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## Distribution, abundance and biology of unicorn cod, *Bregmaceros mccllelandi* in the deep scattering layers of Indian Exclusive Economic Zone

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### ABSTRACT

In the deep scattering layer (DSL) the fishes have accounted for 5.4 % of the total (numerical) biomass. Juvenile fish belonging to different families were the most abundant component followed by Vinciguerria, myctophids, leptocephali, stomi-forms, and unicorn cod. The "unicorn cod is represented by a single species, *Bregmaceros mccllelandi* (2.4%) in the total fish biomass. It occurred in 52 stations out of 445 IKMT stations. During day time the average number per haul was 21 where as in night hauls it was 29. The resource was fairly abundant along the northwest coast within the depth belt of 200 m. Biological studies on the size composition, feeding habits, and reproductive biology of the species were also carried out. The length ranged from 10-65 mm. The major diet consists of copepods, euphausiids, cheatog-naths, ostracods and decapod larvae. Invariably the feeding intensity was low. The catch was composed of mostly females in maturity stages IV-V. The species spawns only once in a year. The fecundity ranged from 530 - 980 in fishes of 42 - 50 mm in total length.

### INTRODUCTION

*Bregmaceros mccllelandi* (Thompson), unicorn cod or the spotted codlet, belongs to the family Bregmacerotidae and is a small fish, distributed along the Indian waters extending to China and Philippines; entering estuaries. It forms a coastal fishery along the coasts of Maharashtra and Gujarat. In dol net fishery the landings are the highest in the October - December period and the lowest in months of June to September. The fishery starts from October after the southwest monsoon with peak landings, which dwindles by March. Along the other coastal regions of India it occurs only in stray catches (Rao, 1973). Menon (1990) reported that Bregmacerotidae formed about 2.4% in the total fish biomass (numerical) from the Isacc Kidd Mid Water Trawl (IKMT)

hauls of deep scattering layer (DSL). The biocomposition of the DSL of Indian EEZ has been described by Silas (1972), Menon (1990), Menon & Prabha Devi (1990) and Mathew & Natarajan (1990). In the total biocomposition meso zooplankton occupied an important component (94.6 %) and finfishes formed 5.4 %. Juvenile fishes belonging to different families were the most abundant component followed by Vinciguerra, myctophids, leptocephali, stomiforms and unicorn cod. They form important prey organisms for many surface shoaling fishes. The unicorn cod is represented by a single species, *Bregmaceros mccllellandi*.

The distribution of the unicorn cod in the deeper waters is not clearly studied so far. Information on the biology is also of vital importance in view of its role in the food chain of the major oceanic pelagic resources. In spite of this, very little attention has been paid towards a detailed study of this fish. Hence an attempt is made to study the distribution, abundance and biology of *Bregmaceros mccllellandi* collected by IKMT from the DSL of Indian EEZ by FORV SAGAR SAMPADA.

## MATERIALS AND METHODS

The material for this study was collected from the *FORV Sagar Sampada* cruises made during February 1985 - May 1986. The samples were collected from appropriate depths (invariably the principle layers) of DSL recorded by echo-sounder. The Isaac Kidd Mid Water Trawl (IKMT) was operated from 445 stations at a 3 knot speed of

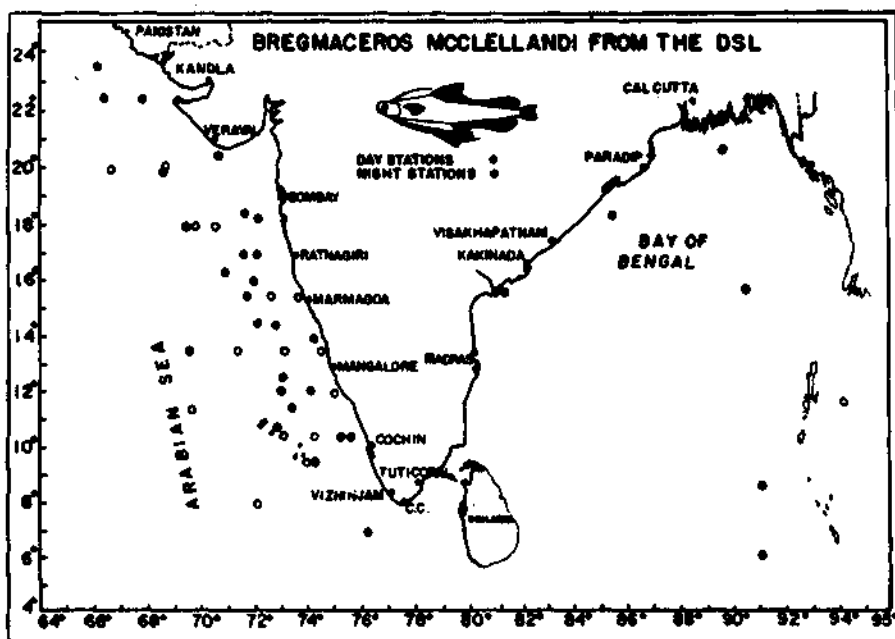


Fig. 1 - Station locations and general distribution of *B. mccllellandi*

which 364 stations yielded DSL biomass. *Bregmaceros maclellandi* occurred in 52 stations. The area (Fig.1) covered, the description of the gear and operational details are reported earlier Menon (1990), Menon & Prabha Devi (1990) and Mini Raman & James (1990). The species was separated for biological studies like length composition, food and feeding habits, maturity conditions, ova diameter frequency and fecundity by using standard techniques.

## RESULTS

The results of this investigation provide a preliminary knowledge of the horizontal and, depthwise distribution, food and feeding habits and its fecundity. Menon (1990) reported that fish abundance in DSL ranged from 0.01 to 45 g/1000 m in the total DSL fish biomass. Fish were recorded in 82 % of the total IKMT stations. Fishes of the family Bregmacerotidae formed about 2.4 % (numerical) of DSL; during day time it was 2 % and in the nighttime it was 2.7 %. It was reported from 52 stations. During daytime hauls the average catch was 21 number per haul and in night the IKMT brought 29 numbers per haul.

*Horizontal distribution* — The DSL, IKMT day and night stations where *B. maclellandi* reported during February 1985 to May 1986 are shown in Fig.1. The unicorn cod is fairly well represented in the northwest coast especially along 15° - 19° N latitude; whereas its occurrence was moderate along southwest coast and Andaman and Nicobar waters. The species was recorded in 22 stations in northwest and 20 stations in the southwest coast of Indian EEZ. The important areas of abundance in all the regions where the catch per haul was more than 10 numbers are given in Table 1.

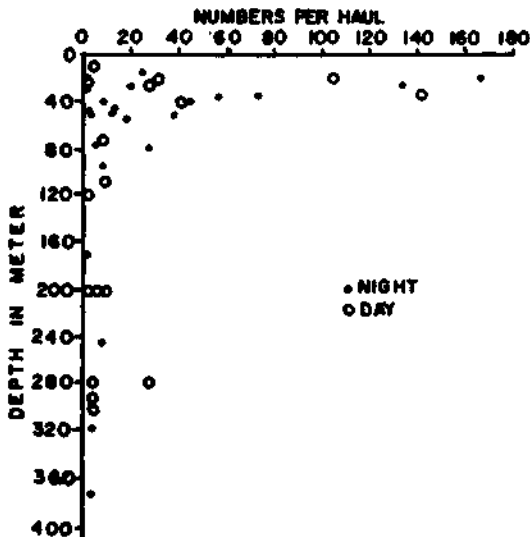


Fig. 2 - Depthwise distribution of *B. maclellandi*

Table 1 - Major area of abundance of *Bregmaceros maclellandi* in the DSL of Indian EEZ

Region	Position		Time	Catch (No/haul)
	Lat. (N)	Long (E)		
Northwest	16°25'	70°54'	N	70
	19°59'	68°30'	D	27
	20°30'	69°30'	N	57
	23°30'	66°00'	N	43
	22°30'	66°21'	N	14
	18°30'	71°30'	N	19
	15°30'	73°20'	D	105
	18°20'	72°02'	N	166
	19°40'	70°40'	D	141
Southwest	13°30'	71°24'	N	51
	10°29'	75°30'	N	74
	15°00'	73°00'	D	44
	14°00'	74°10'	N	25
	12°00'	72°59'	N	21
	08°00'	71°58'	D	29
Northeast	18°33'	85°28'	N	27
	20°57'	89°31'	N	32
A & N Islands	09°00'	91°01'	N	12
	14°50'	92°00'	N	42
	15°00'	87°18'	N	37
	15°00'	90°31'	N	133

*Depthwise abundance* — It is clear that the fish were common in DSL depth range with in 200 m. Fairly high catch was recorded during nighttime in the surface layers upto about 80 m (Fig.2).

*Size frequency distribution* — The distribution of the size composition is based on the study of 400 fishes. The total length ranged from 10 - 65 mm with one or two modes in each months. The monthwise, latitudewise length frequency distribution is given in Fig.3. From the size group studies it is evident that in the DSL the unicorn cod is composed of the size groups 10 - 65 mm.

*Food and feeding habits* — One of the most important problems of fishery research is the investigation of the nutrition of fish in order to understand the qualitative and quantitative connection between them and their food organisms. This

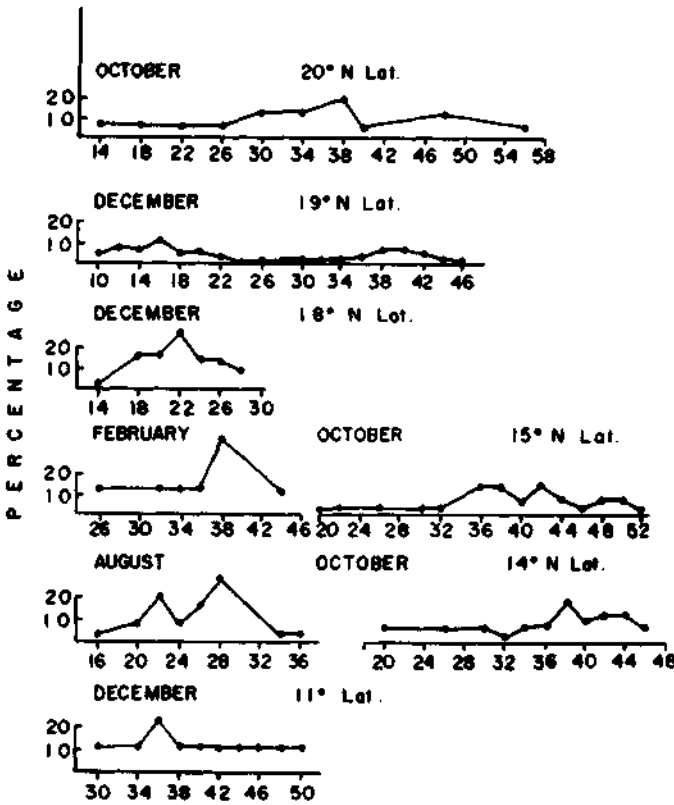


Fig. 3 - Monthwise and latitudewise size distribution of *B. mccllellandi*

provides valuable data not only for the determination of the food chains, but also about the shoaling and migratory habits of the fishes. *B. mccllellandi* forms a major food item of many scieanids, polynemids and other fishes. In the DSL unicorn cod was caught along with many mesozooplankton and it feeds on these organisms.

A total of 300 fishes collected from the DSL, in the size range of 20 - 52 mm of both the sexes were utilised for the study. Generally the feeding intensity was found to be very low. Greater feeding activity was observed in the samples collected during early morning hours of 0400 - 0600 hrs. The feeding intensity was relatively less during day time. In the night samples the fish showed a complete cessation of feeding as evidenced by 100 % empty stomachs. *B. mccllellandi* feeds mainly on the DSL components by selecting a few smaller organisms. The main food was found to be copepods (35.7%), smaller crustaceans (10.7 %), ostracods (9.5 %), cladocerans (4.1%), and small fishes (3.6%). Infrequent items were euphausiids and chaetognaths. The digested matter constituted a good portion (16.7%) and it is mainly of smaller crustaceans (Fig.4). *B. mccllellandi* caught from the DSL showed a preference for smaller planktonic organisms like copepods, ostracods and crustacean larvae, may be

due to the small mouth opening. The feeding generally takes place in the surface layers during early morning hours.

**Maturity conditions** — Pre-adults were observed during October - February. The fishes were found to be in maturing conditions throughout the period. The matured and the gravid (ripe) gonads were observed during October - December. The ratio between male and female is M: F = 1 : 1.8.

**Ova diameter study** — Gonads of mature fish of *B. mccllellandi* were examined for ova diameter studies and the frequency distribution (Fig.5) showed a bimodal distribution with a single group of most mature ova, the size ranging from 0.446 - 3.568 mm. This is a clear indication that *B. mccllellandi* spawns only once in a season.

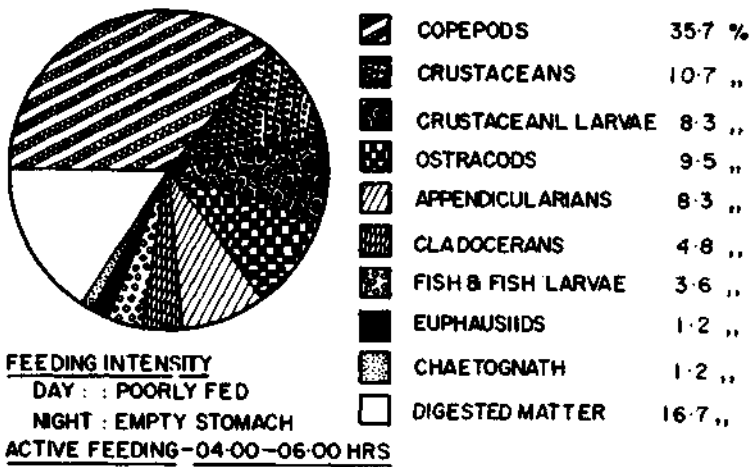


Fig. 4 - Food and feeding habits of *B. mccllellandi*

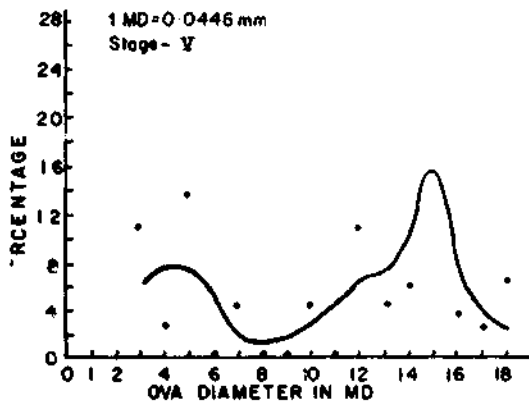


Fig. 5 - Ova diameter polygon on *B. mccllellandi*



**Fecundity** — The fecundity of *B. mccllellandi* was estimated from 15 fishes of the maturity stage V in the size group 40 - 50 mm. The number of most mature ova ranged from 530 - 980 with a mean of 730 ova.

## DISCUSSION

The distribution of *B. mccllellandi* from the DSL showed a good concentration along the coasts off Bombay and Ratnagiri. Another area of good concentration were observed at 10° 29' N - 75° 30' E near the southwest and at a pocket in Andaman waters. It is well-known that good *B. mccllellandi* fishery exist at Bombay by dol nets. Banerji (1973) opined that with slight decrease in fishing effort, it is possible to gain an increase of about 10 % in the yield. Except Maharashtra and Gujarat, nowhere does a commercial fishery exist for this fish. Since the availability of this resource in the DSL shows the possibility of a future fishery in the oceanic waters, attempts may be made to develop a fishing programme for the species considering the market value of this fish due to its palatability. The sporadic availability of juveniles of *Bregmaceros* spp in the southwest coast was earlier pointed that among the fish larvae, *Bregmaceros* composed 4 % (Anon, 1975, 1976). Jones & Pantulu (1958) reported the larvae and juveniles of *B. mccllellandi* in Bengal and Orissa coast. Eventhough the availability of larvae and juveniles occurred in southwest coast and northeast coast there is no commercial fishery for the unicorn cod in these areas; may be due to the larger mesh size of the commercial fishing net used in these areas. In the east coast it is evident that *B. mccllellandi* available in the area forms a food component of *Saurida tumbil*, *Apogon septenstriatus*, *A. nigripinnis*, *Chorinemus lysan*, *Johnius anaeus*, *Upeneus sulphureus*, *Trichiurus haumela*, *Pseudorhombus triocellatus* and *Uranoscopus lebech* (Rao, 1964) and the catfish, *Tachysurus thalassinus* (Mojumder, 1969).

In the coastal waters off Waltair, crustaceans constituted the food of *B. atripinnis* (*B. mccllellandi*) of which prawns were very important (Rao, 1994). The food chain in the DSL is not clearly studied so far and no relationship can be attempted now. But, by and large, *B. mccllellandi* is found to feed on copepods, ostracods and other smaller planktonic organisms from the DSL and the larger pelagic organisms may consume a considerable amount of *B. mccllellandi*. Bapat & Bal (1952) stated that *Otolithus argenteus*, *Sciaena glacuc*, *S. miles*, *S. semiluctosa* and *Apogon bandanesis* were all feeding the *B. mccllellandi*, Suseelan & Nair (1969) found the *B. mccllellandi* in stomachs of *Otolithus ruber*, *Johnis dussumieri*, *Pomadayas hasta* and *Polynemus heptadactylus*. Kagwade (1970) found *B. mccllellandi* in the stomachs of *Polynemus indicus*, *P. heptadactylus* and *P. plebeius*. Bapat (1970) reported that Bombay duck feeds on *B. mccllellandi*. The Koth, *Otolithoides brunneus* fed on *B. mccllellandi* (Jayaprakash, 1971). So this unicorn cod is evidently an important link in the food chain of many commercially important species.

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