

OBSERVATIONS ON THE PLANKTON AND TRAWLER CATCHES OFF BOMBAY*

By D. SUDARSAN

Central Marine Fisheries Research Sub-station, Bombay

IN fishery science, one of the primary objectives of the study of hydrology, productivity and plankton in an area of intense fishing is to understand their individual and combined effect on the fluctuation of the commercial fishery. With a view to finding out the extent of the influence of hydrobiological factors on the trawl fisheries off Bombay, investigation on the above aspects are being carried out at the Central Marine Fisheries Research Sub-station, Bombay. Some of the results obtained are presented and discussed in the following account. Based on the information gathered from the above study and on the findings of earlier researchers in this area an attempt is made to correlate the fish catches with the planktological and other ecological conditions off Bombay.

The displacement volume and the dry weight of plankton (collected by horizontal hauls with a 6 metre diam. organdie tow-net) were estimated. Data on the surface temperature and salinity of sea water were collected. Samples were taken from the major fishing area 18-72 particularly in and around the sub-area 18-72 6D. Catch statistics of the trawler landings of the Government of India fishing vessels M.F.V. *JHEENGA*, M.F.V. *BUMILI* and M.L. *MEERA* from the same major area were obtained from the Monthly Offshore Catch Data issued from the Central Marine Fisheries Research Institute from time to time. Other collateral information on the hydrological features off Bombay were gathered from Gogate (1960) and Jayaraman *et al.* (1961).

OBSERVATIONS

The seasonal fluctuations of the standing crop of plankton, surface temperature, salinity, the catch rates (catch per hour of fishing) of the abovementioned vessels as also the total catch of one of those vessels viz. M.F.V. *JHEENGA* are presented graphically in the text figure.

The volume of standing crop of plankton reached a peak during October 1963 and remained at a very high level during November and December also. In the succeeding months of January and February 1964, the standing crop was very low but again showed a considerable increase during March. The peak during March 1963, though noticeable, was not of a high magnitude. The fluctuation of dry weight of plankton showed a more or less similar pattern.

The total landings of M.F.V. *JHEENGA* showed a dicyclic pattern with two peaks in a year, one during October-November and another during May. Fishermen's

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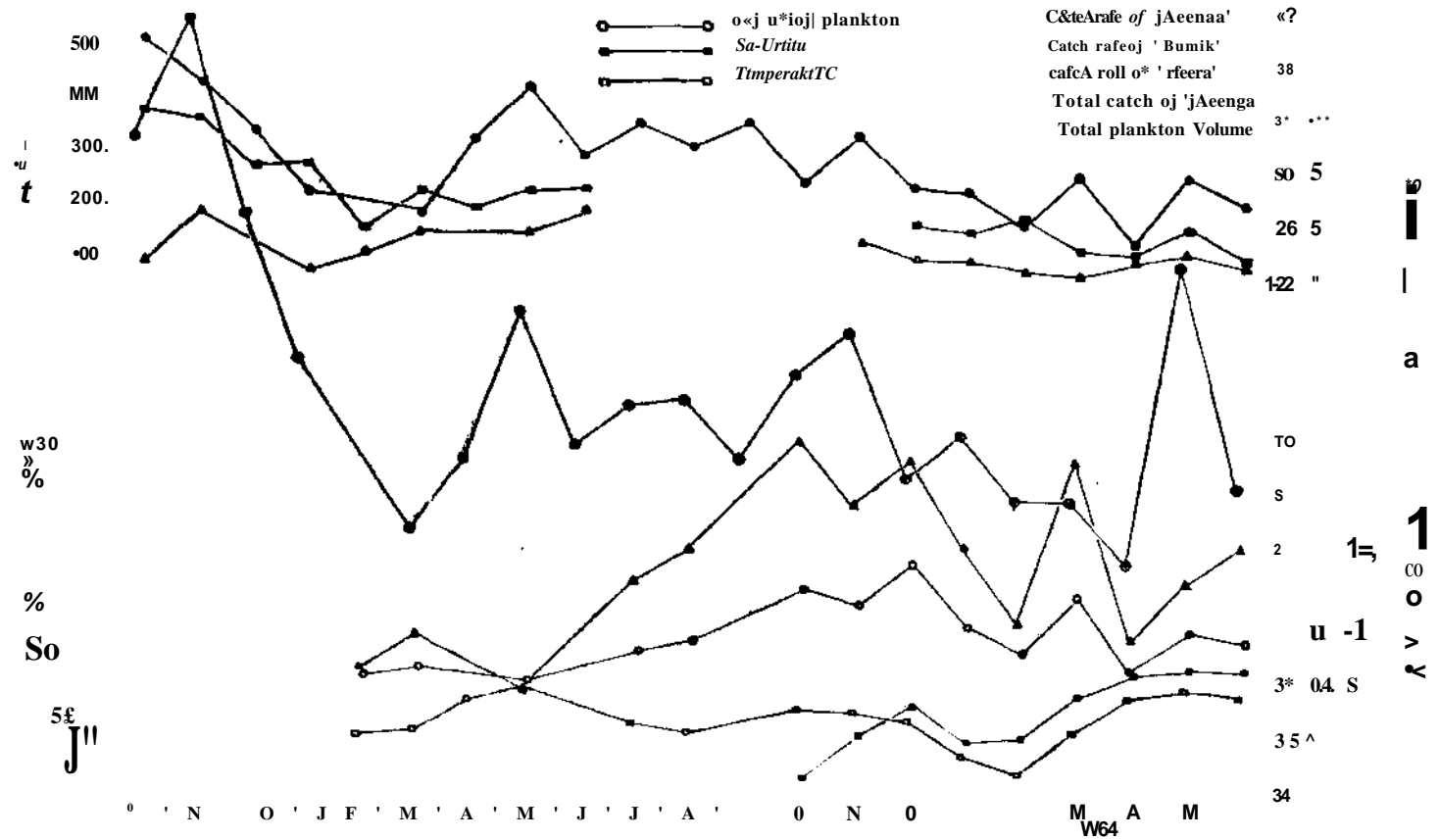


Figure showing the seasonal fluctuations in standing crop of plankton, salinity, temperature and catches of fish trawlers.

catches from Maharashtra during 1962 and 1963 showed a more or less identical pattern with very high landings during the last quarter and fairly good catches during the second quarter (fishery survey data : Quarterly Scientific Reports of the C.M.F.R.I.). Since the total catch alone is not the real index of fish potential of a given area the catch rates of the different trawlers were also taken into consideration. Very high catch rates by M.F.V. *JHEENGA* were obtained during October-November 1962 and May 1963. Fairly high catch rates were also recorded during July, September and November 1963 and March and May 1964. The trend of catch rates of the other two vessels M.F.V. *BUMILI* and M.L. *MEERA* do not vary appreciably from that of M.F.V. *JHEENGA*.

From the data available it could be seen that high catches and catch rates during the post-monsoon months coincide with the period of high plankton standing crop. The other peak of fish landings in May (pre-monsoon) follows the plankton abundance during March. Though the catch rate of M.F.V. *JHEENGA* during March 1964 appears to be high the total landings of the same vessel as well as the catch rates of the other two trawlers were rather low. The catch rates of all the three vessels were high during May 1964. The present observations further indicate that zooplankton was fairly abundant during April-May 1964.

In this connection reference to the observations on the plankton of Bombay by earlier workers is very relevant. Gogate (1960) estimated the chlorophyll content of sea water, which is an index of the phytoplankton standing crop, and found that the peak of phytoplankton production occurred during October-November coinciding with a period of low phosphate concentration. He further observed an inverse relationship between phosphate and chlorophyll during 1958-59. He also measured the total plankton volume and found the peak to occur during November. Bal and Pradhan (1945) have mentioned that the plankton of Bombay showed an appreciable increase (after the lean monsoon months) in quality and quantity during the post-monsoon months. According to Gonzalves (1947) the peak period of phytoplankton off Bombay was January-February. However, the investigations of Bal and Pradhan and Gonzalves were restricted to the Bombay harbour area. In general the previous studies on the plankton of Bombay also indicate that the post-monsoon months namely October-December are very rich in plankton.

Though the amount of plankton food available may not have a direct and immediate effect on the fish obtained in the trawl catches, it undoubtedly has a bearing on the general productivity of the area and indirectly affects their abundance. The trawl catches of Bombay are mostly composed of fishes which are of a semidemersal nature preying on plankton feeding fish. In this context the observations of Carruthers *et al* (1959) are of some interest. They observed upwelling off the coast of Bombay during October-November 1958 and pointed out that the demersal fishes from the deeper areas are driven nearer to the shore due to the shoreward uplift of the oxygen minimum-layer resulting in a glut of fishery during these months. The period of upwelling is always preceded by the monsoon months during which the fishing operations off Bombay are mostly suspended. This probably could explain the fairly high catches and catch rates by M.F.V. *JHEENGA* during the monsoon months June-September 1963. It is interesting to note that large catches of fish are landed during the months when the meteorological conditions at sea are more stable and the sea water is fairly warm. Jayaraman *et al* (1961) have shown that off Bombay variations in the salinity and temperature

of the sea water as well as the biologically important compounds such as phosphates and oxygen are related to the prevalent meteorological conditions.

The above account gives an idea about the extent to which the fluctuations in the plankton standing crop and the other ecological factors are reflected in the trawler catches. In conclusion, it might be said that whereas the high fish landings during May appear to be mainly influenced by the planktological conditions during the preceding months, high catches and catch rates during the post-monsoon months namely October-November might be due to the following causes :

1. High plankton production as evidenced by the rich standing crop.
2. Shoreward movement of the demersal fishes of the deeper layer as a result of the shoreward uplift of the oxygen minimum-layer.
3. Non-exploitation or under exploitation of the area during the preceding monsoon months.

However, the data available at present are by no means extensive and information on the different variables is being collected on systematic lines and the investigations are being continued.

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SUMMARY

A preliminary account of the planktological conditions in the offshore fishing area off Bombay are presented. The trawl landings of the Government of India fishing vessels based at Bombay were studied vis-a-vis the prevailing ecological conditions in this area. The fish catches show two peaks in the year, one following the period of plankton maximum in March and the other coinciding with the period of very high plankton standing crop in the post-monsoon months (October-November). The probable causes contributing to the peak fish landings during the latter period are listed.

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