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MAHIM BAY — A POLLUTED ENVIRONMENT OF BOMBAY

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ABSTRACT

Distribution of marine life in relation to the extent of pollution at and outside the Mahim bay was studied. A poor marine fauna at stations A & B was associated with relatively higher intensity of pollution accompanied by higher BOD and nutrients and lower DO levels. A distinct deterioration in the marine life and water quality along the northern part of the bay as compared to the southern part was evident. An increasing trend in the marine fauna with decreasing intensity of pollution from inside to outside bay was noticed.

INTRODUCTION

The Mahim creek is a well known dumping water body for sewage and industrial waste discharge of the western suburbs of Bombay. About 30 years ago Mahim Bay (Lat 19°2'N, Long 72°49'E) was considered one of the most important fishery centre for clams and rock oysters (Subrahmanyam, Karandikar and Murti, 1949). Today fishing activities within the Mahim bay have been brought down to nil due to reducing fishery potential (Gajbhiye 1982) with increasing pollution (Zingde and Desai. 1980) of the bay waters. Marine life in bay is very meagre today. This ecological change is mainly brought about by the discharges of about 185 million litre per day (MLD) of sewage and industrial effluents (Zingde and Desai, 1980). The present report mainly focusses the hydrographical studies with necessary faunastic details of the Mahim Bay inorder to understand the extent of pollution and its impact on the distribution of marine life especially within the bay.

This study was carried out between May 1976 to April 1977. Location of the sampling stations are indicated in Fig. 1. Station A located on the northern side of the Bay received the sewage load from the Mahim creek and was considered as the outfall station. Stations B and C, and E and F were located on the northern and southern side of the Bay respectively. Stations D and G were located outside the Bay at Bandra and Worli sea-board respectively. The samples for hydrographical

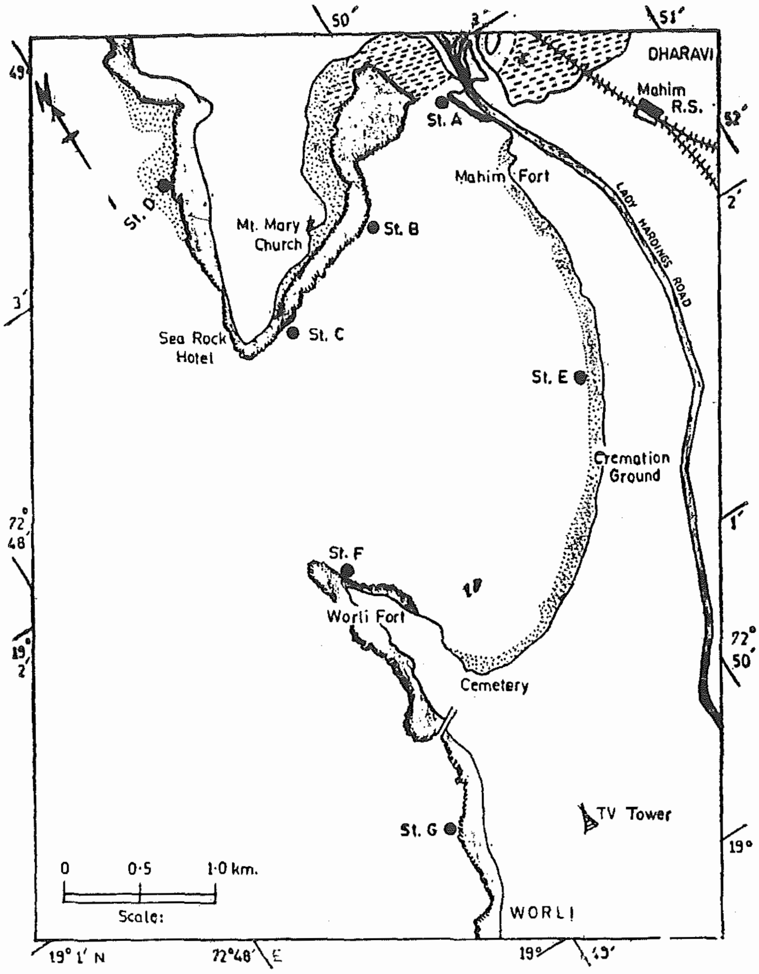

Fig —1. Map showing the locations of the stations at Mahim Bay, Bandra and Worli Seaface.

and biological observations were collected from the shore of the respective stations. The water samples were collected each month both during flood and ebb conditions. The parameters analysed were water temperature, salinity, dissolved oxygen, pH, PO_4-P and NO_3-N. The pH of the water was measured by using a pH meter (Philips model PP9060). The analysis of the remaining chemical parameters was done by following the methods of Strickland and Parsons (1968). The biological observations were made periodically but the samples were collected seasonally and analysed for the presence or absence of different faunal groups.

Environment

The results of certain important environmental parameters are given in Fig. 2 & 3. The salient features of the parameters studied are as follows :

Water temperature varied from 26.5-33.5°C for the seven stations during the period of May '76 to April '77. The values of low and high temperatures were corresponding to winter and summer seasons. Thus seasonal and diurnal variations in temperature were noticed. The water temperature showed a temporal variation of 7°C during the period of study. In general, the temperature fluctuations were comparatively less for the stations outside the Bay than the stations inside the Bay.

The pH values of the seven stations varied from 7.0 — 8.5 during flood and 6.0 — 8.4 during ebb. In general, the pH values of the stations inside the Bay showed higher fluctuations than the outside stations. The low pH values noticed at stations A and B agreed with earlier report (Zingde & Desai, 1980).

Wide fluctuations in salinity and Dissolved oxygen (DO) were observed between ebb and flood conditions especially of the stations inside the Bay (Fig. 2, i & ii). The salinity and DO conditions were found much improved during flood in all the Bay stations including the outfall station A. A fairly mixed watermass during flood as compared to ebb has been reported at the vicinity of station A (Zingde and Desai, 1980). Similarly, wide fluctuations in DO associated with high BOD (20 mg/1) have been reported (Op. cit) in the bay waters especially around station A. On the other hand, no appreciable change in salinity and DO was noticed between flood and ebb of the stations (D & G) outside the Bay.

Concentrations of nutrients (Fig. 3, i & ii) varied widely between stations inside and outside the Bay. The PO_4-P and NO_3-N values in the order of 3 to 6 ug at/1 and 10-30 ug at/1 respectively were common at the stations outside the Bay. Whereas the values of 10-12 ug at/1 of PO_4-P and 20-75 ug at/1 of NO_3-N were commonly encountered of the stations inside the Bay. In general, the stations A and B were associated with relatively very high concentration of nutrients as compared to other less polluted stations. The observed nutrient values of the bay waters agreed with earlier report (Zingde & Desai, 1980).

The foregoing results on water quality clearly indicate very wide influctuations in salinity between flood and ebb. pH, DO levels and concentration of nutrients at stations inside the Bay especially A & B. Thus, a considerable deterioration in water quality especially during ebb is noticed at the stations A & B, which can be directly related to the degree of sewage load. A considerable improvement in water quality is seen during flood at all the stations of the Bay. The present data on water quality correspond to earlier results reported for the Mahim bay (Zingde and Desai, 1980).

Marine Life

Stations A and B contribute relatively a poor intertidal macrofauna chiefly consisting of barnacles, littorinids, polychaetes, foraminiferans, hermit crabs, etc. At the vicinity of station A and its adjacent mangrove environment were found completely devoid of marine animals. Stations C & F were represented by a typical rocky and muddy intertidal fauna consisting of gastropods (patellids, trochids, turbinids, neritids, planaxids, potamidids, cerithids, bursids, buccinids, muricids, conids, etc), clams (arcids. cardiids, vermids, donacids etc), rock oyster (*Crassostrea cucullata*), coelentrates (sea anemones and sea urchins), annelids (chiefly polychetes) and crustaceans (mainly cirripids and crabs). Station E, contributed a muddy and sandy intertidal fauna consisting of gastropods (trochids,potamidids, naticids, nassarids, olivids etc) clams (arcids, venerids, tellinids, donacids. pholadids, solenids etc) annelids (polychaetes), coelentrates and crustaceans (cirripids, crabs etc). Station D and G were represented by a typical rocky marine fauna consisted of molluscs, crustaceans, holothurians, annelids, echinoderms, coelentrates etc.

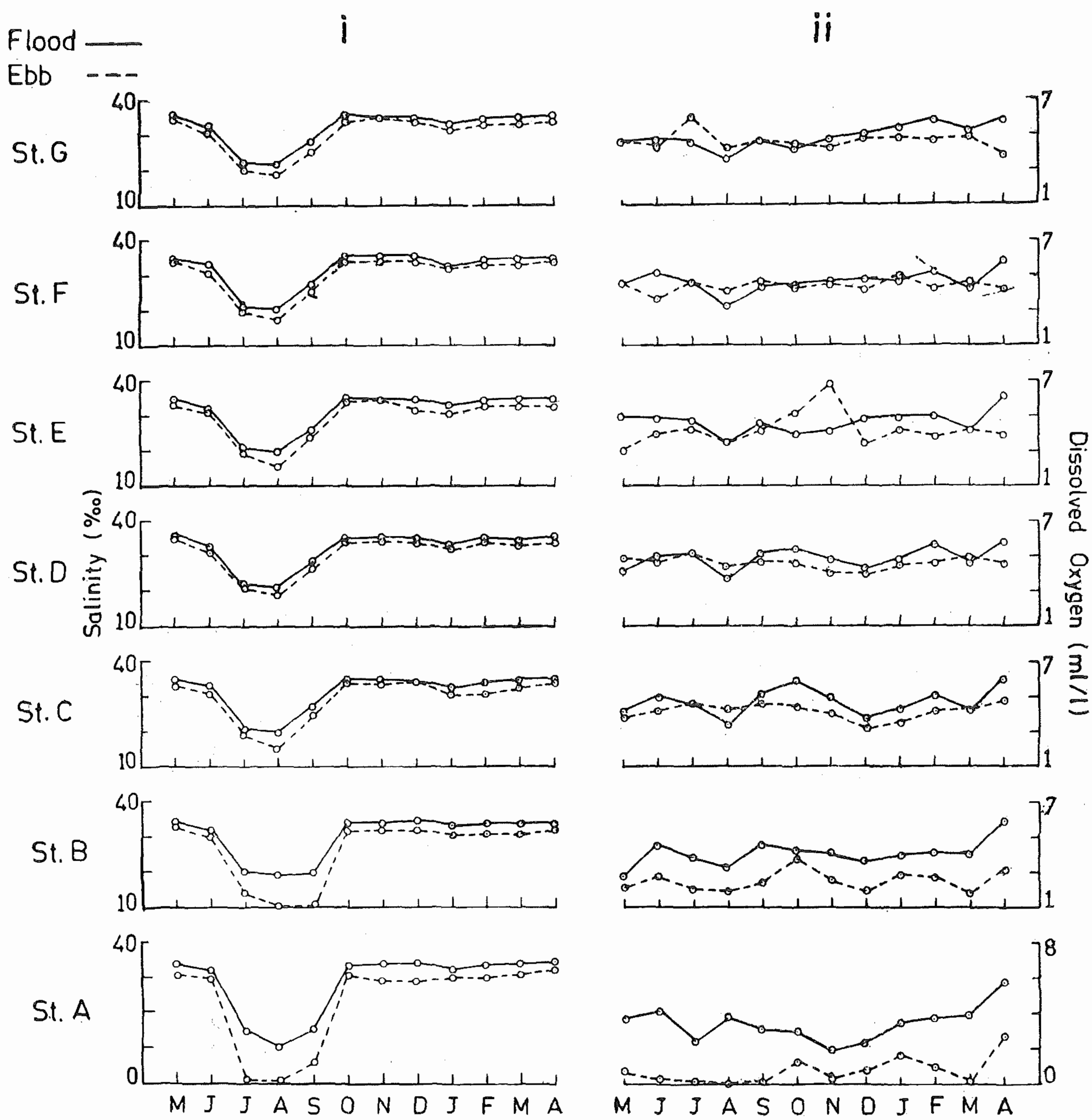

Fig.—2. Variations in i) Salinity, and ii Dissolved oxygen

Barnacles and littorinids colonized the upper limit of stations A and B only, although the population density was poor. A gradual increase in their numerical abundance towards the bay mouth was noticed. The sewage run off mostly takes a course along the northern side (Zingde and Desai, 1980) as a result many marine animals appear on the southern side less than ½ km away from station A. But on the northern side a typical marine fauna appears only 2 km away from station A. A definite depletion in rock oyster and clam fishery inside the bay as compared to outside bay stations was also noticed. The creek region which served as a source of rich oyster fishery about 30 years back (Subrahmanyam, Karandikar and Murti, 1949) now completely devoid of living oysters. The absence of many marine animals inside the bay especially at the vicinity of stations A and B, can chiefly be attribu-

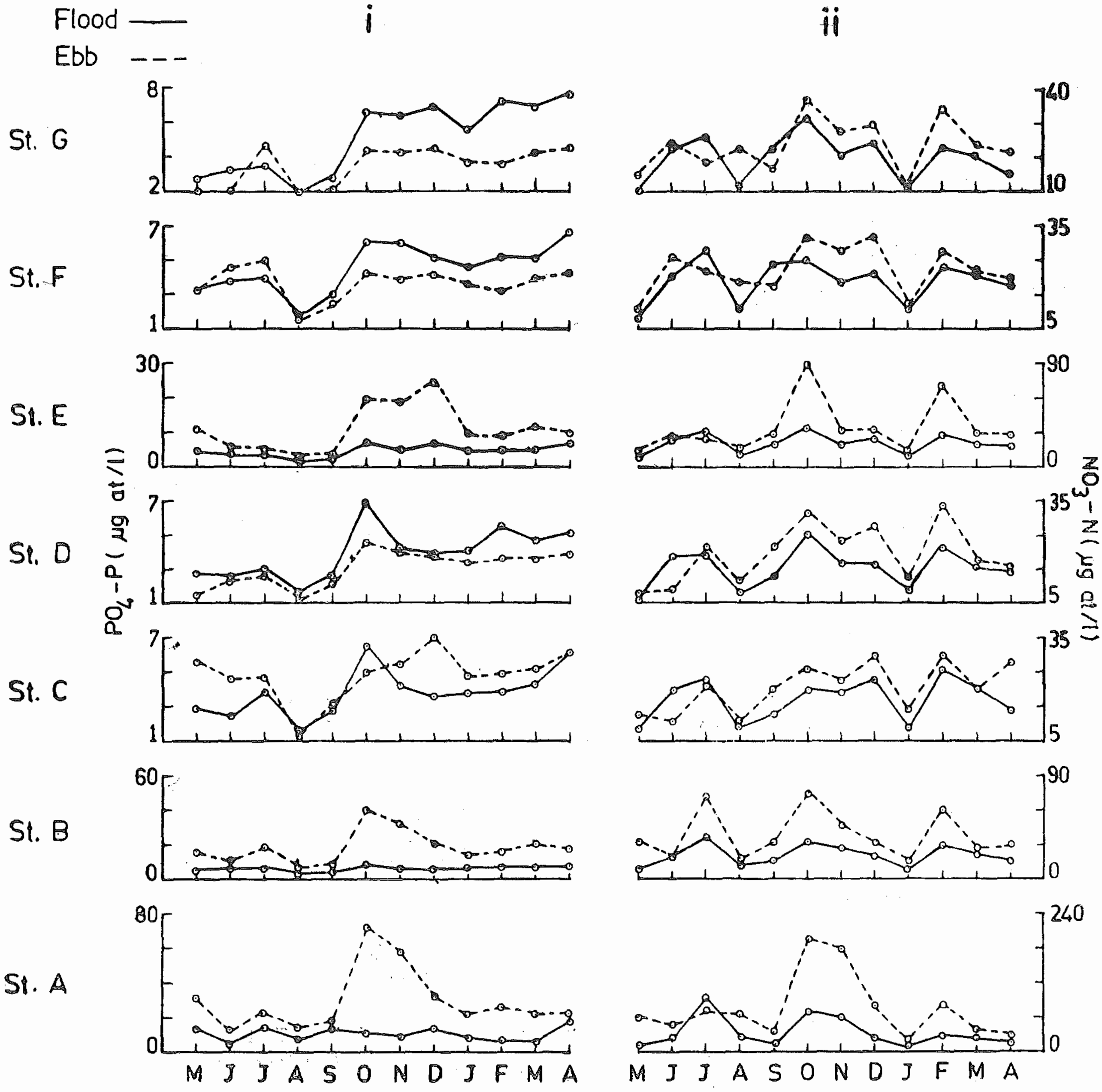

Fig.—3. Variations in i) PO_4-P and ii) NO_3-N.

ted to the amount of sewage load reaching these stations and the resulting adverse environmental conditions especially during ebb periods (Fig. 2). Although, the conditions are very much improved during flood time the intertidal fauna is relatively poor within the bay as compared to outside bay stations.

A marked decrease in zooplanktonbiomass and population counts associated with considerable reduction in group diversity has been indicated in the bay waters especially during ebb than flood conditions (Gajbhiye 1982). A difference of 98% in the values of zooplankton biomass between flood and ebb at the vicinity of station A has been reported (OP. cit). A higher rate of bioaccumulation of heavy metals like Cu (305 ppm) and Cd (14.5 ppm) has also been reported (Op. cit) especially for copepods and decapods of Mahim waters. A very poor subtidal benthic biomass is recorded at station A (Varshney, 1982). Very wide fluctuations in phytoplankton counts and chlorophyll values (Jiyalal Ram and Desai, unpublished data) clearly indicate the environmental instability of the bay waters especially in the northern part. Therefore, it can be concluded that very wide salinity fluctuations, lower oxygen content, higher level of BOD and suspended load (Zingde and Desai, 1980) and other pollutants associated with wastes may play on important role in the ecology of the bay waters. In general, the conditions of ecology and water quality are relatively much better outside the bay than within the bay. The marine environment of Mahim bay may further deteriorate in the years to come if the indiscriminate discharge continues indefinetely.

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REFERENCES

Gajbhiye, S. N., 1982. Ecology of zooplankton with special reference to polluted environments off Bombay. Ph.D Thesis, Bombay University.

Strickland, J.D.A. and Parson, T. R. 1968. A practical hand book of sea water analysis *Bulletin of Fisheries Research Board of Canada.* **167** :1-311.

Subrahmanyam, T. V., Karandikar K. R. and Murti N. M., 1949. The marine Pelecypods of Bombay. *J. Univ. Bombay.* XVII **5**) : 1-33.

Varshney, P. K., 1982. Biological productivity of polluted and unpolluted environment of Bombay with special reference to benthos. Ph.D. Thesis. University of Bombay.

Zingde, M. D. and Desai, B. N. 1980. Waste water discharge and its effect on the quality of water of Mahim creek and Bay. *Mahasagar — Bull. Natn. Inst. Oceanogr.* **13** (3): 205-213.