

## A STUDY OF MEDUSAE FROM ANDAMAN AND NICOBAR WATERS

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### ABSTRACT

The results obtained from 14 cruises undertaken by FORV Sagar Sampada during the period 1986-1990 from Andaman and Nicobar waters are detailed. 346 zooplankton collections were made during this period and medusae were found from 307 stations. A total of 57 species of hydromedusae belonging to 21 families have been studied. Diurnal variation was discernible and the maximum numerical abundance was noticed from night collections. Highest density was observed during monsoon period. Annual variation also was noticeable in the area. *Aglaura hemistoma*, *Liriope tetraphylla*, *Rhopalonema velatum*, *Solmundella bitentaculata*, *Cytaeis tetrastyla*, *Phialidium hemisphaericum* and *Bougainvillia fulva* were the abundantly occurring species. *Bougainvillia bitentaculata* and *Cnidocodon leopardi* are new records from Andaman and Nicobar waters and Bay of Bengal.

**Key Words:** Medusae, Andaman and Nicobar waters, distribution.

### INTRODUCTION

The Andaman and Nicobar groups of islands are located in the South eastern Bay of Bengal, between lat. 6° and 14°N and long. 91° and 94°E and collectively have an area of 8293 km<sup>2</sup>. An oceanic ridge along 10°N separates the Andaman and Nicobar groups of islands. Most of these islands are surrounded by fringing reefs on their eastern side and barrier reef on their western side. They occupy an area of 6.02 × 10<sup>5</sup> km<sup>2</sup> and are connected to the Bay of Bengal by narrow channels. This region is influenced by large quantities of fresh-water run off from the perennial rivers of Burma, Thailand and Malaysia. This run off largely influences the topmost layers. It is known to be rich in marine wealth but limited investigations have been conducted in this area. Andaman Sea is one of the least explored regions of Indian Ocean (Bhattathiri and Devassy, 1981). Very little is known about the oceanographic and

biological aspects of Andaman and Nicobar waters. Medusae of the Indian Ocean have been studied by Navas (1971), Vannucci and Navas (1973 a, b) but the Andaman and Nicobar areas were not thoroughly covered during the International Indian Ocean Expedition. Medusae are exclusively carnivores and hence, they are ecologically important. No detailed study on medusae of this area was carried out. The present investigation was an attempt to study occurrence, abundance, variation and distribution of medusae inhabiting the waters around Andaman and Nicobar islands.

### MATERIALS AND METHODS

Zooplankton collections were made on board FORV Sagar Sampada from Andaman and Nicobar waters during the period 1986-1990. The samples were collected during 14 cruises from this area by oblique hauls from 150 m or less depth to surface using a Bongo - 60 net (mesh aper-

ture 0.33 mm), equipped with a calibrated flow meter and were preserved in 5% formaldehyde solution. The medusae were identified upto species level. The estimated abundance of hydromedusae is expressed as number/1000 m<sup>3</sup>.

The Andaman Sea contains a relatively extensive basin with a maximum depth of 4360 m and an uneven bottom topography. These islands have steeper continental slope on the eastern side compared to the western side which has wider continental shelf (Murthy *et al.*, 1981). On the northern part of Andaman sea the surface water column is warmer on the eastern side compared to the western side. The surface temperature is fairly uniform and showed variation from 27.5° to 30.0°C, and increasing trend from north to south on the western side. The salinity at the surface ranged from 31 to 33‰, with a sun surface maximum of 35.5‰ at about 40-50m. Below 150 m the salinity values were almost stable. Salinity showed increasing trend from north to south on the western side and south to north on the eastern side. The deeper water has the characteristics similar to the Antarctic bottom water. Dissolved oxygen was supersaturated at the surface and few meters below. But on the western side supersaturation was observed even at 50m. The thickness of the oxygen minimum layer (< 1ml/l) varies from 150 to 600 m at stations on the north, east and south of the islands with the lowest recorded at the stations on the north (0.1 ml/l) On the western side, the oxygen minimum layer extends from 100 to 800 m.

## RESULTS AND DISCUSSION

Of the 346 zooplankton collections made, 307 samples contained medusae. Fifty seven species belonging to twenty one families of hydromedusae were obtained. The list of species collected and identified is given below:

### Family Tubulariidae

- Hybocodon unicus* Browne, 1902  
*Hybocodon forbesi* Mayer, 1894

- Euphysora begelowi* Maas, 1905  
*Euphysora annulata* Kramp, 1928

### Family Zancleidae

- Zanclea dubi* Kramp, 1959  
*Zanclea orientalis* Browne, 1916

### Family Corymorphidae

- Cnidocodon leopoldi* Bouillon, 1978,

### Family Cladonematidae

- Cladonema* sp.

### Family Cytaeidae

- Cytaeis tetrastyla* Eschscholtz, 1829  
*Cytaeis vulgaris* Agassis & Mayer, 1899

### Family Rathkeidae

- Lizzia gracilis* Mayer, 1910

### Family Bougainvillidae

- Bougainvillia bitentaculata* Uchida, 1925  
*Bougainvillia fulva* Agassis & Mayer 1899  
*Bougainvillia platygaster* Haeckel, 1879  
*Bougainvillia remosa* (Van Beneden, 1844)  
*Kollikerina octonemalis* Maas, 1905

### Family Pandaeidae

- Merga tergestina* Neppi & Stiasny, 1912  
*Octotiaru russellii* Kramp, 1953  
*Leukartaria octona* Fleming, 1823  
*Leukartaria gardineri* Browne, 1916

### Family Laodiceidae

- Melicertissa orientalis* Kramp, 1961

### Family Companulariidae

- Obelia* spp.

- Phialidium hemisphaericum* Leuckart, 1856  
*Phialidium simplex* Browne, 1902  
*Phialidium maccreadyi* Brooks 1888

### Family Lovenellidae

- Euheilota menoni* Kramp, 1959  
*Euheilota tropica* Kramp, 1959

### Family Phialellidae

- Blackfordia virginica* Mayer, 1910

### Family Phialucidae

- Phialucium carolinae* Mayer, 1910  
*Phialucium condensum* Kramp, 1953  
*Phialucium multitentaculatum* Menon, 1932  
*Octophialucium indicum* Kramp, 1958,  
*Octophialucium begelowi* Kramp, 1955

### Family Eirenidae

- Eirene elliceana* Agassis & Mayer, 1902  
*Eirene hexanemalis* Goette, 1886  
*Helgicirra malayensis* (Stiasny, 1928)

### Family Eutimidae

- Eutima curva* Browne, 1905

Family Aequoreidae

*Aequorea aequorea* Forskal, 1775

*Aequorea conica* Browne, 1905

*Aequorea macrodactyla* Brandt, 1835

Family Proboscidae

*Proboscidaactyla ornata* Mc Crady, 1857

Family Rhopalonematidae

*Rhopalonema velatum* Gegenbaur, 1856

*Rhopalaonema funerarium* Vanhoffen, 1902

*Pantachogon scotti* Browne, 1910

*Pantachogon haekell* Maas, 1893

*Amphagone apicata* Kramp, 1957

*Crossota alba* Begelow, 1913

*Colobonema sericeum* Vanhoffen, 1902

*Aglaura hemistoma* Peron & Lesuer, 1809

*Aglantha elata* Haeckel, 1879

Family Geryonidae

*Geryonia proboscidaalis* Forskal, 1775

*Liriope tetraphylla* Chamisso &

Eysen haret, 1821

Family Aeginidae

*Aegina citrea* Eschscholtz, 1829

*Solumdella bitentaculata* Quoy &

Gaimard, 1833

Family Solmariidae

*Pegantha clara* Begelow, 1909

Family Cuninidae

*Cunina octonaria* Mc Crady, 1857

*Cunina tenella* Begelow, 1909

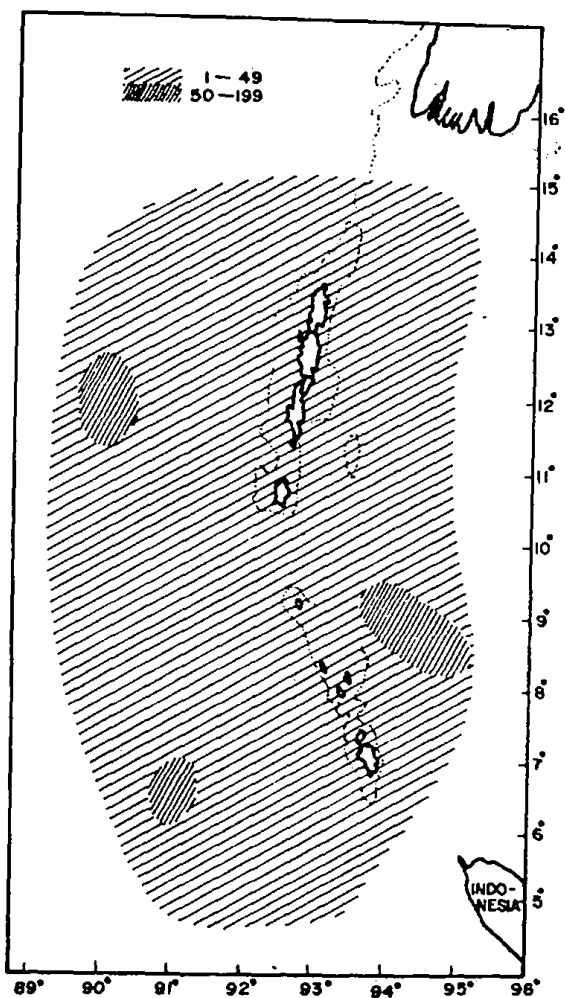


Fig. 1.

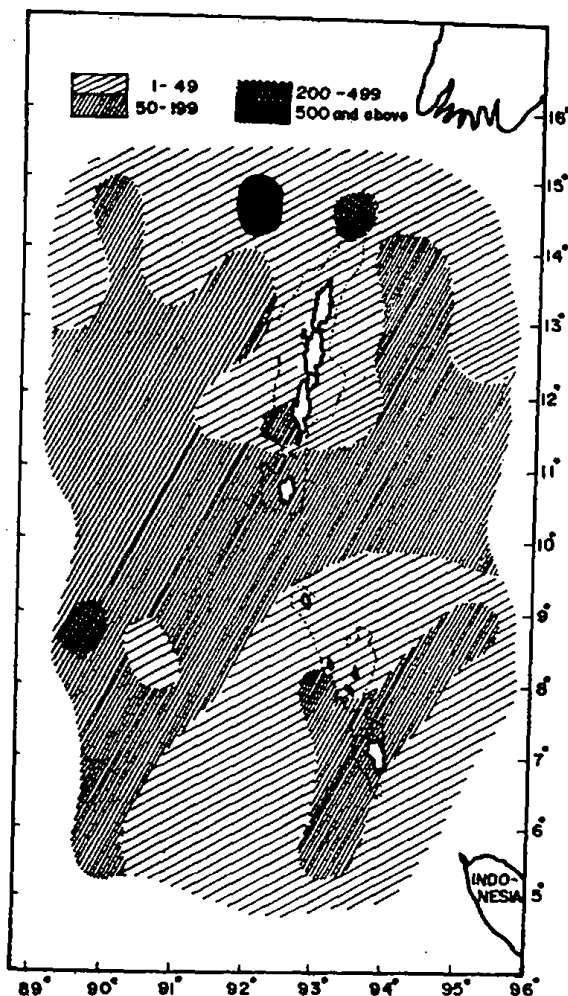


Fig. 2.

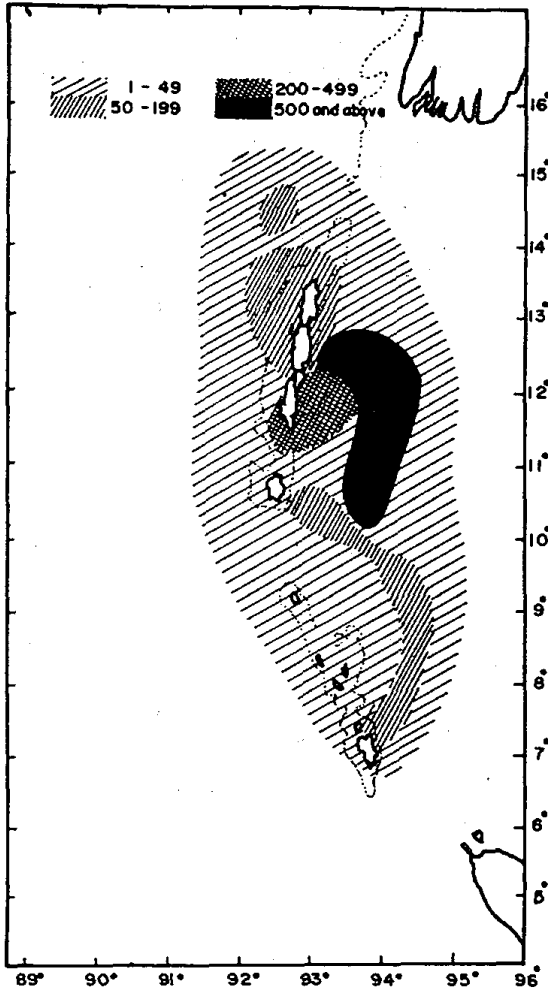


Fig. 3.

**TABLE 1. Monthly occurrence of medusae from Andaman and Nicobar waters**

Month	Highest density	Night average	Day average	Total average
April	196	42	30	36
May	1244	458	128	293
June	6457	977	405	691
July	1481	227	264	246
August	5545	1235	330	783
September	1804	265	301	283
October	1107	56	54	55
November	2856	897	385	641
December	348	138	82	110
January	117	64	38	51
February	824	516	181	349
March	—	—	—	—

It could be seen from Figs. 1-5 that the highest density of hydromedusae was observed from the samples collected in June, 1988. This peak (6457 specimens/1000m<sup>3</sup>) was contributed by the dense swarm of *Aglaura hemistoma* (Fig. 3) especially from the eastern side of the islands. This species was the most dominant of this region and was represented in 71% of the total samples (Fig. 6). It is a good indicator of tropical waters. The second high value (5545 specimen/1000m<sup>3</sup>) was seen in August 1988 and it was due to the swarms of *A. hemistoma* and *Liriope tetraphylla*. *L. tetraphylla* was

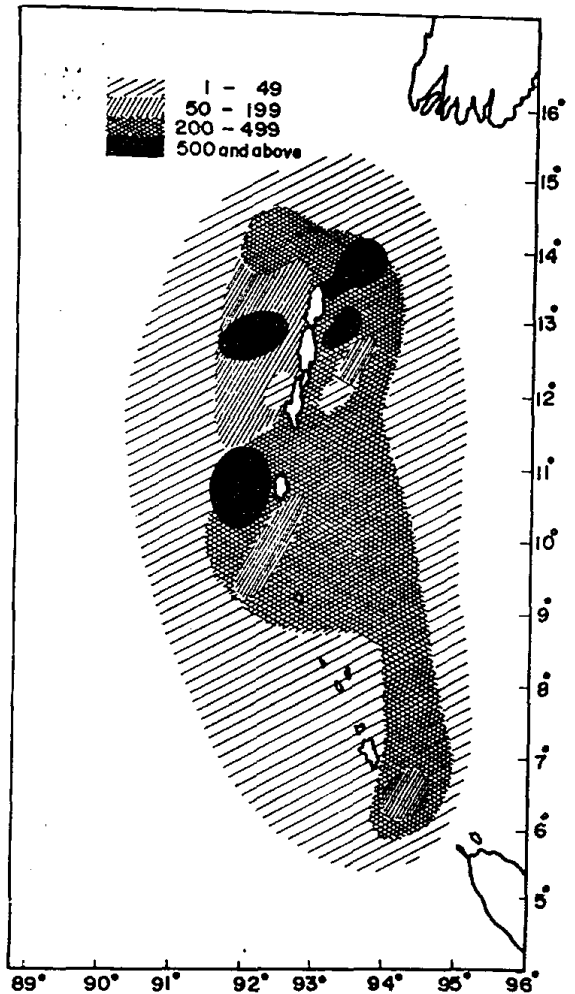
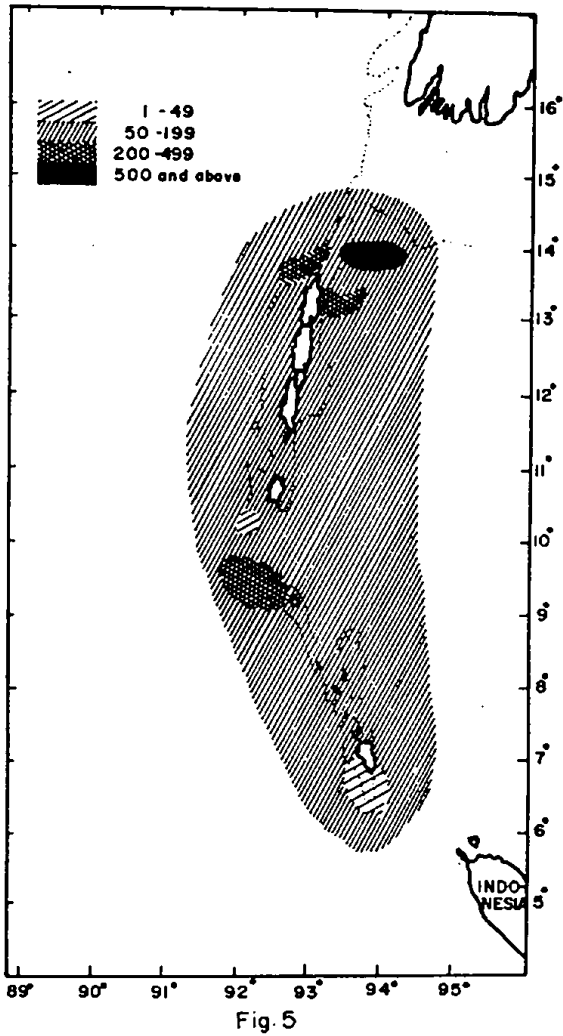
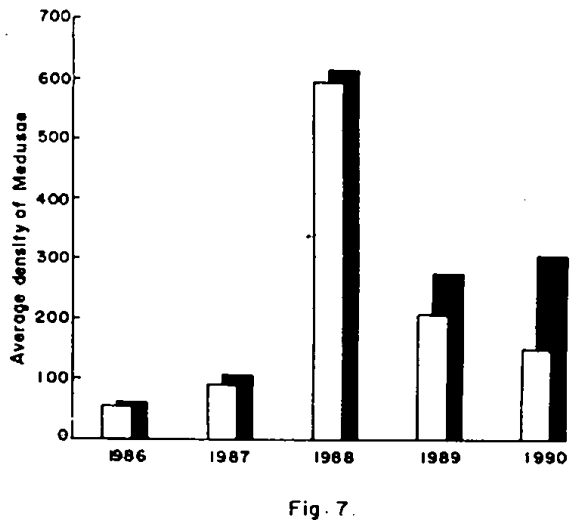
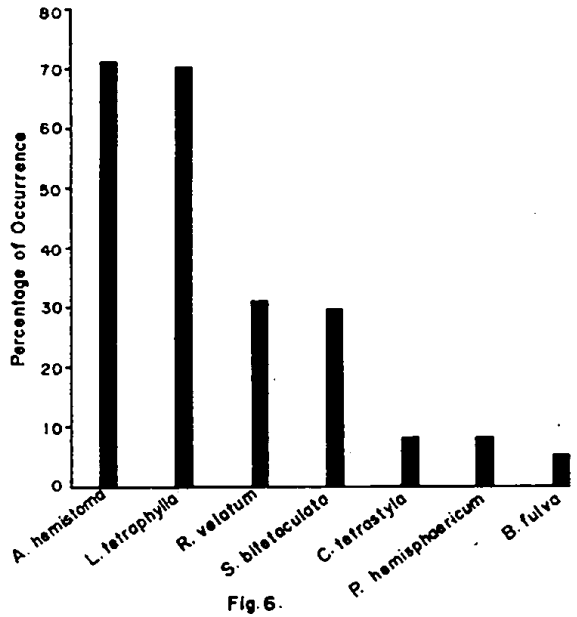


Fig. 4.



the second dominant species with 70% occurrence (Fig. 6). Both are warm water holoplanktonic, eurythermal, euryhaline and frequent surface water species, mostly oceanic but occur in neritic areas too. *Rhopalonema velatum* showed its abundance in 1987 (Fig. 2) along with the abundance of *A. hemistoma*. *R. velatum*, which is also euryhaline and eurythermic, was found to be distributed in almost all watermasses. In 1989 the high density was noticed in small patches both in the east and west sides of the islands (Fig. 4). *Solmundella bitentaculata* and *Cytaeis tetrastyla* were represented fairly well in most of the areas even though not in swarms.



*C. tetrastyla* was noticed from eastern and western sides of the islands. This anthomedusan species normally multiplies through intensive vegetative reproduction and contribute for the density of the population (Fig. 3).

Annual variations could be seen

from Figs. 1—5 for the years 1988 to 1990. The highest value was discernible in 1988 (Fig. 3) and the least value in 1986 (Fig. 1). The population density during 1986 and 1987 was less while species diversity was more. Species next in abundance were *Crossota alba*, *Phialidium simplex*, *Cnidocodon leopoldi*, *Octophialucium begelowi*, *Eirene elliceana*, *Pantachogon scotti*, *Amphagone apicata*, *Rhopalonema funerarium*, *Cladonema* sp., *Aequorea conica*, *Merga tergestina*, *Phialidium macradyi*, *Cunina tenella*, *Hybocodon forbesi*, *Geryonia proboscidalis*, *Euphysora begelowi*, *Cytaeis vulgaris*, *Pegantia clara*, *Bougainvillia tentaculata*, *Obelia* spp. and *Aequorea aequorea*. These species were seen near to the islands in few numbers and also they occurred on eastern and western sides of the islands.

Monthly analysis of medusae is presented in Table 1. The monsoon period ranked first in density with an average value of 503 specimen/1000 m<sup>3</sup>. It was followed by post monsoon period with an average value of 173/1000 m<sup>3</sup> and premonsoon season showed least value (160 specimen/1000 m<sup>-3</sup>). Highest density was observed in the southwest monsoon period when the food availability was more.

*A. hemistoma*, *L. tetraphylla* and *S. bitentaculata* were found to occur throughout the year. The maximum density of *Aglaura hemistoma* was noticed in June, August and July. In density and percentage of occurrence *A. hemistoma* ranked first and at times it outnumbered even the density of all other species put together. Maximum density of *L. tetraphylla* was observed in August, June and May.

All the samples considered here for the present study were put under day or night categories and the results obtained are depicted in Fig. 7. Diurnal variation was noticed from these waters. Increase in values was invariably noticed from night collections. Highest was observed in June and August 1988.

The percentage of occurrence of dominant species is shown in Fig. 6. *A.*

*hemistoma*, *L. tetraphylla*, *Rhopalonema velatum*, *Solmundella bitentaculata*, *Cytaeis tetrastyla*, *Phialidium hemisphaericum* and *Bougainvillia fulva* were seen in decreasing order of abundance.

*Bougainvillia bitentaculata* and *Cnidocodon leopoldi* were found in this region. These species are new records from Andaman and Nicobar islands and Bay of Bengal. With this record the distribution of these species extended to Indian Ocean also.

In general, the highest value of medusae was obtained from the eastern side of Andaman and Nicobar waters. Madhupratap *et al.* (1981) stated that zooplankton biomass was lower compared to coastal waters of India, while it was comparable to that of Laccadive waters. Santhakumari (1991) noticed a swarm of Leptomedusae species, *Aequorea conica* (181 specimen/m<sup>3</sup>) from the south west coast of India. This value is very high when compared to the highest density noticed from the present finding. The highest value of medusae obtained from Laccadive waters was only 3882 specimen/1000 m<sup>3</sup> (Santhakumari, 1994). Usually high density of hydromedusae was observed when there was more food availability. Quasim and Ansari (1981) stated that both Andaman Sea and Laccadive Sea are oligotrophic in nature with low primary and secondary productivity.

Trachymedusae and Nareomedusae are represented more than half of the total catch. All of them are independent of bottom for completing their life cycle and they are responsible for the high density of population. However, Leptomedusae, Anthomedusae and Limnomedusae contributed for the species diversity. An assemblage of meroplanktonic and holoplanktonic medusae was found from Andaman and Nicobar waters. The dominance of *A. hemistoma* and *L. tetraphylla* indicates the capability to survive in all waters especially in tropical waters.

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