

# ZOOPLANKTON BIOMASS, ABUNDANCE AND DISTRIBUTION IN THE NORTH AND NORTHEASTERN ARABIAN SEA

V. T. PAULINOSE AND P. N. ARAVINDAKSHAN

*National Institute of Oceanography, Goa - 403 004, India*

Samples collected during the cruises of I. N. S. DARSHAK from December 22, 1973 to May 5, 1974 from the north and northeastern parts of the Arabian Sea showed that zooplankton biomass was maximum off Kutch in the northeastern Arabian Sea (560 ml 200 m<sup>-3</sup>) which was more than three times the highest volume of zooplankton recorded in any sample during the IIOE (187 ml 200 m<sup>-3</sup>). Highest intensity of zooplankton collections was from the region in between 20 - 23°N and 63 - 70°E and the northeastern part of the Arabian Sea was far richer in zooplankton than any other region of the Indian Ocean.

Ostracods in many of the collections outnumbered the copepods and at station No. 31/07, off Kutch, ostracods were approximately hundred times more than the copepods. This phenomenon has not been observed in any other part of the world oceans.

## INTRODUCTION

An estimate of the fishery resources of the oceans can be made through the study of its zooplankton production. Atlases on zooplankton biomass of the Indian Ocean based on the collections of the IIOE (IOBC, 1963 *a* and *b*) indicate high plankton concentrations in the northern and western parts of the Arabian Sea. The highest biomass of zooplankton was found near the Gulf of Oman and Saurashtra coast. In 1973-74, cruises were conducted by INS DARSHAK in the north and northeastern parts of the Arabian Sea (Fig. 1). This has made it possible to study the zooplankton production in that area and compare these results with those of previous observations. Zooplankton samples were collected from all stations in 5 cruises, from December 22, 1973 to May 5, 1974. A total of 180 samples were collected from 180 stations (Fig. 2) for studying the abundance and distribution of biomass and faunal composition of zooplankton. Samples were collected as vertical hauls using the Indian Ocean Standard Net (IOSN) in cruises I & II and HT Square net in cruises III, IV & V. Sampling was done from 200 - 0 m in the offshore and oceanic waters, wherever such depths were available. In nearshore stations where the sonic depth was less than 200 m, hauls were made from the bottom to the surface. The displacement volumes of the samples are expressed as ml per haul.

## DISTRIBUTION OF ZOOPLANKTON

The biomass data shows that the north and northeastern Arabian Sea was 4 - 10 times richer in zooplankton biomass when compared to the average biomass of the entire Indian Ocean as reported in IIOE results (IOBC, 1969). The transects 9, 11, 13, 29, 31 and 45 were found to be 2 - 3 times richer than the other transects. A collection made in the area off Kutch (Fig. 3) at station No. 31/7 with a displacement volume of 560 ml 200 m<sup>-3</sup> has created a new record for the

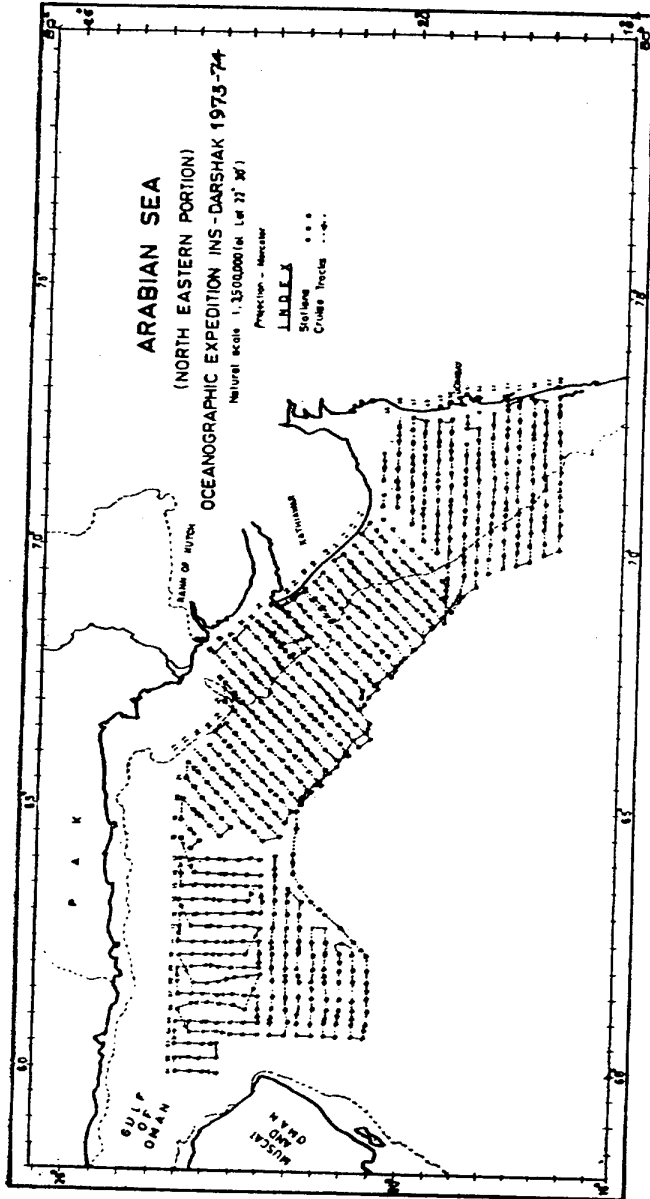


Fig. 1. Map showing the 'INS Darshak' cruises I - V in the Arabian Sea

## Zooplankton in north and northeastern Arabian Sea

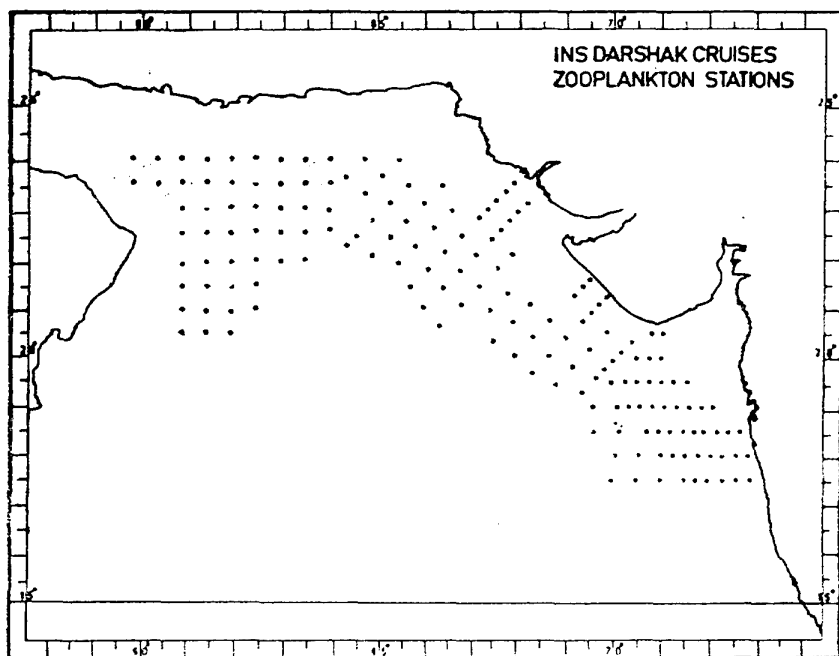


Fig. 2. Map showing the zooplankton stations of 'INS Darshak' cruises in the Arabian Sea

entire Indian Ocean, exceeding 3 times the highest volume of zooplankton ( $187 \text{ ml } 200 \text{ m}^{-3}$ ) recorded during the IIOE (Stn. Ar. Do. 47,  $8^{\circ}\text{N}$  and  $53^{\circ}\text{E}$ . off Somali coast, IOBC, 1969). The highest intensity of zooplankton collections was from a region in between  $20-23^{\circ}\text{N}$  and  $66-70^{\circ}\text{E}$ . Lenz (1973) observed the highest values in the northeastern corner of the Arabian Sea, roughly between  $20^{\circ}\text{N}$  and the Gulf of Oman.

Most of the collections were dominated by ostracods and salps. The population of ostracods - (*Cypridina* sp.) was extremely rich in the night, to the extent of creating dense patches of luminescence at the surface. The predominant occurrence of ostracods over copepods was found to be a unique phenomenon of the area explored and this has not been reported from any other part of the world oceans. A large number of squids and flying fishes were also found along with swarms of ostracods. Swarms of salps (Thaliacea), medusae and pelagic amphipods were observed in the area off Kutch (transects 29 & 31) and the Gulf of Oman (transects 9, 11 & 13).

An attempt was also made to study the difference, if any, in the zooplankton abundance between the pelagic and mesopelagic regions. Hence, two hauls were made from different depths, one from 200-0 m and the other from 900-0 m, at few stations. These showed that the volume of zooplankton obtained remains more or less same thereby indicating that there is very little plankton in the

mesopelagic zone (below 200 m) which is strongly influenced by the oxygen minimum layer.

165 samples were utilized for the study of the faunal composition and their abundance and distribution. Copepods and chaetognaths were present in all samples. Ostracods occurred in 164 samples; amphipods and decapods in 147; siphonophores in 152; euphausiids in 144; polychaetes in 139 and appendicularians in 119 stations. Isopoda, phyllosoma and Cumacea were present in only one sample each while cirripeds occurred in 2 samples, ctenophores in 5 and scyphozoa and stomatopoda in 7 stations each. The percentages of occurrence of various groups of zooplankton are shown in Fig. 4.

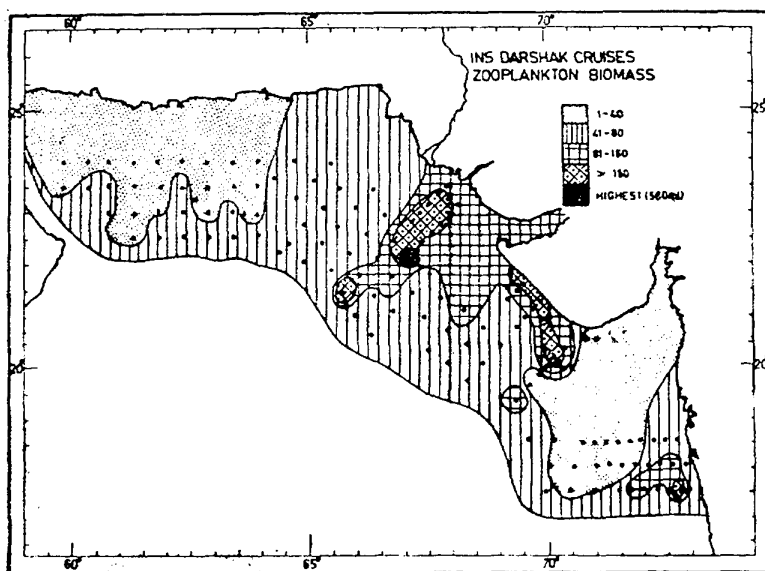


Fig. 3. Map showing the abundance of zooplankton biomass

The ostracods, in as many as 24 samples, outnumbered the copepods. In station No. 31/07, off Kutch, the ostracods were approximately 100 times more than the copepods. In this sample (140 ml) there were as many as 35,750 ostracods when compared to only 350 copepods. It is interesting to note that a collection taken (14 ml) two hours earlier from the same station contained only 300 ostracods and 7500 copepods. Probably this is brought about by the current system in that region. The maximum number of ostracods recorded (21436) from the IIOE collections was also from the Arabian Sea (Co. 58, 10° 29'N and 75° 31'E, George, 1967). It is also noted that the samples which contained the highest number of ostracods (Stn. Nos. 45/07, 03/03, 37/06, 29/13 and 31/07 B) were all collected during night, suggesting that they show a pronounced diurnal vertical migration. Large sized salps measuring 14 ml volume and medusae were also collected during night along with the ostracod blooms in the area off Kutch and Gulf of Oman.

## Zooplankton in north and northeastern Arabian Sea

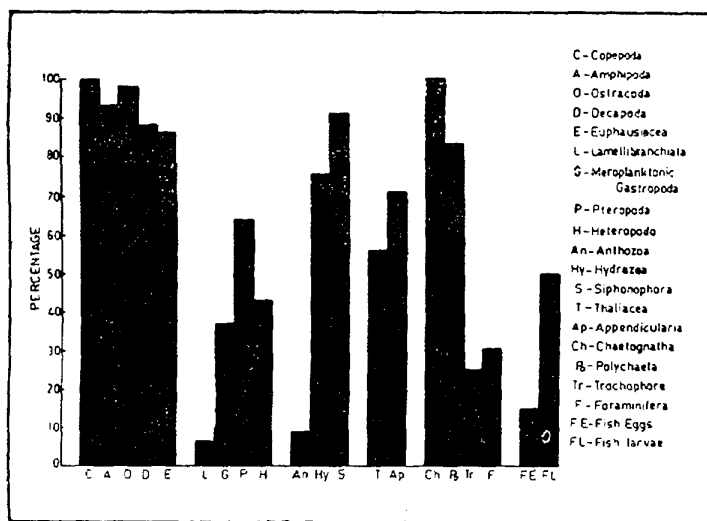


Fig. 4. Percentage occurrence of zooplankton groups

### ACKNOWLEDGEMENTS

The authors wish to thank Dr. S. Z. Qasim, Director, N. I. O., Goa for his encouragements and suggestions. Thanks are also due to Dr. M. J. George, Scientist, N. I. O., Goa, for critically going through the manuscript. Finally, we are thankful to the Hydrographic Department of the Indian Navy for providing facilities on board the vessel INS DARSHAK for the collection of zooplankton samples.

### REFERENCES

- GEORGE, J. 1967. A preliminary report on the distribution and abundance of planktonic ostracods in the Indian Ocean. *Proc. Symp. Indian Ocean. New Delhi, 1967, Bull. Nat. Sci. India, 38, Part II, 641-648.*
- IOBC, 1968 a & b. Maps on total zooplankton biomass in the Arabian Sea and the Bay of Bengal. In Panikkar, N. K., (Ed.), *International Indian Ocean Expedition Plankton Atlas, 1 (1 & 2)* NIO, CSIR, New Delhi.
- IOBC, 1969. *Handbook of the International Zooplankton Collection, 1, station list.* 129 pp. IOBC. Natl. Inst. Oceanogr., CSIR, Cochin, India.
- LENZ, J. 1973. Zooplankton biomass and its relation to particulate matter in the upper 200 m of the Arabian Sea during the NE monsoon. In: Zeitschel, B. (Ed.), *The Biology of the Indian Ocean. Vol. 3*, pp. 239-241. Springer - verlag. Berlin - Heidelberg - New York.