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A COMPARATIVE STUDY ON THE NUTRIENTS, ANIONIC DETERGENTS AND ENVIRONMENTAL PARAMETERS IN İZMİR BAY (AEGEAN SEA)

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ABSTRACT

In all, 10 stations were selected for this study, and the primary ecological factor levels of nutrients and anionic detergent concentrations were recorded from the polluted towards the non-polluted areas of the bay. The results show that there is a gradual decrease in nutrient and anionic detergent levels, from the inner stations towards the outer stations of the bay, with no apparent fluctuation in temperature and pH. On the other hand, the transparency (secchi disc) and oxygen levels have shown increases towards the outer stations. Big changes in levels of salinity have only been observed in the stations where the Gediz river enters the bay (St. 7, 8, 9). However, fluctuations in the parameters observed were due to the seasonal variations in the coastal discharge.

INTRODUCTION

Due to a gradual increase in the volume of effluents from industry, urbanisation, artifacts and agricultural activities, there is a growing increase of the effects of pollution in the bay of İzmir. The effluents come from different sources, 98 of them being discharge points and 11 from streams which enter the bay. In summer, contamination by toxic substances becames quite hazardous for public health.

As indicated in our previous studies (Geldiay and Uysal 1978; Yaramaz and Tuncer 1985), toxicity of the pollutants affects the biological activity. Both the larval development as well as the oxygen transport are inhibited by 0.1 g/m3 anionic detergent concentration in the marine environment. The ratio between N and P should be between 5:1 - 15:1 for the normal development of algae and phytoplankton; beyond this range it has been determined that there is atoxic effect (Topping, 1976). This is the aim of our investigation. The studies in this direction are being continued under this view.

MATERIAL AND METHODS

The locations of the sample stations beginning from the inner bay towards the outer, are shown in Figure 1. Sample of water were collected from the different depths using Hydrobios Water Samples. The analysis of the samples were made by methods described by Strickland and Parsons (1972); Wood (1975).

RESULTS AND DISCUSSION

Ten stations were chosen for obtaining preliminary data related to the different land-based source inputs that may be occuring in the bay (Fig. 1). Stations have been selected starting on the same line from the unpolluted outer bay. Sampling stations 1, 2, 3 were situated within the heavy polluted waters of the inner bay, others stations are located in the unpolluted waters of the outer bay and stations 8, 9, 10 near the mouth of Gediz river, which is polluted by land-based sources i.e. industrial, agricultural and urban inputs.

Due to the importance of İzmir Bay in the Aegean Coast of Turkey, several type of studies have been carried out in previous years (Geldiay & Uysal 1978; Kocataş 1981, Büyükışık 1983; Yaramaz et al 1986, 1987). In addition similar studies have been recently carried out also on the west coasts of the Aegean Sea (Friligos 1985, Friligos and Becacos - Kontos 1987, Scoulos et al 1985).

Samples were collected seasonally from the sampling stations at standard depths 0, 5, 10 m. The primary ecological factors, anionic detergent concentrations and nutrient values were determined in the mentioned water samples collected.

The results obtained are given in the tables 1 and 2. Table 1 shows range and means of the primary ecological factors. Table 2 shows range and means of the nutrient levels.

These tables shows that there is a gradual decrease in the level of mean surface nutrients (NO_2^--N, 1.04-0.06; NO_3^--N 2.14-1.30; PO_4^{3-}-P, 3.32-0.17; SiO_4^{-2}-Si 9.72-3.32 µgat/l) anionic detergent concentrations, 4:34 - 0.42 mg/l; temperature, 18.50 - 18.13°C; pH, 7.74-7.64; and an increase in the transparency (sechi disc), 1.93 - 13.65 m; dissolved oxygen (DO), 5.03 - 7.25 mg/l; salinity, 35.60 - 36.69 psu as we move from the inner parts of the bay towards the outer bay. In addition an increase in the parameters studied was observed due to the effects of Gediz river discharges.

According to our results the mean present nutrient and environmental parameters varied between; Nutrient, NO_2^--N, 0.03-1.34; NO_3^--N, 0.19-2.14; NH_4^+- N, 3.58 -21.24; PO_4^{-3}-P, 0.16 - 3.32; $SiO^{-2}4$ - Si; 2.26 -10.49; µg.at/l anionic detergent concentrations, 0.42-4.34 mg/l temperature 16.15 - 18.90°c pH, 7.45-7.74; transparency (secchi disc), 1.93 - 13.65m; dissolved oxygen (DO), 3.65-7.60 mg/l; and salinity 34.16 - 37.69. Our results have shown no prominent fluc-

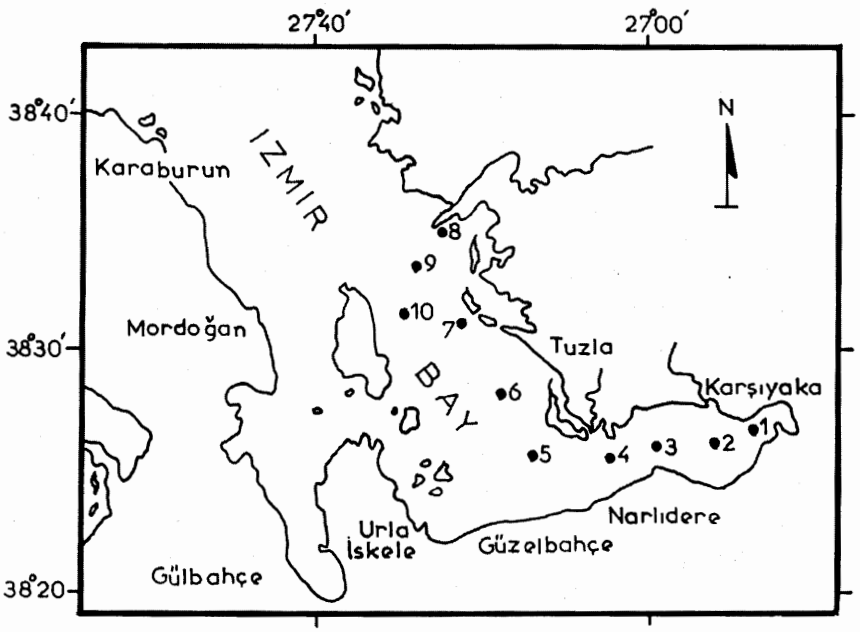

Fig. 1. The locations of the sampling stations in the İzmir Bay.

TABLE 1. Range and means of the environmental parameter Levels in the sampling stations.

	Dept (m)	S.W. Temp.°C	DO mg/L	Sechl-disk (m)	pH	Sal. %0	Ani. Det. mg/L
St. 1	0	13.2-27.0-185	0.40-6.80-5.03	1.30-1.50-1.93	7.50-7.95-7.74	32.12-36.10-35.60	0.53-7.82-4.34
	1m	13.2-26.8-18.3	0.40-7.00-4.70		7.30-7.90-7.55	35.10-36.69-35.80	
	5m	13.0-26.8-18.2	1.60-7.00-4.70		7.20-7.90-7.50	35.35-37.43-36.22	
St. 2	0m	13.0-26.5-18.3	1.00-8.70-5.85	1.50-5.00-3.19	7.40-7.90-763	35.41-37.45-36.62	0.61-645-3.49
	1m	13.0-26.2-18.1	1.00-8.20-5.85		7.40-7.85-7.60	35.44-37.44-36.85	
	5m	12.8-26.0-17.8	1.12-8.40-5.41		7.30-7.85-7.56	35.51-38.03-37.06	
	10m	12.6-25.8-17.6	1.40-6.20-3.65		7.20-7.80-7.45	35.61-38.32-37.05	
St. 3	0m	13.8-26.4-18.7	5.00-8.20-7.05	2.00-7.00-3.80	7.40-7.80-7.60	35.71-38.03-37.07	0.41-4.99-2.51
	1m	13.8-262-18.6	5.20-7.80-6.75		7.30-7.80-7.59	35.77-37.73-37.06	
	5m	13.6-26.0-18.4	4.80-7.10-6.18		7.10-7.70-7.49	35.02-38.90-37.50	
	10m	13.6-25.6-17.9	2.00-6.80-4.93		7.10-7.70-7.50	36.15-38.90-37.57	
St. 4	0m	14.2-26.5-18.7	6.60-8.40-7.60	3.50-8.00-6.38	7.50-7.75-7.60	36.16-38.03-37.51	0.19-2.42-1.73
	5m	14.2-26.3-18.5	6.40-7.60-7.13		7.40-7.75-7.59	36.21-38.3237.69	
	10m	14.0-25.5-18.1	5.12-7.50-6.66		7.40-7.70-7.58	36.34-38.32-37.55	
	20m	13.8-22.5-17.0	3.72-7.00-6.08		7.30-7.65-7.50	36.47-38.44-3747	
St. 5	0m	14.0-26.0-18.9	6.20-8.80-7.33	5.00-7.00-5.94	7.45-7.70-7.56	36.07-38.03-36.94	0.20-2.17-1.19
	5m	13.8-25.5-18.5	6.28-8.20-7.12		7.40-7.70-7.53	36.14-38.32-37.37	
	10m	36.6-25.5-18.4	5.48-8.00-6.77		7.30-7.65-7.50	36.19-38.05-37.15	
St. 6	0m	12.5-25.0-17.9	5.80-8.20-7.05	5.00-7.00-6.00	7.40-7.85-7.61	36.11-37.44-36.79	0.19-1.82-1.04
	5m	12.2-24.8-17.6	5.20-7.40-6.60		7.40-7.85-7.59	36.20-38.03-37.02	
	10m	12.1-24.8-17.2	5.20-7.10-6.43		7.40-7.80-7.55	36.51-39.03-37.09	
St. 7	0m	13.8-24.0-18.0	6.20-7.50-6.93	1.50-9.00-3.93	7.45-7.80-7.60	35.64-36.40-36.10	0.23-1.74-1.02
	5m	13.2-23.4-17.6	6.00-7.35-6.79		7.40-7.85-7.56	36.02-38.03-36.76	
	10m	13.1-23.0-17.3	6.00-7.10-6.53		7.20-7.80-7.48	36.21-37.15-36.62	
St. 8	0m	14.0-24.0-18.5	5.6-8.0-7.05	2.00-9.00-4.75	7.45-7.85-7.68	29.92-36.86-32.09	0.71-2.95-1.70
	5m	13.2-23.4-17.40	4.4-7.6-6.53		7.45-7.80-7.63	31.62-36.56-34.31	
	10m	13.0-23.0-17.05	5.8-7.2-6.73		7.30-7.75-7.56	34.87-35.73-36.17	
St. 9	0m	14.5-23.8-17.83	6.6-8.0-7.3	1.75-11.5-5.56	7.40-7.85-7.63	21.96-36.86-31.16	0.60-2.01-1.32
	5m	13.5-23.6-17.43	6.4-7.0-6.7		7.40-7.80-7.60	36.13-37.44-36.50	
	10m	13.0-23.1-17.03	6.4-7.0-6.45		7.30-7.85-7.58	36.25-37.44-36.57	
	20m	12.8-22.8-16.70	6.1-6.6-6.35		7.20-7.90-7.54	36.40-37.63-36.73	
St. 10	0m	14.5-24.0-18.13	6.6-7.6-7.25	5.00-27.00-13.65	7.45-7.90-7.64	36.08-38.32-36.69	0.11-0.63-0.42
	5m	14.5-24.0-17.95	6.5-7.6-6.93		7.45-7.90-7.64	36.20-37.44-36.62	
	10m	14.0-23.8-17.65	5.9-7.2-6.73		7.25-7.90-7.55	36.33-38.65-36.96	
	11m	13.0-20.2-16.15	6.0-7.2-6.58		7.20-7.85-7.53	36.47-36.86-36.63	

tuation in pH and temperature, observable changes in oxygen, transparency and nutrient levels from the inner towards the outer stations of the bay. On the other hand, fluctuations in the parameters studied were observed due to the effects of Gediz river and other discharge locations. In order to give a clear picture of our findings the results have been plotted in the figures 2 and 3. The mean levels of some of the primary ecological factors and anionic detergents are given in Figure 2, which shows the mean level variations according to the locatities. The mean values of the nutrients are given Figure 3, which also shows the level fluctuations according to locality. As can be seen from the tables and figures, there are fluctuations in the levels of metnioned parameters according to seasonal and coastal discharges inputs from inner bay towards outer bay.

These results are expected to effect the fauna and flora of the bay to large extent (Kocataş 1981). The prohibitive steps taken during the last 5 years by the İzmir Municipality seem to have played a great role in this direction.

We can benefit from the knowledge

TABLE 2. Range and means of the nutrients and anionic detergents levels in the sampling stations (μg.at/l).

	Depth	NO_2^- - N	NO_3^- - N	NH_4^+ - N	PO_4^{-3} - P	ΣN/ PO_4^{-3} - P	SiO_4^{-2} - Si
St. 1	0m	0.42-2.53-1.04	0.72-5.14-2.14	4.72-42.37-21.24	1.05-5.58-3.32	2.56-12.82-8.39	5.53-18.65-9.72
	1m	0.30-4.19-1.34	0.64-1.11-0.91	4.69-31.22-18.08	0.45-6.52-2.73		5.48-18.59-9.35
	5m	0.22-3.19-0.99	0.09-1.18-0.05	4.57-34.04 -20.17	0.09-5.01-2.68		5.33-18.50-8.96
St. 2	0m	0.18-1.26-0.49	0.45-1.12-0.77	3.64-29.75-13.55	0.48-3.94-1.62	6.31-15.35-9.68	5.97-11.59-7.17
	1m	0.14-1.26-0.43	0.58-1.12-0.82	3.87-23.29-12.94	0.48-4.28-1.67		4.95-19.16-9.62
	5m	0.12-3.12-0.93	0.47-1.03-0.66	3.81-25.44-14.51	0.27-4.16 -1.74		1.90-6.73-4.87
	10m	0.09-2.34-0.76	0.19-1.21-0.66	3.59-30.12-16.08	0.09-2.73-1.55		4.85-21.21-9.58
St. 3	0m	0.14-0.58-0.29	0.07-0.71-0.35	2.97-12.88-6.26	0.27-2.00-0.74	6.89-17.44-7.10	2.81-11.46-5.21
	1m	0.13 -0.34-0.23	0.07-0.58-0.30	3.51-10.03-6.07	0.33-1.59-0.94		2.88-12.31-5.39
	5m	0.04-0.70-0.30	0.08-0.56-0.38	3.70-13.41-7.13	0.31-1.31-0.86		3.07-9.61-4.76
	10m	0.05-2.54-0.72	0.09-0.84-0.39	0.23-22.80-10.21	0.11-2.83-1.59		3.30-14.65-6.35
St. 4	0m	0.04-0.17-0.09	0.01-0.71-0.29	0.16-7.09-3.74	0.16-2.04-0.79	1.79-12.86-7.10	2.81-11.46-5.21
	5m	0.07-0.17-0.13	0.10-0.25-0.19	3.09-8.34-4.59	0.11-0.46-0.25		2.88-12.35-5.39
	10m	0.05-0.11-0.08	0.19-0.88-0.39	3.03-13.04-5.98	0.13-1.16-0.46		3.07-9.61-4.76
	20m	0.06-1.58-0.52	0.19-5.41-1.57	3.27-12.39-6.70	0.18-2.15-0.88		3.30-14.65-6.35
St. 5	0m	0.09-0.59-0.25	0.20-2.81-1.09	5.87-11.98-8.77	0.13-1.81-0.67	5.12-72.60-39.70	3.18-24.07-9.65
	5m	0.07-0.28-0.14	0.19-0.82-0.50	4.31-6.99-5.65	0.13-1.81-0.67		2.22-33.63-10.49
	10m	0.09-0.76-0.32	0.18-1.24-0.51	2.99-6.93-4.46	0.04-0.95-0.42		2.30-12.95-3.96
St. 6	0m	0.07-0.13-0.09	0.31-1.53-0.81	2.10-8.03-4.04	0.11-0.54-0.25	16.08-28.36-22.63	2.17-4.54-3.03
	5m	0.07-2.05-0.58	0.15-1.25-0.73	2.68-6.18.3.77	0.11-0.23-0.18		2.03-4.33-2.83
	10m	0.05-0.25-0.12	0.27-1.45-0.79	2.33-6.68-3.89	0.09-0.27-0.18		2.28-4.01-3.08
St. 7	0m	0.03-0.11-0.66	0.22-1.29-0.63	2.62-5.49-3.89	0.05-0.81-0.34	7.25-65.14-29.05	0.66-3.41-2.39
	5m	0.05-0.12-0.09	0.02-2.90-0.98	2.29-6.87-3.89	0.07-0.45-0.24		0.59-3.33-2.26
	10m	0.04-0.10-0.07	0.19-2.60-1.02	2.49-8.75-5.05	0.08-0.51-0.28		0.42-4.54-3.16
St.	8 0m	0.08-0.71-0.29	1.09-7.97-2.95	2.04-8.46-5.54	0.11-0.96-0.54	10.21-87.95-33.79	1.83-13.73-6.72
	5m	0.08-0.18-0.11	0.36-1.41-0.89	2.09-5.86-3.58	0.09-0.42-0.26		1.91-5.11-3.06
	10m	0.02-0.16-0.09	0.58-1.20-0.91	1.99-6.23-3.99	0.15-0.66-0.34		1.55-4.95-3.17
St. 9	0m	0.04-0.55-0.27	0.46-8.11-2.68	2.35-6.51-4.49	0.11-1.50-0.58	10.10-40.80-21.60	0.53-22.67-6.97
	5m	0.02-0.19-0.08	0.33-2.30-1.08	2.32-6.86-4.56	0.09-0.39-0.24		2.83-5.05-3.82
	10m	0.03-0.19-0.11	2.63-2.07-1.13	2.15-8.82-4.55	0.09-0.49-0.25		1.89-3.52-2.72
	20m	0.03-0.19-0.12	0.09-1.53-0.77	2.38-7.45-3.89	0.07-0.40-0.20		1.64-3.20-2.61
St. 10	0m	0.02-01-0.06	0.29-2.12-1.30	2.57-7.71-4.61	0.08-0.32-0.17	25.45-46.13-40.52	1.68-5.64-3.32
	5m	0.02-0.10-0.05	0.20-2.16-1.31	2.89-4.56-3.95	0.07-0.37-0.18		1.93-3.41-2.69
	10m	0.02-0.05-0.03	0.29-1.55-0.86	1.71-5.87-3.96	0.07-0.35-0.17		1.21-3.99-3.07
	20m	0.02-0.06-0.05	0.33-1.49-0.81	1.47-8.28-4.29	0.06-0.31-0.16		1.98-3.54-2.79

gained from Çakalburnu and Ragip Paşa fisheries, due to the effects of pollution. If effective steps are not taken in time, Tuzla Saltern and the Homa Fishery will suffer the same fate.

It appears to us that with the completion of the Grand Canal Project in connection with the Bay of İzmir, which deals with the collection of all domestic and other discharges there will be decrease in pollutants. The harmful effects of the phosphates, found in anionic detergents used by the inhabitants of this area, will also decrease as well as other toxic substances.

If this project could not be realized in time, there will be an increase in phosphate levels which are found in large quantities in the detergents used by the inhabitants of the area around the bay. Naturally phosphates which are among the nutrients entering the bay will cause eutrophication without the required discharge control. To prevent this kind of pollution it has been suggested that Nitrilotriacetic acid (NTA) be

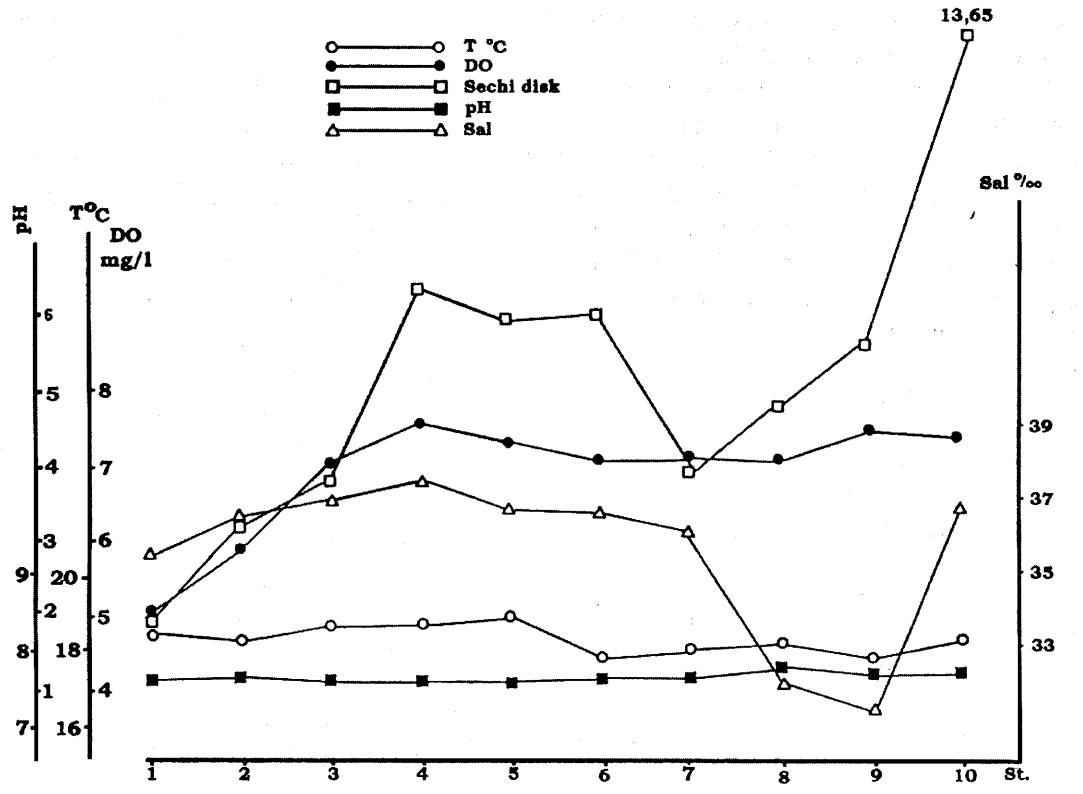

Fig. 2. Areal fluctuations of the average environmental parameter levels.

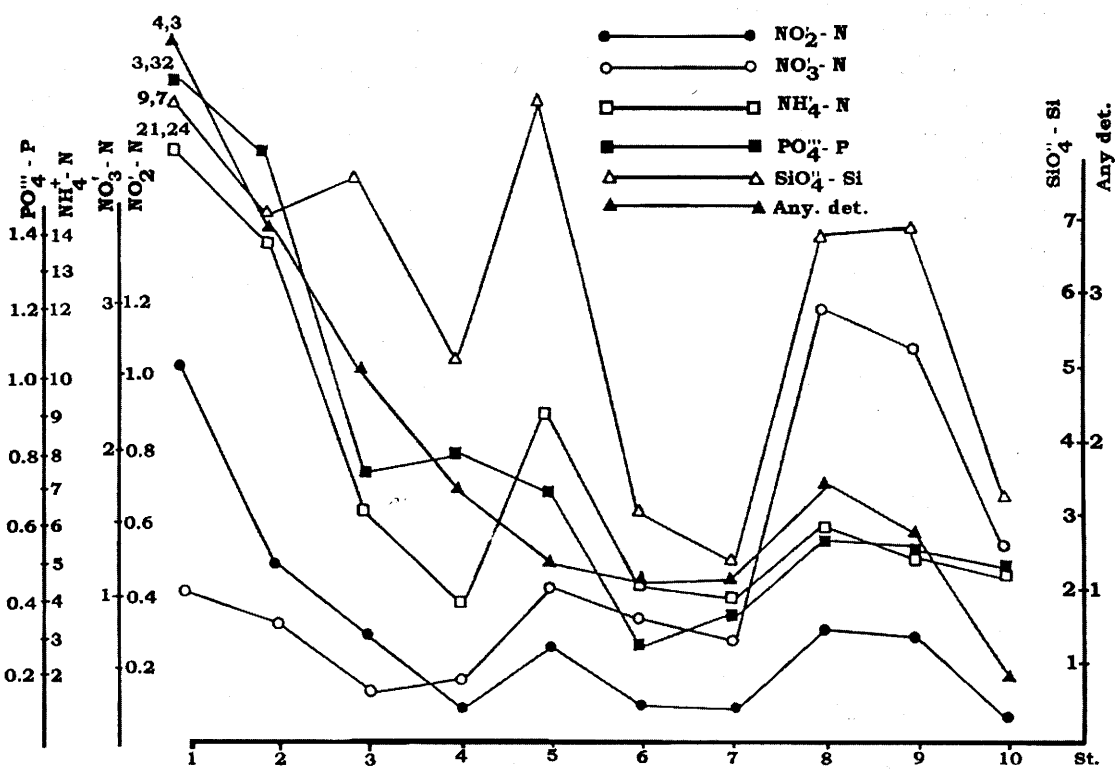

Fig. 3. Areal fluctuations of the average nutrients and anionic detergent levels.

used of phosphate in the anionic detergents (Duthie 1972; Hamilton 1972).

We strongly belive that the prohibitive steps already taken to solve some pollution problems through the commencement of the Grand Canal Project will spread to all other places when there is need in the near future. It is also hoped that this action will assist the marine life in the bay of İzmir to regenerate itself.

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