SURFACE TEMPERATURE AND ITS RELATION TO THE DURATION OF MACKEREL FISHERY AT KARWAR

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Relation between the duration of the mackerel fishery and the minimum temperature observed at surface in the inshore sea-water during the south-west monsoon period is discussed. Its usefulness in advance prediction of the duration of the fishery is indicated. The relation between the catch and the local rainfall and dissolved oxygen in the sea water is also dealt with.

The temperature observed at the surface in the inshore sea-water during the south-west monsoon was found to exhibit some relation to the duration of the following mackerel fishery at Karwar. In literature, a study on the fluctuations of the mackerel landings at Calicut in relation to the hydrological factors by Pradhan and Reddy (1962) and a suggestion by Murty (1965) that the observation of the coastal drift in winter may possibly evolve a prediction system for our pelagic fisheries, are the only available informations.

Studies on the sea-water of the Karwar Bay were carried out through fortnightly collections till September 1962 and weekly twice thereafter. The lowest recorded value of the temperature during every monsoon period and the annual average value of the dissolved oxygen are utilised for this report. The data for 1954 to 1958 were taken from the records of the laboratory, and those from 1959 onwards were collected by the author. The figures on total landings of the mackerel were taken from Banerji and Chakraborty (1962) for 1954-55 to 1958-59, and the rest from the Annual Reports of the Director of the Central Marine Fisheries Research Institute. The year adopted in this communication is the fishery year extending from May to April, and it is convenient in that it includes both the rainy season and mackerel season. Most of the required information are presented in Fig. 1.

The duration of the mackerel fishery which is the important post-monsoon fishery of Karwar can clearly be demarcated with the beginning and end of the *Rampan* operations. The fishery usually commences in October and the length of the season varies from year to year, the longest extending up to April, and it shows some relation to the surface temperature as discussed below.

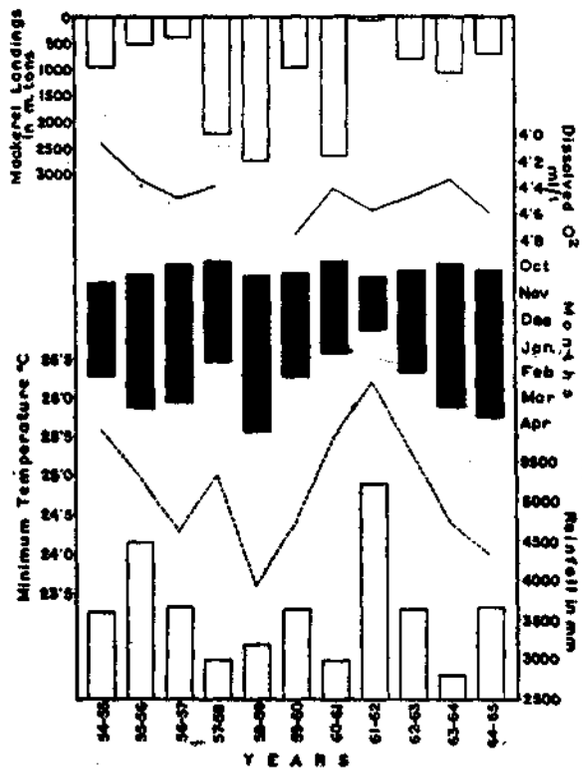

Fig. 1. The duration of the mackerel fishery, surface minimum temperature, mackerel landings, rainfall and dissolved oxygen in the sea water at Karwar.

The minimum surface temperature of the sea during the south-west monsoon season of 1954-55 was 25.6°C and the mackerel fishery existed from the beginning of November to the third week of February. In the succeeding two years the temperature decreased and the duration of fishery increased. In 1957-58, the temperature increased and the duration of fishery was less. The minimum temperature suddenly dropped in 1958-59 to 23.6°C. This happens to be the lowest value for the eleven years under discussion and the mackerel season was the longest. The fishery started by the middle of the last week of October. The season which normally stops by February or March (Pradhan, 1956) continued up to the end of the third week of April. In the next two years the temperature increased and there was a corresponding decrease in the length of the season. In 1961-62, the temperature which was 26.2°C was the highest of the years under study and the duration of the fishery the shortest. In the subsequent three years the temperature values gradually decreased and the mackerel season increased accordingly. It can thus be seen that with the increase in temperature there is a tendency for the duration of the mackerel season to decrease and vice versa. This correlation suggests the possibility

that by observing the minimum temperature of the sea-water the duration of the approaching mackerel season of Karwar may be forecast. Buys (1959) and Plessis (1959) observed some relation between the temperature and the South African pilchard catch with which prediction of a year's fishery in advance could be made with fairness.

The temperature values during the period under study show an upward trend for three years and downward trend in the next three years, and it is very clearly seen during 1959-60 to 1964-65 (Fig. 1). The low value in minimum temperature appears to occur cyclically in alternation with high values of it. Side by side, an inverse trend can be noticed in the duration of the mackerel fishery. If this cyclical occurrence be found correct for a number of years it may possibly help in predicting the trend in advance. It should, however, be mentioned that the duration of the fishery at present has no apparent relation to the magnitude of catch which will mainly depend upon the recruitment strength in a year. This may possibly be also due to the fishing activities restricted to within a range of about 2.4 km from the shore during the mackerel season (Pradhan, 1956). *Rampan* net has to wait for the shoals to come close to the shore and correlation may exist if attempts are made to exploit it offshore using other gears. According to Banerji and Chakraborty (1962) the effort put in to catch the mackerel during the months of their abundance by *Rampan* operations is not adequate enough for maximum exploitation. The annual landings, however, show an inverse relation to the local rainfall (Fig. 1).

The rainfall in 1955-56, in comparison to the previous year was more, but the catch trend was opposite. In the following two years also the trend between the catch and the rainfall was innverse. However, in relation to the year before and after, it was not strictly so. In 1958-59 and 1960-61, there was abundant catch of mackerel with less rainfall than 1959-60 with less catch and more rain. In 1961-62, there were heavy rains and the catch was extremely poor. In the next two years the rainfall decreased and the catch increased, and in 1964-65 there was rise in rainfall and fall in catch. If this relation between the catch and the rainy season holds good for a number of years, it would, as the rainy season precedes the season for the mackerel fishery, help in telling something about the magnitude of the catch in advance. Chidambaram and Menon (1945) observed the catches of the oil sardine at Calicut to depend upon the amount of rainfall there, and by harmonically computing the trends in atmospheric pressure, Murty and Edelman (1966) say that the trend of the oil sardine fishery for any year could be found out. They observed a critical value in the monsoon intensity above which the oil sardine catches improve with increasing monsoon activity and below which the catches decrease with increasing monsoon intensity. They further say, it is the surfacing of oxygen depleted water that decreases the catch before the critical value and after the critical point the equilibrium soon sets in with increased wind and wave action. On the contrary, an inverse relation between the annual mack-

erel landings and the yearly mean values of dissolved oxygen in the sea-water is observed at Karwar. When the catch is more the oxygen is less and the catch decreases when oxygen increases.

The causative factor influencing the occurrence of the minimum temperature values during the monsoon period is worthy of investigation. The temperature of the sea-water lowers during the rainy season. But the rain does not seem to have anything directly to do with the occurrence of low values. For instance, in 1961-62 (Fig. 1) when there was unusually heavy rainfall at Karwar the lowest temperature was 26.2°C. In the next two years the rainfall as well as the temperature decreased. The investigation into the real cause of this may probably help to understand the variations in the mackerel season also.

The lowest temperature values generally occurred in August. But in 1958-59 and 1964-65 it occurred in October. The succeeding mackerel seasons then extended up to April. In 1961-62, it was in July and the fishery was the shortest. It will be worth investigating in future, whether apart from the degree of low temperature in a year, its occurrence earlier or later than August, to have similar effects in the duration of the fishery.

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