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Dr. P.S.B.R. JAMES
DIRECTOR
Central Marine Fisheries Research Institute
COCHIN - 682 031

Edited by

Dr. K.J. MATHEW
Central Marine Fisheries Research Institute
COCHIN - 682 031

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DISTRIBUTION AND ABUNDANCE OF LANTERNFISHES OF THE FAMILY MYCTOPHIDAE IN THE EEZ OF INDIA

MINI RAMAN AND P. S. B. R. JAMES

Central Marine Fisheries Research Institute , Cochin - 682 031

ABSTRACT

Distribution and abundance of laternfishes of the family Myctophidae collected from the eastern Arabian Sea and the Bay of Bengal during cruises 1-15 of FORV *Sagar Sampada* are presented . This investigation is based on the IKMT samples from the DSL which was found in the depth ranges 200-540m during day and 0-75m during night. In the total biomass of the DSL, fish formed only 6% and the rest was constituted by the plankton. The fish fauna of the DSL comprised of meso and bathypelagic forms like myctophids, gonostomids and stomiformes. Among the myctophids the common generawere *Diaphus, Lampanyctus, Diogenichthys, Hygophum, Symbolophorus, Bolinichthys, Benthosema* and *Myctophum*. The myctophids comprised about 31% of the total fish biomass of the DSL. Off the west coast myctophids formed about 82% while off the east coast they formed only 17%. The abundance of myctophids varied in waters north and south of 15°N in both the seas. However, this difference was more pronounced off the east coast with the myctophids comprising about 64% off the southeast and 35% off the northeast coasts. There were differences in the numerical abundance of the myctophids in the day and night catches in both the seas, the night catches being more than day catches. While about 88% of the myctophids were caught at night, only 11.2% formed the day catch. Maximum density of myctophids was recorded in the depth ranges 200-500m during day and 20-90m during night in both the seas. There was no pronounced seasonal variation in the abundance except for April and October when maximum quantities were caught.

INTRODCUTION

Lanternfishes are one of the dominant components of the oceanic ecosystems. They occur in most regions and are included in the fauna of the sound scattering layers of the seas (Bekker, 1967). They have been collected predominantly in the open oceanic waters and are also found on continental and island shelves.

Although abundant and widespread, myctophids are only now beginning to draw attention as a potential source of animal protein. They are reported to contian fairly high quantities of wax esters and results of biochemical experiments in Soviet Union do not preculde the use of southern hemisphere myctophid *Gymnoscopelus nicholsi* for human consumption. These fishes are capable of crossing density gradients such as thermocline and halocline both of which normally inhibit mixing by physical processes. By migrating vertically into surface waters, they provide forage for commercial fishes (Moser and Ahlstrom, 1970). They serve as a vital link between zooplankton community and larger predatory fishes.

Taxonomy and distribution of myctophids from the Arabian Sea has been studied by Nafpaktitis and Nafpaktitis (1969) and by Kotthaus (1972) but their life history, ecology and abundance are largely unknown. Legand (1967) studied the ecology of mesopelagic fauna in the eastern Indian Ocean. Studies on the myctophid fish fauna of the western and northern Arabian Sea were carried out by R/V *Dr. Fridtjof Nansen* during the years 1975 - '76. The studies on the myctophid larvae of the Indian Ocean are limited to the works of Becker (1964), Pertseva - Ostroumuva (1964), Ahlstrom (1968), Valsa (1979) and Peter (1982).

MATERIAL AND METHODS

The material for this study was obtained from the preserved IKMT collections of FORV *Sagar Sampada* cruises made during January, 1985 to May, 1986. A total of 563 stations were covered during 15 cruises out of which IKMT was operated in 364 stations. The area covered ranged from 7°00'N to 23°30'N latitudes and longitudes 77°30'E to 85°E in the Arabian Sea and latitudes 6°00'N to 19°N and longitude 80°38'E to 95°E in Bay of Bengal. Horizontal hauls were made at depths ranging from 20-500 m. These operations were based on the level of DSL. There were 171 night stations and 195 day stations respectively.

Resutls

The resutls of this investigation provide a preliminary knowledge on the geographic variation, seasonal and depth-wise distribution and day and night variations in both the seas. In the total biomass of the DSL, fish formed only 6% and the rest was constituted by the plankton. The myctophids comprised about 31% of the total fish biomass of the DSL.

Geographic variations

Figure 1. shows the general distribution of myctophids in both the seas, the abundance being represented in terms of numbers/half hour haul. In the eastern Arabian Sea, the myctophids formed about 72% showing a wide distribution covering major parts of the nearshore, offshore and oceanic regions. The abundance of myctophids varied in waters north and south of 15°N latitude. Off northwest coast myctophids formed about 53.4% while off southwest coast they were about 46%. Off northwest coast, dominance was noticed in certain pockets along the Ratnagiri - Marmagoa areas (15° - 17°N), off Bombay (19 °- 20°N) and in the northern Arabian waters (23°30'N). Peak abundance of myctophids was in waters along 69°30'E longitude between 18°30'N and 21°30'N latitudes and in the waters north of 15°N between 68° and 73°E longitudes. Highest number of 546 myctophids /half hour haul was recorded from a station (23°30'N 65° 00'E) off northern Arabian coast.

Off the southwest coast, the density maximum pockets were centered along the shelf-slope waters near Mangalore and off Cochin areas. Highest number of 774 myctophids / half hour haul was recorded from a station (9°30'N 74°00'E) off Cochin.

Contribution of myctophids in the Bay of Bengal was 17%. Off the northeast coast, myctophids contributed about 35% while off the southeast coast they formed about 64%. Dominance was noticed in the Bay of Bengal fan area 15°00' - 19° 00'N 85°00'E -90°30'E). Highest number of 198 myctophids/ half hour haul was recorded from a station (19°00'N 91°30'E) off West Bengal.

Off the southeast coast, maximum abundance was found in areas off Madras and in the oceanic areas south of Nicobar Islands.

Diurnal variations

There were differences in the numercial abundance of myctophids in the day and night catches in both the seas (Figs. 2 and 3). Off west coast, about 93% was caught during the night. Similar trends in the day and night catches were found in Bay of Bengal with night catches contributing about 88% and day, only 11.2%.

Seasonal variation

A regular pattern of seasonal variation (Fig. 5) could not be obtained due to insufficient data but some trends are apparent. However, the catches were usually largest during April-May and October- November. The peak catches recorded were 1,000- 1,100/half hour haul.

Discussion

In both the seas, abundance of myctophids varied in waters north and south of 15°N latitude. Density maximum pockets were found to be centered along Ratnagiri - Marmagoa, off Bombay and off northern Arabian coast in the northwest coast, off Cochin and along slope waters near Mangalore in the southwest coast. Density peaks were also observed in the Bay of Bengal fan area, in areas off Madras and in oceanic areas south of Nicobar Islands. Analysis of the catch composition of the fish larvae collected from the Arabian Sea and the Bay of Bengal by Peter (1982) has revealed a similar distribution pattern of myctophid larvae and it was found that estimate of larvae in both the seas came to 25.3% of the total larval collections from the area. Highest number of 546 myctophids/haul was recorded from a station (23°30'N 65°00'E) off northern Arabian coast. Similar findings were obtained by Gjøsaeter, (1975) during the survey of western and northern Arabian Sea by R/V *Dr. Fridtjof Nansen.* The catch rate recorded was 20,000 kg/hr with pelagic trawl.

Differences between day and night catches clearly exist; night catches averaging 2-3 times more than day catches. These findings are consistent with the results of several other workers. Aron (1962) found that regardless of depth, night hauls caught a substantially greater biomass than day hauls. The cause of this difference is uncertain but it is most likely that during day fishes migrate to depths beyond the range of the net. Other possible causes might include better escapement and greater scatter during day. Similar observations were made by Pearcy (1965) in the distribution of mesopelagic fishes off Oregon.

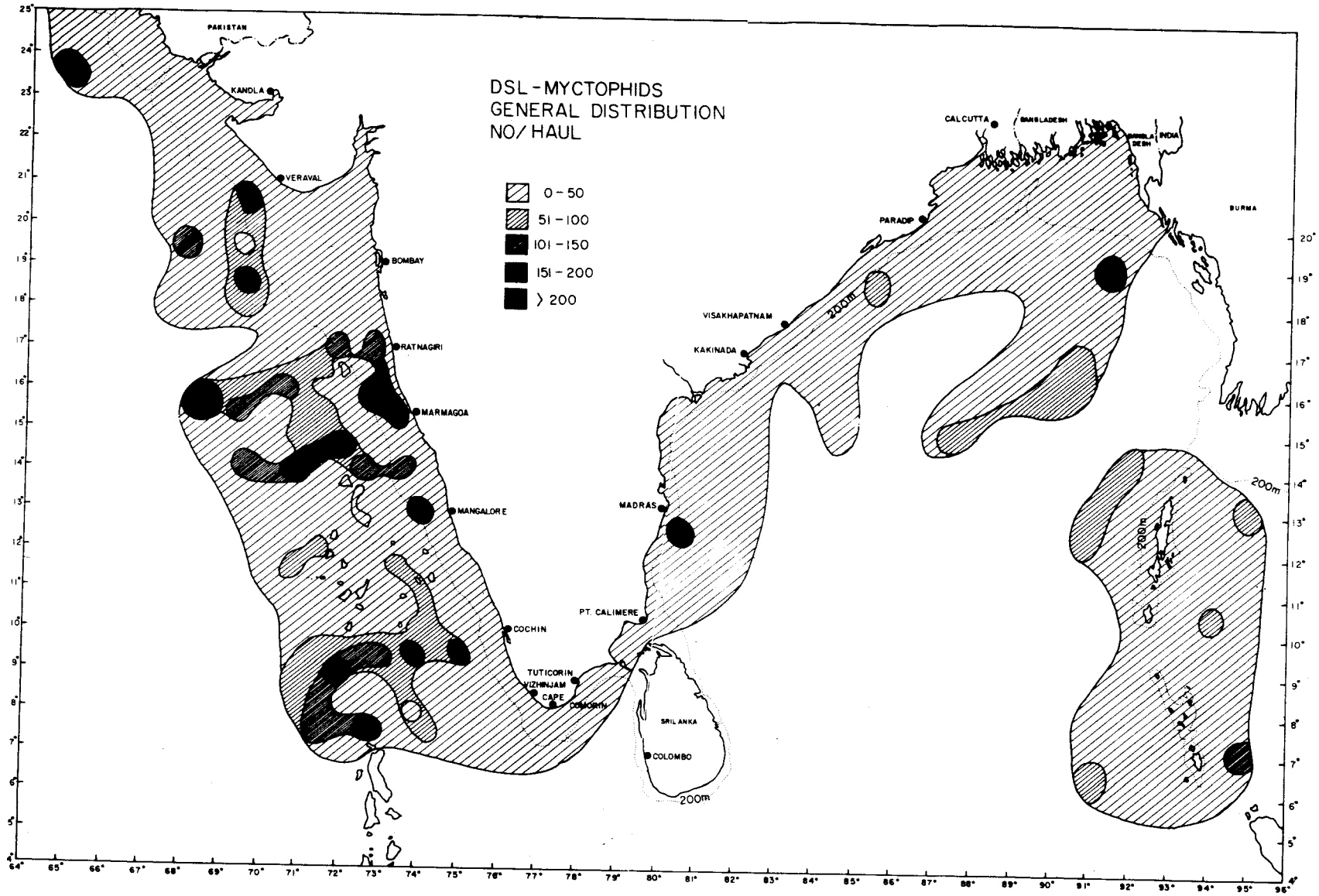

Fig. 1. General distribution of myctophids in the eastern Arabian Sean and the Bay of Bengal.

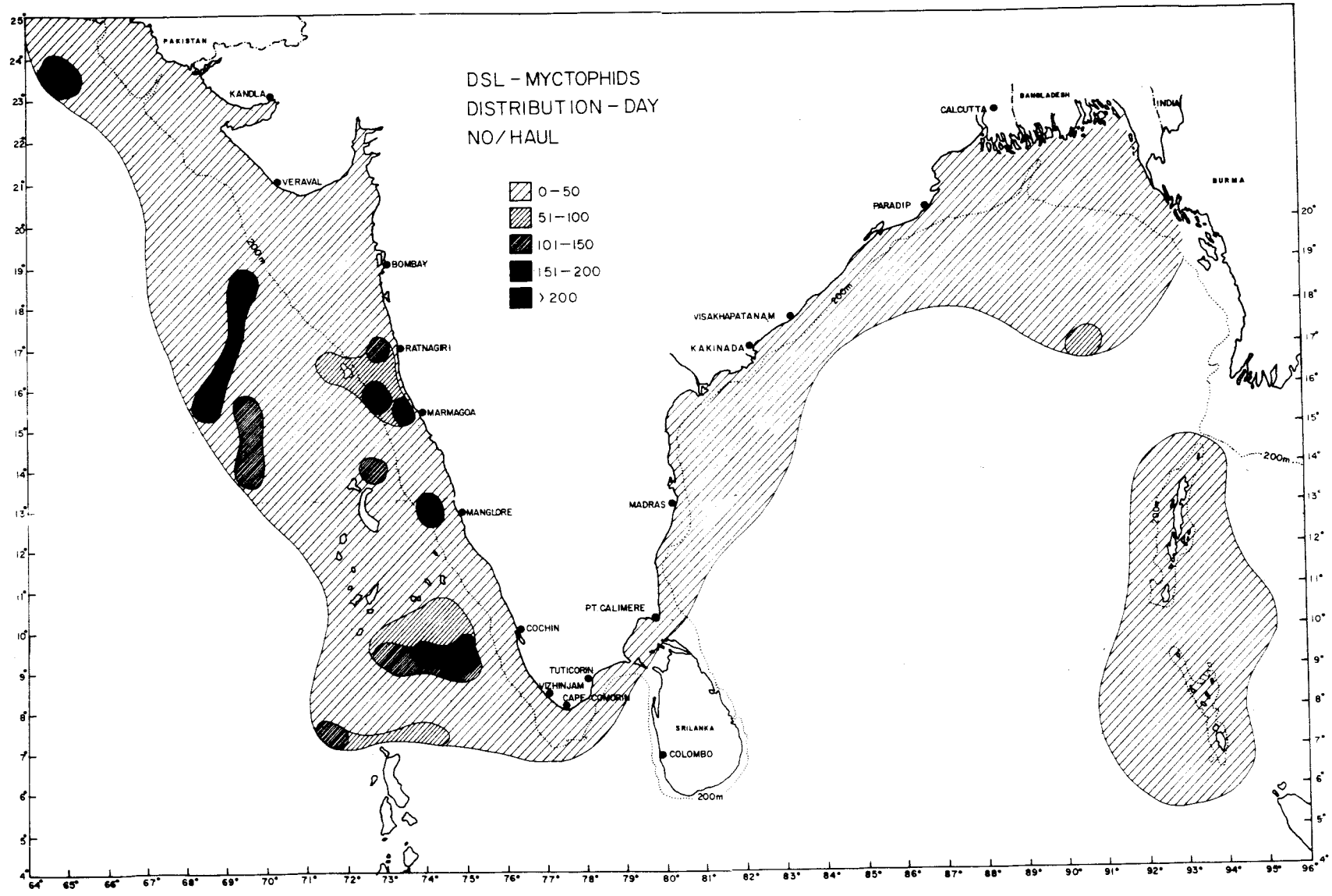

Fig. 2. Distribution of myctophids during day.

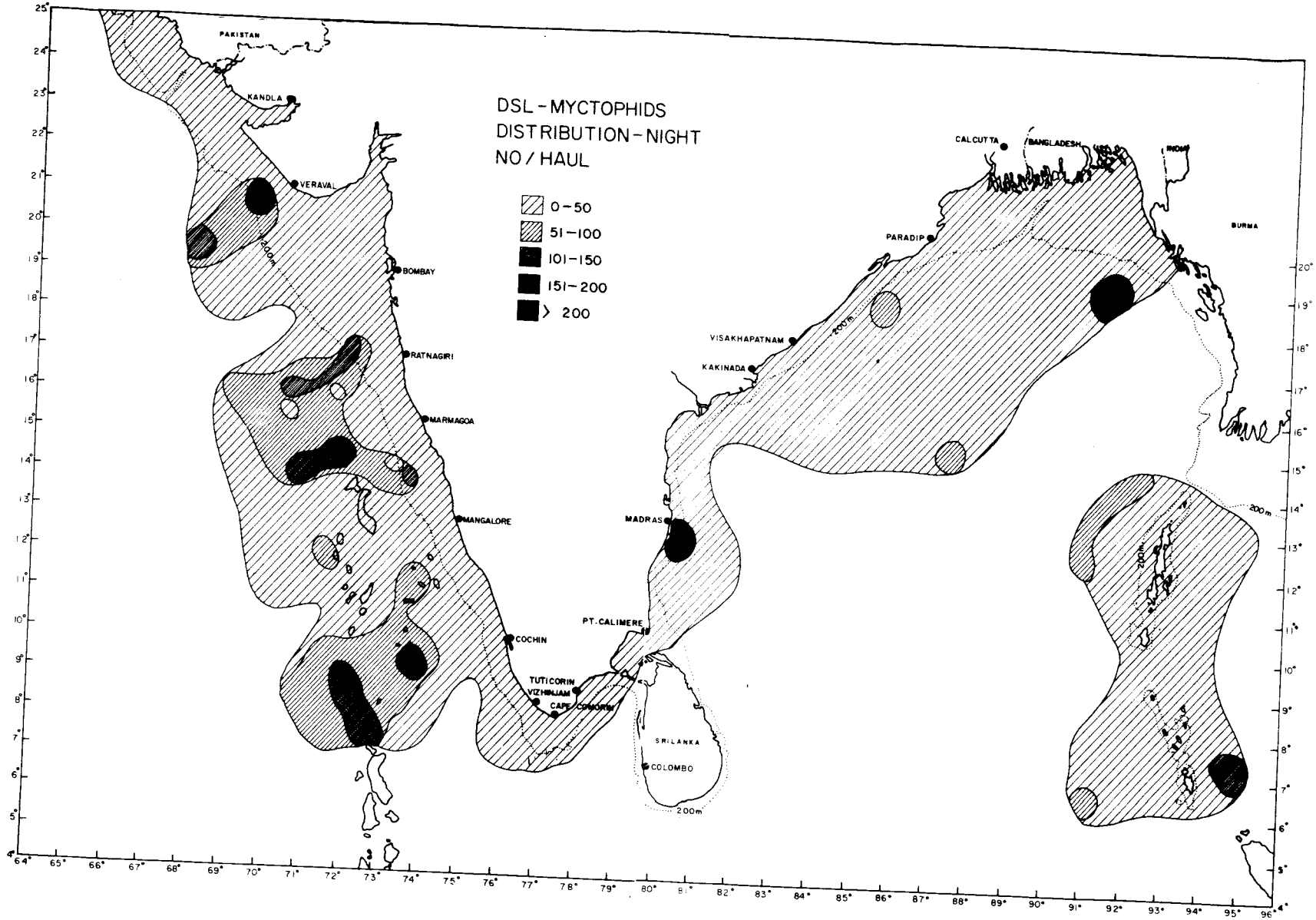

Fig. 3. Distribution of myctophids during night.

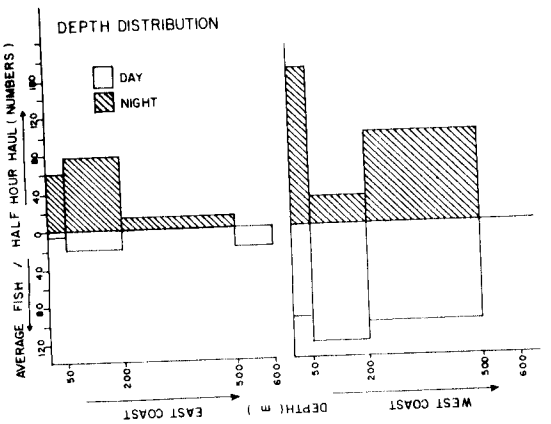

Fig. 4. Depth-wise distribution of myctophids.

Variations in the depth distribution reveal that maximum density was recorded in the depth ranges 200-500m during day and in surface waters 0-100m during night. An interesting observation was the occurrence of myctophids in large numbers in the shallow waters (50 - 60m) during day time. Alverson (1961) recorded similar observation on the day light surface occurrence of myctophid schools off the coast of central America. Skipkjack, yellow fin tuna schools and sea birds were found to forage on the myctophid schools during day.

Seasonal differences in the distribution pattern is not clearly evident due to non - availability of the data. However, catches were usually large during April-May and October-November, 1985. Pearcy (1965) has observed that catches of myctophids were higher during summer and are not related to depth or diel period.

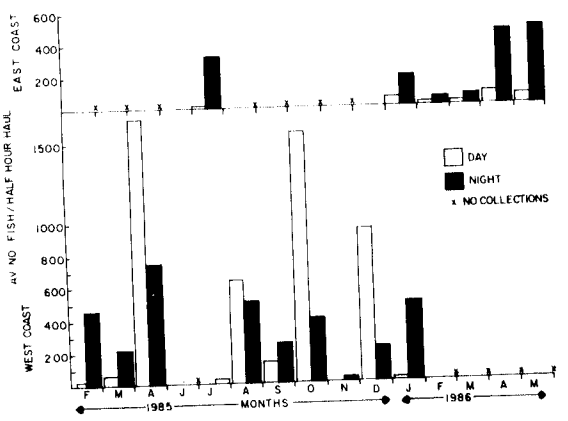

Fig. 5. Seasonal distribution of myctophids.

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