معمل بحوث تلوث المياه ـ الدقي ـ الجيزة
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دراسة الصفات البكتريولوجية والطبيعية الكيماوية لشاطئ رأس البر

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استهدفت الدراسة تسجيل الصفات البكتريولوجية والطبيعية الكيماوية لشاطئ رأس البر وتم اختيار ثلاث مواقع على الشاطئ لأخذ عينات دورية خلال الفترة من نوفمبر ١٩٨١ الى مايو ١٩٨٣ ٠

وأوضحت النتائج البكتريولوجية أن مجموعة البكتريا السبحية البرازية أكثر الكشافات المستخدمة مناسبة كدليل على تلوث مياه٠ البحر ٠

بالاضافة الى ذلك فقد أوضح المسح البكتريولوجي وكذلك القياسات الطبيعية الكيماوية المستخدمة في الدراسة الى وجود مصدر مستمر من التلوث متجها من الطرف الشمالي لفرع دمياط الى المواقع المستخدمة في الدراسة ٠

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STUDIES ON BACTERIOLOGICAL AND PHYSICO-CHEMICAL PARAMETERS AT RAS EL-BAR BEACH

(With One Fig. & 4 Tables)

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SUMMARY

The bacteriological and physico-chemical characters of recreational water at Ras El-Bar beach were estimated during the period between November, 1981-May, 1983. The bacteriological examination showed suitability of faecal streptococci than faecal coliform as an indicator of marine pollution. In addition the monitoring of bacteriological as well as physico-chemical parameters showed the presence of a continuous source of pollution directed from the northest terminal part of Demietta branch to the examined locations.

INTRODUCTION

Recreation is considered as a major part of the natural water benefits. Swimming, boating and fishing are among the most popular outdoor activities in Egypt, especially during summer months. Various pollutants that discharged into different water ways, clearly interfere the enjoyment of these activities especially that provide or accidentally necessaries swallowing water. The aesthetic enjoyment of being in, on or near by a water body is strongly influenced by the pleasantness of all activities and water quality. Deterioration in measures identifying colour, odour, clarity, floating debris and oil content can make water less enjoyable.

Waters containing dilute sweage mostly contain faecal pathogens, especially Salmonellae and viruses, a potential danger to bathers (SPINO, 1966; GRUNNET & NIELSEN, 1968 and BREZENSKI & RUSSAMANNO, 1969). Furthermore, urban and agricultural drainage as well as runoff may be of great danger to public health (MINER, et al. 1967 and EVANS, et al. 1968).

The complex interaction between environmental elements require continuous efforts to elimenate or at least minimize the adverse effects of water pollution. Monitoring is one of the important systems used for the evaluation of water quality, judging its suitability and fittness for natural public uses.

The present study was carried out to evaluate the bacteriological quality, physico-chemical characters of recreational water at Ras El-Bar beach, on the Mideteranean Sea coast, before constructing the new Demietta sea port at the western side of the beach.

MATERIAL and METHODS

1- Sample source:

Samples were collected from 3 fixed locations at the sea shore. Location 1 was chosen at the begining of the beach area, defined by the northern estuary of Demietta branch at the Mediterranean Sea shore, while location 2 at the mid beach and location 3 at the western side of the beach (Fig. 1).

Subsurface samples were collected at 1-3 meters from the shore, in clean glass bottles 5 litres capacity. Samples for bacteriological examination were taken in sterile glass bottles and kept at 5°C during transportation and cultured within 6 hrs from their collection. All other tested parameters were measured within 24 hours of collection, due to the transport facilities.

2- Methods of Analysis:

a) Bacteriological examinations were carried out according to the recommended procedures for the examination of Sea water and Shellfish (APHA, 1970) and entailed Total viable counts, total coliform, faecal coliform and faecal streptococci density.

b) Physico-chemical analysis were done according to the APHA (1980).

c) Oil and Grease analysis were carried out by extraction of the collected samples (2 litres each) twice with 60 ml portions of chloroform (HCl_3). Extract of each sample was mixed and dehydrated, evaporated to dryness, and weighed to determine oil and grease gravimetrically. Then the weighed mateials were saponified by 0.1 N sodium hydroxide. The non-saponifiable matter was separated, vaporiszed to reduce the volume to 5 ml for each sample. The concentrated samples were used for the determination of total hydrocarbons content using gas chromatography (Varian Aerograph 2400, Detector: flame ionization, column; stainless steel; 6 ft. (1.83 m) long, 1/8 in. (3.2 m) O.d.; packing 1.5% OV-101 on chromosorb G, 100/120 mesh, Temperature: injector 25°C; detector 250°C column program 70-200°C at 6°C/min., Attenuation: 8×10^{-11}).

RESULTS and DISCUSSION

Bacteriological Quality

Results in tables 1 and 2 indicate the presence of high bacterial load in all tested samples especially in location 1, which always showed the highest incidence of bacterial parameters. The highest density of total viable bacterial counts were detected during September, 1982, February and May 1983 at locations 3,1 and 2 respectively (Table 1).

The average values of total coliform densities at stations 1, 2 and 3 reached 7.4×10^2, 5.4×10^2 and 4.2×10^2 organism/100 ml respectively (Table 2). In addition about 25% of the collected samples showed total coliform density more than 240 organsim/100 ml. A finding which exceeds the maximum limit for safety use of recreational marine water recommended by U.S. Dept. of Health Educ. & Well. (1965). Furthermore, faecal coliform organisms were not detected in many occasions especially at location 3 (4 samples). On the other hand, faecal streptococci organisms, were mostly detected in all examined samples except in one case only from every location. This means that faecal streptococci group remarks itself as a good indicator of faecal pollution in marine water. These results are in agreement with recent studies which indicate that faecal streptococci group may be more appropriate indicator for the sanitary quality in

different natural materials (HARTMAN, et al. 1966; RAMADAN, et al. 1971 & 1972; EL-HAWAARY, et al. 1981 & 1983 and EL-ABAGY, et al. 1981 & 1985).

The maximum levels of pollution, based on the density of the two indicator groups, was recorded mostly during January 1982 and January 1983 at locations 2,1 and 3 respectively. This is mostly due to water disturbance by active waves during winter season. However, the presence of more than 200 faecal coliform organism/100 ml is an indication for the presence of enteric pathogens in recreational water (GELDREICH, 1970).

From the available results (Table 1&2) it can be noticed that a continuous source of pollution reached location 1 and directed to location 2 and 3 respectively. A condition whcih may be attributed to the canal connects between the northest terminal part of Demietta branch (El-Gerbi) and the Mediteranean Sea which carry out all agricultural drainage and wastes from Demietta and the surrounding area. Such higher levels of contamination in the brackish water, along the area from Demietta city to El-Gerbi beach were previously recorded by EL-HAWAARY, et al. (1983) and EL-ABAGY, et al. (1985).

2- Physico-chemical quality

Results representing the physical and chemical characteristic of salt water at Ras El-Bar beach are indicated in table 3 as minimum, maximum and average for each parameter. These results indicate that the lowest level of organic nitrogen content was estimated as 0.56 mg N/1 at the three shosen locations. On the other hand, maximum values were found to be 2.8, 1.68 and 2.52 mg N/1 at locations 1,2 and 3 respectively. The reduced forms of inorganic nitrogen were detected in low levels reaching 0.038 mg N/1 as nitrite but undetected at all as ammonium nitrogen. Total phosphorous content and COD or BOD requirements showed different results according to the site. Generally location 1 showed the highest values of nutrients levels (BOD, COD, Nitrogen and Phosphorous) than the other two locations (Table 3).

3- Oil and Grease and Total hydrocarbons

Table 4 indicates the concentration of oil and grease and total hydrocarbons at the beach area. It is clearly evident from these results that the maximum values of oil and grease concentration in the locations 1,2 & 3 reached 14.64, 16.82 and 18.64 mg/1 during February 1982, March 1982 and May 1983 respectively. On the other hand, the maximum value of total hydrocarbons (9.462, 18.617 and 8.953 mg/1) were observed during March 1982, May 1982 and January 1982 at locations 1,2 & 3 respectively. As may be expected, average values of oil and grease as well as those of total hydrocarbons were found to be 10.44, 8.92 and 8.86 mg/1 and 5.07, 4.61 and 4.52 mg/1 at the locations 1,2 & 3 respectively (Table 4). As mentioned before, the source of these pollutants, is mostly correlated with the discharging outlet of the northest terminal part of Demietta branch, which is directed to locations 1,2 and 3 respectively.

The load of oil pollutants can drastically affect all water life (BLUMER, 1970). The damaging effects may be concentrated against the smaller and young forms of marine life (NORTH, 1967 and GOLDACRE, 1968). In addition the presence of floating masses in recreational water is significantly hazardious for public health. They contain in most of them sum of highly toxic lower boiling hydrocarbons in addition to some of potentially carcinogenic materials, which having a boiling points between 300-500°C (BLUMER, 1970).

Generally, the present monitoring indicated the presence of continuous source of pollution that is directed from the northest terminal part of Demietta branch to location 1,2 and 3. This is mostly attributed to the northest terminal part of Demietta branch of River Nile which always receives wastes and agricultural drainage water from Demietta city and its surrounding area.

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BACT. PHYSICO. CHEM. PARAMETERS

Table (1)
The density of total viable bacterial counts at 22°C and 37°C during November 1981 - May 1983

Month	Location 1		Location 2		Location 3	
	22°C	37°C	22°C	37°C	22°C	37°C
Nov., 1981	8.0×10^{2}	5.0×10^{3}	N.D	N.D	N.D	N.D
December	3.6×10^{2}	2.3×10^{2}	2.7×10^{2}	2.5×10^{2}	1.8×10^{2}	1.4×10^{2}
Jan., 1982	3.1×10^{2}	2.1×10^{2}	8.9×10^{2}	1.1×10^{2}	3.8×10^{2}	1.3×10^{2}
March	3.4×10^{2}	5.1×10^{2}	5.2×10^{2}	3.1×10^{2}	2.8×10^{2}	1.4×10^{2}
May	1.3×10^{5}	3.4×10^{5}	1.8×10^{4}	2.7×10^{4}	1.0×10^{4}	9.0×10^{4}
Sept.	1.1×10^{4}	1.03×10^{4}	8.8×10^{4}	6.2×10^{4}	9.0×10^{4}	5.2×10^{4}
Jan.,1983	3.9×10^{6}	2.3×10^{7}	8.2×10	5.7×10	2.3×10	1.5×10
Feb.	9.0×10^{6}	1.3×10^{7}	N.D	N.D	N.D	N.D
April	6.1×10^{6}	2.3×10^{2}	2.9×10^{4}	1.2×10^{4}	1.1×10^{3}	8.0×10^{3}
May	N.D	N.D	3.9×10^{6}	1.4×10^{6}	N.D	N.D
Maximum	9.0×10^{6}	1.3×10^{7}	3.9×10^{6}	1.4×10^{6}	9.0×10^{4}	5.2×10^{4}
Minimum	1.3×10^{2}	2.1×10^{2}	1.8×10^{5}	1.1×10^{5}	1.0×10^{4}	9.0×10^{4}
Average	1.7×10^{6}	1.4×10^{6}	5.2×10^{5}	1.9×10^{5}	1.8×10^{4}	1.1×10^{4}

N.D. = Not Done

Table (2)
The density of bacterial indicators during November 1981 - May, 1983

Month	Location 1			Location 2			Location 3		
	T.C.	F.C.	F.Str.	T.C.	F.C.	F.Str.	T.C.	F.C.	F.Str.
November, 1981	7.9×10	4.9×10	1.1×10^{2}	N.D	N.D	N.D	N.D	N.D.	N.D
December	1.3×10^{2}	7.9×10	8.0	8.0	5.0	0.0	2.0	0.0	0.0
Jan., 1982	0.0	0.0	9.0×10	0.0	0.0	8.4×10^{2}	0.0	0.0	2.1×10
March	5.0	2.0	9.0	2.7×10^{2}	5.0×10	1.7×10^{2}	2.0×10	0.0	3.3×10
May	0.0	0.0	1.1×10	0.0	0.0	2.0	0.0	0.0	1.1×10
Sept.	9.2×10^{2}	9.2×10^{2}	2.4×10^{2}	2.1×10^{2}	1.7×10^{2}	2.4×10^{2}	3.3×10	1.7×10	7.0×10
Jan., 1983	5.4×10^{3}	1.3×10^{3}	5.4×10^{2}	3.4×10^{3}	7.9×10^{2}	2.2×10	2.7×10^{3}	7.0×10^{2}	8.0
Feb.	1.2×10^{2}	5.0×10	4.6×10	N.D	N.D	N.D	N.D	N.D	N.D
April	8.0	0.0	0.0	1.1×10	4.0	2.2×10	7.0	2.0	1.1×10^{2}
May	N.D	N.D	N.D	3.9×10^{2}	2.2×10^{2}	N.D	N.D	N.D	N.D
Maximum	5.4×10^{3}	1.3×10^{3}	5.4×10^{2}	3.4×10^{3}	7.9×10^{2}	8.4×10^{2}	2.7×10^{3}	7.0×10^{2}	1.1×10^{2}
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	7.4×10^{2}	3.0×10^{2}	1.2×10^{2}	5.4×10^{2}	1.5×10^{2}	1.8×10^{2}	4.2×10^{2}	1.2×10^{2}	1.3×10^{2}

N.D. = Not Done

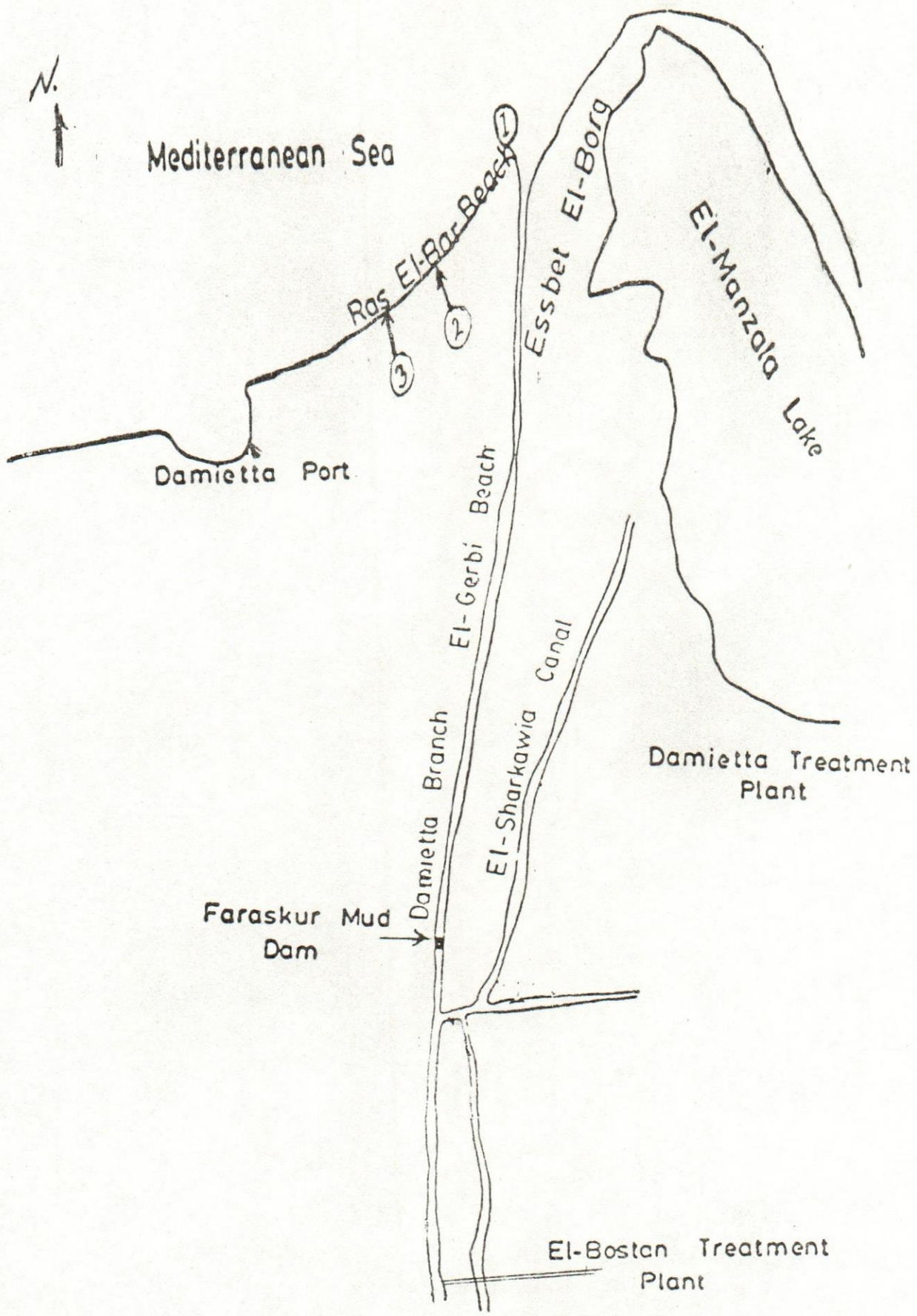
Table (3)
Summary of physico-chemical quality at Ras-Elbar beach during November 1981 - May, 1983

Parameter	Location No. 1			Location No.2			Location No. 3		
	Maxi.	Mini.	Av.	Maxi.	Mini.	Av.	Maxi.	Mini.	Av.
pH	8.5	7.2	7.99	8.5	7.6	8.1	8.5	7.5	7.97
Turbidity (NTU)	60	13	28.7	65	13	25	42	15	21.3
T.R. (105°C) mgL^{-1}	58398	36216	45342	54562	41158	46966	62009	40914	49288
T.R. (550°C) mgL^{-1}	38448	30076	32196	37021	34598	35660	37088	34288	35600
VOM. mgL^{-1}	22102	6140	10444	29724	6474	12681	26454	4112	13825
S.S. (105°C) mgL^{-1}	542	89	256	410	11	175.8	149	20	142
S.S. (550°C) mgL^{-1}	480	68	207	354	78	177.5	122	8	71.3
V.SS mgL^{-1}	92	21	50	190	20	64.8	147	22	64.7
NH_4 mg N L^{-1}	nil	nil	nil	nil	nil	nil	nil	nil	nil
O.N. mg N L^{-1}	2.8	0.56	1.49	1.68	0.56	1.33	2.52	0.56	1.36
NO_2 mg N L^{-1}	0.07	0.02	0.035	0.05	0.017	0.053	0.05	0.025	0.038
NO_3 mg N L^{-1}	-	-	-	-	-	-	-	-	-
Phosphorous $mgP\ L^{-1}$	220	66	119	170	44	49.33	192	40	107.4
COD mg O_2 L^{-1}	148	29.4	77.5	147.2	44.9	73.2	125.7	40.9	69.9
BOD mg O_2 L^{-1}	45.7	3	11.8	17.4	3.2	3.5	15	5.4	10.7
Chloride mg Cl L^{-1}	25000	14500-	21333	25000	20500	22857	32000	20000	24858
EC micro mho cm^{-1}	63000	34000	46611	63000	43000	50857	60000	42500	50185.7
D.O. mg O_2 L^{-1}	8.7	7	8	10	4.2	8.12	8.5	5.2	7.3

Table (4)
Concentrations of oil and grease and total hydrocarbons, mg/1 at Ras-Elbar beach during November 1981 - May, 1983

location	Parameters	1981		1982				1983				Max.	Min.	Average
		Nov.	Dec.	Jan.	March	May	Sept.	Jan.	Feb.	April	May			
1	Oil & Grease	10.56	12.74	10.94	11.37	13.46	7.26	6.58	14.64	N.D	6.47	14.64	6.47	10.44
	Hydrocarbons	2.356	7.569	8.532	9.462	6.359	2.986	2.249	4.256	N.D	1.895	9.462	1.895	5.07
2	Oil & Grease	N.D	6.53	4.58	16.82	10.27	5.48	9.66	N.D	7.43	10.65	16.82	4.58	8.92
	Hydrocarbons	N.D	2.104	3.549	7.874	8.617	3.132	6.453	N.D	2.682	2.462	8.617	2.104	4.61
3	Oil & Grease	N.D	7.34	11.54	10.39	9.12	4.77	3.82	N.D	5.29	18.64	18.64	3.82	8.86
	Hydrocarbons	N.D	5.436	8.953	6.485	5.894	1.976	2.054	N.D	1.783	3.576	8.953	1.783	4.52

N.D. = Not Done



Fig(1) Sampling Locations.