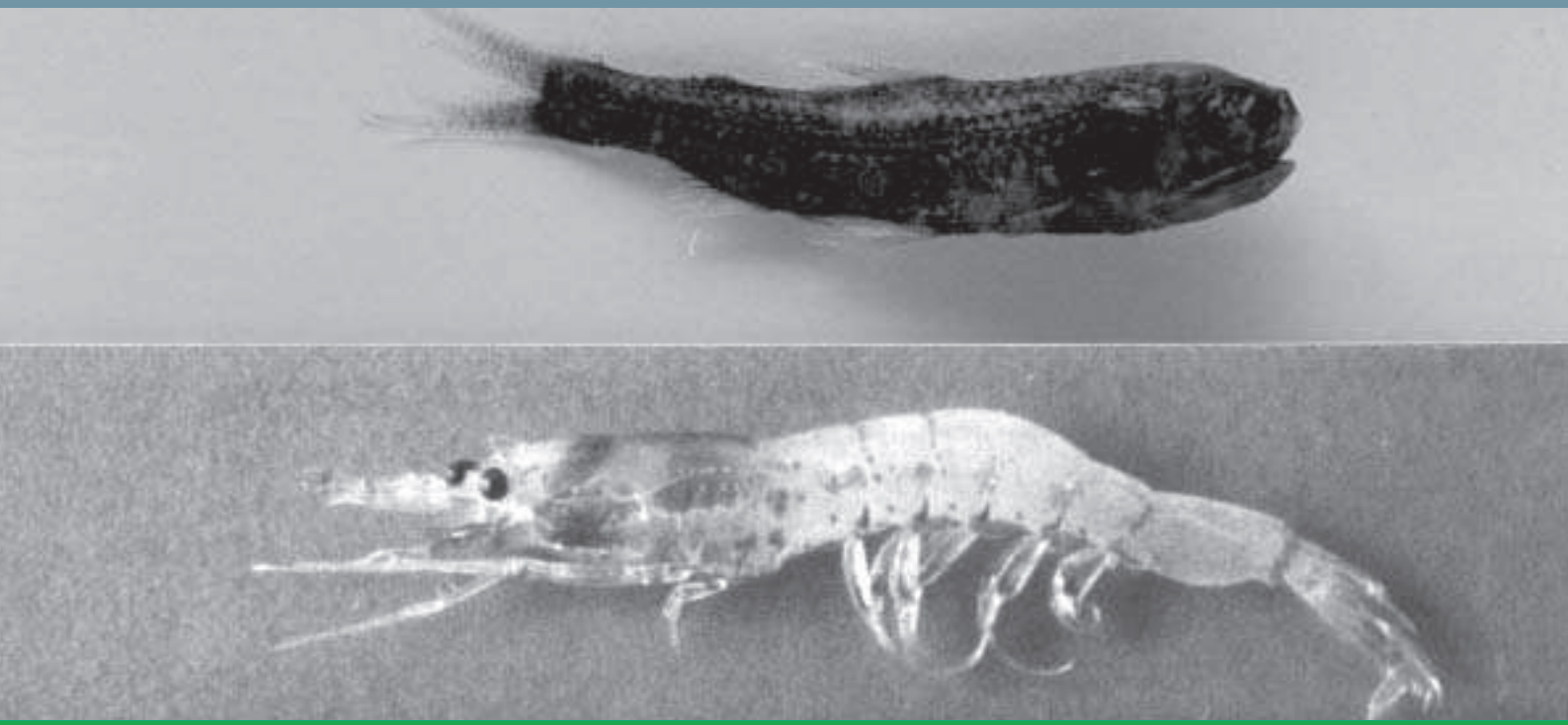
ISSN 0254-380 X

MARINE FISHERIES INFORMATION SERVICE

No. 182

October, November, December, 2004



TECHNICAL AND EXTENSION SERIES

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN, INDIA

(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

1097 Potential exploitable micronektons from the Deep Scattering Layers (DSL) of the Indian EEZ

The coastal resources of India have been subjected to high fishing pressure during the last couple of decades in line with the demand and technological upgradation in harvesting sectors causing concerns for future fisheries from this coastal belt chiefly due to failures in fisheries management and lack of spatial expansion in fishing. The benthic realm of the inner shelf was also swept incessantly and trampled by bottom trawlers leading to habitat degradation, destruction with an ultimate impact on the food web, by-catch and other commercially important species through recruitment / growth overfishing. The average annual production from the coastal waters has even exceeded the threshold level of potential yields warranting immediate management measures to maintain the production at sustainable level. Hence efforts are underway to develop a code of conduct for responsible fisheries in line with FAO guidelines with viable alterations to suit the country's political, economic and cultural perspectives.

In order to meet the ever growing demand for more fish for domestic use and export , besides the above mentioned coastal resource management criteria, the other viable options to increase production are coastal aquaculture and oceanic fisheries for major pelagics and hitherto little known deep sea (outer shelf and slope up to 500m depth) and mesopelagic resources . But this could not progress much as those habitats are relatively remote and difficult to fish. Although low light levels, decreasing temperature, slower currents and increasing salinity and pressure characterize the mesopelagic realm; the food availability there is often supplemented by the diurnally migrating DSL organisms. These biota belonging to several taxa form prey for many mesopelagic fishes and vertically ascending demersal fishes thereby making this vast tropical / subtropical area rich in shellfish biomass. However their diversity is relatively low when considering the volume and extent of habitat available.

Many earlier surveys by government agencies such as FAO/UNDP, FSI, DOD in the EEZ by using demersal trawl / midwater trawl revealed the existence of rich grounds of a few unfamiliar demersal fishes like bull's eye, green eye, black ruff, drift fish in the outer shelf and slope upto 500m depth. The survey results also indicated that these fishes make diurnal / seasonal ascends and coastward migration in search of prey and/ or to avoid environmental extremes, giving clue for their possible exploitation strategies. Besides the above, international expeditions unfold the existence of vast swarms of small mesopelagic fishes / shrimps in the deep scattering layer with characteristic dial ascends and descends. Although most of them form prey for a range of demersal/epipelagic cephalopods and fishes, the viability of mesopelagics as a commercially exploitable component for human consumption either directly or in value added forms has yet to be examined, explored and assessed. The US GLOBEC surveys and investigations in the Arabian Sea offer that the area is rich in mid water fish stocks dominated by myctophids with an estimated potential of 100 million tonnes, predominated by *Benthosema pterotum*. The findings also showed a close correlation with oxygen minimum layer, but there is no suggestion for a specific mechanism for

their aggregation. The results of the survey / investigations on the myctophid biomass potential available in the Arabian Sea made the brim countries to conduct intensive exploration in the Arabian Sea. The above estimate was subjected to much debate, discussion leaving a lot of apprehensions among fishery scientists and policy planners owing to the contemplated scope for exploitation although the resource is unfamiliar in the market.

In view of the importance, vastness and magnitude of living resource potential, as verified from global research results, the deep scattering layer of Indian EEZ was subjected to preliminary survey and investigation on the biomass and bio composition during 1985-86 on board Department of Ocean Development's vessel *FORV Sagar Sampada*. This preliminary observations gave new hopes to venture into a minor survey all along the Indian EEZ by a team of research Institutes (CMFRI, NIO, FSI, CIFT, CIFE, Andhra University, CMLRE of DOD) with the vessel and financial support from Department of Ocean Development (DOD) in 1998-2002. Further, the DSL and mesopelagic resources are a new frontier for Indian researchers and the entire realm and the resources will be a new challenge to the industry and the marine science, as this pristine eco system within the Indian EEZ remains virgin.

DSL micronekton

Micronekton is defined as " the assemblage of actively swimming crustaceans, cephalopods and fishes ranging from 1-10 cm in greatest dimension". Often the macrozooplankton and micronekton overlap catches in plankton net and IKMT. Although the zooplankton of the oceanic realm is well investigated under major exploratory survey programmes, the micronekton in the oceanic water bodies seem to be poorly studied as the same was not a frequent component in many sampling gear operated in the survey work. The present DSL investigation chiefly aims to measure the micronekton, their behaviour, migration, biology and predator - prey interactions in space and time. Many species of micronekton form potential resources for commercial exploitation besides their greater role as prey to oceanic pelagics. Some of them even act as indicator species for aggregation of large pelagics like tuna, sharks, oceanic squids and column and benthic shoaling fishes.

West coast

The biocomposition of the DSL along the west coast during day haul comprise of 27 groups of micronekton and the major items were deep sea eel (Nettastomatidae) followed by Myctophidae, Gonostomatidae, Nemichthyidae, leptocephalus and pelagic shrimps with a catch rate (in IKMT) of 21.88 gm/1000m^3 of water filtered. The night haul yielded a catch rate of 11.96 gm/1000m^3 and the composition includes chiefly gonostomatids, pelagic shrimps, myctophids and leptocephalus in the descending order of abundance.

The south-west coast produced 20 gm/1000m^3 in day haul which comprise chiefly of Nettastomatidae (deep sea eel) followed by Gonostomatidae, swarming crabs, Chauliodontidae, Nemichthyidae and pelagic shrimps; whereas the night haul yielded 13.24 gm/1000m^3 and the catch comprised mainly of pelagic shrimps, swarming crabs, Gonostomatidae and Myctophidae. The biocomposition of northwest include a biomass of 7.76 gms/1000m^3 in day haul comprising chiefly of Myctophidae and leptocephalus. At night the biomass

(5.63 gm/1000m^3) include primarily of Myctophidae, Photichthyidae and leptocephalus.

Along the west coast (day hauls) the DSL micronekton was abundant in depth realm below 100m. In the depth realm 0-50m the micronekton constitute 3.8 gm/1000m^3 and comprised chiefly of pelagic shrimps. In 50-100m depth the biomass was 5.59 gm/1000m^3 with swarming crabs as the dominant constituent. The depth realm 100-300m yielded 13.5-gm/1000m^3 micronekton and here the major constituents were the Gonostomatidae, Myctophidae, Nemichthyidae and crabs. Below 300m depth the biomass was at the rate of 14.3 gm / 1000m^3 and the dominant component items were Myctophidae and leptocephalus. The night haul from the west coast yielded high catches from depths below 300. The depth realm 0-50m produced 8.49 gm/1000m^3 and the biocomponents were Myctophidae, leptocephalus and pelagic shrimps. Similarly the depth realm 50-100m also produced 8.49 gm / 1000m^3 and the dominant item was pelagic shrimp. The depth 100-300m realms produced only 4.32 gm/1000m^3 and the major item was Myctophidae. The depth below 300m produced a biomass of 12.27 gm/1000m^3 and constituent items were crabs, Chauliodontidae, Myctophidae and leptocephalus.

Along the west coast (day) the latitudinal distribution of micronekton showed high values at 12^0, 14^0 and 16^0 N at the rate of 21.1 gm / 1000m^3, 23.0 gm /1000m^3 and 10.4 gm / 1000m^3, respectively. Pelagic shrimps had abundance at 10^0, 11^0, 12^0,14^0 and 15^0 N latitudes; swarming crabs were abundant at 7^0,10^0,11^0,12^0 and 14^0 N. Myctophids concentrate at 7^0, 14^0,16^0,19^0, 21^0 with the maximum abundance of 10.4 gm / 1000m^3 at 19^0 N. Photichthyids as well as leptocephalus were evenly distributed in the latitude from 6^0 to 21^0 N. Similarly fish juveniles were also evenly distributed in the latitudes from 6^0 to 21^0 N. Fish groups like Stomiidae, Sternoptychidae, Bregmacerotidae, Malacostidae, Melanostomidae, Trichiuridae, Ariomiidae, Gonostomatidae, Nemichthyidae, Astronestidae, Evermannilidae and Melamphidae were sparsely distributed in the latitudes. Micronekton formed more than 50% of the total DSL biomass at latitudes 6^o, 7^o, 9^o, 10^o, 12^o, 14^o, 15^o, 16^o, 19^o and 21^o N.

The latitudinal distributional abundance pattern in night haul indicated high values at 6^o, 8^o, 13^o and 21^{o}N with a respective production rate of 15.97, 12.76, 10.99 and 16.58 gm/1000m^3. Pelagic shrimps were abundant in the south latitudes up to 13^0 N where the production rates vary from 0.19 to 5.4 gm/1000m^3; beyond 14^0 N they were evenly but sparsely distributed. Similarly the swarming crabs were rich in the southern latitudes (4.3 gm/1000m^3) upto 10^0 N. Myctophid had abundance at 21^0 N; while photichthyids were uniformly distributed in all latitudes and their abundance vary from 0.01-2.71 gm/1000m^3. Fish juveniles were thinly distributed in all the latitudes from 6^0 to 21^0 N; whereas leptocephalus had abundance in the northern latitudes from 16 ^{0}to 19^0 N. Fish groups like Stomiidae, Sternoptychidae, Bregmacerotidae, Melanostomidae, Trichiuridae, Gonostomatidae, Nemichthyidae, Astronestidae and Melamphidae were uniformly but sparsely distributed in the latitudes. Micronekton formed more than 50% of the total DSL biomass at latitudes 6^o, 8^o, 10^o, 13^{o}18 ^{o} and 21^o N.

Along the west coast DSL biomass (day haul) recorded high value in premonsoon period of Feb-May (24 gm/ 1000m^3) followed by post-monsoon season of October-January (12.57 gm/1000m^3) and the biomass was low in monsoon period of June –September (2.34 gm/

1000m^3). In pre-monsoon season the most common and abundant micronektonic resources in the DSL were Nettastomatidae (9.5 gm/1000m^3), Nemichthyidae (3.96 gm/1000m^3), Myctophidae (3.07 gm/1000m^3) and leptocephalus (2.18 gm/1000m^3), whereas in monsoon the dominant groups were gonostomatids (1.12 gm/1000m^3), swarming crabs (1.79 gm/1000m^3) and pelagic shrimps (1.31 gm/1000m^3). During post-monsoon the predominant micronektonic component in the DSL were Chauliodontidae (2.93 gm/1000m^3), Myctophidae (1.94 gm/1000m^3), leptocephalus (1.07 gm/1000m^3) and pelagic shrimps (1.03 gm/1000m^3). In night hauls, micronekton had abundance during premonsoon (12.83 gm/1000m^3) followed closely by monsoon (12.03 gm/1000m^3). Pelagic shrimps were common during monsoon (1.96 gm/1000m^3), whereas myctophids were abundant in pre-monsoon (2.59 gm/1000m^3), swarming crabs appeared abundantly in monsoon (2.46 gm/1000m^3). Leptocephalus appeared throughout the seasons with dominance in pre-monsoon. The micronekton formed more than 50% of the DSL total biomass in monsoon.

More than 9.3% of the pre-monsoon DSL biomass of the south west coast (day) comprised of micronekton; whereas it formed 80% of the total biomass in post-monsoon in the south west coast. During monsoon they formed only 37% of the total DSL biomass.

East coast

The east coast was represented by 12 groups of micronekton forming 56.4% of the total DSL biocomposition. At lower temperature the micronekton biomass was found to be more along the east coast, while the macrozooplankton was abundant at higher temperature. The biomass during day hauls is dominated by myctophids followed by crabs, pelagic shrimps with a catch rate (in IKMT) of 2.77 gm/1000m^3 of water filtered. The night haul yielded a catch rate of 6.11gm/1000m^3 and the composition included chiefly pelagic shrimps, crabs, myctophids and leptocephalus in the descending order of abundance.

The north east coast is dominated by crabs, pelagic shrimps and leptocephalus with a catch rate of 2.79 gm/1000m^3 of water filtered in the day hauls. The micronektonic composition contributed to 47.3% of the total DSL biomass. The night haul yielded a catch rate of 7.88 gm/1000m^3. They contribute to 69.6% of the total DSL biomass. They were dominated by pelagic shrimps, which contributed to almost 67% of the micronektonic biomass. Crabs, myctophids, photichthyids, cephalopods, bregmaceros, fish juveniles and gonostomatids were present at much lower quantities. The South east coast during day is dominated by crabs, pelagic shrimps, chauliodontids and myctophids with a catch rate of 2.54 gm/1000m^3. The micronektonic components contributed to 57.7% of the total DSL biomass. The night haul yielded a catch rate of 7.17 gm/1000m^3 and the composition included crabs, pelagic shrimps, myctophids, leptocephalus and photichthyids in descending order of their abundance. The micronekton contributed to 79% of the total DSL biomass.

In the Andaman Sea the day hauls were dominated by pelagic shrimps, myctophids and leptocephalus with a catch rate of 1.88 gm/1000m^3. They represented 58% of the total DSL biomass. The night haul yielded a catch at the rate of 2.56 gm/1000m^3. They were represented by myctophids, crabs, leptocephalus and cephalopods in the descending order of abundance. They contributed

to 52% of the total DSL biomass.

In the east coast (day hauls) the micronektonic biomass was abundant in the depth realm below 300m at 4.98 gm/1000m^3. At depth of 0-50m the micronekton constitute 2.54 gm/1000m^3 and here swarming crabs were more abundant at the rate of 2.13 gm/1000m^3. At depth 50-100m the micronekton constitute 1.61 gm/1000m^3 and crabs and myctophids were the main constituents. At depth realm 100-300m micronekton constitute 3.51 gm/1000m^3 and myctophids at the rate of 1.02 gm/1000m^3 were dominant followed by chauliodontids (0.29 gm/1000m^3). Below 300m the micronekton constitute 4.98 gm/1000m^3 and leptocephalus, Stomiidae, Sternoptychidae, Bregmacerotidae, Gonostomatidae and other fishes were the main constituents. During night hauls in the east coast the micronektonic biomass was abundant at depth realm 0-50m and 50-100m. At 0-50m the micronekton constitute 12.93 gm/1000m^3 and pelagic shrimps and crabs were dominant at the rate of 13.12 gm/1000m^3 and 7.63 gm/1000m^3. Myctophids also formed the main constituent at this depth realm. At 50-100m the micronekton constitute 10.89 gm/1000m^3 and pelagic shrimps, crabs, fish juveniles, leptocephalus, Chauliodontidae, Photichthyidae, Stomiidae, Sternoptychidae, Bregmacerotidae, Gonostomatidae were the main constituents. At depth realm of 100-300m the micronekton constitute 5.11 gm/1000m^3 and crabs were the chief item. At depth realm below 300m the micronekton constitute 2.48 gm/1000m^3 and pelagic shrimps, photichthyids and crabs were the main constituents.

In the Andaman Sea during day the micronekton were abundant at depths below300m at the rate of 2.34-gm/1000m^3. At depth of 0-50m the micronekton constitute 0.24 gm/1000m^3 and composed of pelagic shrimps, fish juveniles and leptocephalus. At depth of 50-100m the micronekton constitute 0.66 gm/1000m^3. At 100-300m the micronekton constitute 0.79 gm/1000m^3; whereas at depths below 300m the micronekton constitute 2.34 gm/1000m^3 and pelagic shrimps, myctophids, fish juveniles, leptocephalus, Stomiidae, photichthyids and Sternoptychidae were the chief constituents. During night the micronekton was highest at depth range of 50-100m at the rate of 14.62 gm/1000m^3. *Bregmaceros* sp. were highest to the tune of 4.26 gm/1000m^3 at 50-100m depth range. This was followed by Sternoptychidae, Stomiidae and Chauliodontidae. Myctophidae, leptocephalus, Photichthyidae, crabs, cephalopods, fish juveniles production ranged between 0.56-0.93 gm/1000m^3. At 0-50m the micronekton constitute only 1.11gm/1000m^3 and pelagic shrimps, myctophids, leptocephalus were the main constituent. At 100-300m and below 300m the micronekton constituted only 1.62 gm/1000m^3 and 1.56 gm/1000m^3, respectively.

The latitude wise distribution in the east coast revealed that the micronekton were abundant at 17^o during day hauls at the rate of 7.41 gm/1000m^3. At 11^o, 19^o, 18^o, 13^o they were evenly distributed at the rate of 4.59 gm/1000m^3, 4.5 gm/1000m^3, 4.18 gm/1000m^3 and 4.17 gm/1000m^3, respectively. At 6^o, 8^o, 9^o, 10^o, 11^o, 14^o, 15^o, 16^o, 17^o, 18^o and 19^o the micronekton comprised of more than 50% of the total DSL biomass. Pelagic shrimps were highest at 13^o (1.94 gm/1000m^3). Crabs, cephalopds and myctophids were the other dominant items at 17^o at the rate of 2.13 gm/1000m^3, 0.19 gm/1000m^3, and 3.22 gm/1000m^3 respectively. Photichthyidae were high at 19^o at the rate of 0.21 gm/

1000m^3. Chauliodontidae were present at the rate of 1.53 gm/1000m^3 at 15ºN. Fish juveniles dominate the biomass at 6º N at 0.33 gm/1000m^3. Leptocephalus had a high biomass at 17º N at the rate of 1.50 gm / 1000m^3. Fish groups like Stomiidae, Sternoptychidae, *Bregmaceros* and Gonostomatidae were evenly distributed in the latitudes in a low biomass.

During night haul in the east coast the micronekton were abundant at 16º and 17º N at the rate of 15.59 gm/ 1000m^3 and 20.36 gm/1000m^3 respectively. They were present in good concentration at 13º, 14º and 20º N at the rate of 9.35 gm/1000m^3, 8.75 gm/1000m^3 and 8.11 gm/1000m^3, respectively. Pelagic shrimps were highest at 17º N (15.97 gm/1000m^3). Crabs had a fairly good abundance at 11º, 12º, 13º and 20º N at the rate of 3.55 gm/1000m^3, 3.50 gm/1000m^3, 4.57 gm/1000m^3 and 4.38 gm/1000m^3 respectively. Cephalopods were evenly distributed ranging from 0.01-0.19 gm/1000m^3. Myctophids were abundant at 13º and 17º N at the rate of 1.35 gm/1000m^3 and 1.15 gm/1000m^3 respectively. Photichthyidae, fish juveniles, leptocephalus and *Bregmaceros* were evenly distributed in the latitudes ranging from 0.02-1.49 gm/1000m^3. Chauliodontidae were sparsely distributed with a fairly good abundance at 14º N. Stomiidae, Sternoptychidae, Gonostomatidae and other fishes were sparsely distributed.

Along the east coast DSL biomass (day haul) recorded high value in monsoon period of June –September (3.71gm /1000m^3) followed by post-monsoon season of October-January (2.37 gm/1000m^3) and the biomass was low in pre-monsoon period of Feb-May (1.41 gm/ 1000m^3). In pre-monsoon the most common and abundant micronektonic resource in the DSL were myctophids (0.48 gm/1000m^3) and pelagic shrimps (0.45 gm/1000m^3) whereas in monsoon the dominant groups were pelagic shrimps (1.04 gm/1000m^3), swarming crabs (0.94 gm/1000m^3) and myctophids (0.68 gm/1000m^3). During post-monsoon the predominant micronektonic component in the DSL were myctophids (0.54 gm/1000m^3), pelagic shrimps (0.33 gm/1000m^3) and swarming crabs (0.28gm/ 1000m^3).

In night haul, micronekton had abundance during premonsoon (15.04 gm / 1000 m^3) followed closely by monsoon (10.82 gm/1000m^3). Pelagic shrimp was common during pre-monsoon (6.97 gm/1000m^3), whereas myctophids (0.82 gm/1000m^3) and swarming crabs (1.54 gm/1000m^3) appeared abundantly in monsoon. Leptocephalus occurred throughout the year with dominance in monsoon. In the total DSL biomass the micronekton formed more than 50% of the DSL biomass in all the seasons.

In the southeast during day haul the monsoon showed a high yield (3.56 gm/1000m^3) followed by post monsoon (3.56 gm/1000m^3) and pre-monsoon (0.47 gm/1000m^3). Pelagic shrimp yield was high at monsoon at the rate of 1.28 gm/1000m^3 followed by crabs (0.77 gm/1000m^3) and Chauliodontidae (0.54. gm/1000m^3). The other components were present at all seasons and were evenly distributed. At night, monsoon gave a high yield at 9.23 gm/1000m^3 followed by post-monsoon at the rate of 4.08 gm/1000m^3 and pre- monsoon at the rate of 1.58 gm/1000m^3. Crabs dominated during monsoon at the rate of 3.49 gm/1000m^3 followed by pelagic shrimps (2.22 gm/1000m^3) in post monsoon and the same yielded at the rate of 1.71 gm/1000m^3 during monsoon.

During day haul the monsoon gave a high yield from

the northeast at the rate of 5.33 gm/1000m^3 followed by post- monsoon (2.12 gm/1000m^3) and pre- monsoon at the rate of 0.18 gm/1000m^3. Crabs were common during monsoon (2.41 gm/1000m^3) followed by myctophids (1.52 gm/1000m^3) and pelagic shrimps (0.61 gm/1000m^3). In night haul pre-monsoon and monsoon produced a yield of 10.51 gm/1000m^3 and 10.30 gm/1000m^3 respectively. Post- monsoon gave a very low yield of 1.65 gm/1000m^3. Pelagic shrimps were dominant in pre-monsoon and post-monsoon at the rate of 9.13 gm/1000m^3 and 6.28 gm/1000m^3 respectively followed by crabs (1.03 gm/1000m^3) in monsoon.

In the Andaman Sea day haul gave a uniform yield ranging from 1.21-2.91 gm/1000m^3. Pelagic shrimps and myctophids were abundant in pre-monsoon at the rate of 1.09 gm/1000m^3 and 1.08 gm/1000m^3, respectively. In night haul the micronekton were more abundant in premonsoon at 4.17 gm/1000m^3 followed by post-monsoon (1.55 gm/1000m^3) and monsoon (1.34 gm/1000m^3). Pelagic shrimps and myctophids were dominant in premonsoon while the myctophids dominate the post monsoon.

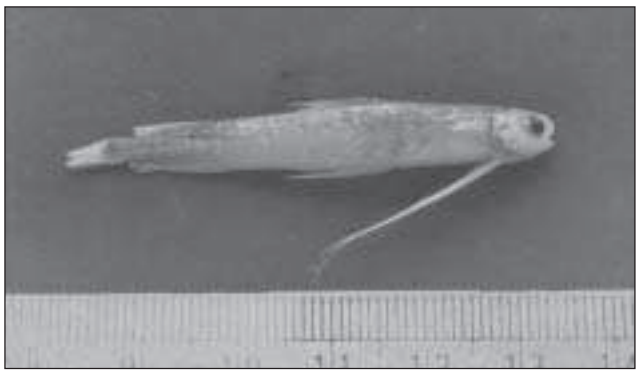
Exploitable resources from the DSL

The epi-pelagic and mesopelagic zones, being aphotic realm, support a loose assemblage of macrozoo-plankton together with pelagic shrimps and mesopelagic fishes. There is considerable trophic interaction among these larger epi-pelagic fishes and their meso-and bathy-pelagic counterparts during dial vertical migration. Their diversity is relatively low, especially considering the volume of water habitat available. On the contrary their distribution is worldwide and help to transport food from surface to deep water. The commercially exploitable resource comes under the category micronekton and macronekton cohabitant assemblages both dwell the photic and dysphotic realms.

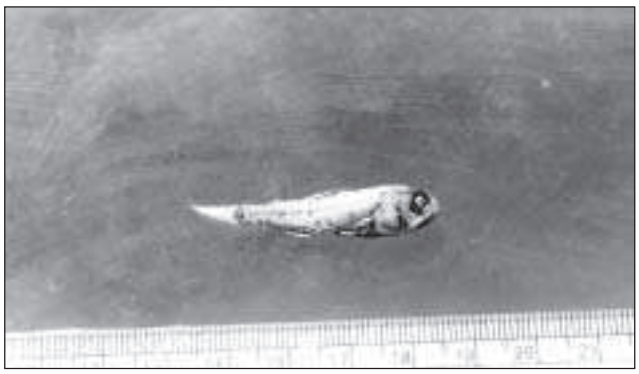
One of the most common and abundant item of the mesopelagic realm is the lantern fish of the family Myctophidae. There are many species of lantern fishes in the tropical seas around India. They are in the size range of 6-8 cm and weigh 2-6 gms. While distribution is worldwide, production appears to be highest in tropical and sub-tropical areas. At present none of the tropical Indian lantern fishes are commercially targeted as a fisheries resource. Myctophids appear in large shoals / swarms in the north west part of Indian EEZ with distribution decreasing from north to south. Echo sounder recordings showed that many myctophids aggregate in compact layers, especially during daytime when they are relatively quiescent in depth below 200-400 m. These aggregates are the primary components of the acoustically dense deep scattering layer. Although their densities had attained high concentration leading to commercial feasibility in trawl and acoustic surveys from north Arabian Sea, the present IKMT survey could not locate any concentration pocket for myctophids probably for want of a suitable mass harvesting gear and high escapement from large trawls.

Another major resource of exploitable magnitude in the DSL is the pelagic shrimps. The present survey is aimed to understand whether the pelagic shrimp stocks in the DSL form an exploitable resource of its own or it remains only as a source of food for commercially exploitable epi and mesopelagic organisms. There are 29 species of pelagic shrimps belonging to 19 genera

MAJOR MICRONEKTONS OF THE DSL



Bregmaceros sp.



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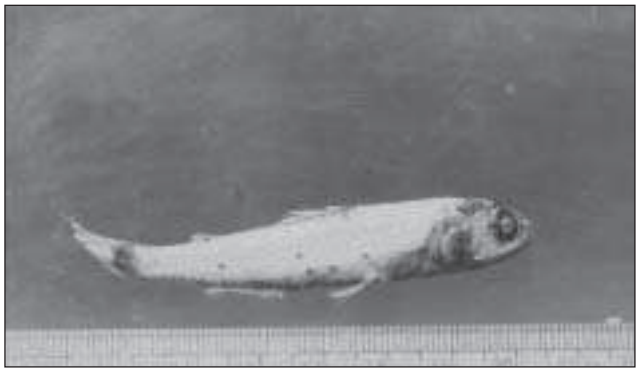

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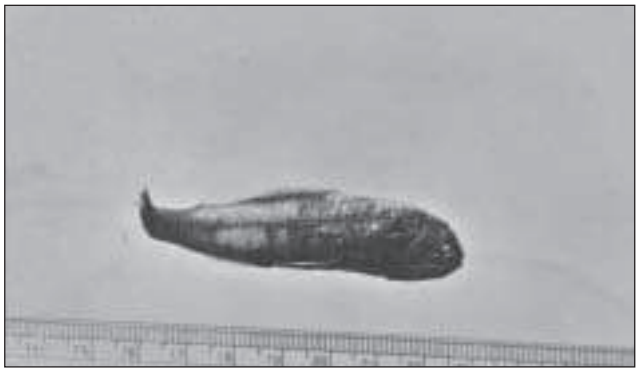

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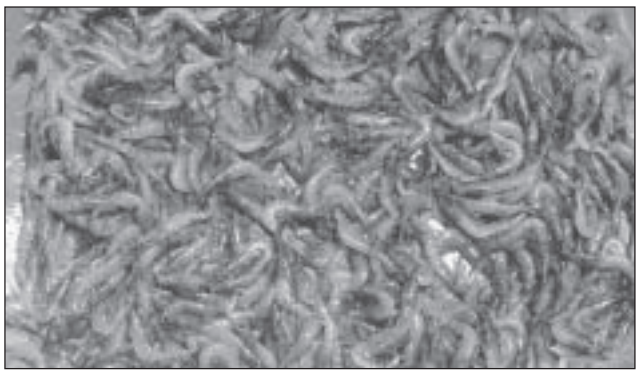
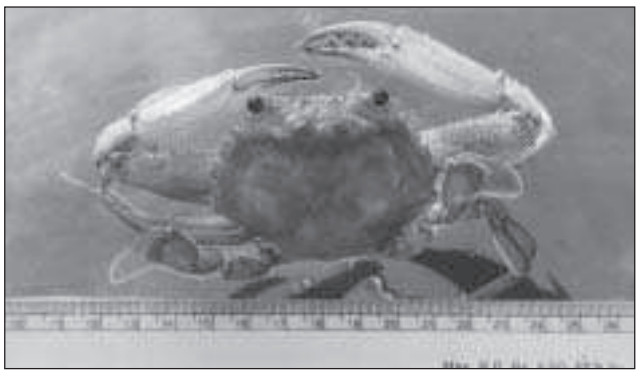


Swarm of *Sergestes seminudus*



Charybdis smithii

under 11 families recorded from the Indian DSL. Their biomass ranged from 0.04 –106.4 numbers / 1000 m^3 in the surveyed area. The maximum biomass was recorded at 8° N –74° E marsden square off Vizhinjam. The geographic distribution map of pelagic shrimps shows a clear north south variation with abundance increasing from north to south. About 65% of the pelagic shrimp catch was realized from the south west coast (6-15 ° N) whereas the northwest (15-22 ° N) contributed the rest (35 %) of the catch with concentration pocket ("hot spot") in 6-10 ° N and 16-17 ° N. Two species of pelagic shrimps belonging to the family Pandalidae, such as *Plesionika martia* and *P. alcocki* are prospective candidates for fishery along the outer shelf / slope of the west coast. The former species was recorded in abundance at latitude 7° 59′ N longitude 76° E, while the latter was common all along the west coast. Both species attain a maximum size of 35 mm and occur up to 350 m depth and make diurnal vertical ascents. They form part of regular deep-sea trawl fishery in the "Quilon Bank" during September – March season. Exploratory surveys of 1960's and 70's have revealed the occurrence and commercial feasibility of deep-sea crustaceans in trawlable concentration in an area of 3300 sq km, the Quilon Bank. Subsequent preliminary survey of *FORV Sagar Sampada* during 1988-91 also revealed the availability and abundance of deep-sea prawns / lobsters in the same area. Till recently the resource and the area was considered as a close reserve for large trawlers. During 1999-2000 period some medium type trawlers (38-65 feet OAL) from Sakthikulangara / Cochin ventured into the deep grounds (175-400 m) with upgraded and innovative facilities like GPS, Navigators and Echo sounders for multi day trawling. The catch per hour of the trawling varied from 34 – 77 kg, which included deep-sea lobsters and prawns belonging to 8 species. The present DSL minor survey and experimental commercial fishing along the southwest and south east coasts thrown open a new source of trawlable wealth (*Sergestes seminudus, Oplophorus typus, Acanthepyra sanguinea*) in the shelf edge / slope. By evolving an appropriate rational and biologically sustainable harvesting technology / management strategy in the mesopelagic realm, the production from the hitherto little exploited oceanic water could be increased many folds.

The predominant micronektonic components (See Figs.) of ecologic / economic value in the DSL are leptocephalus, pelagic shrimps, photichthyids and myctophids, all of which play significant role in the oceanic food web or many though unfamiliar are economically important as prospective candidates for commercial exploitation and utilization as food or meal. The IKMT survey of 1998–2002 revealed the dominance of the above four groups of micronekton in the Indian DSL. Rough biomass estimation showed that they contribute to above 80% of the total micronekton available for use in the surveyed region. The above minor survey helped to identify the priority areas and target resources for evolving a major survey in the Indian waters. The major survey contemplated is in the upper Arabian Sea for myctophids by virtue of their abundance, dense concentration, schooling and migratory behaviour and intend to assess their biomass, economics, market feasibility and harvest and post harvest possibilities before taking it to policy planners and to the industry.

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