

OCCURRENCE OF SWARMS OF *SAGITTA ENFLATA* (CHAETOGNATHA)  
AND *PLEUROBRACHIA GLOBOSA* (CTENOPHORA)  
IN THE COASTAL WATERS OF GOA

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ABSTRACT

Swarms of Chaetognatha *Sagitta enflata* Grassi and Ctenophore *Pleurobrachia globosa* Moser were studied in coastal waters of Goa. These two forms together constituted 90 to 94% of total biomass. Medusae and Siphonophora were the other main groups and preponderance of carnivores was evident in the zooplankton samples. The economic importance of coincident occurrence of aggregations of chaetognaths and ctenophores is briefly reviewed.

*Key words:* Chaetognatha, Ctenophore, zooplankton, biomass, Aguada.

INTRODUCTION

Dense congregations of several zooplankton species such as cladocerans *Penilia avirostris* (Selvakumar, 1970) and *Evadne tergestina* (Menon, Venugopal and Goswami, 1971), the amphipod *Hyperia sibagimis* (Nair, 1972) and of calanoid copepod species, viz., *Pontella spinipes*, *P. principes*, *P. securifer* and *Pontellopsis regalis* (Goswami and Rao, 1981) have been reported from the neritic and coastal waters of India. Occurrence of swarms of carnivores, *Sagitta enflata* (Chaetognatha) and *Pleurobrachia globosa* (Ctenophora) from coastal waters of Goa is described in this paper.

MATERIAL AND METHODS

Twelve surface zooplankton samples were collected at 4 stations off the Aguada transect (Fig. 1) on 15th October, 1980, using Heron-Tranter net (mouth - area = 0.25 m<sup>2</sup>) fitted with a calibrated flowmeter. The samples were preserved in 5% formaldehyde and biomass was estimated by displacement method. An aliquot of 1 to 4% of zooplankton sample was analysed for abundance of major groups and species. The number of organisms was calculated for the whole sample and estimated per 100 m<sup>3</sup>. The surface water samples were also taken for the determination of temperature and salinity.

RESULTS AND DISCUSSION

The swarm was caused mainly by 2 species, viz., *S. enflata* and *P. globosa* forming 90 to 94% of the total zooplankton biomass. The biomass values at the 4 stations varied from 162 to 390 ml. 100 m<sup>3</sup> (Table 1). The values were higher than

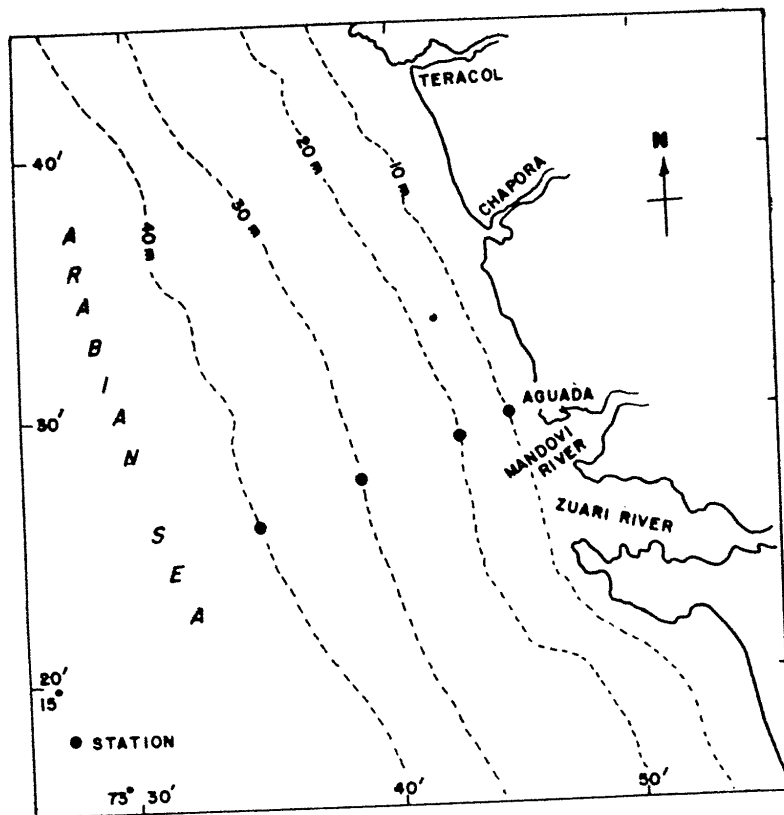


Fig. 1. Position of sampling stations.

the highest biomass recorded from the Indian Ocean (280 ml/100 m<sup>3</sup>) off Kutch consisting of swarm of ostracods (Paulinose and Aravindakshan, 1977) and of 124 ml/100 m<sup>3</sup> caused by the 'mixed swarm' of chaetognaths and ostracods off Maharashtra coast (Nair, 1978).

Maximum population density of chaetognath, *S. enflata* was obtained along the 40 m depth contour (14000/100 m<sup>3</sup>). The chaetognath component at all the 4 stations was composed mainly of this species along with a few specimens of *S. bedoti*. The highest number of *S. enflata* recorded during the International Indian Ocean Expedition was at a station off Somalia coast (14200/100 m<sup>3</sup>). The number is almost the same as obtained during the present study but still a higher density range of 15500 to 18700/100 m<sup>3</sup> has been reported for this species (Nair, 1978).

*P. globosa* was the only species representing ctenophore population. The adults (20 to 40 mm in diameter) were abundant in the zooplankton samples collected at 30 and 40 m whereas juveniles (2 to 5 mm in diameter) were numerous in the collections taken at 10 and 20 m sampling stations. This indicated that ctenophores breed in the coastal water as reported from Madras waters (Nagabhushanam and Jothinayagam, 1977). Swarms of *P. globosa* occur in Goa coastal waters during October-November. This species has been reported to occur in small numbers during

December-January off Bombay (Chopra, 1960) and throughout the year around Krusadai island, being abundant from November to February (Chacko, 1950). The density range of 595 to 910 individuals/100 m<sup>3</sup> obtained for this species during the present investigation is much higher than the maximum number (150 specimens/5 min haul) obtained from the Madras coast (Nagabhushanam and Jothinayagam, 1977).

Surface temperature and salinity values did not vary much at the sampling stations (Table I). However, nutrient concentrations were high (Devassy — personal communication). Carnivores predominated the zooplankton population in the sampling areas and other zooplankton taxa, usually observed in the plankton collections from the coastal waters were absent. It is probable that the enrichment of the coastal waters by the monsoonal efflux leads to phytoplankton bloom during August-September, followed by abundance of herbivore zooplankters and finally there is manifestation of carnivores such as chaetognaths, ctenophores, medusae and siphonophores. Succession of organisms in the enriched environment following the *Trichodesmium* bloom in the Goa waters has been reported (Devassy, Bhattathiri and Qasim, 1979). There is lot of speculation on the role of these gelatinous organisms, especially of ctenophores in the marine food chain. Ryther (1969) has stated that ctenophores and other gelatinous organisms are not eaten by other animals and they represent the dead end of the food web in a special situation. However, several species of fish have been reported to feed occasionally on the ctenophores (Fraser, 1969). Fish-trawling done in the swarming area which was spread over a distance of several kilometers, gave a very good catch of Indian mackerels (*Rastrelliger kankana*) but no pomfret was caught. There seems to be no relationship between the ctenophore abundance and occurrence of pomfrets as observed earlier (Chopra, 1960). The crustaceans, particularly copepods constituted 80–85% of the stomach content of the ctenophores collected at the sampling stations. Bishop (1967) estimated that ctenophore *Mnemiopsis leidyi* consumed about 22000 copepods per m<sup>3</sup> daily in the Patuxent River. The stomachs of most of the mackerels caught contained gelatinous mass which may be disintegrated ctenophores. The present study has shown that the coincident occurrence of chaetognaths and ctenophores has some economic importance as they affect the fisheries. The pelagic fishes may be utilizing them as their food. The gelatinous organisms maintain the biological balance in nature by grazing

Table I. Station details, hydrographic data, total biomass and abundance of *Sagitta enflata* and *Pleurobrachia globosa* at four stations off Aguada transect during October 1980.

Values in parentheses denote biomass (ml/100 m<sup>3</sup>)

Depth (m)	Time (hrs)	Temp. (°C)	Sal. ‰	Total biomass (ml/100 m <sup>3</sup> )	Average number/100 m <sup>3</sup>		Other major groups
					<i>S. enflata</i>	<i>P. globosa</i>	
40	0930	28.9	32.46	252	14000 (68.5)	595 (165.0)	Medusae (14.0)
30	1100	29.1	32.12	268	10800 (58.0)	680 (194.0)	Medusae (11.0)
20	1215	29.2	31.98	390	12600 (65.0)	882 (286.0)	Medusae (21.0)
10	1245	29.2	30.92	162	9500 (42.0)	910 (105.0)	Siphonophora (11.0)

on herbivore zooplankters. The chaetognaths and ctenophores annihilate the zooplankton in the swarming areas and thus seriously compete with fishes for food. The observed abundance of Indian mackerels amongst the gelatinous carnivores may be to feed on them or to seek the common food source, the zooplankters.

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