Preliminary Observations on the Lunar and Tidal Influences on the Catches of Mullets (Family-Mugilidae) by Gillnet in the Estuary of Mangalore, Karnataka

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The paper deals with the lunar and tidal influences on the catches of mullets (Family-Mugilidae) by gillnets in the estuarine waters of Mangalore. The landings during full-moon and new moon phases and during different quarters of the lunar month for a period from October 1990 to April 1991 are discussed.

Among the many fish resources of the estuaries and backwaters, mullets (Family-Mugilidae) constitute an important group. The chief fishing method employed for the capture of this commercially significant fish resource is gillnetting. The fish catching efficiency of the gear depends upon the gear material used, construction of the net, mesh size and environmental parameters of the fishing ground. Among the various environmental parameters, information regarding effects of moon- phases and tides on the catching efficiency of the gear are meagre. Isomae (1894), in his account on driftnets for bluefin tuna, observed that the number of tuna gilled on dark nights was greater than that on moonlit nights. Savage & Hodgson (1934) recorded that the herring driftnet catch, on the east coast of England, was greatly influenced by the phase of the moon. Liu (1957) also reported that the fish catch has a direct relationship to the phase of the moon or to the sequence of the tides. Racek (1959), while investigating the prawn fisheries of the estuaries and off shore waters in New South Wales, distinguished the effects of lunar phase on diurnal movements and the migrations of prawns towards off shore waters. Ingle *et al.* (1959) and Iverson & Idyll (1959) stated that the prawn catch in Tortugas, Florida, was very poor when the moon was full. Nomura (1959 and 1961) and Hopson (1962) are of the opinion that moon is one of the several factors influencing the behaviour of fish. Stewart (1988) reported on the effects of tidal flow on the headline heights of bottom set gillnets set perpendicular to the flow and found that the headline height lowers at peak tidal flows.

Subramanyam (1965) observed a significant relationship between the lunar, diurnal and tidal rhythms and the prawn catch by gillnets in Godavari estuary. Mathai *et al.* (1971) also found a similar relationship on the catch of seer fish (*Scomberomorus* spp.). They also stated that the best period for the efficient exploitation of seer fish was darker nights with low tide.

As the authors have not come across with any similar information pertaining to mullet fish resources of the estuaries, an attempt has been made to study the lunar and tidal influences on the catches of mullets in the estuary of Mangalore.

Materials and Methods

Weekly experimental fishing was carried out from October 1990 to April 1991 using a gillnet of 75 m hung length, 3.6 m depth and 40 mm mesh size. The net was fabricated out of 0.2 mm dia nylon

monofilament twine. The design details of the gear is shown in Fig.1.

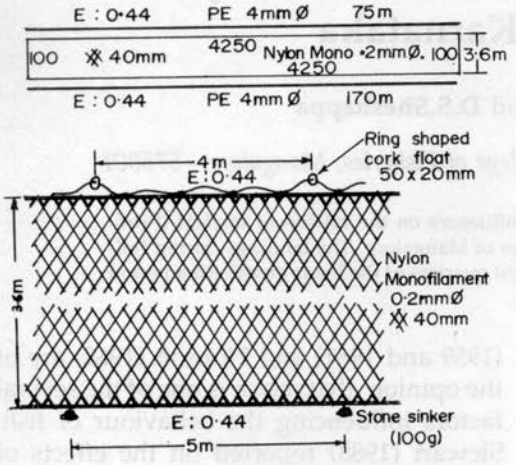

Fig. 1. Details of experimental gill net

Experiment was carried out in the same ground within 3 m depth in Netravati Gurupur estuary of Mangalore. The net was set during the evening hours at 5.30 P.M. on all the days of fishing for a period of 3 h. During each fishing operation the information such as the tide, the phase of the moon and its visibility at the time of fishing were noted. Even though the catch comprised of various types of estuarine fishes, the catch particulars of mullets (Family-Mugilidae) were recorded separately for the present study.

Results and Discussion

A total number of 28 fishing operations were conducted during the period from October 1990 to April 1991. Table 1 gives the details of catch of mullets in each quarter of the lunar month with the periods of full visibility, partial visibility and non-visibility of the moon. Table 1 also details the total catch, the average catch per haul and the average weight of fish during the entire period of experiment. Similarly, Table 2 represents the catch details of mullets during the low tide and high tide with reference to the visibility of moon.

Out of the total of 28 hauls, 14 hauls were made during the new moon phase and the remaining during the full-moon phase. The total catch during these two phases (Table 1) indicates that during the new moon phase the mullets were landed more in quantity with 235 number of fishes weighing 12.76 kg. while during the full-moon phase, the number of mullets caught

Table 1. *Catch of mullets (Family-Mugilidae) caught in the experimental gillnet during new moon and full moon phase and the quarters*

		Moon visibility: Fully visible				Partially visible				Non-visible						
		No. of hauls	No. of fishes	Wt. kg.	Wt./haul kg.	No. of hauls	No. of fishes	Wt. kg.	Wt/haul kg.	No. of hauls	No. of fishes	Wt. kg.	Wt/ haul kg.	Total catch kg.	Av. catch/ haul kg	Av. wt of fish kg
New moon phase	First quarter	5	87	4.3	0.87	0	-	-	-	2	37	2.55	1.28	6.89	0.98	55
	Second quarter	-	-	-	-	3	41	2.1	0.7	4	70	3.80	0.95	5.90	0.84	53
	Total	5	87	4.3	0.87	3	41	2.1	0.7	6	107	6.3	1.10	12.8	0.91	54
Full moon phase	Third quarter	-	-	-	-	-	-	-	-	7	74	4.5	0.65	4.5	0.64	61
	Fourth quarter	5	55	3.5	0.71	2	4	0.21	0.11	-	-	-	-	3.8	0.54	63
	Total	5	55	3.5	0.71	2	4	0.21	0.11	7	74	4.5	0.65	8.3	0.59	62

were 133 weighing 8.3 kg. The average catch (kg/haul) during new moon phase is almost double than that during full-moon phase. The average weight of fish caught during the entire period indicates that the majority of the fishes caught were immature since mullets during its maturity usually weigh around 80 g. In Table 1, it can be seen that the average weight of fish caught during new moon phase is 54 g which is much less than that of the average weight of fish caught during full-moon phase (63 g). However, it can be concluded that the mullets are caught in more quantities during the period of new moon phase than during the full-moon phase. A perusal of the total catch obtained in each quarter (Table 1) indicates that the first quarter landed the highest number of fishes (124 numbers) with highest average weight of mullets per haul (0.98 kg/haul). The number of fishes during the remaining quarters reduced progressively with the least of 59 numbers in fourth quarter and the average weight of mullets per haul were only 0.54 kg. Even during the first quarter, the non-visible period yielded better catch than the fully visible period. In the second quarter, comparing the catches between the non-visible and partially visible period, the non-visible period yielded better catch. During the third quarter, all the seven fishing operations invariably had non- visibility of moon but this falls under full-moon phase and the catch was better than the catch in fourth quarter which comprised both fully and partially visible periods of the moon. However, it can be observed that in the fourth quarter better catches were obtained during fully visible period than partially visible period. This may be due to the interactive effect of tides during the period of fishing operation in that quarter.

A perusal of the Table 2 shows that average number of fishes per haul landed during high tide is almost one and half times more than that landed during low tide with average catches of 0.824 kg and 0.656 kg per haul respectively. The average weight of fish caught was less during high tide (52 g) than during low tide (68 g). It seems that fish activities are more during high tide and the probability of fish getting caught in this period is also more. During low tide, the catch of mullets was better during non-visibility of the moon. However, from Table 2 it can be noted that during the low tide the catch was higher when the moon was fully visible than that when it was partially visible. Since the number of fishing operations during the partially visible period was only two, it is difficult to be conclusive regarding these results. The good catch obtained during the high tide and the different visibility periods of moon indicates that fishing during high tide is the best time of the day to catch mullets in estuarine waters.

Table 2. *Catch of mullets (Family-Mugilidae) in experimental gillnet during low and high tides*

	Moon visibility														
	Fully visible				Non visible				Partially visible						
	No. of hauls	No. of fishes	Wt. kg	Wt/ haul kg	No. of hauls	No. of fishes	Wt. kg	Wt/ haul kg	No. of hauls	No. of fishes	Wt. kg	Wt/ haul	Total catch kg	Av. catch/ haul kg	Av.wt of fish kg
Low tide	5	55	2.8	0.56	5	54	4.1	0.8	2	6	0.34	0.17	7.87	0.656	68
High tide	5	89	4.4	0.88	8	125	6.8	0.85	3	39	1.97	0.66	13.19	0.824	52

The mullet landings are not only effected by the moon visibility but also by the tidal state. The best period for the operation of gillnets for the efficient exploitation of mullets in estuaries and backwaters is the darker nights with high tide. Further, the mullet catch during new moon phase is better than during the full-moon phase in a lunar month.

The authors are grateful to the Director of Instruction, College of Fisheries, Mangalore for providing the facilities for carrying out this study.

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