Observations on the Lunar and Tidal Influence on Gill Netting in the Bay of Bengal

S. PATI

Department of Zoology, Ravenshaw College, Cuttack-753 003

The effect of lunar and tidal influence on the landing of pelagic fish with drift gill nets has been studied for the first time from Bay of Bengal along the Orissa coast. The catchability of the gear was highest during the first quarter and lowest in the fourth quarter of the moon. The variation in catch rates during the four different quarters was not statistically significant. Contrary to the earlier belief, landing with gill net was not poor during the moonlit nights. The extensive use of bluish grey nylon twine matching with seawater in place of indigenous hemp or cotton twine, has largely eliminated the visibility of gear during the brighter phase of the moon. The rate of exploitation was found to be significantly higher during the nights of neap tide, compared to those of spring tide. A plausible explanation for this phenomenon has been offered.

The coastal fishery is governed by several biotic and abiotic factors. The moon is one of the factors which determines the behaviour of a fish (Nomura, 1959; 1961 Hopson, 1962) and consequently its fishing. Variation in the catch owing to lunar and tidal influence is reported by Isomae (1894), Savage & Hodgson (1934), Hickling (1946), Rounsefell & Everhart (1953) and Liu (1957). From India, Jayaraman *et al.* (1959), Subramanyam (1965), Bhatt *et al.* (1967) and Kagwade (1972) have made brief observations in the variation of trawl catch in relation to the phases of moon from the Arabian sea. Although drift gill nets contribute to a major part of the pelagic fish landing of India, very little is known on the effect of moon on the gill net catch. Excepting a preliminary study by Mathai *et al.* (1971) on the landing of seer by gill nets from Cochin waters, no other information is available on this respect from the Indian subcontinent. The present paper deals with the lunar and tidal influence on the gill net catch from the Orissa coast, washed by the Bay of Bengal.

Materials and Methods

The data were collected from Chandipur, an important gill netting centre of Orissa coast. The fishing season extends from September to March and the gill nets are operated in the night from mechanised boats. The daily landing data recorded by the Orissa State Fisheries Department from 1969-'70 to 1974-'75 were analysed. As the number of boats in operation varied during the period of investigation, the catch per boat day was considered to be the catch per unit effort. The phases of the moon were followed according to the Indian calendar and the lunar month was divided into four quarters. The total quantity of fish landed during each quarter was recorded separately. The landing during the spring tides of full-moon and new-moon were compared with the neap tide catch of the first and third quarters.

Results and Discussion

The total effort in boat days and the corresponding landing during each quarter of the lunar month is appended in Table 1. The average catch was observed to vary in different quarters with a maximum in the first and minimum during the fourth quarter. To ascertain the significance if any of the lunar phase on catch, the catch per boat day for all the four quarters were subjected to chi-square (X^2) test. The calculated chi-square with 3 d.f. was 1.58, indicating that the catch rate with drift gill net in different quarters of the lunar month was not significant. The catchability during bright phase (first and second quarter) were compared with that of the dark phase (third and fourth

Table 1. *Statistics of gill net catch by the mechanised boats from Chandipur during different lunar phases*

	First quarter		Second quarter		Third quarter		Fourth quarter	
	no. of boat days	Total catch kg	no. of boat days	Total catch kg	no. of boat days	Total catch kg	no. of boat days	Total catch kg
1969–70	908	73,192	919	61,850	924	61,153	697	32,188
1970–71	844	75,693	847	68,182	971	89,229	641	59,537
1971–72	1,059	74,964	616	32,056	1,082	67,003	530	31,441
1972–73	948	56,789	566	23,375	851	35,238	527	31,152
1973–74	315	39,947	273	29,796	476	52,893	321	19,726
1974–75	568	30,065	445	28,183	322	19,859	330	13,382
Total kg	4,642	350,650	3,666	243,442	4,626	3,25,375	3,046	187,426
Average kg		75.53		66.40		70.33		61.53

Table 2. *Statistics of gill net catch from Chandipur during spring and neap tides*

	Spring tide		Neap tide	
	no. of boat days	Total catch kg	no. of boat days	Total catch kg
1969–70	209	7,900	303	22,907
1970–71	226	16,288	265	24,135
1971–72	168	5,854	245	24,043
1972–73	135	5,613	233	16,021
1973–74	48	5,407	102	14,224
1974–75	152	5,609	136	10,743
Total kg	938	46,671	1,284	112,073
Average kg		49.75		87.28

quarter). The calculated chi-square for 1 d.f. was observed as 0.15, showing no significant difference in the catch between the bright and dark phases of the moon.

The landing data with gill nets during spring tides and neap tides are presented in Table 2. The catch rate was observed to be higher during the neap tide compared to that of spring tide. The chi-square with 1 d.f. was 10.09 indicating significant difference between the two tides.

Isomae (1894) in his investigation on the catch of bluefin tuna with drift gill net, observed that the number of tuna gilled in dark nights was more than that of the moonlit nights. Savage & Hodgson (1934) noted that the herring drift net catch on the east coast of England was greatly influenced by the phases of the moon. Nomura (1959, 1961) and Hopson (1962) opined that moon is one of the several factors influencing the behaviour of fish. Hela & Laevastu (1961) laid emphasis on the visibility of net combined with the turbidity of water and current as important factors in determining fishability with drift gill nets. According to them catchability of the gill nets during nights is related to the lunar calendar, the largest catch being made usually during new-moon.

During the present investigation the catchability of the gill net was observed to vary in different quarters with highest during nights of the first quarter following new-moon

and lowest in the fourth quarter ending in new-moon. But no significant difference was observed in the catch rates of different quarters and also between the dark nights and moonlit nights. This is contrary to the common belief of a good catch during the dark phase due to poor visibility of the gear.

In India, cotton or hemp twine was formerly used for gill nets. The contrast in colour between the net and the seawater increased its visibility in the moonlit night with consequent drop in the catch and vice versa. During the past decade nylon twine has gradually replaced the indigenous netting material, the preferred colour being bluish grey that matches with the seawater. This has largely eliminated the contrast between the gear and its surrounding water, with no apparent difference in the catch during different phases of the moon.

A significant difference in the gill net catch was observed between the spring and neap tides along Orissa coast with better catches during the nights with neap tides. Mathai *et al.* (1971) noted that the dark nights with low tide to be the best period for exploitation, but did not offer any explanation. The tidal pattern near Cochin is mixed semidiurnal, whereas along the Orissa coast it is predominantly semidiurnal, with large rise of seawater during the spring tides. Near Chandipur, the difference between the spring and neap range is nearly 3 m. During the inundation of high spring tide, huge amount of detritus is washed from the beach and estuarine region into the seawater, increasing its productivity and ensuring a rich crop of plankton during the succeeding neap tide period. This would undoubtedly allure pelagic fishes resulting in better exploitation with gill nets in the nights of neap tide. In the absence of direct observation, it would be premature to predict for the rich crop of planktonic organisms during neap tide. A comparative study of hydrobiology of the coastal water in relation to the lunar phases may shed more light on this aspect.

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