Marine Pollution by Determination the Total Phenolic Compounds in El-Mex Bay, Alexandria (Egypt)

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El-Mex Bay, west of Alexandria, has a mean depth of 10m. Its surface area is of about 19.4 km^2 and its volume 190.3 x 10^6 m^3. It receives a heavy load of waste water (2.4 x 10^9 m^3/year) both directly from industrial outfalls and indirectly from lake Maryut via El-Mex Pumping Station. Throughout the period from January 1988 to January 1989, seven marine trips were carried out in El-Mex Bay area using a motor boat. In four of them, temperature, salinity, dissolved oxygen and the total phenolic compounds were measured at surface and bottom from seven sampling stations. Fig.1, presents El-Mex Bay area and locations of the sampling stations. Phenol determinations were carried out colorimetrically with antipyrine method using a Shimadzu-Double-Beam model spectrophotometer UV-150-02. The method is described in the Standard Methods of Water Analysis published by the American Public Health Association (1985). Table 1, illustrates the total phenol concentration at some stations in El-Mex Bay area. The total phenol is generally presented in higher concentrations in the near-shore stations decreasing seawards.

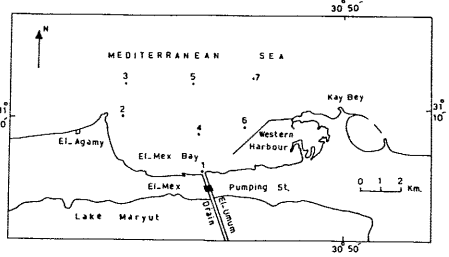

Fig.1. El-Mex Bay area.

Table 1. Total phenol concentration (ppm) at some selected stations.

Station No	January Surface	January Bottom	February Surface	February Bottom	April Surface	April Bottom	June Surface	June Bottom
1	186.25	100.74	212.08	202.56	154.44	125.89	231.11	76.40
2	184.76	85.38	207.46	143.29	183.94	101.96	147.10	52.48
7	62.54	25.17	90.13	21.21	87.16	44.05	77.22	38.07

The statistical analysis between data sets of the total phenolic compounds and temperature, salinity and dissolved oxygen during the period of investigation are listed in table 2.

Table 2. Linear regression analysis.

Parameter	n	$\bar{x}$	A	B	r	significant
Temperature	44	19.83	32.33	-0.070	-0.390	no
Salinity	44	29.67	43.83	-0.136	-0.626	yes
Dissolved oxygen	44	2.22	19.46	-0.040	-0.186	no

The weak correlation ($r < 0.4$) could be attributed to another independent factors such as meteorological or biological conditions. For $r = 0.4$ is not fairly bad for such type of study. Our value of ($r = -0.626$) confirms the high degree of correlation between the total phenolic compounds and salinity that was apparent from table 2. Negative values of r indicate a line going down to the right (as one of the values increases the other decreases).

Referring to table 10A (Neil R. Uliman, 1978), we find that the critical values of correlation corresponding to n = 44 are 0.2976 (at the 5% level of significant) and 0.3848 (at the 1% level of significant). Our computed coefficient was 0.626, which far exceeds even the upper value of 0.3848. Then there is a significant linear relationship between the total phenolic compounds and salinity. Fig.2. represents the best linear equation for the data given. The regression line is only for predicting phenol values from salinity-values.

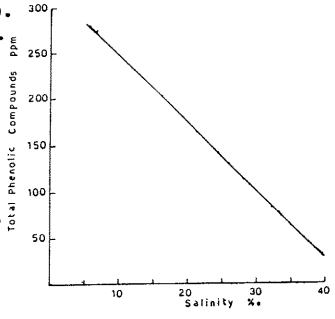

Fig 2 : A possible regression line to predict the total phenolic compounds from salinity.

References :

American Public Health Association. 1985. Standard Methods for the Examination of Water and Wastewater, 16th Edition. APHA. AWWA. WPCF, New York, 1268 p.

Neil R. Uliman. 1978. Elementary Statistics : An Applied Approach. John Wiley & Sons Inc., New York, 372 p.

Effect of Pollution on the Hydrochemical Characteristics of Different Water Types in El-Mex Bay Area, West of Alexandria, Egypt

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El-Mex Bay, west of Alexandria, has a surface area of about 19.4 km^2 and volume 190.3 x 10^6 m^3. It receives a heavy load of wastewater (2.4 x 10^9 m^3/year). Seven marine trips were carried out in El-Mex Bay area during the period from January 1988 to January 1989 using a motor boat. Temperature, salinity, pH, alkalinity, dissolved oxygen, oxidizable organic matter, hydrogen sulphide, phenolic compounds and nutrients salts were measured at surface and bottom from seven sampling stations. The present work is an attempt to illustrate the extent of the influence of the polluted water on the characteristics of El-Mex Bay waters and to shed more light on the pathways of the pollutants in the Bay.

Based on the distribution of surface salinity in the investigated area, four types of water are identified :

1- Mediterranean Sea water (S) of salinity > 38.50‰.
2- Diluted sea water (D) with a salinity range from 30 to 38.50‰.
3- Mixed water (M) of salinity 10 to 30‰, and
4- Mixed land drainage (L) with a salinity of less than 10‰.

According to El-Maghraby and Halim (1965), Said (1979) and Abdel-Moati and Said (1987), the salinity value 38.50‰ was taken to represent the inner boundary of the neritic water off alexandria. This value still could be generally accepted and will be used here to identify the limits within which the diluted sea water extends horizontall seawards. The hydrochemical characteristics of the water types referred to the mentioned above are listed in table (1). The most important features which distinguish water type "L" from other types are the low salinity, low oxygen content, high concentration of hydrogen sulphide, organic matter, alkalinity, chlorophyll a, nutrient salts (which is mainly present in the ammonia form) and total phenolic compounds. In contrast, water type "S" free from the effects of drainage water has high salinity values and relatively high oxygen content but low alkalinity, hydrogen sulphide, organic matter, chlorophyll a, and nutrient salts. The study pointed out also that water types "M" and "D" are affected to a certain extent by land drainage water which does indeed more clear in "M" water type than in "D" water type.

Table (1). Seasonal variations of the hydrochemical characteristics of average values for the different water types (L, M & D respectively).

Parameter / Month	T °C	Dissolved Oxygen $ml O_2$ L-1	Organic matter $mg O_2$ L-1	Alkalinity millieq.L-1	Ammonia uM	Nitrite uM	Nitrate uM
January, 1988	14.20	1.79	9.94	5.40	32.20	2.52	0.08
February,1988	14.93	1.52	7.07	4.76	40.74	1.74	2.70
April, 1988	21.07	1.70	1.46	4.36	57.66	3.87	4.41
June, 1988	27.25	0.85	2.39	2.87	7.54	0.63	0.67
August, 1988	28.41	0.81	6.66	5.62	72.20	4.87	19.50
November 1988	19.60	3.12	1.68	5.61	***	***	***
January, 1989	14.20	2.93	6.62	5.66	***	***	***
January, 1988	14.80	2.21	3.66	4.03	24.05	3.06	8.78
February,1988	15.45	1.82	4.80	3.89	31.91	0.41	3.40
April, 1988	19.50	2.08	2.66	3.45	28.40	4.17	9.29
June, 1988	26.50	2.21	1.72	3.14	3.78	17.24	22.27
August, 1988	28.??	1.60	5.26	4.19	16.89	3.57	16.15
November 1988	22.40	3.50	3.99	4.37	***	***	***
January, 1989	14.80	3.47	5.29	3.56	***	***	***
January, 1988	15.27	2.28	4.80	2.82	4.97	0.59	0.17
February,1988	16.00	3.37	2.40	3.23	8.83	0.77	3.58
April, 1988	19.70	2.55	1.20	3.04	12.71	2.66	17.49
June, 1988	26.28	2.00	1.94	3.40	5.46	7.62	16.71
August, 1988	---	---	---	---	---	---	---
November 1988	22.72	3.68	0.95	3.78	***	***	***
January, 1989	15.27	3.35	4.31	3.08	***	***	***

*** not sampled.

References :

Abdel-Moati, A.R. & M.A. Said. 1987. Hydrographic structure of the Mediterranean shelf waters off the Egyptian coast during 1983-1986. J. Thalassographica, 10(2) : 23-39.

El-Maghraby, A.M & Y. Halim. 1965. A quantitative and qualitative study of plankton of Alexandria waters. Hydrobiologia, 25 : 221-238.

Said, M.A. 1979. Effect of oceanographic and meteorological factors on the transport of pollutants in Abu Qir Bay. M.Sc. Thesis, Alexandria University, 95 p.