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A PRELIMINARY EVALUATION OF DAY AND NIGHT PURSE SEINE FISHERY AT MANGALORE, KARNATAKA

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Introduction

Purse seines were introduced along the Dakshina Kannada coast of Karnataka State in 1975 for exploiting the pelagic fish resources. Encouraged by the initial successful operation of the gear, additional number of units were introduced into the fishery, and within a period of four years, the fleet strength increased to 80 at Mangalore. Between 1975 and 1986, the purse seiners were operating essentially during day time, realising appreciable catch and catch rates. However, with further addition of purse seines and increasing fishing effort, the catch and catch rate started showing declining trend, particularly after 1987 (Table 1). This situation made the purse seiners of the area to introduce night fishing operation after December, although it was banned and not practised in earlier years. Regular night fishing was thus started in the area from December 1990. This paper presents a comparative account of the day and night fishery by the purse seiners at Mangalore during the years 1990-'91 and 1991-'92.

TABLE 1. *Estimated total catch (in tonnes), effort (units) and catch per unit effort (in kg) by purse seiners landed at Mangalore during 1979-'80 to 1991-'92*

Year	Effort (units)	Catch (in t)	Catch/unit effort (in kg)
1979-'80	12,383	28,078	2,267.5
1980-'81	12,762	27,968	2,191.5
1981-'82	17,412	54,119	3,108.1
1982-'83	16,727	30,917	1,848.3
1983-'84	13,341	17,822	1,335.9
1984-'85	12,107	25,868	2,136.6
1985-'86	14,502	42,717	2,945.6
1986-'87	10,760	23,261	2,161.8
1987-'88	11,100	31,060	2,798.2
1988-'89	17,123	22,919	1,338.5
1989-'90	14,217	24,173	1,700.3
1990-'91	12,797	16,847	1,316.5
1991-'92	13,436	14,214	1,057.9

At present, about 97 purse seine boats are based at Mangalore and they operate along a coastal stretch of 85 km between Kaup (45 km north of Mangalore) and Kasaragod (40 km south of Mangalore). Although, the number of units engaged in day and night fishing shows daily variation, usually the boats which do not operate during day time undertake night fishing. It has been recorded that a maximum number of 40 to 50 purse seine units carry out night fishing during peak period.

Night fishing operation

The details of purse seine boat and the nets employed in the fishery, and their operational aspects have been reported by Dhulkhed *et al.* (1982). While the day time purse seine fishing is generally carried out from 06.00 hours to 18.00 hours with the help of carrier boats for transportation and unloading of fishes caught at frequent intervals, for night fishing, the boats set out for fishing ground around 17.00 hours. On reaching the ground, the units, generally make 1 or 2 hauls depending on the availability of shoals. The time taken to complete one haul is about 1 to 3 hours depending on the catch. Immediately after fishing, they returned to the landing centre as they neither carry facilities for preservation of the catch nor employ the carrier boats. The fish is auctioned immediately on reaching the harbour despite the midnight hours. Thus, the fishing activities, unloading and auctioning of the catch extend throughout the night and often upto the morning hours.

Night fishing of purse seiners commences from the second quarter in the darker lunar phase Fig. 1a & 1b. With the progress of this phase, the activities and the number of units engaged in the fishery increase to reach the peak around the new moon days. In the brighter phase, the night fishing activity is found to be lean, particularly from the second quarter to full moon days. It is reported that during the brighter phase, the pelagic fishes (particularly the Indian mackerel and oil sardine) move to sub- surface

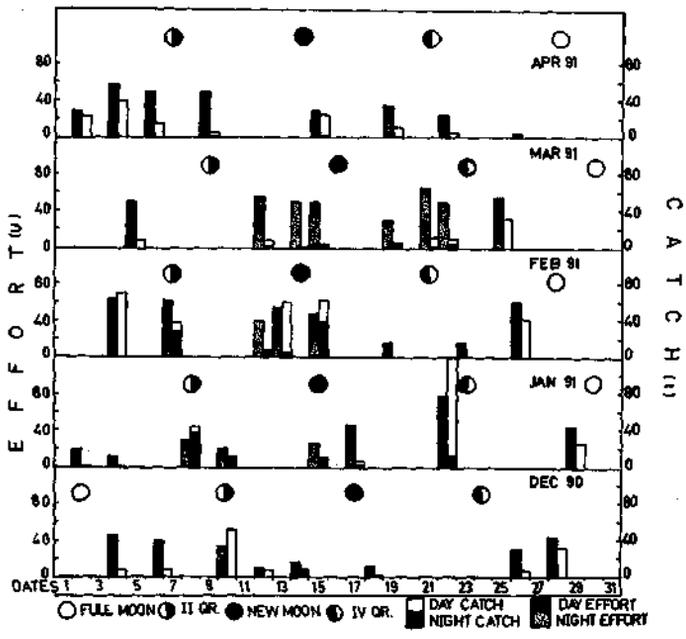

Fig. 1. Catch and effort of day and night fishing on observation days.

waters. While in the darker phase, they come to the surface and the fishermen could easily site the shoal from a distance by the silvery shining nature caused by the movement of the fishes in the shoal. While the day fishing operations are generally made in the fishing grounds of 10-40 m depth zone, night fishing operations are restricted within 20 m depth region.

The purse seine fishery season at Mangalore starts from first September and continues upto May end. During the southwest monsoon period (June-August) it is suspended following the general prohibition of mechanised fishing activities along the Karnataka coast. The night fishing is undertaken from December to April.

Observations

Catch and effort

The data on catch, effort and biological aspects of the important species landed by purse seines during day and night time were collected twice a week from the Mangalore Fishery Harbour. The data of the night fishing operation were collected in the morning, when normally, only about 25% of the total units operated during the previous night could be covered. These data were further supplemented by enquiry. For the present study, the data of five months from December to April of the years 1990-'91 and 1991-'92 season when both the day and night fishing was carried out were considered and compared.

Table 2 presents the catch and effort realised by day and night fishing operation of purse seines at Mangalore. During 1990-'91 season, the total catch realised by the purse seines operating during day time was 2,315.1 t as against 668.1 t by those operating during night time. The catch rate was 566 kg per boat by day fishing units and 407 kg per boat by night fishing units respectively. A similar trend of higher catch and catch rate was also recorded in the purse seines operating during day time as compared to those during night time in the 1991-'92 season. Month-wise catch and catch rate, however, showed that although the quantum of catch by the night fishing purse seines was lower than those by the day fishing purse seines, the catch rates were higher in the night fishing units during December-February in 1990-'91 season and during January and March of 1992 season. The highest catch rate of 1,380.6 kg per boat by night fishing was recorded in December 1990 the lowest (97.9 kg per boat) in March 1991. In the pooled data for the two seasons, the higher catch rate in the night fishing was recorded in January and February (Table 3 and Fig. 2). In general, December to March appears to be the more lucrative season for night fishing.

To understand which phase of the lunar cycle is more productive for night fishing, the catch and effort data in respect of the darker and brighter phases of moon were analysed and

TABLE 2. *Estimated total catch (in tonnes), effort (units) and catch per effort (in kg) during day and night fishing by purse seiners at Mangalore during December to April 1990-'91 & 1991-'92.*

Months	Night fishing			Day fishing		
	Effort	Catch	Catch/ effort	Effort	Catch	Catch/ effort
December '90	9	12,425	1,380.6	885	379,340	428.6
January '91	268	263,897	984.7	859	717,006	834.7
February	284	276,367	973.1	997	621,729	623.6
March	1,033	101,074	97.9	736	263,093	357.5
April	47	14,386	306.1	612	333,934	545.6
Total	1,641	668,149	407.2	4,089	23,15,102	566.2
December '91	606	240,255	396.5	567	307,544	542.4
January '92	136	61670	453.5	666	240,956	361.8
February	98	38,594	393.8	1,071	442,125	412.8
March	228	128,085	561.8	910	415,129	456.2
April	576	199,500	346.4	921	606,137	658.1
Total	1,644	668,104	406.4	4,135	20,11,891	486.6

TABLE 3. *Pooled catch (in kg), effort (units) and catch per unit effort (in kg) landed by day and night purse seiners at Mangalore during December to April 1990-'91 & 1991-'92.*

Months	Night fishing			Day fishing		
	Effort	Catch	Catch/ effort	Effort	Catch	Catch/ effort
December	615	252,680	410.9	1,452	686,884	473.1
January	404	325,567	805.9	1,525	957,962	628.2
February	382	314,961	824.5	2,068	1,063,854	514.4
March	1,261	229,159	181.7	1,646	678,222	412.0
April	623	213,886	343.3	1,533	940,071	613.2
Total	3,285	1,336,253	406.8	8,2224	4,326,993	526.1

presented in Table 4. It is observed that the effort put in during the darker phase in both the seasons was much higher than those put in during brighter fortnight. During 1990-'91 season, the fishing activity in the brighter phase was observed during January-March 1991, while it was restricted to December 1991 and April 1991 in 1991-'92 season. The catch realised during the darker phase in all the months was higher than those in the brighter phase. However, the catch rate was found higher with 1988 kg, 3,488 kg and 536 kg during January 1991, February 1991 and April 1992 respectively in the brighter fortnight. This higher catch rate was attributed to the low effort put in during brighter phase in these months. It is interesting to note that when appreciable effort was put in during

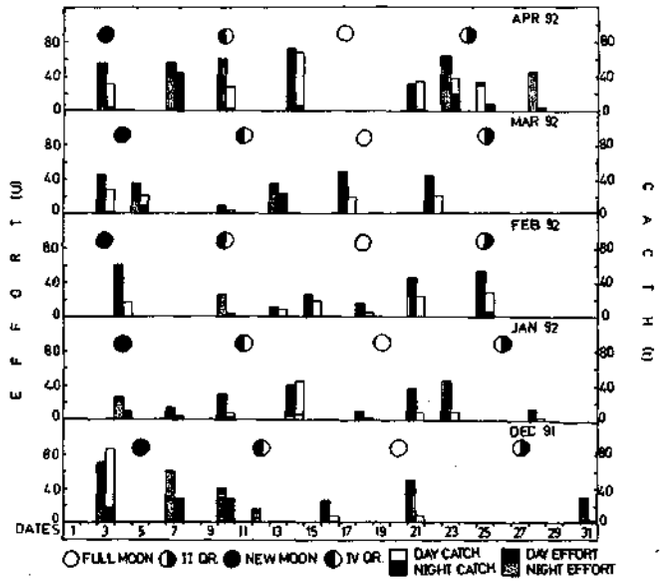

Fig. 2. Catch and effort of day and night fishing on observation days.

the brighter phase, as observed in March 1991 and December 1991, the catch rate was relatively lower. Perhaps, this factor and the empirical knowledge of fishermen on the behaviour of fishes during the brighter phase have contributed for the reduced activity and the effort put in the night fishing during the brighter phase.

TABLE 4. *Catch (in kg), effort (units) and catch per unit effort (in kg) of night landings operated at Mangalore during dark & bright phase*

Months	Night fishing			Day fishing		
	Effort	Catch	Catch/ effort	Effort	Catch	Catch/ effort
December '90	9	12,425	1,380.6	—	—	—
January '91	238	204,257	858.2	30	59,640	1988.0
February	256	178,717	698.1	28	97,650	3,487.5
March	758	78,444	103.5	275	22,630	82.3
April	47	14,386	306.1	—	—	—
December '91	456	236,505	518.7	150	3,750	25.0
January '92	136	61,670	453.5	—	—	—
February	98	38,594	393.8	—	—	—
March	228	128,085	561.8	—	—	—
April	537	178,587	332.6	39	20,913	536.2

Species composition

Considerable difference is observed in the species composition of the night and day fishing catch of purse seines (Fig. 3). Bulk of the night fishing catch is comprised of *Sardinella* spp. which contribute to 59% of the total night landings pooled for the two years. Indian mackerel ranks second in the order of abundance (21%). The rest of the catch comprises of anchovies (9%), prawns (7%), carangids (3%) and other miscellaneous fishes (2%) formed mostly of other clupeoids. In the day fishing operation anchovies form the major group contributing to 56% of the total fishing catch, followed by *Sardinella spp.* (34%). The other fishes caught are mackerel (2%) and fishes such as tuna, pomfrets, seerfish and some species of clupeoids. It is interesting to note that while the India mackerel forms an appreciable portion of the catch in the night fishing, its contribution in the day fishing is insignificant. Further, the depth of operation of purse seine during day and night fishing is also generally carried out in relatively shallow waters of less than 20m and the day fishing in deeper waters.

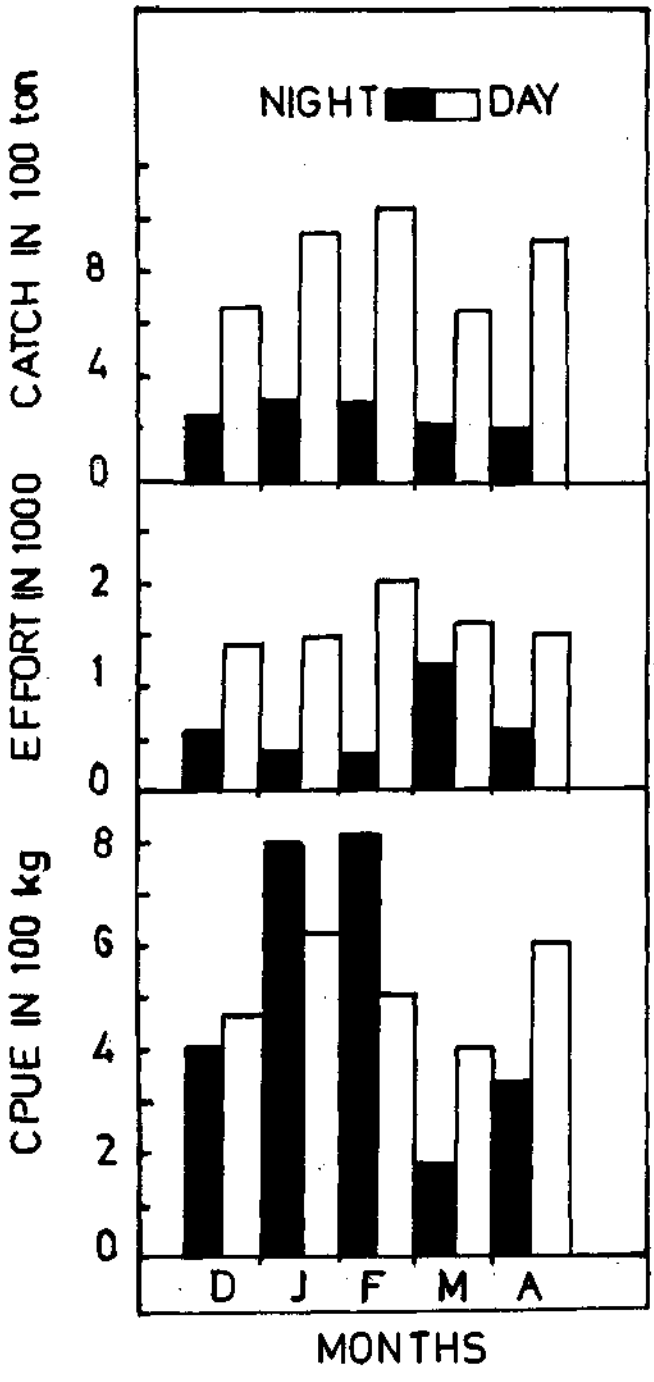

Fig. 3. Month-wise catch, effort and cpue of day and night fishing

Biology

Biological aspects such as size composition, distribution of sex ratio and maturity stages, and stomach contents of oil sardine and mackerel, the major species which contribute into the day and night purse seine fishery are studied and compared. The length of oil sardine caught during night fishing ranged form 95 to 199mm

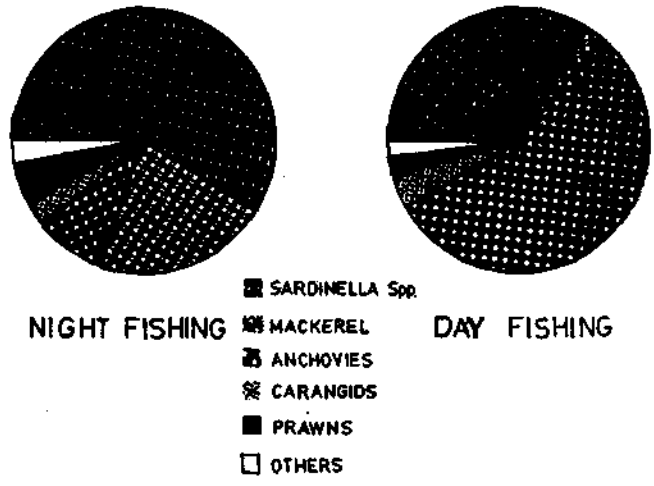

Fig. 4. Species composition of day and night purse seine.

in total length with modal size at 132, 157 and 177mm. The male to female ratio was 1:1.2 indicating dominance of females in the catch. The recovering fish (resting IIb) dominated the catch (contributing to 79%) followed by developing (stage III-IV) fish (18%). A comparison of these biological parameters with those caught during day time showed no difference. The stomach content analysis of the oil sardines caught during night time showed that 13% of the fish had full stomach, 19% half full, 22% quarter full and 46% empty stomach. However, the fishes caught during day time showed 1% with full stomach, 12% with half, 32% with quarter and 55% with empty stomach.

In the case of mackerel, the length ranged from 170 to 275mm with modal size at 182, 192 and 227mm in both the population landed by day and night fishery. The male to female ratio was 1:0.64. Spent (stage VIIb) maturity stage and developing fishes (stage III-IV) predominated in the fishery. Stomach content analysis showed that the mackerel with full, half, quarter and empty stomachs contributed to 10, 19,61 and 10% respectively in the population caught during day time and 24, 39, 27 and 10% respectively in those landed by night fishing purse seiners. The occurrence of greater percentage of both oil sardine and mackerel with full and half stomachs in the night fishing operation indicates that the fishes move to surface waters in search of food during night time. It is also interesting to note that while the female population of oil sardine is found to be more in the catches of night fishing, in the case of mackerel males are encountered in greater percentage.

Remarks

An evaluation of the day and night purse seine fishery at Mangalore as revealed from the data presented above shows that although the quantum of catch realised is better in the purse seines operating during day time from December to April, the night fishing helps to reduce the heavy fishing pressure on the exploitation of pelagic fishes during day time. It is observed that as many as 50% of the total purse seine units go for night fishing particularly during the darker phase, during the period which coincides the peak fishing season in the area. This distribution of effort helps further in reducing the competition among the purse seiners operating in the area.

The night purse seine fishery although practised for five months from December to April, January and February are found to be more productive than the other months. While no difference in the length composition and maturity stages of oil sardine and mackerel population exploited by day and night fishing is observed, the quality of night fishing catch is found to be better as greater percentage of oil sardine and mackerel is caught. In the day time fishing anchovies form the main component of the catch. Night fishing appears to be more economically advantageous to fishermen as it is carried out in relatively shallow waters and no carrier boats are employed in the fishery.