SOME ASPECTS OF HYDROBIOLOGICAL STUDY ON THE SHELF WATERS OFF BOMBAY

ABSTRACT

Variations in salinity, temperature, dissolved oxygen and zooplankton biomass in the shelf waters off Bombay where the exploratory fishing vessels were operating, studied for one year from April 1972 to April 1973. Hydrographic features in the locality showed double oscillations. Zooplankton biomass exhibited two peaks - one immediately before and the other soon after the southwest monsoon, the latter being secondary in nature. List of dominant zooplankters found in the area in various months are given in the order of their abundance.

OUR knowledge of the hydrography of the shelf waters off Bombay is based mainly on the works of Jayaraman and Gogate (1957), Carruthers *et al.* (1959), Banse (1968), Sudarsan (1964) and Pillai (1968). The area 18-72 (18°00-19°00 N ; 72°00 E) near Bombay forms an important fishing ground with considerable fishing activity (Prabhakaran Nair, 1974). However, detailed observations on the oceanographic conditions of the locality of this area are not available. Hence, a study of these aspects off Bombay for a month to month variations of some hydrographic parameters was carried out from April 1972 to April 1973. Results of observations on surface temperature, salinity, dissolved oxygen, inorganic phosphate and silicate and zooplankton biomass are presented here.

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Material and Methods

Samples were collected from the fishing area 18-72 off Bombay on board the trawler M.V. *Meenabharati* of the Exploratory Fisheries Project, Government of India, during April 1972 April 1973. Data could not be collected during August 1972 due to inclement weather and during June 1972 and February 1973 when the vessel was dry-docked.

Surface water samples were collected with a polythene bucket and the temperature was recorded. The samples were analysed for salinity, dissolved oxygen, inorganic phosphate and silicate by using standard methods (Strickland and Parsons, 1968). Surface plankton was collected with an half metre diameter organdy net (15 strands/cm) without a flowmeter, for a duration of 15 minutes at a speed of two knots. Large forms of the zooplankton were

measured by the displacement method and smaller forms by settlement method.

Results

The average monthly values of hydrographic parameters such as temperature, salinity and dissolved oxygen are shown in Fig. 1 and the salient hydrographic features are discussed here.

Temperature : The observed values of surface temperature showed that temperature increased from April and reached the maximum in May. Temperature fell during July-September when the southwest monsoon was most active. It rose gradually and attained a peak during October after which there was a steep fall during November-February. From then, the temperature increased steadily, reaching high values in the month of April-May (28.5°C-29.3°C). The peak occurring in summer months formed the primary and that in the post-monsoon months was secondary. The fall during the winter formed the primary, another secondary fall occurred in monsoon season. The maximum temperature recorded was 29.3°C (May) and the minimum was 25.5°C (January) during winter. The annual variation of temperature shows a double oscillation, its lowering is insignificantly low during monsoon months. This small reduction of temperature may be attributed to low thermal radiation from the sun due to thick monsoon clouds. The temperature depression is very large during winter. It appears that the winter monsoon lowering of temperature further intensified due to upwelling effects in the waters (Carruthers *et al.*, 1959).

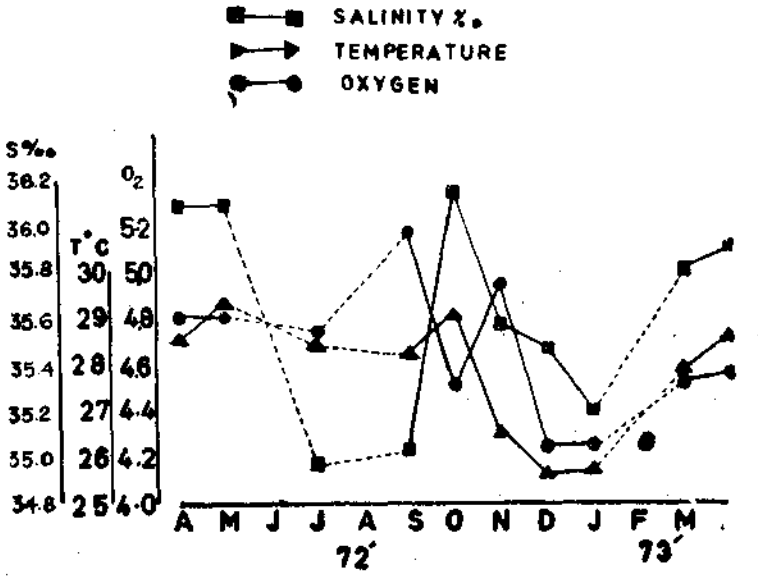

Fig. 1. Monthly mean values of hydrographic parameters.
Δ—Δ Temperature (°C), × —× Salinity ‰,
○—○ Dissolved oxygen ml/l.

Salinity : Salinity showed a similar trend as temperature, with high values in April-May (36.09‰) and low value in July (34.96‰). The lowering of salinity in July was due to the heavy precipitation during the monsoon. The

salinity increased to 36.14‰ in October and decreased to around 35.5‰ in the winter months of November-January. With the onset of summer the salinity gradually increased to 35.9‰ in April. Thus, two peaks of salinity—first in May and second in October were observed.

during September (5.47 ml/l and the minimum was observed during December (4.25 ml/l).

Phosphate : During this study, the concentration of inorganic phosphate at the surface was found to be uniform through different months varying from 0.48-0.69 μg at/l with

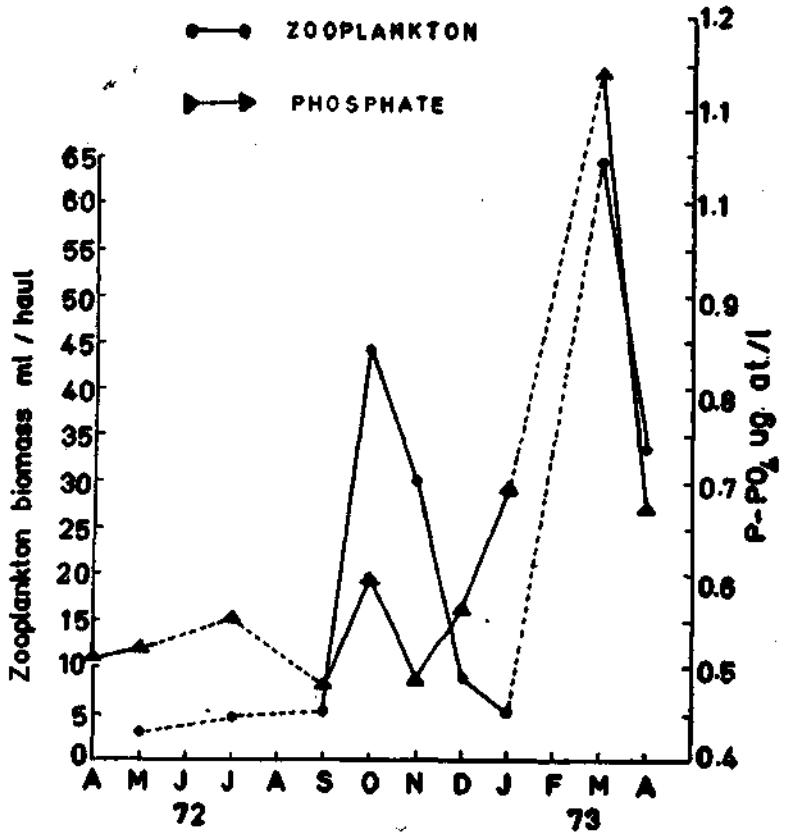

Fig. 2. Correlation between zooplankton biomass and inorganic phosphate.

Oxygen : The dissolved oxygen values showed little variation during the period of observation. The variation of the mean monthly value of dissolved oxygen off Bombay was between 4.25-5.17 ml/l. Pillai (1968) observed a wider range of oxygen, varying between 0.313 ml/l and 6.77 ml/l. Highest values were

the exception of March when the concentration reached to 1.14 μg at/l. The high concentration in March coincided with the high value of zooplankton biomass (64.6 ml) in that month. The monthly fluctuations in the concentration of phosphate and the zooplankton biomass are presented in Fig. 2.

Silicates : Silicate was analysed only during the latter half of the period of study. The monthly averages for October, November and December 1972 were 17.3, 18.8 and 200 μg at/l respectively. An unusually high value (61.3) was encounted in January 1973. During March 1973, its value was 27.4 μg at/l.

TABLE 1. *Occurrence of zooplankton in different months in the order of abundance in the offshore water off Bombay*

Group/Genus/Species	Months
Diphyes	November, December, March, April.
Porpita	May.
Pleurobrachia	November.
Medusae	November, October, December, January, April, May.
Sagitta enflata	July, October, November, December, March, April.
Sagitta robusta	March, April.
Cladocera	March.
Amphipoda	October, March, September, November.
Mysidaceae	March, April.
Copepoda	November, March, December, April, July, June, October, September, May.
Lucifer	March, November, January, April.
Pteropods	March, April, May.
Salpa	March, April, May.
Doliolum	December, October, July, May.
Oikopleura	March, April.
Fish eggs	July, November, September, May, October.
Fish larvae	November, April.

Zooplankton : A study has been made for seasonal variation of zooplankton biomass. Only a brief mention is made here about the seasonal fluctuation in volume of the plankton. Full details about the composition of the plankton, the abundance and fluctuation of the various components will be dealt with elsewhere. The volume of plankton for a fifteen minutes haul varied widely during the course of the study. The biomass was generally low, as the hauls were taken only during day time. The displacement volume of plankton in the sample varied between 3.06 to 64.6 ml with two peak periods, one in March/April (64.6-33.5 ml) and the other in October/November (44.2-30.1 ml). The dominant planktonic organisms observed during the period are given in Table 1. Sudarsan (1964) and Pillai (1968) also observed two peaks for the plankton volume one in October and the other in March.

From Fig. 2 it is also clear that the zooplankton 'bloom' followed the two monsoons and the winter monsoon has more impact to enrich the bloom when compared to summer monsoon. The inorganic phosphate and zooplankton biomass correlate well in their annual variations.

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