PRAWN FISHERY OF ALLEPPEY COAST DURING THE S.W. MONSOONS OF 1972-1976

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ABSTRACT

The annual total catch of prawns showed wide fluctuations. The catch per unit effort varied considerably from month to month of the same season and also during the corresponding months of different seasons. The prawn catch was mainly constituted by *Metapenaeus dobsoni* (Miers). June-July months were more productive on account of recruitment of more individuals belonging to higher size groups. The monthly average mean sizes of *M. dobsoni* showed great disparity, ranging between 75.2 mm and 91.5 mm for males and 81.3 mm and 103.4 mm for females. In the species, males were found in a higher proportion than females in lower size groups, but females occurred in higher proportions in higher size groups. The recruitment of mature females into the fishery was quite irregular throughout the seasons of different years under study. The analysis of stomach contents revealed that *M. dobsoni* mainly fed on decayed organic matter.

INTRODUCTION

During the S.W. monsoon the inshore waters of Alleppey supports a traditional indigenous fishery. The most characteristic feature of this area during this season is the formation of mudbank, when catches of varying quantities of prawns are realized. Regarding this prawn fishery not much information is available except the earlier contributions by George (1961) and the more recent works by Kurup and Rao (1974) and Regunathan et al (1978). The present paper deals with the observations made from 1972 to 1976 on the fishery and some biological aspects of the commercially important marine prawns, with special reference to *Metapenaeus dobsoni,* exploited in the area extending from Purakkad to Thottappally. Since *M. dobsoni* was the dominant species, forming the bulk of the catch, studies on its sex ratios, maturity, distribution and food and feeding habits are dealt with in more detail.

MATERIAL AND METHODS

The data collected for five consecutive years from 1972 to 1976 were used for the study. Observations on the total prawn landings and collection of samples were made once a week. The average weight of catch per gear-unit in

an observation day was multiplied by the total number of units in operation on that day to get the total catch for the day. By adding similar data the total for the observation days in that particular month was obtained, and this total was raised proportionately to the total number of fishing days of the month to get the estimated weight of the catch in that month. In a similar way the total monthly fishing effort, in terms of fishing hours, was also estimated.

The weekly prawn samples were analysed for weight, total length (length measured from the tip of the rostrum to the posterior end of telson), number and sex ratios. The length measurements were grouped in 5-mm-size intervals. The monthly total number of prawns in each size group was calculated from the sample weight, number of specimens in the group of each size and the specieswise estimated total catch. The sex ratio was calculated from such monthly estimated numbers for each species. The differences observed in sex ratios were studied by Chi-square test as described by Cochran (1954). The condition of gonads was examined. In the case of females, according to the developments of gonads they were classified into four groups, namely, immature, maturing, mature and spent.

About 100 specimens were examined to study the food and feeding habits. The specimens in length 85-105 mm were preserved in formalin immediately after collection. In the laboratory, the specimens were dissected in a week's time and the stomachs were separated. Their contents were removed on to counting slide and examined under microscope. The studies regarding the food was made on a qualitative basis.

Fishing Range and Season

The prawn fishing ground normally extended about 4-6 km from Thottappally in the south to Purakkad in the north in depth range 4-8 metres, but varying in location year after year.

The indigenous fishery during the S.W. monsoon, usually called the mudbank fishery (locally known as *chakara*) starts after the commencement of S.W. monsoon. In gerenral, the monsoon starts by middle of May, prevails in full swing for the next two months, June and July, and subsides gradually from the beginning of August. But, at times, the commencement of the monsoon is subject to fluctuations, as has been observed for the current period. In 1972 the monsoon started only in July and continued till middle of September, whereas, the next succeeding two years, 1973 and 1974, it prolonged from June to September. Whereas the commencement of monsoon during 1975 was in May and continued till end of August, 1976 experienced it for a shorter period of June-August. The data collected indicated that the peak varied between June and September during different years as observed by George (1961).

Craft and Gear

The indigenous wooden boats, locally known as *Vallam* or *Vanchi,* were employed throughout the season. These boats were of two types, a bigger type of 10 m length, with 10-13 men operating, and a smaller type measuring 4.5 to 5 m in length and manned by 4-6 people.

Throughout the season the boat-seine, *Thanguvala,* was used, the common gear for prawn fishery. It was more or less rectangular in shape, with maximum width in the middle (about 50 m) and narrowing slightly towards the ends, where they measured about 16 m. The net was made of nylon or cotton threads with a mesh size of 20 mm. The floats were attached along one of the longer sides and the weights on the opposite side.

For the net to operate, one person from the boat descended into the water taking with him one end of the rope, the other end being held at the boat. Then the boat was rowed in a circle, paving the net to its full length, and encircling the shoal. The catch was collected at the bottom of the net and was hauled up into the boat.

Trend of Prawn Production

The fishery for prawns showed wide fluctuations both in the monthly and annual catches. A fishery of considerable magnitude was observed in 1973, with a total estimated catch of 4269.3 t. But during the years 1974 and 1976 the fishery suffered a set-back, yielding only 392 t and 467.5 t, respectively. During 1972 and 1975 the fishery was of middling success (Table 1).

Metapenaeus dobsoni was characteristically predominant in the fishery throughout all the seasons (Fig. 1). Whereas the year 1973 registered the maximum catch of 4267.2 t of this species, with the rest of the species together constituting only about 2 t, in 1974 the catch declined to the minimum of 348.1 t, indicating clearly that the success of the fishery was determined by the highly fluctuating *M. dobsoni.*

The effort spent also fluctuated widely in different months. Whereas the monthly total effort in June 1974 was only 1530 h, when the maximum catch rate of 66.0 kg was realized, during the same month in 1975 the total effort was at the maximum of 30200 h (for details of effort and CPUE, *see* Table 1). But it was generally seen that both effort and the CPUE fell toward the end of August.

A comparison of the catch rates and total efforts of the entire zone with those of the mudbank seasons is presented in Table 1. While the CPUE was very low and effort high for different months of the same season in the outlying areas, the catch rates were high in the mudbank area. The fishery was supported

TABLE 1. *A comparison between the total marine landings and CPUE of the entire zone with that of the total prawn landings and CPUE of mud-bank area during the period,* 1972-76.

Period	For the entire zone			For mudbank area alone			
	Total marine catch in tonnes	Total effort in hours	CPUE in kg	Monthly prawn catch in tonnes	Yearly prawn catch in tonnes	Total effort in hours	CPUE in kg
1972							
July				1170.0	1171.0	62961	18.6
August				1.0		5554	0.2
1973							
June	46190	92400	0.5	6.3		9096	0.7
July	5746160	1889941	3.0	4230.7	4269.3	13826	30.6
August	7840190	1449483	5.4	32.3		16205	2.0
1974							
June	1246080	1058465	9.4	100.9		1530	66.0
July	130460	733808	0.2	58.0	392.2	1700	34.1
August	4338400	1488793	2.9	233.3		4904	47.6
1975							
June	133320	1074500	0.1	271.6		30200	9.0
July	2504650	223701	11.2	862.3	1155.3	17305	49.8
August	2182400	592099	3.7	21.4		5967	3.6
1976							
June	7046930	864413	8.1	327.2		21300	15.4
July	449510	90001	5.0	72.8	467.5	12386	5.9
August	7767050	883620	8.8	67.5		7303	9.2

chiefly by *Metapenaeus dobsoni,* though *Parapenaeopsis stylifera* and *Penaeus indicus* were also present. Negligible quantities of *Metapenaeus monoceros* (Fabricius) and *Metapenaeus affinis* (H. Milne Edwards) were also recorded during certain months of the periods under study. The total catch of different species of prawns and their percentages in the total prawn catch fluctuated in different months (Fig. 1). *Parapenaeopsis stylifera* was the second important species in the order of abundance. This species occurred in the fishery throughout, forming percentages ranging between 9.0 and 33.0 during different months of the season for each year. *Penaeus indicus* occurred in small quantities throughout the season constituting about 3 to 15% of the total prawn catch. Stray numbers of *Metapenaeus affinis* and *Metapenaeus monoceros* were also occasionally encountered in the fishery.

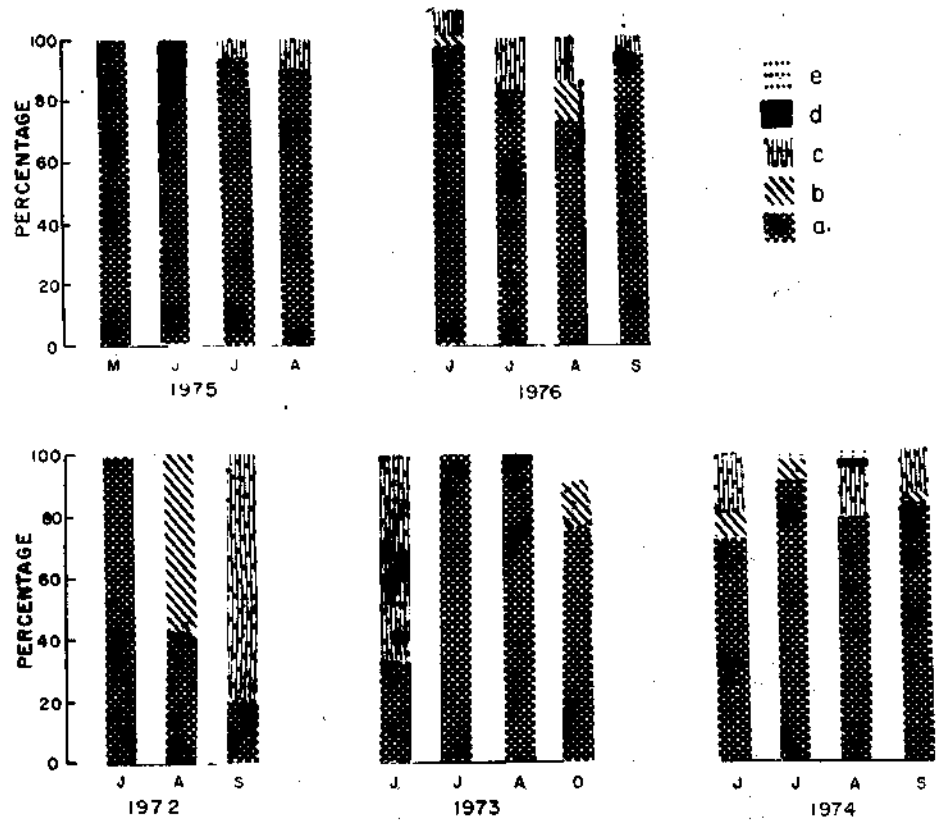

FIG. 1. Monthly percentage composition of prawn catches of mudbank seasons of Alleppey area during the period 1972-76. a. *Metapenaeus dobsoni*, b. *Penaeus indicus*, c. *Parapenaeopsis stylifera*, d. *Metapenaeus monoceros*, e. *Metapenaeus affinis*.

Distribution of Length Frequencies and Modal Sizes

As the fishery extended only for 4-5 months a study of the length frequency curves did not help much in estimating the monthly growth rate. So also, the different modes for males and females from month to month were not following a definite pattern or progressive increase in size. However, they helped in showing the trend of distribution of dominating modal sizes in different months of the same season and in same seasons of different years.

In the case of *M. dobsoni*, in July, 1972 the modal length was 91-95 mm in males. The mode was 81-85 mm in August and 71-75 mm in September. A similar erratic trend has also been recorded in females; modes 101-105 mm in July and 81-85 mm in September. But in 1973 the prominent mode was 81-85 mm throughout the season except in August, when it was 91-95 mm in

males. In the case of females, the modal size group was 101-105 mm. Recruitment of smaller ones to the fishery belonging to the size range of 61-75 mm was, however, noticed during the beginning of the season in 1973 and 1974 in both the sexes. (for the monthly mean sizes, *see* Table 2).

TABLE 2. *Monthwise distribution of mean sizes of* M. dobsoni *of mudbank seasons during the period,* 1972-76.

	Mean sizes in mm	
	Males	Females
1972		
July	91.5	98.5
August	78.0	89.0
September	75.9	83.8
1973		
June	75.2	88.8
July	85.3	91.1
August	91.1	103.4
1974		
June	80.1	81.3
July	83.9	88.4
August	80.9	85.4
1975		
May	82.5	88.4
June	80.7	88.4
July	85.7	89.6
August	90.5	100.7
1976		
June	81.5	88.7
July	77.3	89.6
August	82.5	92.9

P. stylifera was not commonly available. However, the length-frequency modes could be traced for the years 1974 and 1976, and partially for the season in 1975. The principal modes for males remained at 81-85 mm all through the season in 1974 and in the later part of the season in 1976 (August-September). The entry of females into the fishery was more in the size group of 81-85

mm during July-August, with change of the mode to 76-80 mm in June and 91-95 mm in September 1974. But in July 1976 the smaller group of individuals within the range of 76-80 mm for males and 81-85 mm for females were dominating in the fishery.

P. indicus did not contribute much to the fishery. So length-frequency progression could not be traced continuously for all the seasons. However, the modes for the season of 1974 indicated that 151-155 mm size was dominant in the fishery during the beginning of the season (June). The same mode continued in July, the middle of the season, and then changed to 146-150 mm and 141-145 mm in August and September, respectively. In the case of females, 151-155 mm was dominating in the fishery throughout the season.

This erratic length-frequency distribution of mean sizes clearly indicates an irregular recruitment of different age groups into the fishery, or a mixing up of different populations into a single fishable stock, forming a lucrative fishery for the season.

Sex Ratio

In the case of *M. dobsoni* the sex ratios varied from month to month during different years (Tables 3 and 4). The males were found in higher proportion than females in lower size groups, whereas the proportion of females were higher in bigger size groups. The differences observed in sex ratios were studied by Chi-square test as of Cochran (1954) and the results of the analysis are as follows:

	1972	1973	1974	1975	1976
Chi-square	8.018*	8.27*	39.05*	0.008	20.00*
d.f.	2	2	3	1	3

* Significant at 5% level

The results show that, except in 1975, the males and females were not in equal proportion.

In 1972, during the month of July, the males and females were approximately in equal proportion. But considerable reduction in the proportion of males was observed during the subsequent months, August and September. In 1973 the distribution of sexes was quite uneven. In the month of June only 46.0% of the individuals were males while this increased to 58.0% during July. Again it was reduced to 52.0% in August of the same year. During 1974 the dominance of females was in the order of 72.2%, 61.4% and 72.9% for the months of June, July and August, respectively.

TABLE 3. *Monthly sex ratio distribution of* M. dobsoni *in mudbank seasons during the period,* 1972-76.

Year	May		June		July		August		September	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
1972	—	—	—	—	50.3	49.7	38.2	61.8	36.7	63.3
1973	—	—	46.3	53.7	58.7	41.3	52.2	47.8	—	—
1974	—	—	27.8	72.2	38.6	61.4	27.1	72.9	44.6	55.4
1975	43.3	56.7	46.0	54.0	53.2	46.8	52.8	47.2	—	—
1976	—	—	46.0	54.0	45.3	54.7	407.	59.3	42.9	57.1

TABLE 4. *Sexwise distribution of* M. dobsoni *in mudbank seasons during the period,* 1972-76.

Periods		1972		1973		1974		1975		1976	
May	Male	—		—		—		—		—	
	Total	—		—		—		—		—	
June	Male	—		76	0.4634	109	0.2781	—		202	0.4601
	Total	—		164		392				493	
July	Male	190	0.5026	305	0.5843	135	0.3855	196	0.5312	81	0.4525
	Total	378		522		345		369		179	
August	Male	26	0.3824	153	0.5222	112	0.2712	153	0.5276	200	0.4065
September	Male	44	0.3729	—		176	0.4490	—		201	0.4295
	Total	118		—		392		—		468	

MATURITY DISTRIBUTION

The mature females of *M. dobsoni* occurred in varying numbers throughout the season in length groups of 51-75 mm during 1974 as shown in Table 5 for the year 1974. During the years, 1972 and 1973 in July, by matured females in size range 101-105 mm were significant.

FOOD AND FEEDING HABITS

Regarding the feeding condition of *M. dobsoni,* out of a hundred stomachs examined, nearly 75 percent were in well-filled stage and the rest in half-filled stage. Most of them contained more quantity of mud and sand particles and

TABLE 5. *Sizewise distribution of mature females of* M. dobsoni *in mudbank seasons for the period,* 1972-76. (*Numbers are given in thousands, figures in parenthesis indicate percentage*)

Periods	Size range in mm			Totals with percentage
	51-55	76-100	101-105	
1972				
July	—	1454.9	5087.5	6542.5(10.4)
August	—	4.4	—	4.4 (9.2)
1973				
June	—	—	—	—
July	—	4257.1	15985.1	20242.2(17.1)
August	—	33.8	163.1	196.9 (9.5)
1974				
June	—	329.4	108.7	438.1(29.1)
July	26.0	1218.3	801.5	2019.8(33.7)
August	21.8	1473.5	264.6	1759.9(30.1)
1975				
May	19.8	100.0	6.4	126.1(35.3)
June	47.5	406.6	73.0	527.2(27.0)
July	—	1250.2	1044.2	2294.4 (4.1)
August	—	6.9	18.6	25.2 (1.2)
1976				
June	25.7	688.4	559.8	1274.0 (3.0)
July	—	120.5	8.2	128.7 (2.2)
August	—	374.7	142.2	516.9(10.0)

less quantity of decayed organic matter. The partially digested and decayed organic matter could be analysed and the following items could be identified. Partially digested *Fragillaria, Pleurosigma* and *Coscinodiscus* were the items of vegetable matter. Regarding the identifiable animal matter, copepods and decapod larvae were the important items. Besides, a considerable quantity of partially digested crustacean appendages also could be detected.

DISCUSSION

The annual monsoon fishery at Alleppey, with Purakkad as its centre, extending 3-4 months between May and September, is associated with the mudbank formation, which makes the sea along this region calm, facilitating easy

operation of the indegenous crafts. For the same reason the fishery is popular and, in certain years, very intensive. The catch often consists of heavy quantities of prawn, the bulk of which is *Metapenaeus dobsoni.*

The erratic trend of catch, length-frequency distribution, sex composition and muturity stages of this prawn, all point to a concentration of prawns in this area from the outlying regions. It has to be taken into consideration that, at this period, the coastal waters all along the south-west coast are in a disturbed condition but the Alleppey coast is calm due to mud in suspension. Banse (1959) and others have pointed out that the bottom fisheries at the conventional trawling grounds is suffering a set-back in this period due to the migration of at least a part of the constituents, of which *M. donsoni* is a major one, toward the nearshore area, a view to which the existence of a minor cast-net fishery in several regions has lent support. This migration has been attributed to the abrupt changes caused by upwelling. It is possible that such a migration is taking place in a larger scale to the Alleppey coast as the large-scale recruitment of the fully mature and impregnated females during the commencement of the season indicates. Because, at this time, the area around the vicinities of the mudbank are physically and biologically conducive. The preponderance of females in the higher length groups is an observed phenomenon in the offshore catches along the entire south-west coast particularly at the end of the trawling season, which, according to George et al (1968) and George and Rao (1967), is due to breeding migration. That the majority of the stomachs are filled with mud and organic matter is sufficient indication to the active feeding on these items, which are available in plenty in and around the mudbanks.

The high magnitude of effort unrelated to catch or catch rate is because the boats from places far and wide are brought to the area often on exaggerated, easily-spread heartell reports on fishery, and having taken the trouble of coming from long distances with heavy craft and tackle, these fishermen are forced to work for some time notwithstanding the absence of a remunerative fishery.

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