SOME OBSERVATIONS ON THE FISHERY AND BIOLOGY OF THE RIBBONFISH *EUPLEUROGRAMMUS GLOSSODON* (BLEEKER)

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ABSTRACT

In the Kakinada area *Eupleurogrammus glossodon* forms a minor seasonal fishery from June to October. The caatch composition for the period 1966-71, length-weight relationship, size at first maturity, spawning, fecundity, and food are briefly dealt with.

INTRODUCTION

In the course of studies on the fishery and biology of various ribbonfish species from the Kakinada area, it was observed that, while *Trichiurus lepturus* Linnaeus was dominant, *Eupleurogrammus glossodon* (Bleeker) occurred in small quantities in the commercial catches. Except for the work of James (1961 and 1967), there is no information available on this species. The results of a 6-year study, from 1966 to 1971, on the fishery and biology of *E. glossodon* from the Kakinada area are dealt with in this paper.

MATERIAL AND METHODS

The area of study, details of craft and gear operated, method of data collection and treatment are the same as given by Narasimham (1976). For grading the food items in postlarvae the Points method, and in juveniles and adults, the Index of preponderance method (Natarajan and Jhingran 1961) were followed. Four post-larvae and juveniles measuring 34.5, 59, 62 and 110 mm were deposited in the Reference Collecton museum of the Central Marine Fisheries Research Institute and bear registration No. CMFRI-F, 126|373b.

THE FISHERY

In the ribbonfish fishery of the Kakinada area *E. glossodon* formed a minor component, as revealed by the catches at the 3 landing centres (Table 1). At Dummulapeta, where the country craft operated shore-seines, boat-seines and gill nets, the yearly landings varied from 433 kg in 1968 to 3060 kg in 1967. It formed 2.1 to 13.9% in the total ribbonfish catch. At Uppada, where similar craft and gear operated, the annual landings of *E. glossodon* varied from 216 kg in 1970 to 6385 kg in 1968, and they formed less than 2% of total ribbonfish catch. At both landing centres, gear-wise, in shore-seines *E. glossodon* formed on an average 8.69% (range 5.4 to 28.6%), in boat-seines 0.52% (range 0.2 to 1.3%) and in gill nets 0.48% (range 0 to 2.5%) of ribbonfish catches during different years. The increased catches at both Dummulapeta and Uppada in 1966 and 1967 were due to increased effort by shore-seines, compared to other years. The fishery for *E. glossodon* is seasonal from June to October (Table 1). At Kakinada fishing harbour, from where mechanised boats operated otter trawls, the maximum annual catch of this species is 152 kg. On an average, it formed 0.076% (range 0 to 0.36%) of total ribbonfish catches (Table 1). *E. glossodon* in commercial catches varied in length from 16 to 49 cm.

THE OCCURRENCE OF POST-LARVAE

The post-larvae are easy to identify as they resemble the adult in the diagnostic characters of the species, such as the presence of median lateral line, 3 dorsal spines, pelvics and the origin of anal fin below D 31-32. The latter character was found to be very useful to separate the post-larva of *E. glossodon* from that of its congener *E. muticus*, which has the anal origin below D 34-42. The specimens measuring up to 60-80 mm length showed serrations on the frontal, the pelvics and the anterior margin of the 3 dorsal spines. The pelvic spines were transformed into the characteristic scale-like structure of the adults beyond 80 mm length. Further confirmation of the identification of the material was obtained by Alizarin staining of 4 specimens which measured 35, 45, 59 and 60 mm. The following is the range for the meristic characters studied and they are within the range given by James (1961) for this species: total vertebrae 161-162; precaudal vertebrae 31-32; caudal vertebrae 129-131; dorsal fin rays 111, 125-127; dorsal extends up to vertebra number 128-130; fin rays i + 1, 117-118; and anal extends up to vertebra number 150. In the 35- and 45-mm post-larvae, only pre-caudal vertebrae were counted as calcification was incomplete in the caudal region.

The most significant feature noticed in the post-larvae was the presence of caudal fin. The middle caudal rays were elongate and measured up to 2.3 mm. The caudal fin was present in 89.3, 69.0, 38.2 and 2.4% of the fish in the length range 33-40, 41-50, 51-60 and 61-70 mm, respectively (Table 2). Beyond this size it was shed in all the specimens. As suggested by Jones (1967), specimens up to 41-50 mm length may be called post-larvae since majority have caudal fin. After this length they pass into the juvenile stage by shedding the caudal fin. The description of a 59.5 mm specimen given by James (1967) agrees with the description of fish of comparable length. The post-larvae occurred for 5 months, April, May, July, October and November, during the different years and were particularly abundant in July 1967 (Table 2).

TABLE 1. *Ribbonfish landings in kg and percentage composition of* E. glossodon *in it during* 1966-71 *at Dummulapeta, Uppada and Kakinada Harbour.*

Type of net	Year	Total fish catch in tonnes	Ribbonfish catch (% in total fish catch)	*E. glossodon* catch (% in ribbonfish)	Peak months of occurrence of *E. glossodon*
DUMMULAPETA					
Boat-seine, gillnet and shore-seine	1966	1305	19,486 (1.48)	2,715 (13.93)	Jun-Aug
	1967	1710	109,840 (6.42)	3,060 (2.78)	Jul, Aug & Oct
	1968	1026	20,784 (2.03)	433 (2.08)	
	1969	1415	9,600 (0.68)	667 (6.95)	Aug & Oct
	1970	950	21,793 (2.29)	964 (4.42)	Sep & Oct
	1971 (11 months data)	506	20,652 (4.08)	1,005 (4.87)	Dec
UPPADA					
Boat-seine, gillnet and shore-seine	1967 (10 months data)	970	265,447 (27.36)	2,667 (1.0)	Jun & Jul
	1968	1908	323,098 (16.93)	6,385 (1.97)	
	1969	1593	198,544 (12.46)	1,067 (0.54)	Aug & Sep
	1970	969	51,406 (5.30)	216 (0.42)	Aug
	1971 (8 months data)	649	98,716 (15.21)	636 (0.6)	Aug
KAKINADA HARBOUR					
Otter trawls	1967	792	23,892 (3.01)	86 (0.36)	
	1968	1697	76,483 (4.55)	110 (0.14)	
	1969	1300	54,457 (4.19)	nil	
	1970	1456	59,391 (4.08)	nil	
	1971	2309	236,230 (10.23)	152 (0.06)	

TABLE 2. *Occurrence of post-larvae and juveniles of* E. glossodon *(Also shown is the size at which caudal fin is shed).*

Length	1966			1967					1968		Total	Number with	% with
(mm)	May	Oct	Nov	Mar	Apr	May	Jul	Aug	Mar	Apr		caudal fin	caudal fin
33-40	—	7	2	—	—	2	17	—	—	—	28	25	89.3
41-50	—	4	4	—	—	1	15	—	—	2	26	30	69.0
51-60	—	2	8	—	—	—	19	—	—	5	34	13	38.2
61-70	—	1	—	—	1	2	68	—	—	10	82	2	2.4
71-80	—	1	—	—	—	2	87	—	1	19	110	—	—
81-90	—	—	—	—	—	4	32	—	—	7	45	—	—
91-100	—	—	—	1	1	—	15	—	—	6	23	—	—
101-110	2	—	—	1	—	—	11	1	—	5	20	—	—
111-120	2	—	—	—	1	—	9	—	—	7	19	—	—
Total	2	15	14	2	3	11	273	1	1	61	385		
Min. size	105	33	34.5	97	68	34	35	107	71	45	33		
Max. size	120	78	57	102	118	90	119	—	—	119	120		

LENGTH-FREQUENCY ANALYSIS

The otoliths did not show any growth checks to be of use in age determination. As the fishery was seasonal, growth was studied by the length-frequency analysis for a period of 4 to 5 months in a year (Figure 1). The length-frequency distributions were multimodal, but generally the dominant size groups were present in the 19-31 cm range. In May 1966 mode A was present at 21 cm

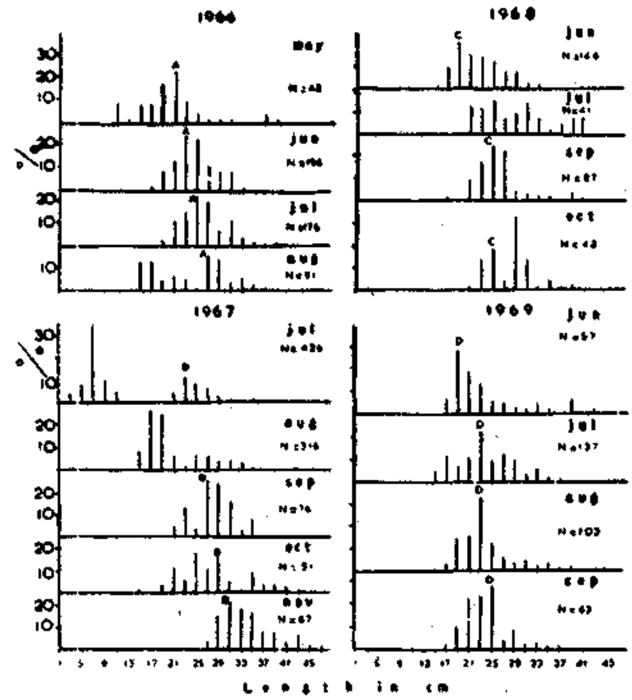

FIG. 1. Length-frequency distribution in *E. glossodon*. N indicates the number of fish measured.

and it progressed to 27 cm by August, which gave a growth rate of 2 cm|month. In the follwing year mode B, present at 23 cm in July, could be traced to 31 cm by November and the growth rate was 2 cm|month. In June 1968 mode C, present at 19 cm was traced to 25 cm by October. Here the monthly growth rate worked out to 1.5 cm. Mode D present at 19 cm in June 1969 shifted to 25 cm by September and the monthly growth rate was 2 cm. It may be summarised that the fish measuring 19-23 cm modal length have shown a growth rate of 1.5 to 2.0 cm per month for 3-4 months. A noteworthy feature was the occurrence of modes between 23-25 cm in July in all the years except 1968. The spawning period in this species was prolonged (*vide infra*). Added to this, the seasonal nature of the fishery rendered it difficult to establish the age of the fish for which the modal progression was studied.

Length-weight Relationship

The length-weight relationship was studied in 102 fish measuring 22.5 to 46.5 cm in length. The following regression equation describes the logarithmic relationship between the length and weight in *E. glossodon* (Figure 2).

$$\text{Log } W = -2.9398 + 2.8202 \text{ Log } L$$

Where W = weight in g and L = Length in cm. The correlation coefficient for the regression is 0.9638 which indicates a high degree of correlation. The t test was applied to see whether the regression coefficient differs from 3. In *E. glossodon* t was found to be 2.3053 (d.f. = 100, $t_{1\%}$ = 2.625; $t_{5\%}$ = 1.982). The regression coefficient is significant from 3 at 5% level but not at 1% level.

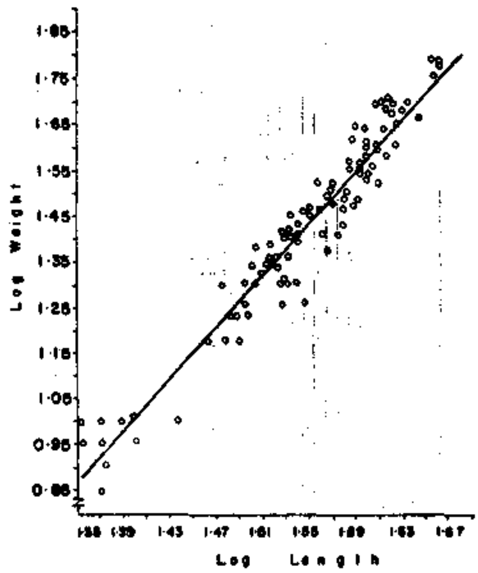

FIG. 2. The logarithmic relationship between length and weight in *E. glossodon*.

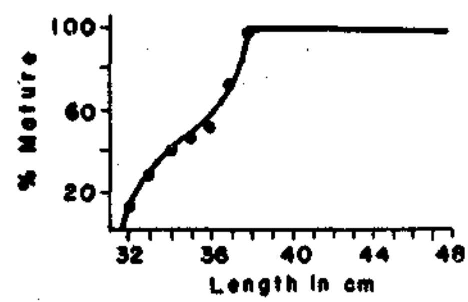

FIG. 3. Size at sexual maturity in *E. glossodon*.

Size at First Maturity

A total of 472 fish were studied. Mature fish formed 13.3% at 30 cm length and their percentage increased to 46.7% at 35 cm length (Figure 3). Majority of the fish (53.3%) were mature at 36 cm length and cent percent maturity was attained at 38 cm length. The smallest fish with spent gonads measured 33 cm.

Spawning

Figure 4 shows that immature fish (stage I and II) were available in all the months studied. Among the mature fish, stage III were available in all the months. Stages IV|V (stage VI absent in collections) occurred during June to August and October to January. Further, during these months the spent fish (stage VII) often showed blood-shot ovary with distorted residual ova, indicating recent spawning. The availability of considerable proportion of mature fish in stage IV and V, together with the occurrence of spent fish with indications of recent spawning, suggests that in *E. glossodon* spawning takes place

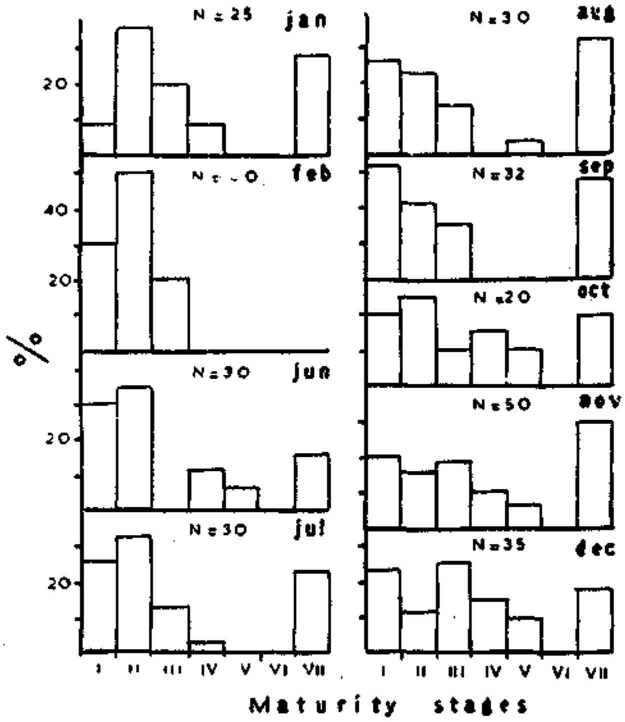

FIG. 4. Percentage occurrence of different maturity stages. N. indicates the number of fish studied.

off Kakinada during June-August and October-January period. The ova-diameter-frequency polygons of fish in different maturity stages are similar to figure 34 given by James (1967). In stage V ovary, apart from the immature stock of ova, two distinct groups, one with a mode at 1.62 mm and the other with a mode at 0.45 mm, were observed. The former group was compact and sharply differentiated from the latter, which indicates that in individual fish the duration of spawning for this group of ova will be of a short time. The presence of the second group, represented by ova with made at 0.45 mm, would suggest that the fish may spawn more than once in the spawning period.

Fecundity

The fecundity was studied in 9 fish varying in length from 38.7 to 46.5 cm. It varied from 2403 to 8429 ova per fish (Table 3). The fecundity data show considerable variation between fish of the same length or comparable length. In general, the number of ova increased with increase in the size of fish.

TABLE 3. *Fecudity in* E. glossodon.

Date	Fish length (cm)	Fish weight (g)	Maturity stage	Ovary weight (g)	Fecundity
29-12-69	38.7	37	V	1.823	3012
30-6-69	40.5	50	V	1.641	2403
14-11-67	41.0	43	V	2.414	3765
14-12-66	41.0	47	V	1.948	2927
25-10-67	42.6	56	V	3.214	7424
13-11-67	43.3	50	V	2.421	6742
3-10-66	44.5	48	V	3.402	5176
12-10-66	45.8	54	V	4.624	8429
29-6-67	46.5	60	V	3.848	6428

Food

Postlarvae: The food was studied in 25 post-larvae measuring 33 to 50 mm. The incidence of empty stomachs was high (16%). The average feeding intensity was 29.2 points which showed that the stomachs were more than a quarter full. Among the important food items calanoid copepods ranked first (63.2%), followed by prawn larvae (24.6%) and anchovy larvae (10.2%).

Jueniles: A total of 249 fish of the size 120 to 339 mm were studied. Empty stomachs formed 13.5%. Cannibalism was observed in one fish. The feeding intensity was high (38 points) which indicates that the stomachs were about half full. Among the gut contents fishes (larvae and juveniles of clupeoids and carangids) ranked first (90.0%), followed by prawns (7.7%), represented mostly by *Acetes*. Traces of other food items observed were *Lucifer*, crab larvae and stomatopods.

Adults: A total of 67 fish in the size range 380-460 mm were studied. The incidence of empty stomachs was high (20.9%). The feeding intensity was moderate (27.4 points) and the stomachs were more than a quarter full. Marked preference for fish (90.6%), mostly comprised of larvae and juveniles of clupeoids and carangids, was observed, followed by prawns (8.1%). On a few occasions stomatopods and crabs were also bserved.

The analysis of the gut contents of juveniles and adult fish collected from boat-seines and shore-seines did not reveal any noticeable difference in the food composition between gears.

The results obtained by the present author on size at first maturity, spawning, fecundity and food in *E. glossodon** are generally in agreement with the observations of James (1967) on the same species. Although the post-larvae were collected from bottom trawls, the planktonic nature of their gut contents shows that they are pelagic like other ribbonfishes (Narasimham 1972 and 1976), and were caught obviously at the time of hauling of the nets. The occurrence of the post-larvae for a considerable period of time indicates that *E. glossodon* spawns off Kakinada over a number of months.

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