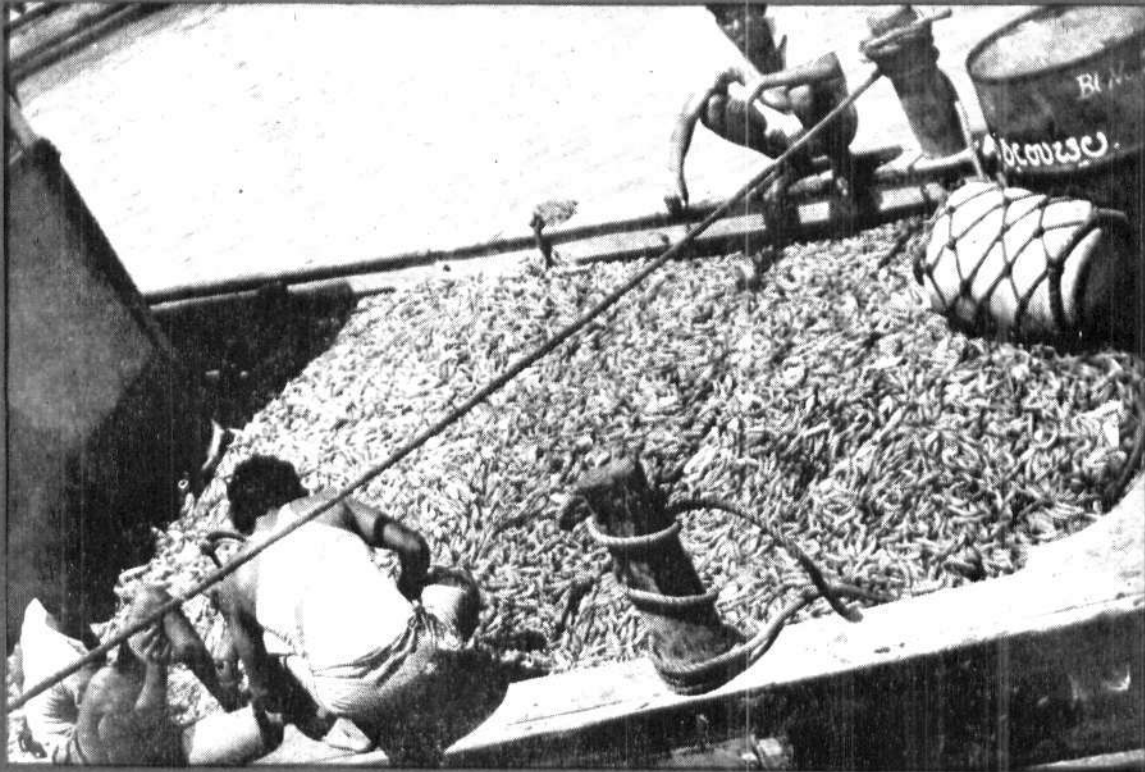




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Abbreviation – *Mar. Fish. Infor. Serv. T & E Ser.*, No. 65: 1985

THE PRAWN FISHERY OF THE SOUTH KANARA COAST WITH EMPHASIS ON THE UNUSUAL CATCHES OF *METAPENAEUS DOBSONI* BY PURSE SEINES AND TRAWLS DURING THE FIRST HALF OF SEPTEMBER, 1983

K. K. Sukumaran

Mangalore Research Centre of C.M.F.R.I., Mangalore

Introduction

The large scale introduction of purse seines along the South Kanara coast in late seventies, and the subsequent addition in the following years, were mainly intended to exploit the vast pelagic resources of this region. Prawns, being demersal in habit, were seldom caught in purse seines except in a few sporadic cases. However, the unexpected heavy catches of prawns in purse seines, particularly in the beginning of the fishing season, i.e., in the first few days of September, have been a boon to a large number of purse seiners since the last two to three seasons. The commencement of the 1983-'84 fishing season witnessed bumper catches of prawns (*Metapenaeus dobsoni*), particularly in purse seines, breaking all previous records. The unprecedented catch of *M. dobsoni* in purse seines necessitated intensive monitoring of the data in order to find out whether there was any over-fishing during this period resulting in the depletion of the resources. With this in mind, a programme was worked out to collect all basic data from important centres in South Kanara. The data from Mangalore (Bunder), and Malpe (Fisheries Harbour) were collected on a day-to-day basis, while Gangolli where the prawn landing was generally poor during this period, was observed only on a few occasions and the catch data was collected mostly on enquiry. Based on the above studies, an appraisal of the prawn fishery of the South Kanara coast by purse seiners during the first half of September, 1983 has been attempted here. The prawn landings by shrimp trawlers during the above period have been incorporated in order to make the study more comprehensive as well as to get a clear picture of the prawn landings in this area. Since *M. dobsoni* formed the bulk of the prawn catch, a brief account on its resource is also included.

Fishing operations

The craft and gear employed in purse seine fishery together with its mode of operation along the South Kanara coast have been mentioned by Dhulkhed *et al.* (*Mar. Fish., Infor. Serv. T & E Ser., No. 37, 1982*). Similarly, the trawl unit and its operation have been reported by Sukumaran *et al.* (*Mar. Fish. Infor. Serv. T & E Ser., No. 44, 1982*).

During this period, fishing was mostly carried out within 18 m depth. The units operating from Mangalore fished north of Mangalore, off Panambur, Suratkal, Mulky, Hejamadi, Padubidri, Kaup etc. from 1st to 9th September. There was a peak in the prawn catches in the first few days and a gradual decline was noticed from 4th to 9th September. There was a second peak from 10th onwards lasting up to 15th September. During the second peak, most of the fishing for prawns was carried out south of Mangalore (off Uppala, Kasaragod, Kanhangad etc.). At Malpe, except on 5th September, fairly good catch of prawns was obtained up to 7th September. The units were operated south of Malpe, and the fishing area was extended up to Kaup. It was found that a large number of purse seines and trawl units belonging to other centres like Hangarkatta and Gangolli were operated from Malpe during this period.

Each purse seiner, generally made one to four hauls per day, each lasting 1-3 hours. Each unit was found to engage one carrier boat during this period, for transporting the catch after one or two hauls.

Prawn production during the first half of September, 1983

It is estimated that around 1,939.0 t of prawns landed in the South Kanara coast during the first half

of September, 1983 as against 1,187.2 t of prawns landed during the corresponding period of 1982 (Table 1). This showed an increase of about 63.3% in prawn landings. During this period, the prawn catches were so unprecedented that it alone accounted for about 34% of the 11 years annual average landings of prawns of Karnataka for the period 1971-81.

Table 1. Estimated prawn landings in tonnes by mechanised units at Mangalore, Malpe and Gangolli during the first half of September, 1983 (September, 1982 data is also given for comparison)

Centre	1983	1982	increase during 1983 (%)
Mangalore	1,318.4	710.3	85.6
Malpe	565.5	430.9	31.2
Gangolli	55.1	46.0	19.8
Total	1,939.0	1,187.2	63.3

A. Gear-wise analysis of the prawn landings

1) *Purse seiners*: The purse seines alone accounted for 76.3% of the prawn landings in South Kanara during this period (Fig. 2 A) and the catch amounted to 1,479.3 t (524.6 kg/unit). Out of this, the bulk of the catch was obtained at Mangalore (1,165.2 t and 853.6 kg/unit) forming 78.8% (Fig. 1 A) of the prawn landings by purse seiners in South Kanara. (The estimated prawn catch at Mangalore by purse seiners during 1983-'84 season amounted to 1,244.0 t of which 94% was obtained in September itself). Malpe accounted for 20.7% (306.3 t and 214.9 kg/unit) of the prawn catches (Table 2). Other than 7.8 t (8.8 kg/unit) of prawns landed on 11-9-1983, practically there was no catch of prawns by this gear at Gangolli.

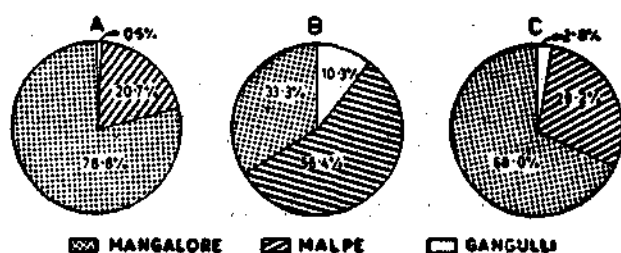


Fig. 1. Percentage contribution of prawns at Mangalore, Malpe and Gangolli (A - Purse seine; B - Trawl; C - All gear).

2) *Shrimp trawlers*: The prawn landing by mechanised trawlers was estimated at 459.7 t (62.9 kg/unit) forming 23.7% of the total prawn landings in South Kanara during the first half of September, 1983 (Table 3, and Fig. 2 A). Out of this, 153.2 t (79.8 kg/unit) were landed at Mangalore forming 33.3% of the prawn catches by this gear (Fig. 1 B). It could be seen that the prawn landings at Malpe was considerably higher than those obtained at Mangalore and Gangolli and accounted for 56.4% (259.2 t and 61.3 kg/unit). At Gangolli, it was comparatively poor than the other two centres and contributed only 10.3% (47.3 t and 40.8 kg/unit) of the prawn landings by this gear.

B. Centre-wise analysis of the prawn landings

1) *Mangalore (Bunder)*: It is seen that the highest catch was realised at Mangalore which contributed 68.0% of the prawn landings in South Kanara during this period (Fig. 1 C). The prawn catch was to the tune of 1,318.4 t (Table 1) of which 88.4% was obtained by purse seiners and the rest by mechanised trawlers (Fig. 2 B).

2) *Malpe (Fisheries Harbour)*: Malpe accounted for 29.2% of the prawn landings (Fig. 1 C) amounting to 565.5 t (Table 1). Of this, purse seiners contributed 54.2% and the rest by shrimp trawlers (Fig. 2 C).

3) *Gangolli*: Among the three centres under study, the prawn landing at Gangolli was the lowest, being 55.1 t (Table 1) forming only 2.8% of the total prawn landings in South Kanara (Fig. 1 C). Out of this, 85.8% was caught by shrimp trawlers and the rest by purse seiners (Fig. 2 D).

Table 2. Estimated landings of different category of prawns in tonnes by purse seines at Mangalore, Malpe and Gangolli during the first half of September, 1983

Centre	No. of units operated	M. <i>dobsoni</i>	P. <i>indicus</i>	Total	% of prawns in total purse seine catch
Mangalore	1,365	1,139.5	25.7	1,165.2	48.2
Malpe	1,425	297.2	9.1	306.3	4.9
Gangolli	920	7.6	0.2	7.8	not known
Total	3,710	1,446.0	35.0	1,479.3	
%		97.6	2.2		

Table 3. Estimated landing of different category of prawns in tonnes by shrimp trawlers at Mangalore, Malpe and Gangolli during the first half of September, 1983

Centre	No. of units operated	<i>M. dobsoni</i>	<i>P. indicus</i>	<i>P. monodon</i>	<i>P. styliifera</i>	Total	% of prawns in total trawl catch
Mangalore	1,920	140.8	11.1	—	1.2	153.2	55.2
Malpe	4,225	235.0	11.2	0.3	12.7	259.2	40.5
Gangolli	1,158	19.5	4.3	—	23.5	47.3	not known
Total	7,303	395.3	26.7	0.3	37.4	459.7	
%		86.0	5.8	0.1	8.1		

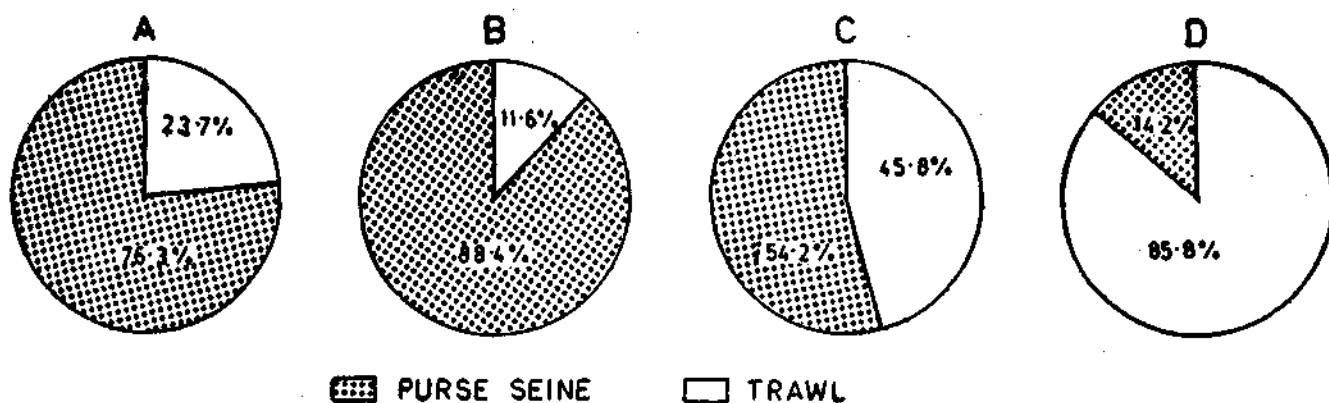


Fig. 2. Distribution pattern of prawns in purse seines and trawls during the first half of September, 1983, (A-South Kanara; B-Mangalore; C-Malpe; D-Gangolli).

C. Species-wise analysis of the prawn landings

1) *Species composition of prawns in purse seine catches:* *M. dobsoni* and *Penaeus indicus* were the only two species recorded in the prawn catches by purse seines during this period.

In purse seines, *M. dobsoni* was the most abundant species contributing to the bulk of the prawn catches. It formed 97.6% of the prawn landings in South Kanara by purse seiners (1,446.3 t) (Table 2). The highest catch of this species was obtained at Mangalore (1139.5 t), followed by Malpe (297.2 t). The catch at Gangolli was low (7.6 t).

P. indicus formed 2.2% of the prawn landings by purse seiners (35.0 t). The highest catch of 25.7 t was obtained at Mangalore (Table 2) followed by Malpe (9.1 t). The landing of this species at Gangolli was negligible (0.2 t).

2) *Species composition of prawns in trawl catches:* Unlike in purse seines, the prawn catch by shrimp trawlers was constituted by a number of species.

M. dobsoni was the chief species as in purse seines, followed by *Parapenaeopsis styliifera*, *Penaeus indicus* and *P. monodon* in the order of their abundance.

M. dobsoni was the most predominant species forming 86.0% (395.3 t) of the prawn landings by shrimp trawlers (Table 3). It is seen that the best catches of this species by this gear were obtained at Malpe (235.0 t). The landing of this species was 140.8 t and 19.5 t at Mangalore and Gangolli respectively (Table 3).

P. styliifera was the second important species but forming only 8.1% of the prawn landings by trawlers (37.3 t). Maximum catch was recorded at Gagolli (23.5 t) followed by Malpe (12.7 t). This species was poorly represented at Mangalore (1.2 t) (Table 3).

P. indicus formed 5.8% of the prawn landings in South Kanara by shrimp trawlers. The catch was to the tune of 26.7 t of which 11.2 t were landed at Mangalore, 11.2 t at Malpe and the rest (4.3 t) at Gangolli (Table 3).

P. monodon was available only at Malpe on 1-9-1983 (0.3 t) (Table 3).

D. Catch value

Based on the auctioning rates of individual species of prawn in the landing centres on each day of observation, the catch value with respect to prawns has been estimated at Rs. 30.0 million for whole South Kanara during the first half of September, 1983, out of which Mangalore alone accounted for 71.7% (Rs. 21.5 million) (Table 4). The contribution of Malpe towards the total value was only Rs. 7.9 million (26.3%), whereas, that of Gangolli was the lowest being 0.6 million (2.0%).

A gear-wise analysis of the catch value indicated that purse seines alone accounted for 77.7% (Rs. 23.3 million) and the rest (Rs. 6.7 million) by trawlers (Table 4).

Studies on the resources of *M. dobsoni*

Since the prawn fishery was largely supported by *M. dobsoni* during this period, some of its resource characteristics have been studied in detail and an account is given below.

Size distribution

The fishery of *M. dobsoni* was exclusively supported by large sized prawns during this period. At Mangalore, the size ranged from 83 to 108 mm and 93 to 128 mm for males and females with modal sizes at 93 mm and 113 mm respectively in purse seine catches, while, in the trawl catches the size ranged from 83 to 108 mm with mode at 98 mm for males and 93 to 123 mm with mode at 113 mm for females.

At Malpe, the size ranging from 83 to 103 mm and 93 to 123 mm for males and females with modal sizes at 98 mm and 113 mm respectively represented the purse seine fishery, whereas, the trawl fishery was supported by sizes ranging from 83 to 103 mm with mode at 93 mm in males and 78 to 123 mm with mode at 108 mm in females.

The gear-wise size distribution of *M. dobsoni* at Mangalore and Malpe is given in Fig. 3. It is seen that there was no marked difference in the size distribution in different gears except the higher modal sizes noticed in males in the trawl fishery at Mangalore. However, at Malpe, the modal sizes for males and females in trawl catches were small as compared to those of purse seines.

It is interesting to note that *M. dobsoni* was mostly represented by one year class and above during this period, and 0-year class was seldom found in the catch.

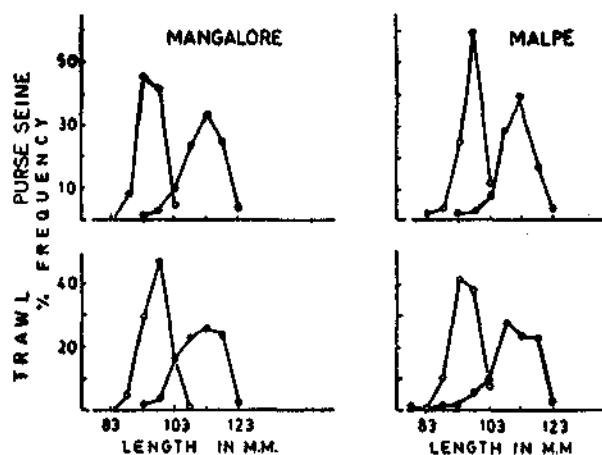


Fig. 3. Size frequency distribution of *M. dobsoni* in purse seines and trawls at Mangalore and Malpe during the first half of September, 1983. (open circles indicate males and closed circle, females)

Table 4. Value of prawns landed at Mangalore, Malpe and Gangolli by purse seiners and shrimp trawlers during the first half of September, 1983 (in Rupees)

Centre	Purse seine	Trawl	Total	% of catch value (centre-wise)
Mangalore	1,89,67,820	25,79,270	2,15,47,090	71.7
Malpe	42,69,070	36,77,530	79,46,600	26.3
Gangolli	98,200	4,55,000	5,53,200	2.0
Total	2,33,35,090	67,11,800	3,00,46,890	
% of value (gear-wise)	77.7	22.3		

Centre-wise age composition data is given in Table 5 which indicated that 95 to 97% was comprised by one year olds, 2 to 3% by two year olds and 1 or less than 1% by 0-year prawns. It is seen that there was not much difference in the age structure of *M. dobsoni* in trawls and purse seines at these centres.

Table 5. Age composition * of *M. dobsoni* (in percentage) in purse seines and trawls at Mangalore and Malpe during the first half of September, 1983

	Mangalore			Malpe		
	0-year	1-year	2-year	0-year	1-year	2-year
PURSE SEINE						
Males	0.4	99.3	0.3	0.7	99.3	—
Females	1.1	95.0	3.9	1.2	95.2	3.6
TRAWL						
Males	0.2	98.9	0.9	0.4	99.6	—
Females	1.6	95.6	3.4	5.5	92.1	12.4

* Males up to 85 mm, 86 - 105 mm and above 106 mm; Females upto 95 mm, 96 - 120 mm and above 121 mm for 0 - year, 1 - year and 2 - year classes respectively.

Sex ratio

The sex ratio in percentage in respect of *M. dobsoni* for purse seines and trawls at Mangalore and Malpe is given in Table 6. It could be seen that males and females were distributed more or less equal in trawl catches at Mangalore and Malpe, whereas, females dominated in purse seines at these centres (61.8 and 82.0% respectively). The preponderance of females in higher proportions in purse seine catches may be attributed to the behavioural pattern of females to come out of the bottom layers during night, possibly for spawning, which in turn was removed by purse seines in the early hours of the day. This is further supported by the fact that a purse seine sample of 100 prawns collected from Mangalore on 1-9-1983 had only two males and the rest were all females.

Table 6. Sex ratio distribution (in percentage) of *M. dobsoni* in purse seines and shrimp trawlers at Mangalore and Malpe during the first half of September, 1983

Sex	Mangalore		Malpe	
	Purse seine	Trawl	Purse seine	Trawl
Males	38.2	49.0	18.0	47.1
Females	61.8	51.0	82.0	52.9

Maturity

In *M. dobsoni*, spent and spent recovering females were noticed fairly in large quantities (Table 7). In addition, mature and impregnated females were also found in considerable numbers at both centres. All these suggested peak spawning in this species during this period. The maturity distribution in purse seine and trawl at these centres showed more or less a similar pattern.

Table 7. Distribution of various maturity stages of *M. dobsoni* in purse seines and trawlers at Mangalore and Malpe during the first half of September, 1983 (figures denote percentage)

Maturity stages	Mangalore		Malpe	
	Purse seine	Trawl	Purse seine	Trawl
Immature	15.9	18.6	15.9	27.1
Maturing early	15.4	17.0	3.5	10.1
Maturing late	18.1	10.5	4.5	19.0
Mature	8.7	6.5	9.7	11.8
Spent/spent-recovering	41.9	47.4	66.4	32.1
Impregnated	35.4	23.0	25.7	30.2

Soft-prawns

It is seen that in a sample analysed on 7-9-1983, 46.9% of females was in soft condition and the rest with hard shells. (similar data for the other days not available). It is interesting to note that practically all males were with hard shells. The presence of soft females in fairly large numbers indicated that females might have underwent moulting probably after spawning. This conclusion is based on the occurrence of large number of spent and spent recovering females during this period (Table 7). This also suggested that males might have undergone moulting first and females at a subsequent period as recorded in other crustaceans. By the time the females underwent moulting and become soft, the males might have hardened their shells and were ready for impregnation. The occurrence of good number of impregnated females also supported this view (Table 7).

Survival rate, S and the total instantaneous mortality coefficient, Z

Since the fishery of *M. dobsoni* during the first half of September, 1983 was supported largely by one year

class and above, which were fully recruited age groups, the survival rate, S , was calculated based on the age composition data of this prawn by employing the formula,

$$S = n_2/n_1$$

where, the n_1 and n_2 are the number of prawns per unit of effort in the same fishing season in different age groups, i.e., 1 year and 2 year olds respectively. From the S value, the total instantaneous mortality coefficient, Z , could be obtained by the relation,

$$S = e^{-Z}$$

This can be rewritten in the following form,

$$-Z = \log_e S$$

$$Z = -\log_e S$$

It is seen that the Z values for purse seines and trawls at Mangalore were 3.64 and 3.80, while these values for Malpe were 3.47 and 4.34 respectively (Table 8).

Table 8. Age composition (c.p.u.e. in numbers), survival rate, S , and instantaneous total mortality coefficient, Z of *M. dobsoni* in purse seines and trawls at Mangalore and Malpe during the first half of September, 1983

	Mangalore		Malpe	
	Purse seine	Trawl	Purse seine	Trawl
1-year	49,775	7,272	11,226	5,707
2-year	1,301	162	46	74
S	0.026	0.022	0.031	0.013
Z	3.64	3.80	3.47	4.34

It could be seen that there is not much variation in the Z values of purse seines and trawls of these centres. These values also indicated that this prawn was heavily exploited during this period.

Conclusion

Even before the advent of purse seiners there was fairly good catches of prawns by shrimp trawlers in September atleast during some years. But the introduction of purse seines has resulted in bumper catches of *M. dobsoni* in September, when the fishing season commenced. Though purse seines were introduced with an intention to exploit the vast pelagic resources available along the Karnataka coast, its contribution towards the exploitation of Prawn of this area, has been

considerably high, atleast in September. It is a fact that 76% of the prawn catch during the first half of September, 1983 was obtained by purse seines, whereas, the shrimp trawlers which are supposed to be the principal gear for exploiting the prawn resources, could contribute only 24% of the prawn landings during this period. The unprecedented catch of prawns in purse seines might possibly be due to the fact that the resource of *M. dobsoni* was found to be very close to the shore. Moreover, the behavioural pattern of females to come off the bottom for spawning and remain in the column waters for considerable amount of time as they were fully exhausted, might have helped the mechanised fishery, particularly purse seiners, to exploit them heavily. The huge size of the purse seine nets helped to encircle large areas and fish the 'accumulated stock' resulted out of the closed season (June-August) due to monsoon.

The heavy catches of *M. dobsoni* in September after the closed season revealed some interesting facts and suggested the following.

- i) The closed season helps in replenishment of the resources.
- ii) It results in the accumulation of stock.
- iii) It provides sufficient protection for younger prawns to feed and grow to larger sizes.
- iv) The closed season is a natural way of conservation of the resources and results in better yields in a short period, than during the regular fishing season.

The most striking feature was that the fishery of *M. dobsoni* during this period, was exclusively consisted of larger sizes. (On the other hand, the purse seine fishery during January-February, 1984 was supported by relatively smaller sized prawns of this species with modal sizes at 73 mm and 93 mm as against the present 98 mm and 113 mm respectively obtained for males and females.

This species was heavily exploited by purse seines and trawlers resulting in unprecedented catches during the first half of September, 1983. It is pertinent to ask whether this has any adverse effect on the resource. Generally, when a resource is subjected to heavy exploitation by different types of gears, it may lead to the depletion of the resource. Although there has been wide fluctuations in the catch of *M. dobsoni* in September, during various seasons, the present studies indicated that the intensive fishing during September may not lead to any conservatory problems. These prawns have already reached their maximum size (prawns larger than

the presently reported ones have not been recorded any time in the fishery) and hence in the fag end of their life. In addition, they might have spawned atleast three to four times before they attained the present size. It is reasonable to assume that they may possibly die of natural mortality if not exploited at that size. This has been further supported by the occurrence of dead and decayed prawns in trawl catches during this period, as well as the large scale occurrence of shells of dead prawns along the beaches of this region towards the fag end of the monsoon season. Therefore, it is not likely to

pose any serious conservatory problem, atleast in the near future. However, a close monitoring of the situation is essential.

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