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OBSERVATIONS ON ZOOPLANKTON BIOMASS IN RELATION TO THERMOCLINE IN LAKSHADWEEP AREA

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Abstract

Based on a survey conducted in February, 1987 in the oceanic waters around Lakshadweep Islands by FORV *Sagar Sampada*, zooplankton abundance from 28 stations was correlated with the top-depth of thermocline and its intensity. Thermocline was generally found to be around the depth of 75m. Interesting results found are (i) the animal congregations generally occur at the thermal front, (ii) the less the depth of thermocline, the more would be the plankton biomass, (iii) the amount of plankton collected by the net is inversely related to the intensity of thermocline and (iv) in the present study the net collection of plankton was determined by the thermocline depth since the Bongo net was lowered to a limited depth only.

Introduction

Very little information is seen from the published work on the effect and influence of physical characteristics of water masses on the secondary production from oceanic waters around Lakshadweep. Some of the recent publications on zooplankton from Lakshadweep area are by Goswami (1973, 1979, 1983), Madhupratap *et al.* (1977), Tranter and George (1972) and Rengarajan (1983) and on water quality and water masses by Jayaraman *et al.* (1960), Patil and Ramamirtham (1963), Murty (1965, 1981), Silas (1972) and Rengarajan (1983). Hence an attempt has been made to study the influence of thermocline on zooplankton biomass during the day and night in the oceanic waters of Lakshadweep and the results are presented in this account.

Material and Methods

The oceanic area between 08° and 13° N and 70° and 75°E around Lakshadweep Islands, in transects more or less parallel to latitudes, was surveyed during February, 1987 by FORV *Sagar Sampada* (Cruise No. 28). In all, 28 stations; 11 during day time and the rest at night, were covered in 6 transects, each 1° apart (Fig.1). Zooplankton collections were made by Bongo net from about 150 m to the surface as oblique hauls. The vertical profile of temperature was recorded by a bathythermograph. Samples were preserved in 5% formalin before displacement volume for total biomass was taken.

The bottom depth at each station was more than 1000 m except at stations 954, 960 and 968 where the depth was between 300 and 500 m. However, the depth of each station was more than sufficient for studying the vertical spread of thermocline. An attempt was, therefore, made to understand the behavioural pattern of zooplankters with respect to the thermocline location and its intensity.

As the net is not a closing type and the vessel makes a circle at the station dragging the net, it gives only the total abundance of zooplankton in the entire column of water swept by the mouth of the net. Due to water current and the movement of the vessel, the net used to make a slant which did not give a correct quantity of water filtered to assess the zooplankton biomass in the vertical column of water at the station.

Results and Discussion

The displacement volume of zooplankton is plotted stationwise in Fig. 2 and the stations are arranged as per increasing latitude position of the transect and in the order of increased distance of the stations from the coast off the mainland in each transect. The stations numbered 949, 961 and 965, were not considered, as samples were either spoiled or not collected. The zooplankton abundance computed as per the formula supplied by CMFRI, ranged from 4.36 ml/1000 m^3 at station 958 to 108.93 ml/1000 m^3 at station 968. Fig. 2 indicates that there is no systematic relationship of zooplankton abun-

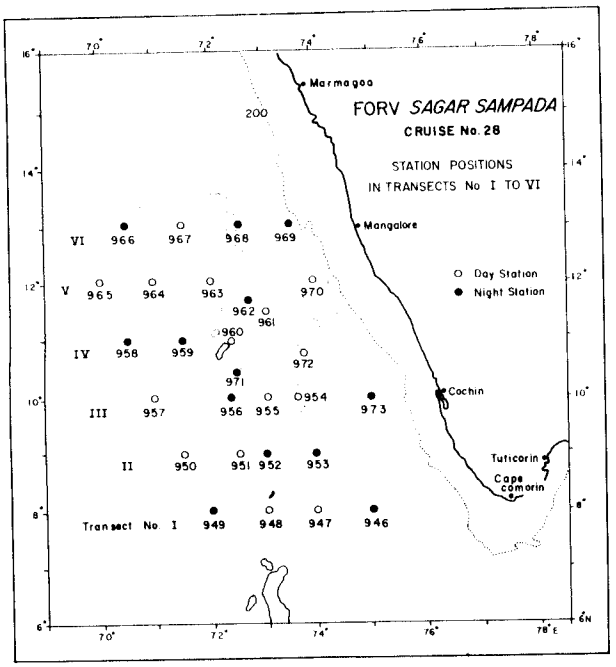

Fig. 1. Station positions and Cruise (No. 28) track of FORV *Sagar Sampada* to Lakshadweep in February, 1987.

dance with the change of either latitude or distance from the mainland. However, the night collection per haul was more than twice to that during day (29.28 ml/1000 m^3 during night, 12.90 ml/1000 m^3 during day per haul). In fact, the day time collection per haul was only 44% of that of the night time collection.

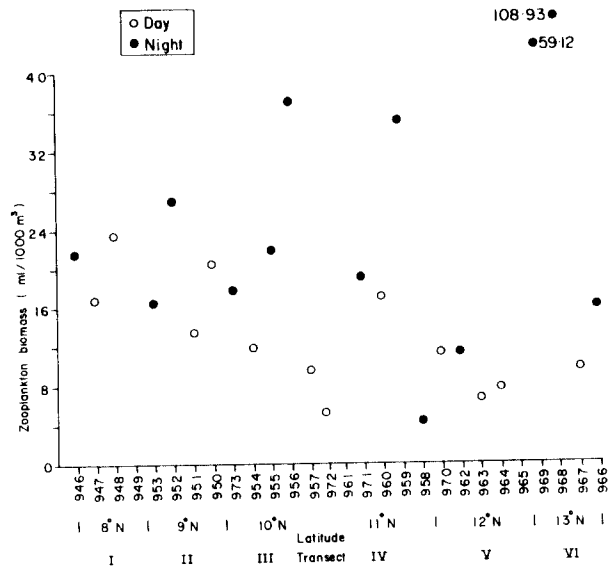

Fig. 2. Zooplankton biomass distribution over the six transects.

The first five highest or maximum zooplankton collections are from night stations only. The highest zooplankton biomass among the day stations was 23.41 ml/1000 m^3 from station 948.

The day time observations of zooplankton abundance were analysed in relation to thermocline condition both in its intensity and depth. On an average, the depth of thermocline was found to be 75 m. The waters above the thermocline are warmer than the waters below the thermocline. Therefore, the thermocline may be treated, in a broad sense, as a thermal front where animal congregations generally occur. Fish congregations are known to be associated with frontal regions (Taivo Laevastu and Ilmo Hela, 1970; Cushing, 1982).

If the thermocline is much shallow, say less than 75 m and the plankton net is sent far below the thermocline say about 150 m, there is every chance of getting more plankters as the amount of water filtered through the thermal front is also more. Therefore, the less the depth of thermocline, the more would be the plankton collection. The same inverse relation of plankton with depth of thermocline is expressed in Fig. 3.

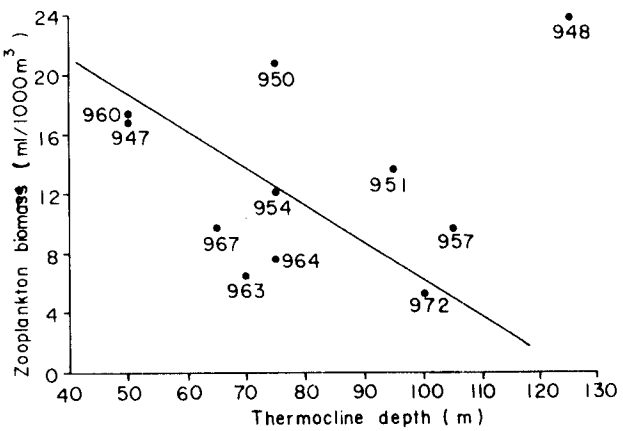

Fig. 3. Variation in zooplankton biomass in relation to the depth of thermocline.

Stable layers of water impede vertical movement of plankters. Stability of water within the thermocline layer depends upon the thermocline intensity. The more the intensity of thermocline, the more is the stability leading to less vertical movement of plankton and therefore the zooplankton collections in such condition would be poorer. The plankton collection by the net is, thus inversely related with the intensity of thermocline (Fig. 4). It

is therefore concluded that the efficiency of the Bongo net towards collection of plankton is to give improved collections with less depth of thermocline and with less intensity of thermocline as revealed by Figs. 3 and 4.

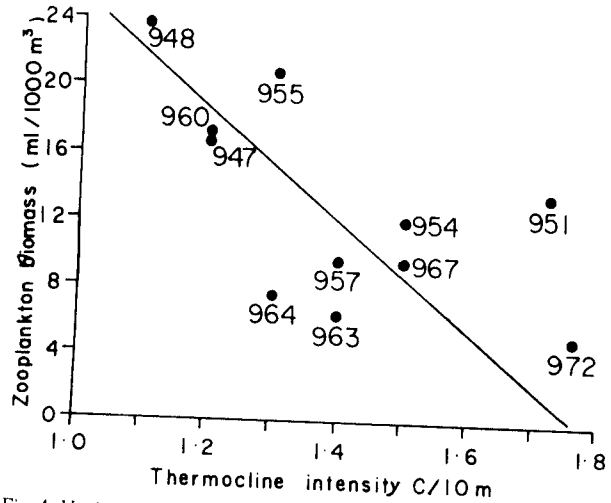

Fig. 4. Variation of zooplankton biomas in relation to the intensity of thermocline.

Conclusions

The above results which were based on the concept that thermocline be treated as a "front" and the congregation of plankton and fishes are associated with such fronts, deserve further investigation in a detailed manner by using a plankton net with closing mechanism and depth indicating unit to obtain the descrete level of distribution of plankton. Large pooled up information of plankton thus obtained and the details of thermocline formation and intensity and fish catch data may lead to quantitative determination of the influence of thermocline on the abundance of fish stocks in the sea. This in turn leads to better forecasting the availability of pelagic fishes before shooting the net.

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