

## Chaetognatha of the Andaman Sea

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Chaetognatha of the Andaman Sea were studied during 51 and 52 cruises of *R V Gaveshani* (Jan. to Feb. 1979). The area between southeast of Andaman island and north of Nicobar island had relatively higher density. Total population of chaetognaths ranged from 126 to 1959/100 m<sup>3</sup> (av. 659/100 m<sup>3</sup>). Thirteen species belonging to 3 genera, *Krohnitta*, *Pterosagitta* and *Sagitta*, were identified in this region. *S. enflata* was the dominant species (44.7%) followed by *S. bipunctata* (15.3%), *S. pacifica* (12.3%) and *K. pacifica* (8%). Some species were collected rarely mainly from station located north of 10°N lat.

Chaetognaths are usually represented in appreciable quantity in plankton hauls<sup>1</sup>. The results of the International Indian Ocean Expedition (IIOE) collections provide the first extensive reports on the Indian Ocean chaetognaths<sup>2-6</sup>. Chaetognatha from selected regions<sup>5,7-11</sup> in the Indian Ocean were studied in detail. Even though during the IIOE a few samples were collected from the sea surrounding Andamans<sup>5</sup>, this communication presents more details on the chaetognaths inhabiting the waters around these islands.

### Materials and Methods

During the 51 and 52 cruises of *R V Gaveshani*, the sea around Andaman islands up to 48 km from the coast was surveyed. The period of study extended from 29.1.1979 to 27.2.1979 representing the northeast monsoon period of the northern Indian Ocean. Zooplankton samples were collected from 34 stations, of which 6 stations (1167-1175) were located enroute to the Andaman islands (Fig. 1). All collections were vertical hauls from 200 m to the surface using an HT net (mouth area 0.25 m<sup>2</sup> and mesh size 0.5  $\mu$ m) with a flow meter attached. In each sample 50% was analysed for the enumeration of different species in the sample. Distribution of different species are given in Figs 1-3. For calculating mean value and percentage incidence of various species in the Andaman Sea data from 29 stations around the island (1177 to 1211) alone were considered.

### Results

**Environmental characteristics**—The surface temperature was fairly uniform and ranged between 28.3 and 28.5°C. Salinity at the surface was around 33.5‰ with a sub-surface maximum of 34.3‰ at about 40-50 m. Below 150 m the salinity values were fairly stable

(about 34.9‰). Salinity was slightly higher on the western side of the Andaman Sea. Oxygen was supersaturated at the surface and few meters below. But on the western side supersaturation was observed even at 50 m. In general, oxygen values were less on the eastern Andaman Sea than that of the western side. Among the 3 water masses of the Bay of Bengal, the Southern Bay of Bengal Water occupies the Andaman Sea during January to February<sup>12</sup>. Chemical data collected during the cruise indicate that water masses in the eastern and western margins of the islands have similar hydrographic features to a depth of about 1500 m<sup>13</sup>.

**Distribution**—Chaetognaths occurred at all stations studied. They formed the 2nd abundant group in the collections accounting for 12.9% of the total zooplankton count. Maximum density of 1959/100 m<sup>3</sup> was recorded at st. 1185. Total population ranged from 126 to 1959/100 m<sup>3</sup>. Stations located between

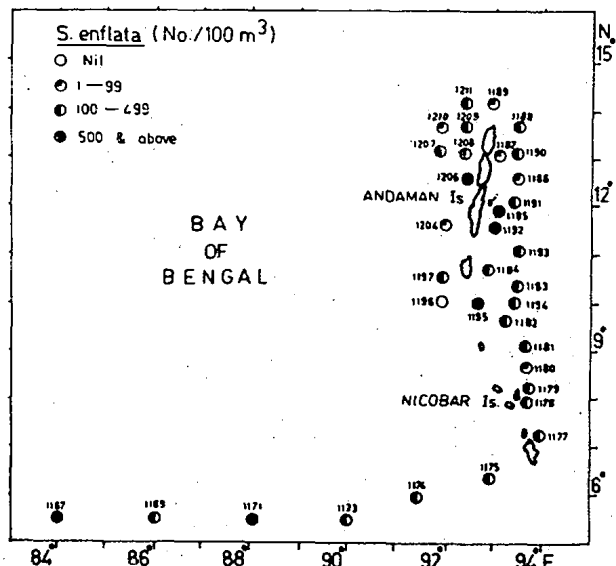


Fig. 1—Distribution of *S. enflata* in the Andaman Sea [Station numbers are also indicated]

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southeast of Andaman island and north of Nicobar Island had relatively greater density. Low values were continuously recorded at stations enroute to Nicobar Islands (sts 1173-1178). The mean density of chaetognaths in the area was 659/100 m<sup>3</sup>.

In all, 13 species belonging to 3 genera *Krohnitta*, *Pterosagitta* and *Sagitta* were identified from the samples. *S. enflata* was the most abundant chaetognath. Other common species were *S. bipunctata*, *S. pacifica* and *K. pacifica*.

*S. enflata* (Fig. 1): This was the dominant chaetognath species in 83% of the collections and was absent only at st 1196. Percentage incidence of this species in the collection was 44.7. Maximum density of the species was found at stations located southeast of Andaman Islands. At sts 1167-1175 also they were relatively abundant.

*S. bipunctata* (Fig. 2): This species was 2nd in abundance and constituted 15.3% of the total chaetognath population. Their maximum density was noted towards the northern part of the surveyed region. Maximum density of 577/100 m<sup>3</sup> was obtained from st 1193.

*S. pacifica* (Fig. 2): Percentage incidence of *S. pacifica* (12.3) was next to *S. bipunctata*. This species was very common in the collections and was dominant at st 1186 (51%). Higher density was observed southeast of Andaman islands. The highest recorded density of 337/100 m<sup>3</sup> was at st 1185.

*K. pacifica* (Fig. 2): This species was commonly encountered in the samples. Their incidence in the Andaman sea was 8%. They were found all around the Andaman and Nicobar islands with scattered areas of

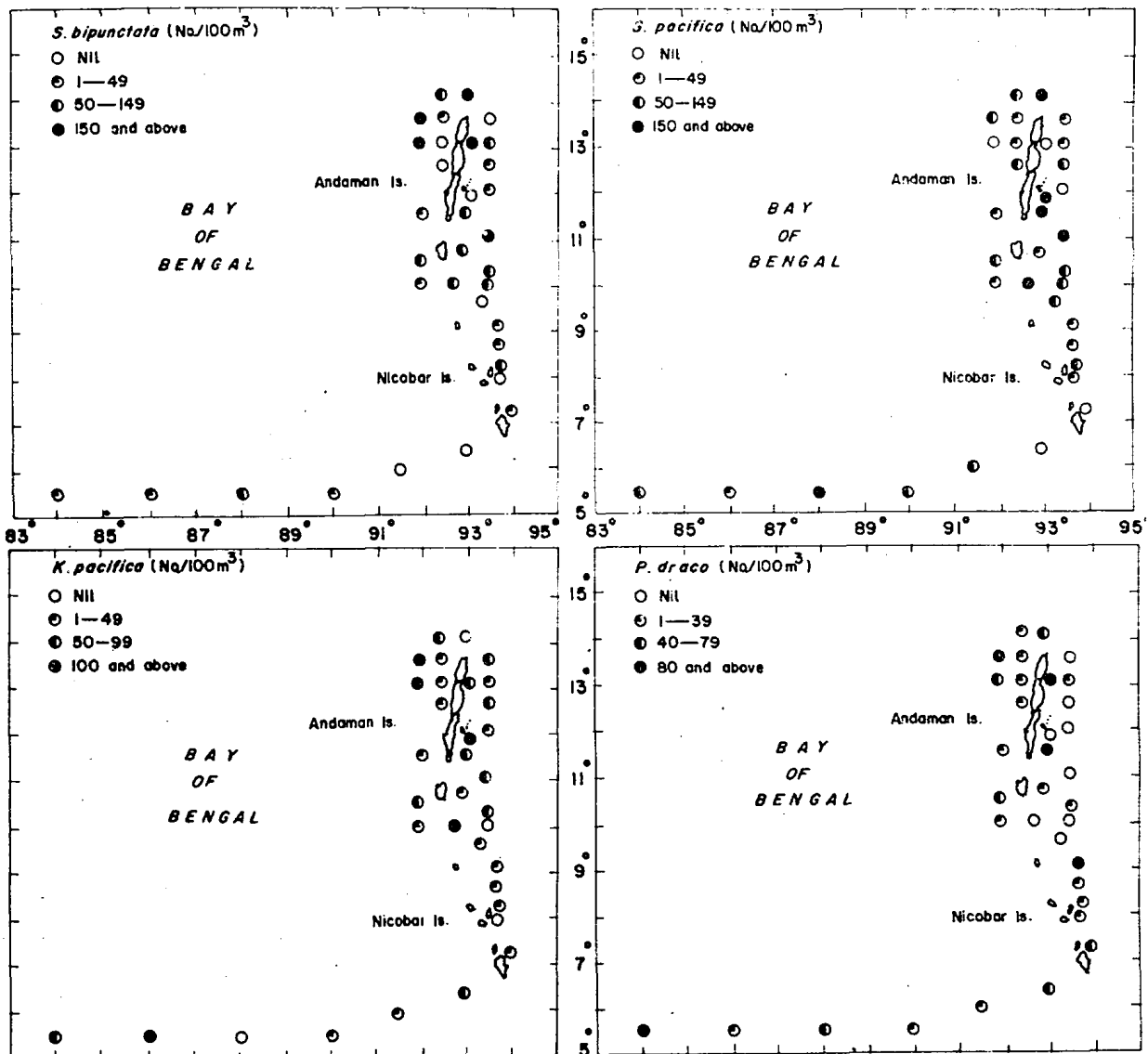


Fig. 2.—Distribution of *S. bipunctata*, *S. pacifica*, *K. pacifica* and *P. draco* in the Andaman Sea

high density. Maximum number of specimens (209/100m<sup>3</sup>) was obtained from st 1195.

In mature specimens of *K. pacifica*, the arrangement of ova in the ovaries appeared to be different from the normal pattern. Usually the ova are small, round and closely arranged within the ovary. In all the present mature specimens (stage IV or maturity) ova were elliptical with distinct spacing in between. This type of arrangement of ova is similar to that described for *S. oceania*. Such variations in the disposition of ova had not been reported for any of the species of *Krohnitta*.

*P. draco* (Fig. 2): This species was commonly encountered in the collections. All the negative stations were located east of Andaman islands and north of Nicobar islands. *P. draco* formed 5.7% of the total chaetognath population. The highest density of 172/100m<sup>3</sup> was recorded at st 1167.

*S. neglecta* (Fig. 3): *S. neglecta* was not very common in the area. Wherever present, they were represented in fairly good numbers and hence the percentage incidence amounted to 5.3%. Maximum number of 126/100m<sup>3</sup> was obtained from st 1187. Relatively higher density of the species was noted close to the islands.

*S. bedoti* (Fig. 3): *S. bedoti* was occasionally found in the collections and their incidence was 4%. The highest density was recorded at st 1182 (114/100m<sup>3</sup>). Stations located south of Andaman islands sustained higher density of the species.

*Rare species* (Fig. 3): The two closely related species, *S. ferox* and *S. robusta*, were confined mainly to the sea surrounding the Andaman islands and percentage of incidence of each of them was 1.3. Stationwise

representation was more for *S. ferox* than *S. robusta*. *S. pulchra* and *S. regularis* were found only at a few stations. *Krohnitta subtilis* was obtained mostly from stations located away from the land. *S. hexaptera* was limited to the stations south of Andaman islands.

**Discussion**

Even though chaetognaths were present at all stations, numerically they were not very abundant as can normally be expected from the northern Indian Ocean<sup>5</sup>. Maximum population of chaetognaths was confined to the central eastern part of the Andaman Sea. This area synchronised with the reported zone of highest biomass<sup>14</sup>. The IIOE data on chaetognaths from the Andaman Sea gave a mean value of 20/m<sup>3</sup> for the northeast monsoon period<sup>15</sup>. The present density of 7/m<sup>3</sup> was only 1/3rd of IIOE record. The different types of net used for collecting zooplankton samples may account for some of the variation. Again the mesh size of HT net (0.5 μm) used for the present collection is bigger than that of the Indian Ocean Standard Net (0.33 μm). Small chaetognaths like *S. regularis* which was common in the Andaman Sea in the IIOE collection was represented only at 2 stations in the present study.

During the IIOE, 7 samples were collected from the Andaman Sea and 12 species were recorded<sup>5</sup>. In the IIOE collections *K. subtilis* was absent and *K. pacifica* was very rare. *S. bedoti* was relatively low in the present samples unlike the IIOE samples. Of the 13 epipelagic species recorded from the sea around Andaman islands, *K. subtilis*, *P. draco*, *S. bipunctata*, *S. enflata* and *S. hexaptera* are cosmopolitan species

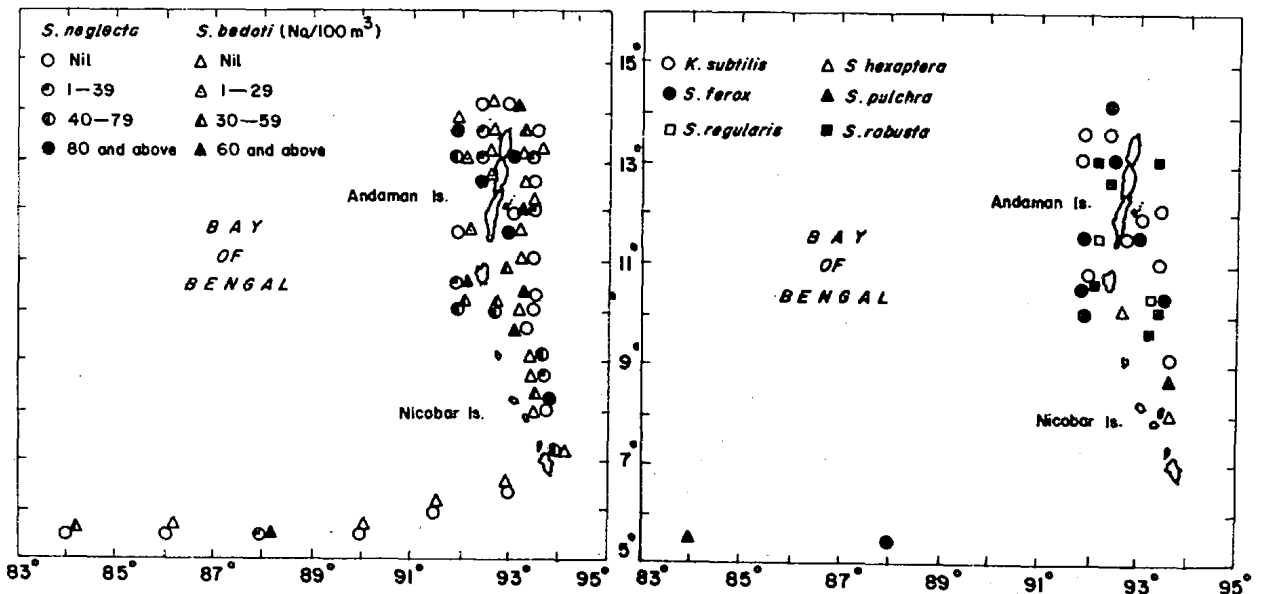


Fig. 3 Distribution of *S. neglecta*, *S. bedoti*, *K. subtilis*, *S. ferox*, *S. regularis*, *S. hexaptera*, *S. pulchra* and *S. robusta* in the Andaman Sea

of warm and temperate oceanic waters. *K. pacifica*, though widely distributed is usually restricted to the equatorial belt of the Atlantic, Pacific and Indian Oceans. The remaining species are typical Indo-Pacific forms.

The Lakshadweep atolls and Andaman Islands harbour rich population of corals. A comparison of the chaetognath fauna abounding these 2 habitats indicates difference in the total population. The average number of chaetognaths in the Lakshadweep ( $31/m^3$ ) for the northeast monsoon period<sup>8</sup> is about 4 times higher than the mean value obtained for the Andaman Sea. The different species encountered at both the seas are almost same with certain amount of variation in their percentage incidence. *S. regularis*, *S. neglecta* and *S. bedoti* were common in the Lakshadweep, while their abundance was relatively low in the Andaman Sea. *S. bipunctata*, which was 2nd in the order of dominance in the Andaman Sea was rarely found in the Lakshadweep Sea.

Depending on the pattern of abundance of various species, different groups could be recognised within the area of study. (1) *S. enflata*, *S. pacifica* and *S. bedoti* sustained maximum density southeast of Andaman islands. (2) *K. pacifica* and *S. bipunctata* which were also common in the collections exhibited higher abundance towards the northern part of the surveyed region. (3) *P. draco* and *S. neglecta* showed a patchy

distribution. (4) Incidence of the rare species was observed mainly north of 10°N.

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#### References

- 1 Alvarino A, *Oceanogr mar Biol Ann Rev.* 3 (1965) 115.
- 2 Silas E G & Srinivasan M, *J mar biol Ass India*, 10 (1969) 1.
- 3 Nair V R, *Indian J mar Sci*, 2 (1972) 85.
- 4 Nair V R, *Indian J mar Sci*, 5 (1976) 107.
- 5 Nair V R, *Proc symp warm water zoopl (Spl Publ, UNESCO/NIO) 1977*, 168.
- 6 Nair V R & Rao T S S, in *The biology of the Indian Ocean* Vol. 3, edited by B. Zeitschel (Springer Verlag, Berlin) 1973, 293.
- 7 Goswami S C, *Proc Indian natn Sci Aca.* 39B (1973) 678.
- 8 Nair V R & Rao T S S, in *The biology of the Indian Ocean* Vol 3 edited by B Zeitschel (Springer Verlag, Berlin) 1973, 319.
- 9 Madhupratap M, Wafar M V M, Haridas P, Narayanan B, Menon P G & Sivadas P, *Indian J mar Sci*, 6 (1977) 138.
- 10 Rao T S S & Nair V R, *Spl Publ Mar biol Ass India* (1973) 183.
- 11 Srinivasan M, *J mar biol Ass India*, 16 (1974) 126.
- 12 Wyrтки K, *Oceanographic atlas of the international Indian Ocean expedition* (Washington D C, National Science Foundation) 1971.
- 13 Sen Gupta R, Moraes C, George M D, Kureishy T W, Noronha R J & Fondecар S P, *Indian J mar Sci* 10 (1981) 228.
- 14 Madhupratap M, Achuthankutty C T, Nair S R S & Nair V R, *Indian J mar Sci*, 10 (1981) 258.
- 15 Indian Ocean Biological Centre, *International Indian Ocean expedition plankton atlas*, 4 (Fas. 2) (1973).