PART 4

4 - Ecological investigation

4-1- Physico-chemical parameters of water:

4-1-1- Temperature (°C):

Surface water temperature revealed a seasonal marked fluctuation as shown in Table 3 and Fig.12. It was varied between 18.467±0.033 and 28.633±0.033°C. The average minimum temperature value was recorded in Winter (18.611±0.065°C) and the maximum one in Summer (27.944±0.175°C). Regarding stations variations, minimum temperature was recorded at El-Anfushi (22.942±0.990 °C), while the maximum one was recorded at Abu-Qir (23.525±1.122°C). The mean temperature for stations reached 23.233±0.580°C. Analysis of variance of temperature (two way ANOVA) is shown in Table 4. Temperature revealed highly significant differences for both stations and seasons and stations x seasons ($p \leq 0.01$).

4-1-2- Hydrogen ion concentration (pH):

The pH values at the studied stations ranged between 7.357±0.009 and 8.067±0.024, with an average value of 7.661±0.036 (Table 5 and Fig.13). Seasonal variations showed that, Autumn 2001 and Winter 2002 have the lowest pH values (7.474±0.046 and 7.499±0.011 respectively) while Spring and Summer 2002 revealed the highest pH values (7.842±0.032 and 7.829±0.060 respectively). Regarding to stations, El-Mex and El-Anfushi have the minimum values (7.598±0.055 and 7.627±0.057 respectively) and Abu-Qir has the maximum value (7.758±0.066).

Table (3): Seasonal variations in temperature (°C) of surface sea water at three stations of Alexandria during Autumn 2001 to Summer 2002. (a-k, sequence of temperature values and A-C, sequence of total means at different stations and seasons; M±SE, mean ± standard error).

Stations / Seasons	Abu-Qir	El-Anfushi	El-Mex	M±SE
Autumn	24.867±0.033 d	24.033±0.033 f	24.367±0.033 e	24.422±0.122 B
Winter	18.467±0.033 k	18.500±0.000 k	18.867±0.033 j	18.611±0.065 D
Spring	22.133±0.067 g	21.733±0.033 i	22.000±0.000 h	21.956±0.063 C
Summer	28.633±0.033 a	27.500±0.000 c	27.700±0.000 b	27.944±0.175 A
M±SE	23.525±1.122 A	22.942±0.990 C	23.233±0.975 B	23.233±0.580

Table (4): Analysis of variance (two way ANOVA) for temperature (°C) of surface sea water at three stations in Alexandria during four seasons (% P, percentage point of probability at 0.05 level; **, highly significant).

Factor	F value	% P
Stations	421.0920	**(0.0000)
Seasons	57674.2997	**(0.0000)
Stations X Seasons	120.5793	**(0.0000)

Table (5): Seasonal variations in hydrogen ion concentration (pH) of surface sea water at three stations of Alexandria during Autumn 2001 to Summer 2002. (a-e, sequence of pH concentrations and A-C, sequence of total means at different stations and seasons; M±SE, mean ± standard error).

Stations / Seasons	Abu-Qir	El-Anfushi	El-Mex	M±SE
Autumn	7.653±0.009 c	7.413±0.012 de	7.357±0.009 e	7.474±0.046 B
Winter	7.497±0.003 d	7.500±0.006 d	7.500±0.036 d	7.499±0.011 B
Spring	7.813±0.088 b	7.887±0.055 b	7.827±0.003 b	7.842±0.032 A
Summer	8.067±0.024 a	7.710±0.006 c	7.710±0.006 c	7.829±0.060 A
M±SE	7.758±0.066 A	7.627±0.057 B	7.598±0.055 B	7.661±0.036

Table (6): Analysis of variance (two way ANOVA) for pH concentration of surface sea water at three stations in Alexandria during four seasons. (% P, percentage point of probability at 0.05 level; **, highly significant).

Factor	F value	% P
Stations	24.8476	**(0.0000)
Seasons	105.6347	**(0.0000)
Stations X Seasons	11.5383	**(0.0000)

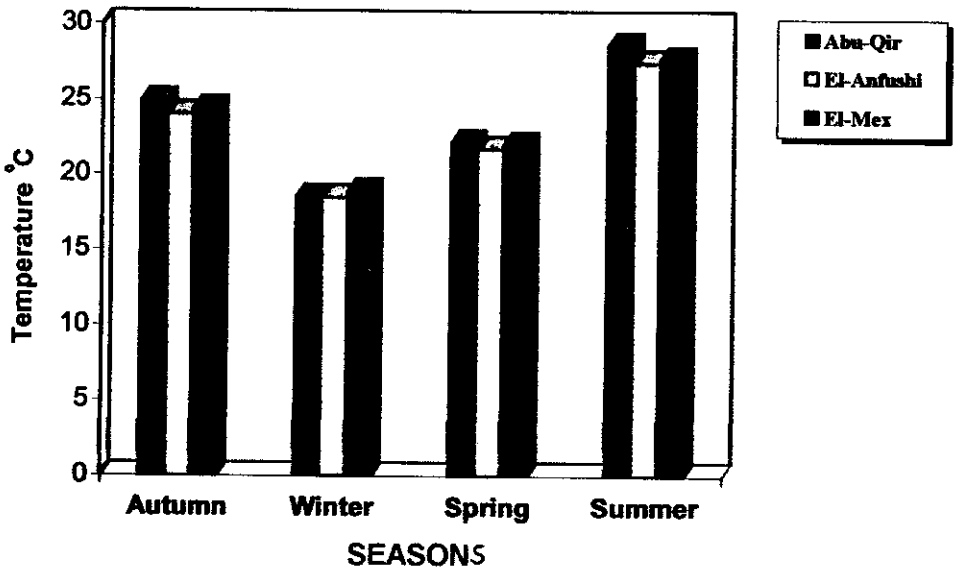

Fig.(12) :Seasonal variations in temperautre at three stations in Alexandria.

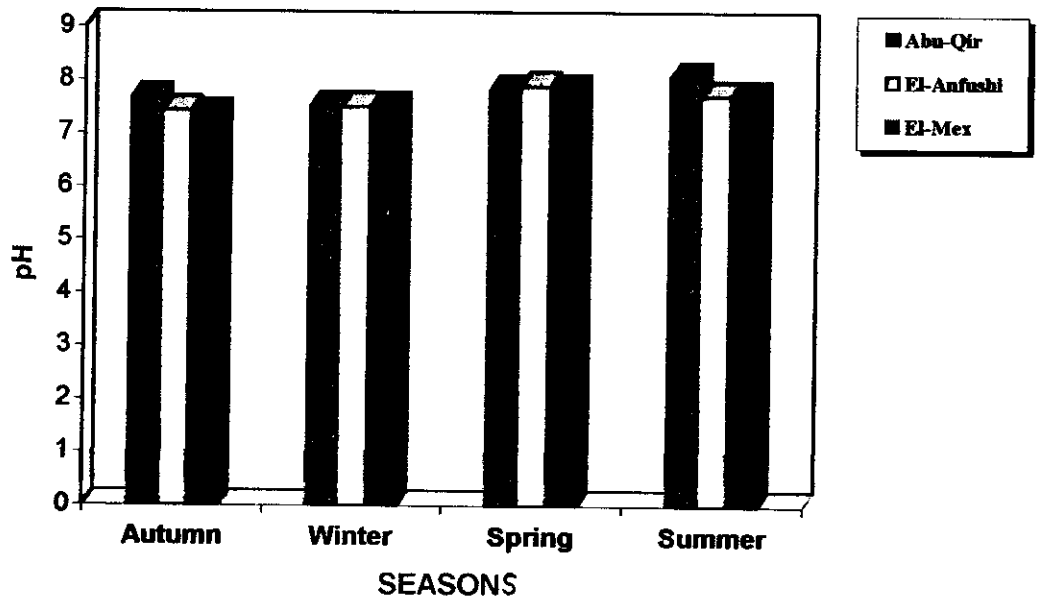

Fig.(13) :Seasonal variations in pH concentration at three stations in Alexandria.