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OBSERVATIONS ON THE DISTRIBUTION OF LEPTOCEPHALI OF THE EEZ OF INDIA

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Abstract

Isaacs-Kidd Midwater Trawl samples form the Deep Scattering Layers (DSL) collected during FORV *Sagar Sampada* cruises 1-20 were analysed. A total of 6,000 leptocephali of various size classes were sorted out form 255 samples. The spatial distribution of leptocephali based on these observations showed that species compositon as well as abundance were maximum on the west coast, between Goa and Cochin, beyond 1000 metres line. The distribution of larvae coincided very well with the depth of DSL and no regular seasonality was noticed. The total length of the leptocephali varied from 2 to 70 cm for different stages of metamorphosis. Leptocephali belonging to six families of the order of Anguilliformes namely Synaphobranchidae, Netastomatidae, Ophichthidae, Muraenidae, Nemichthyidae and Congridae were identified of which the family Congridae was represented by maximum number of larvae. An interesting type of leptocephalus of the family Congridae, Ariosoma type with outer intestine occurred at 37 stations. The leptocephali of the order Elopiformes were also recorded from few stations of the west coast.

Introduction

Among eels, the commercially important family Anguillidae has attracted the attention of fishery biologists in India and studies were made mainly to estimate their production and distribution in the marine and brackishwater environments. Very few workers have focussed their attention to study the systematics of the leptocephalus larvae collected from the plankton samples of the nearshore waters from the west and east coasts of India. Gopinath (1950) summarised the earlier studies on the leptocephali of the Indo-Pacific region and attempted to describe a few leptocephali from Trivandrum coast.

Much work have been published on the anguillid leptocephali of the temperate and subtropical regions. Several cruises were conducted to locate the breeding grounds of the American and European eels in relation to water masses and other oceanographic features. (Kleckner and McCleave, 1985; McCleave and Klecker, 1987; Castonguay and McCleave, 1987). Karmovskaya (1986) worked out in detail the identification of the leptocephali of Anguilliformes based on the collection from the world oceans. No such studies have been carried out along the seas of Indian subcontinent.

Eventhough eel is considered as a food fish in India, the exploitation of this fish is limited as indicated in the catch data during 1982-'85 (Anon., 1986). Hence it is of utmost necessity to evaluate availability of the larvae of eels in the seas around India and their metamorphosis in order to estimate the resource potential.

The leptocephali of Anguilliformes formed one of the most important groups among the zooplankton collected from the mesopelagic zone during the cruises conducted by *Sagar Sampada*. The present study is aimed to bring out the availability and distribution of the leptocephali in space and time in the EEZ of India.

Material and Methods

Samples for this study were obtained during the cruises (No. 1- 20) of FORV *Sagar Sampada*, using Isaacs- Kidd Midwater Trawl. The samples of leptocephali were sorted out and preserved in 10% formaledhyde solution. The sampling operations were mainly carried out during day and night from the Deep Scattering Layer. For each operation the net was towed at limited speed of 3 knots for 30 minutes. The stations covered fell between 00°00' and 23°00'N and 65°00' and 95°00'E, The leptocephali were measured and counted under binocular microscope following the methods adopted by Jespersen (1942) and identified as per descriptions by Smith (1979).

Results

It was observed that the leptocephali formed one of the major groups in the total biomass collected from the mesopelagic zone almost in all

the samples and particularly from the Arabian Sea. Leptocephali were recorded from the pelagic trawl catch from both the coasts and waters around Andaman and Lakshadweep islands. With regard to the depth distribution, the leptocephali were more abundant along the 1000 m depth zone whereas its abundance was at its minimum along the 200 m depth zone along the coasts. The biomass of leptocephali collected from the Arabian Sea off 1000 m depth zone was found to be maximum at all times and distributed from off Veraval to Trivandrum and around Lakshaweep and Maldives. Along the Bay of Bengal the larvae were distributed north of Gulf of Mannar and south of Paradip and they were also collected from the equatorial waters.

During the cruises 1- 20 a total of 719 stations were sampled and 255 stations recorded the presence of leptocephali (Fig. 1). The abundance of the larvae coincided with the night samplings from both the coasts. Leptocephali belonging to six families of the order Anguilliformes were identified, viz. Congridae, Synaphobranchidae, Netastomattidae, Ophichthyidae, Muraenidae and Nemichthyidae. The leptocephali of the order Elopiformes were also collected from two stations.

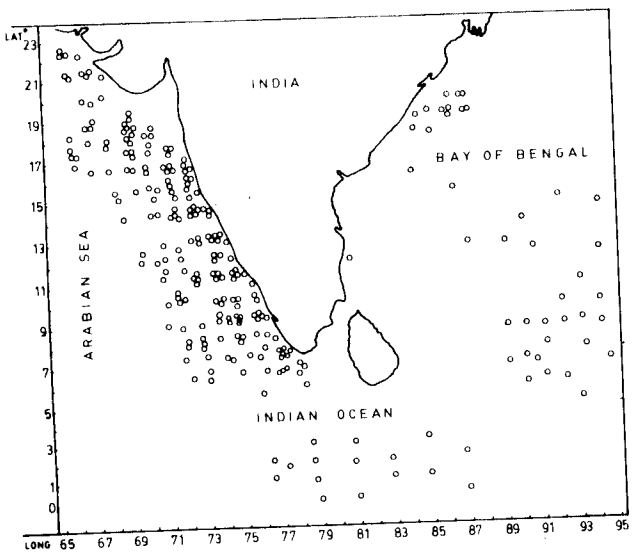

Fig 1. Distribution of Leptocephali in the EEZ of India.

The larvae of the family Congridae was the most dominant among others. The total length of the leptocephali ranged from 2 to 70 cm of different stages of metamorphosis.

Among Congridae the Ariosoma type larva with an outer intestine was found to occur at 37 stations. The total length of the larvae varied from 5 cm to 17. 8 cm. Based on the length of the outer intestine, the number of myomeres and melanophores, this larva can be grouped into different types (Mochioka *et al*., 1982). However, similar type of larvae have not been described by earlier workers from Indian waters. The distribution and abundance of exterillum type larva in the present observation is given in Fig. 2. It was found that the biomass of this type was high around Lakshadweep islands in particular and in the Arabian sea in general. Ariosoma type larvae were also recorded from four stations in the equatorial region and between south of Madras and Paradip along the east coast. There is no regular seasonality in the occurrence of this particular larvae and were collected throughout the year. The numerical abundance of the larvae was recorded during postmonsoon and premonsoon periods.

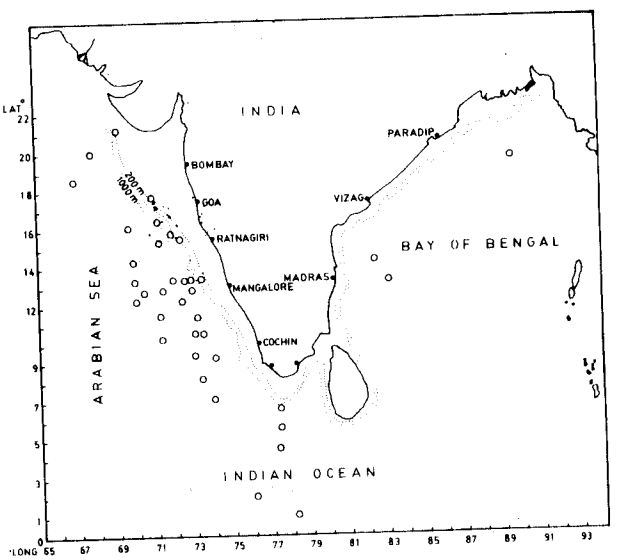

Fig 2. Distribution of Ariosoma type leptocephali in the EEZ of India.

Discussion

Earlier works on the distribution of anguillid leptocephali (Kleckner and Mc Cleave, 1985) have revealed that the high concentration follows the areas of upwelling and circulatory currents in the ocean. Nair (1947) stated that there is no seasonality in the occurrence of leptocephali and the eels in the tropics breed throughout the year. Seasonal variation in the abundance of ichthyoplankton in the Arabian Sea (Peter, 1973) was observed maximum during southwest monsoon in areas of upwelling and places under the influence of divergence. The

present study on the occurrence of leptocephali showed maximum during postmonsoon and premonsoon periods eventhough regular seasonality was not observed in seas around India. However, extensive analysis of the data is inevitable. The present observation on the occurrence and distribution of leptocephali indicated that maximum number of larvae as well as positive stations were located in the Arabian Sea where high salinity water masses (Sen Gupta *et al.*, 1976) existed. Kleckner and Mc Cleave (1985) observed a positive correlation between the distribution of American eel spawning, and the shallow, warm, high salinity watermass of the subtropical underwater. It is obvious in the present study that the distribution of leptocephali in Bay of Bengal and the equatorial waters were less when compared to Arabian Sea. It is observed based on the IKMT Samples that high Salinity and temperature of the midwater in addition to depth form the major factors associated with the distribution of the larva.

The continuous distribution of the Ariosoma type larvae in the Arabian Sea, around Lakshadweep Islands may probably be due to high salinity and temperature in addition to high surface productivity. Nair *et al* ., (1986) who detailed the environment around Lakshadweep have pointed out that the eddy-like circulatory motion of the waters helps to keep the fish eggs and larvae within the productive waters in the vicinity of the islands for a considerable length of time. The environment around Lakshadweep with the coral reefs are found suitable habitat for the eels to grow and breed as indicated in the present study. It seems possible that most species breed in the open sea as stated by Nair (1947) since the leptocephali were found in abundance at stations off 200 m depth zone on the west and east coasts of India. Without having adequate data of the pelagic trawl catch during the peirod of study and relating the major oceanographic parameters it is impossible to locate the breeding grounds in the Indian seas.

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