea water (38.48‰) in the northern zone to brackish water near El-Umum Drain outlet and the sewage outfall off Kayet Bey (6.50‰). Bottom water, on the other hand, showed less pronounced salinity variations (from 39.92 to 36.05‰). On the basis of salinity distribution, El-Mex Bay could be actually distinguished into three regions viz: region I, where the effect of mixing is highly obseved (salinity fall down to be less than 15‰), region II with salinity ranged between 15‰ and 38‰ and region III with salinity 38‰ which represents a pure Mediterranean sea water with no effect of land dischatge.

The horizontal extension of the land runoff is highly variable and depends upon the pattern of circulation and the rate of outflow. In spring 1990, waste water spreaded to cover large area of El-Mex Bay as a result of the increased drainage water discharged into the Bay (5.2×10^8 m^3) during March, April and May, 1990. Accordingly, salinity of 6.5‰ was recorded at the inshore area in front of El-Umum drain (region I). Water at region II showed salinity of 28.02‰ and water at region III showed salinity of 38.01‰. In summer, on the other hand, mixing is slightly less pronounced, with salinity 10.3‰ just off the drain (region I), and 30.69‰ at region II.

The mentioned above water types have the following characteristics (Figs. 2 & 3) :

1- Water at region III is characterized by its low salinity, low transparency (< 80 cm), low oxygen content with saturation of less than 80 %, high BOD (> 10 mg O_2 /l), high



i - Salinity ‰
ii - Suspended M. mg/L
iii - Organic M. mg O2/L
iv - DO mg O2/L
v - BOD mg O2/L
vi - Chlorophyll a µg/L
vii - Total Phosphorus µM
viii - Phosphate-p µM
ix - Total Nitrogen µM
x - Nitrate-N µM
xi - Ammonia-N µM

Fig. 2

Water quality at different regions of El-Mex Bay during spring.

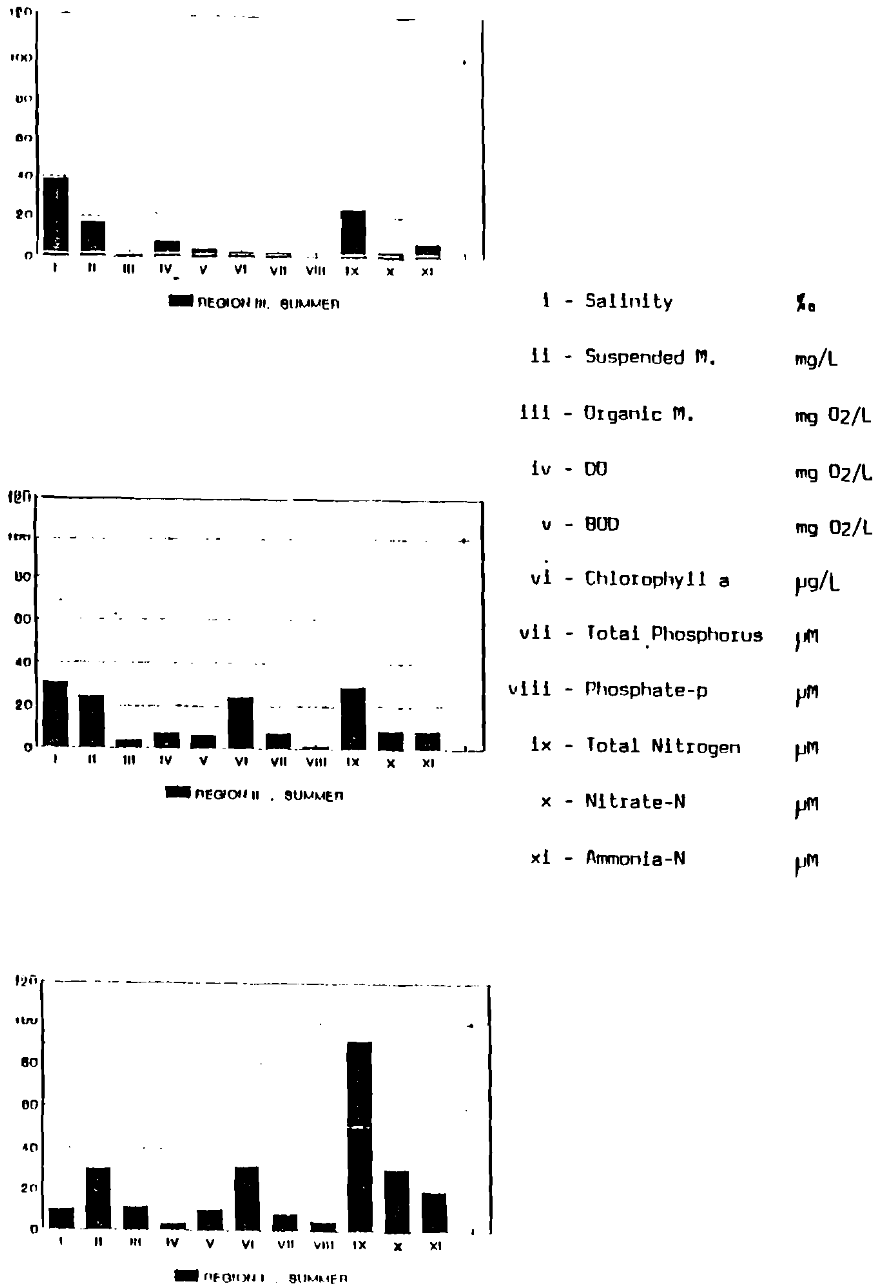


Fig. 3

Water quality at different regions of El-Mex Bay during summer.

organic matter, highest concentrations of chlorophyll-a (52 mg pigment /m^3), high concentrations of nitrogen and phosphorus and high content of suspended matter. Fresh water genera of blue green algae Oscillatoria spp. and the green algae genera Scenedesmus spp. and Closterium sp. were recorded by Dorgham et al. (1987) in this region.

2- Water at region III is characterized by high salinity, high transparency (> 10 m), high oxygen with saturation of more than 100 %, low BOD (< m3 mg O_2/l), low organic matter, low chlorophyll-a (< 10 mg/m^3), low concentrations of nitrogen and phosphorus, and the lowest concentration of suspended matter (< 20 mg/l). Dinoflagellates (**Ceratium** sp. and **Protoperidinium** sp.) and diatoms (**Chaetoceros** spp, **Rhizosolenia** spp, **Biddulphia** spp and **Nitzschia** sp.) were recorded in this region Dorgham et al. (1987) and El-Sarraf (1988).

3- The waters at region II have intermediate characteristics.

CONCLUSION

The present data show the effects of human intervention on physical and chemical characteristics of coastal marine environment, which in some cases lead to the so called eutrophication. However, self purification could sometimes lead to output more than 50 % of the nutrient load through bacterial activity (El-Samra,1983), while El-Sarraf (1988) stated that El-Mex region is characterised by autochthonous heterotrophic bacteria. Bacterial activity and circulation of water due to local inshore current could be the main reason that only the inshore area (region I) is affected by eutrophication. The open water (region III), on the other hand, shows oligotrophic or mesotrophic conditions allover the year.

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