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Mesopelagic fishes from equatorial waters contiguous to Indian EEZ

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ABSTRACT

Observations on the mesopelagic fishes taken by mid water trawl in the equatorial region (lat. 03°S- 03°N to long. 76°- 86°E) are presented. The trawling operations were carried out at 12 stations at a depth range of 40-200 m where the station depth varied from 2760-3600 m. The total catch from these stations was 156.6 kg at a catch per hour of 13.1 kg. The average catch per hour was 6.5 kg from the northern side of the equator compared to a higher value of 15.7 kg recorded from the southern side of the equator. Out of a variety of mesopelagic fishes caught, the myctophids constituted 61.3 per cent and the most dominant species were *Diaphus effulgens*, *Triphoturus nigrescens*, *Symbolophorus evermanni* and *Lampanyctus pusillus*. Among the rest of the mesopelagic fishes *Cubiceps natalensis* was the dominant species. The species and size composition of the major constituents are given. The need for target oriented fishing for the economic utilisation also is discussed.

INTRODUCTION

There are a number of mesopelagic and bathypelagic fishes occurring in the EEZ of India and the contiguous seas. These resources, especially the myctophids have assumed importance in recent years in view of their potential for exploitation, human consumption, for production of fish meal/oil and as a source of animal protein. Recently the US GLOBEC (1993) studies have indicated that the Arabian Sea is dominated by myctophids and *Benthoosema pterotum* is the largest single species population in the world with a stock estimate amounting to 100 million tons. The mesopelagic fishes are part of the deep scattering layer and are represented either in the juvenile or adult stage. They are opportunistic feeders on zooplankton, prawns and fishes. As part of the food web they are predators or prey at various trophic levels. They exhibit diurnal migration between surface and 200 m at night, and during day time remain at depths between 800 to 1000 m. During the vertical migration they

provide forage for commercial fishes and serve as a vital link between zooplankton community and larger predatory fishes.

Some of the studies on the mesopelagic resources such as the myctophids are on their taxonomy and distribution (Nafpaktitis & Nafpaktitis, 1969; Kotthaus, 1972) and on the ecology of the mesopelagic fauna in the eastern Indian Ocean (Legend, 1967). Studies on the myctophid fauna of the western and northern Arabian Sea were carried out by R/V Dr. Fridtjof Nansen during 1975-76. Information on the myctophid larvae is limited (Bekker, 1964; Ahlstrom, 1968; Valsa, 1979; and Peter, 1982; Mini Raman & James, 1990; Menon, 1990). The biochemical and nutritional aspects have been studied by Gopakumar *et al.* (1983) and Nair *et al.* (1983). The present paper gives a preliminary account on the qualitative abundance and size composition of mesopelagic fishes caught in the midwater trawl from the equatorial waters contiguous to the Indian EEZ.

MATERIALS AND METHODS

The material for the study was collected from the mid water trawl catch onboard *FORV Sagar Sampada* cruise 12 in the equatorial waters contiguous to the Indian EEZ during 21 January to 18 February 1986. The area covered ranged from lat. 03°N to 03°S and long. 76°E to 86°E. German type rectangular mid water trawl was operated during day and night time at 12 stations (Fig. 1) at depths varying from 40-200 m. The station depth varied from 2760-3600 m. The trawling time was maintained at

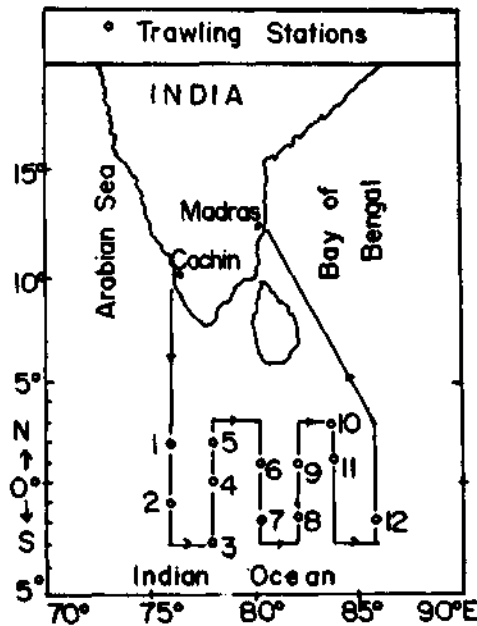


Fig. 1 - Areas covered and pelagic trawling stations

30 minutes and the catch in each haul was computed to get the catch per unit effort in hour. Six hauls were made in the north side of the equator, one in the equator and five hauls in the southern side of the equator. The total catch, species and size composition was recorded onboard itself.

RESULTS

The total catch from the 12 stations was 156.6 kg at a catch per hour of 13.1 kg. The catch was nil at stations 4 and 9. From the north side of the equator (stations 1,5,6,9,10 and 11) the total catch realised was 78 kg at a catch per hour of 6.5 kg. The total catch from the five stations (2,3,7,8 and 12) on the southern side amounted to 78.6 kg at a catch per hour of 15.7 kg. Taking the overall catch of mesopelagic fishes, the myctophids formed 61.3% , and regionwise they contributed to 59.8% on the northern side and 62.7% on the southern side of the equator. The important species of myctophids encountered were *Diaphus effulgens*, *Triphoturus nigrescens*, *Symbolophorus rufinus*, *Lampanyctus pusillus* and *Bolinichthys photothorax*. The size of these species ranged from 25-130 mm (Table 1). Among other mesopelagic fishes *Cubeiceps natalensis* constituted 5%. In addition a number other species were encountered and the details are given in Table 1.

DISCUSSION

Though the mid water trawling operations in the equatorial region were not successful, the study has indicated the qualitative abundance of various mesopelagic species. The low catch and catch per hour appeared to be due to the poor performance of the gear, mostly due to non-target fishing. Various other reasons and setbacks have been attributed to it (Kuttappan *et al.* 1990). During the present cruise the position of the deep scattering layer (DSL) varied between 20- 400 m (Pon Siraimetan, 1990). Menon (1990) opined that in the equatorial Indian Ocean the Deep Scattering Layer was found in one to several layers. A thick but diffuse layer was recorded at 900-1000 m depth in station 01°N 80°E - 3500 m, 02°N 84°E - 3231 m and 00°N 86°E - 3325 during daytime. However, the principal layer was found at 250-400 m in most of the oceanic stations during January and February 1986. Based on the Issacs- Kid Mid Water Trawl collections Pon Siraimetan (1990) recorded the average fish biomass (vol in ml per 30 minutes haul) as 51.4 ml, 68.1 ml and 70.3 ml in the areas north of equator, equator and south of equator respectively. Here only two species of myctophids such as *Myctophum effulgens* and *M. evermanni* and among other fishes *Polyipnus spinosus*, *Nemichthys scolopaceus*, *Vinciguerria lucetia* were encountered compared to a variety of fishes noticed in the midwater trawl while only the juveniles of *M. effulgens* (5-40 mm) and *M. evermanni* (15-40) were noticed in the IKMT, larger and adult specimens occurred in the midwater trawl, indicating their concentration in the deeper layers of the deep scattering layer. The concentration of

Table 1 - Total catch and percentage contribution of mesopelagic fishes from the equatorial waters of the Indian sub-continent

Species	Contribution (%)			
	North of Equator	Equator	South of Equator	Size range (mm)
Myctophids				
<i>Diaphus effulgens</i>	8.7	-	26.1	40-130
<i>D. perspicillatus</i>	8.5	-	-	30-60
<i>D. splendidus</i>	7.0	-	-	25-65
<i>Symbolophorus evermanni</i>	-	-	1.9	30-85
<i>S. rufinus</i>	11.2	-	3.7	30-95
<i>Myctophum spinosum</i>	3.6	-	0.4	55-85
<i>M. phengodes</i>	5.0	-	-	40-65
<i>Lampanyctus pusillus</i>	2.8	-	10.3	30-85
<i>Lobianchia gemellarii</i>	2.8	-	1.0	35-80
<i>Triphoturus nigrescens</i>	9.5	-	6.0	40-85
<i>Bolinichthys photothorax</i>	-	-	10.6	40-90
<i>Ceratoscopelus warmingii</i>	0.8	-	2.8	30-75
Other fishes				
<i>Cubiceps natalensis</i>	4.7	-	5.3	15-120
<i>Diplophos taenia</i>	2.3	-	-	70-145
<i>Vinciguerria lucetia</i>	0.6	-	0.3	35-60
<i>Idiacanthus atlanticus</i>	0.8	-	0.6	140-240
<i>Stomias boa</i>	1.2	-	1.7	140-240
<i>Chauliodus sloani</i>	0.4	-	1.3	85-130
<i>Astronesthes niger</i>	1.7	-	0.5	
Miscellaneous fishes	4.9	-	8.9	
Prawns & squids	23.5	-	18.6	
Station Nos.	1,5,6,9,10 & 11	4	2,3,7,8,12	
Total catch (kg)	78	nil	78.6	

these fishes was comparatively higher before mid night compared to daytime and early hours.

Recent studies by the U.S. GLOBEC (1993) have indicated good potential of the myctophid fishes to the tune of 100 million tonnes in the world oceans. *Benthoosema pterotum*, reported to be the most dominant species in the northern Arabian Sea was absent in the collections of IKMT and mid water trawl from the equator. The biochemical and nutritional aspects of myctophids and the immense possibilities for their utilisation have been indicated by Gopakumar *et al.* (1983) and Nair *et al.* (1983). Large quantities of myctophids such as *Diaphus* spp. are consumed by fishermen of Suruga Bay, but they sort out and discard *B. pterotum* as inedible (Kubota, 1982).

In view of the importance of the mesopelagic fishes, the need is to make target oriented surveys in the EEZ to study these resources in detail about their availability in space and time, and it is essential to investigate various aspects of the biology and fishery potential so that ways of economic exploitation can be worked out.

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