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MONSOON PRAWN FISHERY OF NEENDAKARA COAST, KERALA— A CRITICAL STUDY

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Introduction

In a previous article in these columns *(Mar. Fish. Infor. Serv. T & E Ser.* **18**: 1-8, 1980) the results of a detailed analysis of the prawn fishery of Neendakara area with special reference to the trends in production, fishing operations, species composition, seasonal abundance and other biological aspects have been reported. The depletionary tendencies in the fishery leading to an economic overfishing of the resources and the need for adopting suitable conservation measures were indicated in the study. Since the publication of this report in 1980, in a further monitoring of the fishery with a view to evaluate the extent of overfishing of the major species involved during the peak season, the effect of fishing over the seasons on the size of the shrimps and to determine the effective conservation measures to be adopted for optimum exploitation of the resources with reference to both size as well as quantity of the species, an intensive study of the fishery was undertaken during the peak fishing seasons of 1980 to 1982. The outcome of this critical evaluation in continuation of the earlier study is reported in the present contribution.

Trends in seasonal fishery (Fig. 1)

As established earlier the peak fishing season accounting for nearly 83% of the total trawl landings of the year, of which about 38% are constituted by prawns, is during the southwest monsoon period June to September when trawling operations remain very inactive in other parts of the west coast. So the prawn fishery of the area is almost a monsoon fishery, nearly 87% of the total prawn catches of the whole year being landed during the months June to September. Hence the present intensive study is limited to the particular season of the fishery.

The trend in prawn landings at Neendakara-Sakthikulangara area in relation to total catch and effort during the monsoon seasons of the 10 year period from 1973 to 1982 is shown in table 1. The maximum catch during the season (47,951 tonnes) is recorded in 1975. In 1976 there was a steep decline to 11,538 tonnes, and in 1980 again steadily increased to 36,070 tonnes. Thereafter both in 1981 and 1982 very poor catches of less than 8,000 tonnes have been recorded. The effort and catch per effort also show a very similar trend.

Table 1: *Estimated catch, effort and catch rates of prawns for the monsoon period (June-September) against the annual prawn landings at Sakthikulangara (Neendakara) from* 1973 *to* 1982.

Year	Effort (No. of trawler trips)	Total prawn catch (tonnes)	Catch/ boat/ day (kg.)	Annual prawn landings at the centre (tonnes)
1973	62,859	38,542	613	45,477
1974	75,366	18,698	248	27,765
1975	1,50,364	47,951	318	56,750
1976	43,444	11,538	265	14,993
1977	81,184	21,290	262	24,121
1978	1,30,527	28,017	214	33,143
1979	69,455	12,784	178	14,582
1980	99,411	36,070	362	36,558
1981	62,557	7,444	119	9,399
1982	66,708	7,278	109	9,487

Monthly catch variations

From the data given in table 2, over the years it is seen that the fishery starts in the month of June, picks up considerably in July and August and decreases by September, recording the maximum catches either in July or in August. Only in one exceptional year, *ie.* 1977 a regular increase from the minimum in June to a maximum in September is noticed. Among the other years, in all the years prior to 1977 the maximum catches are

seen in the month of August and in the years after 1977 July shows the maximum catches of prawns except in 1981. The monthly input of effort also shows more or less the same trend, increasing steadily from June, reaching maximum in July or August and with the decrease in landings the effort also declines considerably by September. But in 1977 contrary to the regular increase of the catches from June onwards to September, recording the maximum catch in that month, the effort is maximum in August, resulting in a lesser effort bringing in higher catches in September or in other words a higher catch rate in the month. This is exceptional, but in all the other years the catch rate remains high either in August or in July.

Table 2. *Monthwise trawling effort and catch details at Sakthikulangara during the monsoon period from* 1973 to 1982

Year	Effort - No. of boat trips (Catch rate of prawns in kg/boat trip)					Prawn landings in tonnes (Percentage of prawns in total trawl-catch)				
	June	July	August	Sept.	Total	June	July	August	Sept.	Total
1973	15,157 (211)	19,443 (651)	17,799 (1235)	10,460 (67)	62,859 (613)	3,202.8 (53.1)	12,652.2 (83.4)	21,983.3 (85.3)	703.9 (32.8)	38,542
1974	16,002 (80)	8,722 (27)	20,525 (494)	30,117 (234)	75,366 (248)	1,283.0 (21.5)	235,2 (11.6)	10,140.7 (65.5)	7,038.9 (19.3)	18,698
1975	31,557 (67)	61,377 (235)	47,310 (671)	10,120 (31)	1,50,364 (319)	2,109.5 (19.3)	13,806.7 (31.0)	31,722.2 (57.7)	312.8 (11.6)	47,951
1976	8,080 (82)	3,426 (200)	19,721 (495)	12,217 (34)	43,444 (266)	665.0 (33.0)	685.0 (60.1)	9,768.2 (79.2)	419.8 (16.7)	11,538
1977	6,289 (38)	22,191 (150)	30,106 (264)	22,598 (432)	81,184 (262)	241.9 (15.7)	3,334.3 (32.3)	7,949.8 (40.2)	9,763.8 (73.9)	21,290
1978	26,083 (186)	28,039 (573)	41,030 (167)	35,375 (7)	1,30,527 (215)	4,849.7 (49.2)	16,068.1 (64.1)	6,855.9 (26.9)	243.7 (4.2)	28,017
1979	6,801 (132)	23,531 (396)	22,878 (90)	16,245 (10)	69,455 (179)	900.0 (45.3)	9,313.1 (63.5)	2,064.2 (14.9)	506.9 (7.7)	12,784
1980	16,342 (58)	35,681 (757)	21,904 (270)	25,484 (87)	99,411 (363)	946.1 (27.4)	27,012.1 (79.8)	5,903.8 (43.6)	2,208.1 (15.9)	36,070
1981	16,890 (80)	20,679 (119)	16,621 (208)	8,367 (21)	62,557 (119)	1,349.0 (36.0)	2,465.3 (29.0)	3,454.5 (59.6)	175.4 (89.9)	7,444
1982	19,594 (64)	18,063 (258)	18,436 (58)	10,615 (29)	66,708 (109)	1,246.3 (22.8)	4,653.2 (46.7)	1,069.8 (21.4)	308.7 (16.5)	7,278

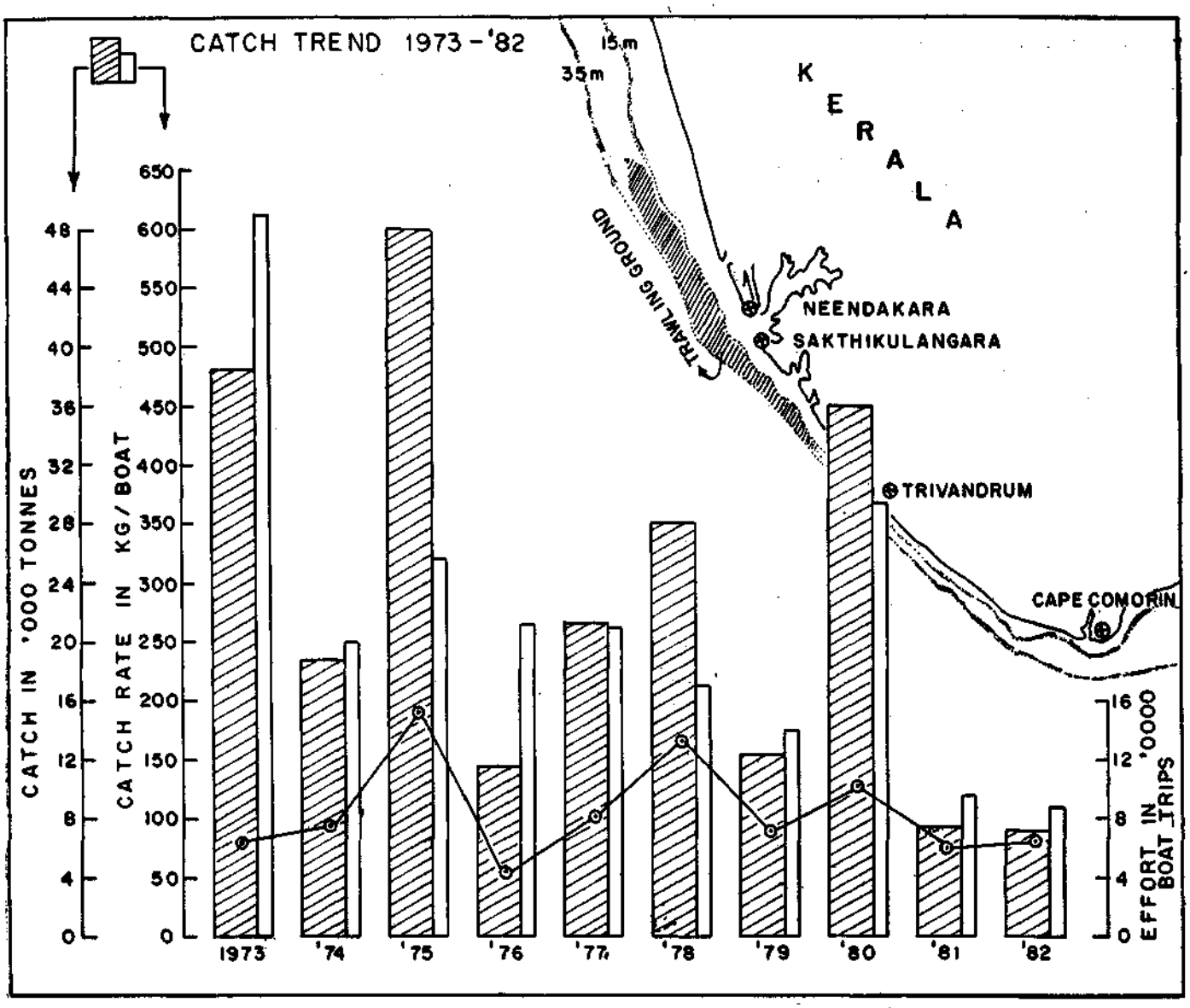

Fig. 1. Production trend of prawns at Neendakara during the monsoon periods of 1973 to 1982

Species composition and variation in abundance

The prawn fishery is supported by penaeid prawns only and that too mostly by one species. The catch composition of the prawn landings of the area during June to September period over the past 10 years is shown in table 3. *Parapenaeopsis stylifera, Metapenaeus dobsoni, M. monoceros, M. affinis* and *Penaeus indicus* are the species represented. *P. monodon, P. canaliculatus* and a few other species are represented rarely. On an average the percentage of *P. stylifera* (Karikkadi) over the years is 85.8, *M. dobsoni* 5.3, *M. monoceros* 4.4, *M. affinis* 1.8, *P. indicus* 1.8 and other species 0.9. As indicated in the earlier publication it is clear from the present study also that the fishery is mostly for *P. stylifera* and thus the fishermen and the industry has named the fishery as 'Karikkadi fishery.' In a period of 10 years only in the years 1973, 1975, 1979 and 1982 does the overall percentage of the species in the fishery go below 90. The least percentage of 70.8 was recorded in 1975 and the highest percentage of 95.7 in 1980.

It is interesting to note that among the less represented species the smaller and medium sized species of *Metapenaeus* which were present in comparatively higher percentages have come down considerably in 1981 and 1982, while in the large sized *P. indicus* the percentage which was very low in earlier years has gone up to 3.1 and 6.9 respectively in 1981 and 1982. This is one reason why in these years although the total quantity of prawns landed is considerably less the value realised does not show any serious decrease. The

increase in percentage of *P. indicus* (naran chemmeen) is especially noticed in the month of June when the seasonal fishery commenced. During 1982 season out of 1,246 tonnes of prawns landed at the centre in June, this species alone accounted for 35%. But in subsequent months the representation of the species declined considerably, *P. stylifera* taking up the place exclusively.

Fluctuations in catches

A day to day analysis of the total catches of the species landed at the centre (Fig. 2) shows that there is wide variation in the catches during the season. A study of the figure would indicate that very heavy catches occur only on a few days during the entire season and the magnitude of the fishery for the season mainly depends on the catches of these days. For instance in 1980 this really heavy catch, going upto 1700 kg per boat, occurs only in a few days in the latter half of July and this is reflected in the total catch for the season, reaching a comparatively high figure. On the contrary such high catches are never encountered on any day in the 1982 season, the catch per boat never rising above 400 kg with the result the total catch of the season keeps a very low profile. From the figure it seems that the effort put in is fairly high throughout the season, giving a comparatively low rate of catch per boat. This might probably indicate that the abundance of the

Table 3. *Catch composition of prawn landings at Sakthikulangara during the monsoon period (June-September) from* 1973 *to* 1982

Year	Landings in tonnes (species-wise percentage in parenthesis)						
	P. indicus	*M. affinis*	*M. monoceros*	*M. dobsoni*	*P. stylifera*	Other species	Total prawns
1973	234.7 (0.61)	1,719.7 (4.46)	4,403.6 (11.43)	141.9 (0.36)	31,951.6 (82.90)	90.6 (0.24)	38,542
1974	144.7 (0.77)	238.1 (1.27)	749.5 (4.01)	22.7 (0.12)	17,396.1 (93.04)	146.9 (0.79)	18,698
1975	2,164.7 (4.52)	799.6 (1.67)	2,015.7 (4.20)	7,484.2 (15.61)	33,960.4 (70.82)	1,526.7 (3.18)	47,951
1976	119.6 (1.04)	127.0 (1.10)	147.9 (1.28)	108.0 (0.94)	10,967.0 (95.05)	68.5 (0.59)	11,538
1977	168.7 (0.79)	41.6 (0.20)	1,535.3 (7.21)	—	19,442.6 (91.32)	101.7 (0.48)	21,290
1978	306.2 (1.09)	299.7 (1.07)	423.2 (1.51)	1,721.5 (6.14)	25,239.9 (90.09)	26.9 (0.10)	28,017
1979	78.0 (0.61)	304.5 (2.38)	334.6 (2.62)	1,847.3 (14.45)	10,205.7 (79.83)	14.1 (0.11)	12,784
1980	201.0 (0.56)	386.9 (1.07)	296.1 (0.82)	627.7 (1.74)	34,523.1 (95.71)	35.6 (0.10)	36,070
1981	229.5 (3.08)	77.9 (1.04)	102.6 (1.38)	72.2 (0.97)	6,864.0 (92.21)	98.1 (1.31)	7,444
1982	504.0 (6.92)	40.1 (0.56)	130.8 (1.80)	166.6 (2.29)	6,361.3 (87.40)	75.3 (1.03)	7,278

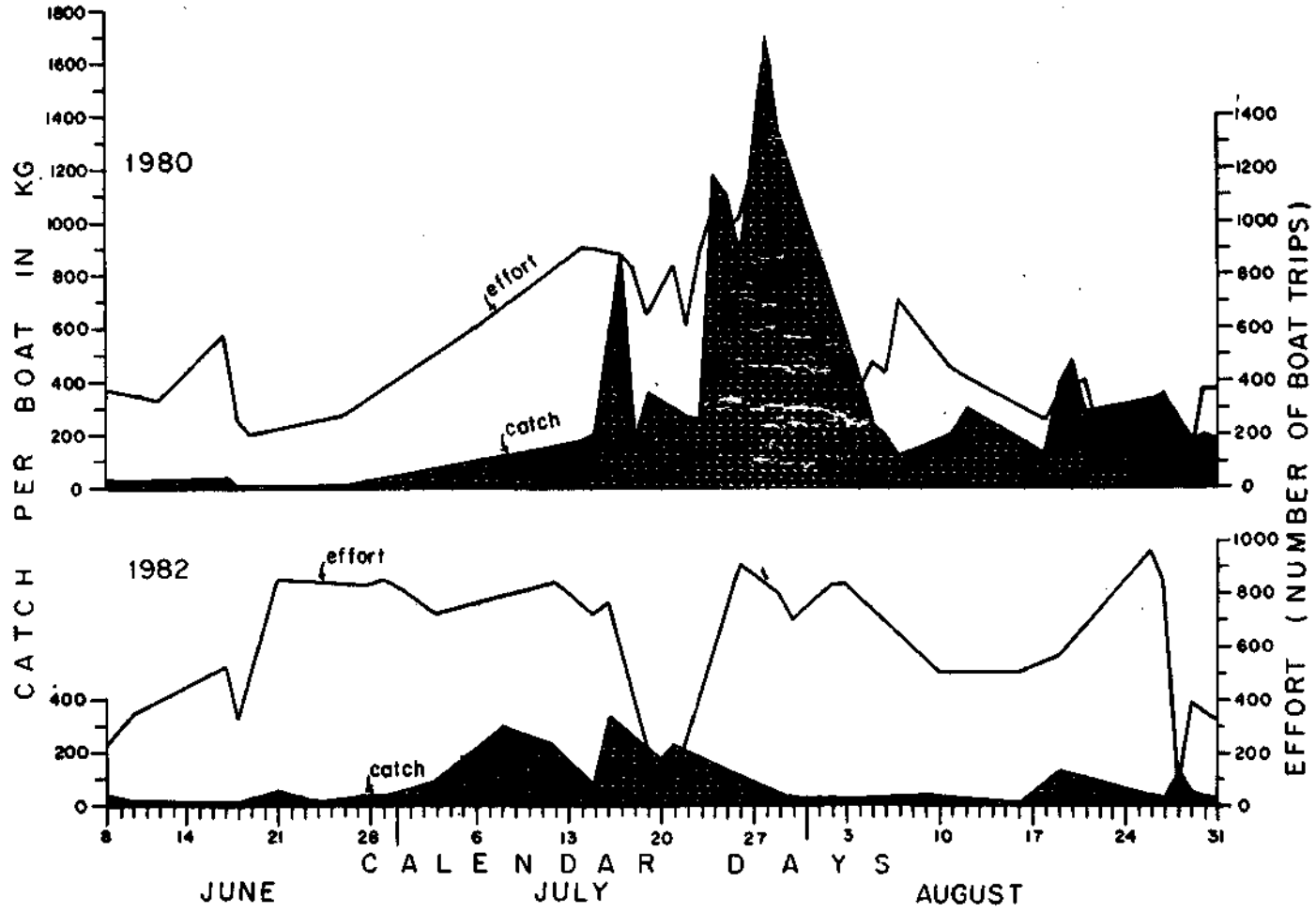

Fig. 2. Catch and effort details of *P. stylifera* on observation days during 1980 and 1982 seasons.

prawns in the particular area of operation of the boats is quite low throughout this season or in other words the stock size has gone down. The sudden fall in fishing effort on 20th and 21st July, 1982 was due to rough sea.

Size distribution

The sex-wise size distribution of *P. stylifera* recorded from June to August 1982 is depicted in Fig. 3. In the overall fishery the size, measured from tip of rostrum to that of telson, ranged from 32 to 103 mm in males and 33 to 115 mm in females. However, the bulk of the catch was made up by 56–95 mm of the former and 56–105 mm of the latter. The size preferred by the industry is normally above 65 mm and since the meat recovery below this size is extremely poor they are otherwise disposed. As could be seen from the figure the catch was mostly constituted by prawns above 75 mm in the beginning of the season and thereafter still smaller sizes entered into the fishery in substantial quantities. In fact, smaller sizes below 65 mm dominated the fishery towards the end of June and July, indicating fresh recruitment of juveniles into the area during that period.

The occurrence of undersized prawns in the fishery was studied in detail during the fishing season of 1981. Table 4 indicates the catch distribution of smaller and larger size groups of *P. stylifera* against the daily catch rates recorded during the observation days. Based on the sample analysis, for the whole season an average of nearly 30% of the catch in terms of number was constituted by smaller size groups below 65 mm. This works out to about 10.5% in terms of weight which, undoubtedly, is quite substantial in an exploited stock. It could be seen from the table that maximum quantities of the young prawns are caught during the period of peak catch rates recorded during the latter half of the season, especially towards the end of July when the catches are at the maximum. The number of smaller prawns caught on certain days during this period sometimes exceeds the larger sizes preferred by the industry and on those days it has been noticed that large quantities of the undersized specimens of the species mingled with small juveniles of fishes are discarded after sorting out the larger sizes. This is evident only on the days when the catches are really high, consequently rendering it

difficult for handling for the lady sorters and at least on those days some wastage of the young prawns is taking place in this area.

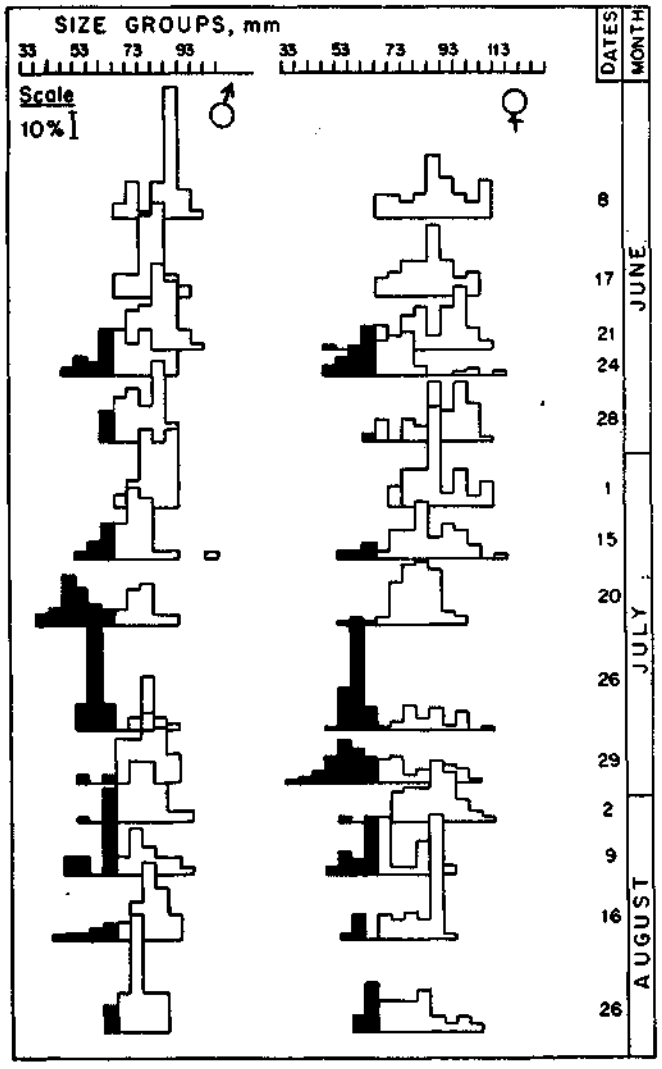

Fig. 3. Size composition of *P. stylifera* on observation days in 1982 season. Undersize groups are indicated in black.

Sex ratio

The general trend of the sex composition of the species in the fishery in 1982 was domination of males over females during major part of the season. From the 2nd to 4th week of July when the highest catch rates were recorded a steady decline in the number of females in the catch (48.8% to 25.3%) was noticed. The overall monthly sex ratio worked out to 56.5:43.5, 58.3:41.7 and 50.6:49.4 for June, July and August respectively with preponderance of males.

Spawning stock

Distribution of different maturity stages of the species was noted for females based on the ovary conditions. Normally the female prawn attains maturity when it is about 65–70 mm total length and the male at slightly smaller size. Throughout the period under investigation the female population included specimens of all maturity stages like immature, early maturing, late-maturing, gravid and spent-recovering. The proportion of late-maturity and gravid females, which can be easily detected from the thick greenish ovary visible through the exoskeleton, was not found to be of any significant level in comparison with the conditions prevailing during the pre-or post-monsoon periods. These stages formed only 17.3% in June, 10.4% in July and 21.8% in August out of the total females exploited by the trawlers. This would indicate that the fishery is not touching the spawning stock of the species at the peak period of the fishery.

Relationship of catch and rainfall

Relationship of prawn catches with rainfall has been indicated in certain areas by earlier workers. In the case of the prawn fishery of Neendakara area the very fact that the fishery is highly seasonal and occurring during the rainy monsoon season indicates that there is a relationship for this fishery with the rainfall. An examination of the rainfall data along with the monthly catches of prawns during the monsoon season for the period 1974 to 1982, as depicted in figure 4, indicates that there is a relationship between the peak fishing days and the peak of the monsoon rains. It is seen that, in general, the peak period of the prawn landings occur in the following month or the month after the heavily raining months. It is also noticed that in the years when there is maximum rains the prawn catches here also are relatively high, showing a direct relationship between the two.

Discussion

Among the interesting facts which emerge from the study may be pointed out that almost single species namely, *Parapenaeopsis stylifera* dominated in the fishery of the area. As mentioned in an earlier investigation (George *et al.*, *Mar. Fish. Infor. Serv. T & E Ser.* **18**: 1-8, 1980) this dominant species is different from the species dominating in the mud bank or 'Chakara' fishery of the adjoining areas north of this particular fishing ground, the species dominating there being *Metapenaeus dobsoni*. It is all the more intriguing that Neendakara fishing

ground which is just outside the estuarine backwaters of the Ashtamudi lake supports a species which does not have an estuarine phase while the area north and farther away from the mouth of the same estuary supports the fishery of a species which uses the estuary as a nursery ground for its juvenile phase. It is probable that it is the nature of the substratum which brings about this peculiar distribution of the species in the fishery in adjoining areas.

both 1981 and 1982 the catch has reached the lowest minimum so far recorded, giving very poor catch rates. Nearly 75% reduction in the catch is noticed in these years as compared to 1980. The situation is quite alarming when viewed coupled with the fact that the input of effort during the period is kept fairly high, probably indicating thereby that the stock of prawns in the fishing ground has really gone down.

Table 4. *Percentage composition of smaller and larger size groups and catch rates of* P. stylifera *landed by shrimp trawlers at Neendakara during June-August* 1981

Observation days	Percentage ratio				
	In number		In weight		
	Below 65 mm TL	Above 65 mm TL	Below 65 mm TL	Above 65 mm TL	Average catch/ boat In Kg.
June, 1981					
11-6-81	3	97	1	99	29.1
25-6-81	24	76	7	93	56.6
30-6-81	3	97	1	99	50.7
July, 1981					
13-7-81	18	82	6	94	137.3
20-7-81	12	88	4	96	171.7
21-7-81	31	69	11	89	46.6
22-7-81	40	60	20	80	216.7
23-7-81	56	44	22	78	226.0
28-7-81	45	55	18	82	14.0
30-7-81	30	70	8	92	1357.0
August, 1981					
6-8-81	30	70	4	96	24.5
7-8-81	34	66	11	89	35.7
10-8-81	38	62	14	86	79.3
24-8-81	34	66	12	88	243.7
25-8-81	47	53	19	81	124.5
28-8-81	26	74	8	92	4.3

TL--Total length measured from tip of rostrum to tip of telson

The investigation mentioned earlier has established that economic overfishing of prawns is taking place in Neendakara fishing grounds. The data on prawn catch and effort during the subsequent years included in the present study confirm this conclusion. Although there was increase in total catch in 1980, subsequently in

Implementation of some effective conservation method seems to be very essential here for the proper management of the fishery. The State Government is advised to take prompt action in the matter before it is too late, so as to prevent any further decline in the fishery which contributes to the shrimp exports from

the state to a very large extent. Taking all aspects into consideration, both biological and economical, the possible management approach which could be advised in the particular fishery may be any one of the two

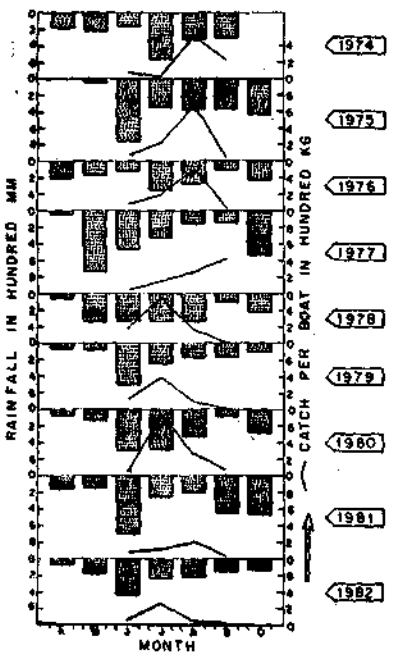

Fig. 4. Relationship between prawn catch and rainfall (shown as shaded) at Neendakara (1974–1982).

methods mentioned below or a combination of both. As indicated in an earlier publication, the most suited method seems to be the restriction of the input of effort in the particular area by limiting the number of vessels in operation through proper licensing and restricting of entry of boats from other parts of the country. Since the peak season fishery is mostly contributed by a single species and very small sizes are fished in large quantities on certain days during the season, the regulation of mesh size of the nets in operation at a higher size than at present is the other method which could be used with advantage. In any case immediate attention of the authorities concerned is required for managing the fishery properly.

At the same time another point worth mentioning here which gives hope for the future, is that the study of the maturity conditions of the species fished shows that at no time during the season does the spawning population of the species appear in real high abundance. Added to that in the sex ratio a preponderance of males is noticed all the time. These might be pointers to the existence of a spawning population of the same species somewhere outside the area where the present fishing operations are carried out. The constant recruitment of younger specimens of the species in the fishery, often in larger quantities and sometimes discarded by the industry when the catches are very high, further strengthens this view. Exploratory cruises being planned to be conducted in the area during the fishing season would probably throw more light on the source of recruitment of the species and the factors influencing the dynamics of the population.