

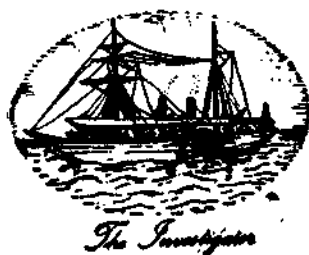
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PRAWN SEED RESOURCES OF THE ESTUARIES IN THE MANGALORE AREA

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ABSTRACT

A survey of the juvenile prawn resources of three estuaries viz., at Kasaragod, Mangalore and Mulki along the Karnataka coast was undertaken during 1969-72 by operating a drag net. The magnitude of the resource and its composition (species and size-wise) and the seasons of availability are dealt with in this account. The environmental parameters such as temperature and salinity are also presented.

INTRODUCTION

PRAWNS constitute about one seventh of the total marine fish production of India (CMFRI, 1979). Nearly two thirds of the prawn production is by the penaeid group which is of great export value. However, the exploitation of a natural resource has got its own limitations. Hence, there has been a global awakening to find out ways and means of augmenting fish production through coastal aquaculture.

It is well known that penaeid prawns spend their early life in the estuaries and near shore waters. The estuarine phase in their life history affords ample scope for collection of fry and stocking them for culture purpose. Though the Karnataka Coast has about 5000 ha. of estuarine areas, no information is available regarding the occurrence of prawn fry except for an account on the capture fisheries of the Mangalore Estuary (Ramamurthy, 1972). A knowledge of the availability of prawn fry and its composition in space and time is essential for planning aquaculture on scientific basis. The present paper deals with these aspects from three estuarine systems during 1969-72. Besides, the environmental parameters viz., temperature and salinity have also been considered.

The author is thankful to his colleagues Shri G. Subramanya Bhat for his help in the illustrations and Mrs. P. V. Shanbhag and Shri B. R. Dalvi for secretarial assistance.

MATERIAL AND METHODS

The material for this study came from 3 estuaries namely, the Chandragiri Estuary at Kasaragod in the south and the Shambhavi Estuary at Mulki in the north with Gурpur Estuary at Mangalore in between these two centres. Though Kasaragod is in Kerala, in view of its close proximity, it is considered along with other centres of the Karnataka Coast. While the study centre at Mangalore lies within a distance of 1 km from the bar, the other centres are about 1½ km from the bar.

A drag net consisting of 5 pieces (5.0 × 2.7 m each) with a stretched mesh varying from 0.9 to 2.5 cm was operated at ebb tide between 0630 and 0830 hrs. in depths of 0.5-2.5 m. The net was cast in a semicircular pattern from a boat and then dragged at either ends towards the shore. The number of hauls on a day varied from 3 to 5. Normally the frequency of fishing was twice a month and was carried out during the 3rd and 5th day following the full/new moon. During January-March 1969,

Present Address : Bombay Research Centre of CMFRI, Bombay.

fishing was also conducted in the evening to get a comparative picture of the yield at different times of the day. During the monsoon (June-August) fishing operations became often impossible due to the swollen nature of the rivers.

The weight of the prawn and fish catch was separately recorded. Random samples of the prawn catch were sorted out species-wise and their weight and total length (from the tip of rostrum to the tip of telson) were recorded. The CPUE is expressed in terms of a haul. Since each haul is estimated to cover an area of about 50 sq.m the CPUE is also regarded as density per 50 sq.m. Salinity was estimated by the Mohr's method of titration of chlorides.

HYDROLOGICAL CONDITIONS

All the estuaries have connection with the sea throughout the year. The bottom is muddy, mixed with sand. The tidal difference varied from 0.15 to 1.80 m depending upon the phase of the moon.

The surface temperature and salinity values on the observed days at the three centres during the different years are plotted in Fig. 1.

Kasaragod : The temperature varied from 24.5°C during July 1971 to 32.5°C during April 1969. Generally, it remained high during March-April (30.0-32.5°C) and low during June-August (24.5-28.0°C) coinciding with the monsoon. A secondary rise in temperature was noticed during October-November (29.0-31.0°C). However, during 1971 and 1972 this occurred in August (29.2°C) and December (32.1°C) respectively.

Salinity ranged from 0.37‰ during August, 1970 to 34.90‰ during April, 1972. The values were high during Jan-April (27.93-34.90‰) with peak during March-April. During 1969, however the peak was observed in May. With the onset of monsoon the values

gradually declined and touched lowest values during July-August (0.37-2.20‰). Subsequently the salinity steadily registered an increase to reach the peak in the summer months.

Mangalore : The range in temperature and salinity values was respectively from 25.9°C in July, 1972 to 31.8°C in April, 1969 and from 0.37‰ in August, 1970 and July, 1972 to 34.72‰ in April, 1969. The seasonal variations were generally similar to these at Kasaragod. However the peak values in temperature (30.8-31.0°C) were recorded during May of 1971 and 1972.

Mulki : The minimum and maximum values for temperature and salinity were respectively 25.2°C in August, 1970 and 32.5°C in April, 1969 and 0.24‰ in August, 1971 and 36.47‰ in May, 1972. The seasonal trends were similar to those at the other two centres.

JUVENILE PRAWN RESOURCE

The annual average catch of fish and prawns and the constituent species with their percentage composition is shown in Table 1. Figs. 1-4 depict the catch of prawns and the various species with size range and mean length on the observed days.

The prawn catch showed wide variations. It surpassed the fish catch quite often during October-December and occasionally during August-September, February and April. 90-95% of prawns belonged to the penaeid group comprising of mostly *Metapenaeus dobsoni*, *Penaeus indicus*, *M. monoceros* and *P. merguensis*. Species of lesser importance were *P. monodon* and *P. semisulcatus*. *M. affinis*, *M. burkenroadi* and *Parapenaeopsis stylifera* were rarely caught. The non-penaeids were represented by *Macrobrachium idae* and *M. rude*. Crabs (*Scylla serrata*) were occasionally caught in appreciable numbers.

TABLE 1. Annual prawn catch composition at different centres (CPUE in g ; numbers in parenthesis)

Year	<i>M. dobsoni</i>	<i>M. monoceros</i>	<i>M. affinis</i>	<i>P. indicus</i>	<i>P. merguensis</i>	<i>P. monodon</i>	<i>P. semisulcatus</i>	<i>M. burkenroadi</i>	Non-Penaeids	Total prawns	Fish	Prawns percentage
Centre : KASARAGOD												
1969	90.7(123)	6.1(5)	—	29.4(13)	1.6(1)	3.0	—	—	1.0	131.8	182.5	42.2
(% Wt)	68.8	4.6		22.3	1.2	2.3			0.8			
1970	17.6(58)	14.3(17)	0.4	24.2(22)	—	0.2	—	—	5.5	62.2	126.6	32.9
	28.3	23.0	0.6	38.9		0.3			8.9			
1971	100.2(394)	12.8(23)	—	21.2(88)	—	3.2	—	—	1.5	138.9	157.8	46.8
	72.1	9.2		15.3		2.3			1.1			
1972	57.7(59)	30.6(29)	—	9.7(30)	—	1.3	0.8	—	11.0	111.1	189.0	37.0
	51.9	27.5		8.7		1.2	0.7		10.0			
Average	66.5(159)	16.0(19)	0.1	21.1(38)	0.4	1.9	0.2	—	4.8	111.0	164.0	40.0
(% Wt)	59.9	14.4	0.1	19.0	0.4	1.7	0.2		4.3			

Centre : MANGALORE

1969	11.1(16)	1.6(1)	0.2	12.4(3)	12.6(3)	1.1	—	—	1.8	40.8	1460.7	2.7
	27.2	3.9	0.5	30.4	30.9	2.7			4.4			
1970	26.2(48)	3.7(2)	—	14.4(8)	1.3	2.1(1)	—	—	1.0	48.7	234.9	17.2
	53.8	7.6		29.6	2.7	4.3			2.0			
1971	65.2(287)	4.6(5)	0.1	17.4(8)	—	0.2	—	—	2.6	90.1	124.1	42.1
	72.4	5.1	0.1	19.3		0.2			2.9			
1972	60.0(198)	8.6(7)	0.2	22.9(12)	2.5(1)	5.1	1.5	—	8.0	108.8	136.5	44.3
	55.1	7.9	0.2	21.0	2.3	4.7	1.4		7.4			
Average	40.6(137)	4.6(4)	0.1	16.8(8)	4.1(1)	2.1	0.4	—	3.4	72.1	489.0	12.8
	56.3	6.4	0.1	23.3	5.7	2.9	0.6		4.7			

Centre : MULKI

1969	22.7(91)	3.5(2)	0.4(2)	21.7(13)	7.8(4)	0.3	—	0.1	1.4	57.9	258.3	18.3
	39.2	6.0	0.7	37.5	13.5	0.5		0.2	2.4			
1970	8.2(47)	1.2(2)	0.1	5.8(16)	0.9(1)	0.1	—	—	0.3	16.6	118.7	12.3
	49.4	7.2	0.6	35.0	5.4	0.6			1.8			
1971	45.3(136)	8.7(12)	—	13.7(48)	—	2.1	—	—	1.0	70.8	136.2	34.2
	64.0	12.3		19.3		3.0			1.4			
1972	8.8(61)	1.5(5)	—	18.8(47)	0.3	2.5	1.0	—	1.3	34.2	149.9	18.6
	25.7	4.4		55.0	0.9	7.3	2.9	—	3.8			
Average	21.3(84)	3.7(5)	0.1	15.0(31)	2.3(1)	1.3	0.2	—	1.0	44.9	165.8	21.3
	47.4	8.3	0.2	33.4	5.1	2.9	0.5		2.2			

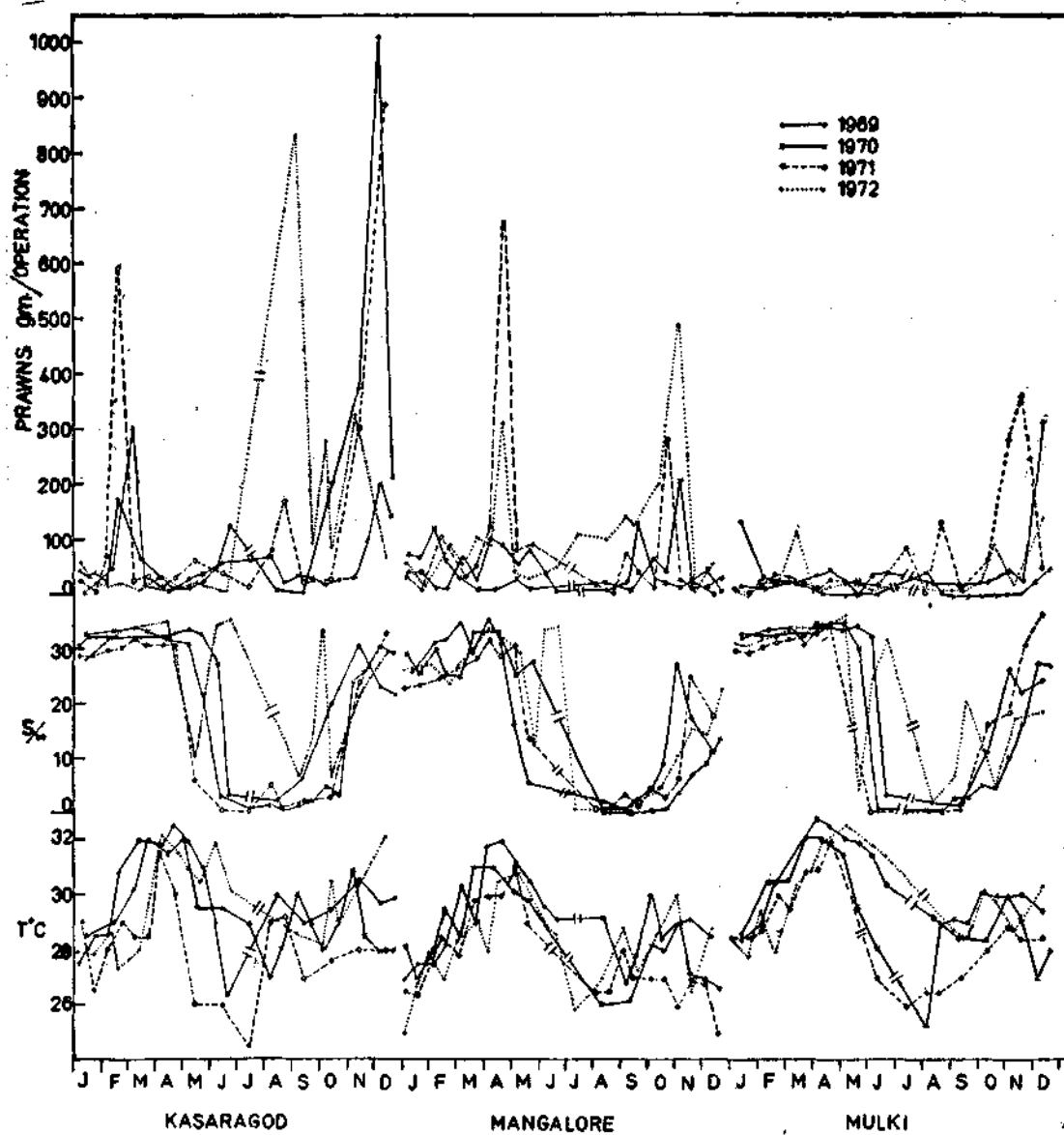


Fig. 1. Seasonal variations in surface temperature, salinity and juvenile prawn catch at different centres during 1969-72.

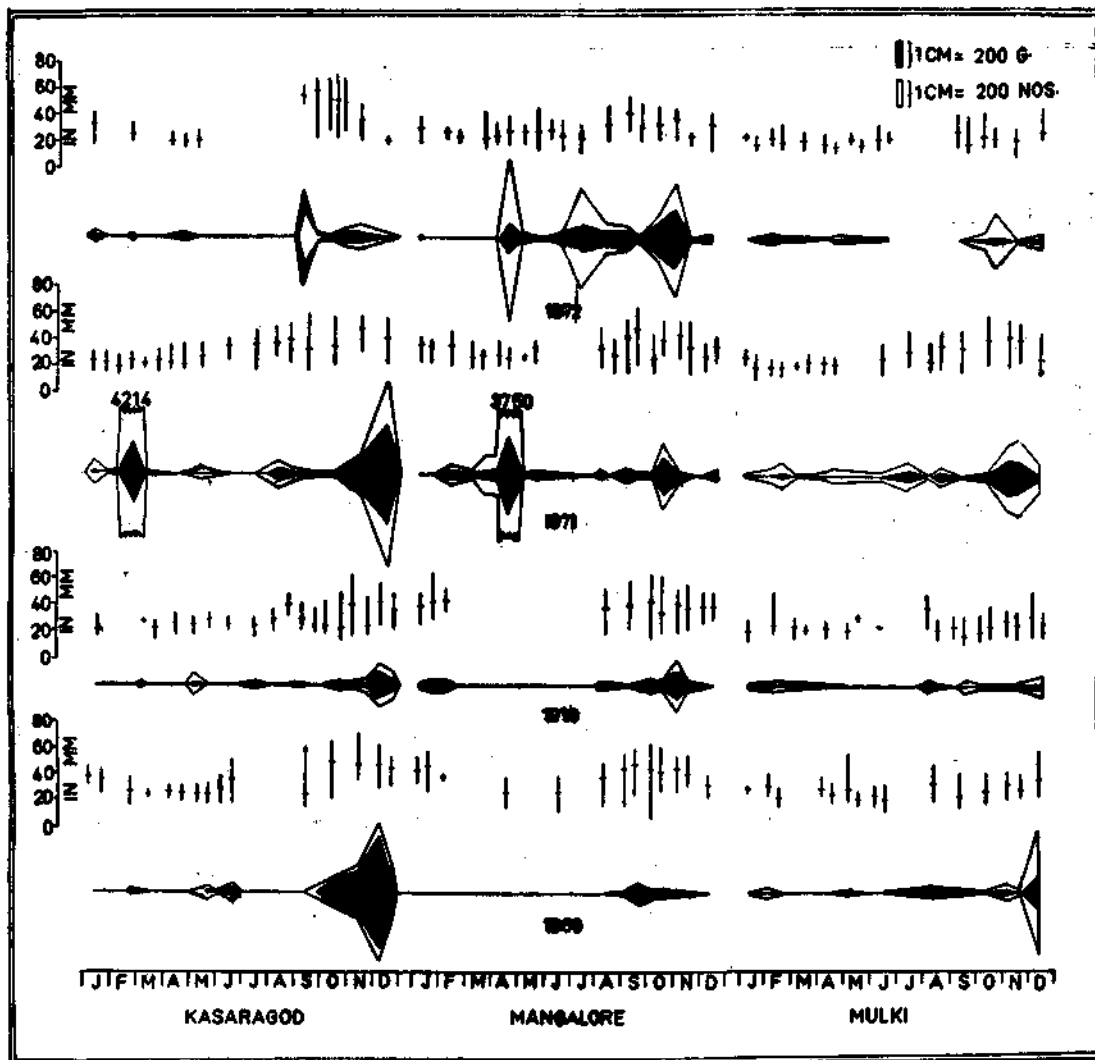


Fig. 2. Seasonal abundance of juvenile *M. dobsoni* in CPUE and size composition at different centres during 1969-72.

The fish catch consisted mostly of species of *Ambassis*, *Mugil*, *Stolephorus*, *Thrissocles*, *Tachysurus*, *Lates*, *Therapon*, *Sillago*, *Gerres*, *Etroplus*, *Tilapia* and *Platycephalus*.

Polyzoans and sea-weeds appeared in considerable quantities during January-March of 1971 and 1972 at Mulki.

The salient features of observation at the different centres are summarised below:

Kasaragod: Prawns constituted 32.9 to 46.8% of the total catch during the different years. The catch was generally poor during the monsoon months when the estuarine areas were freshened due to influx of rain water.

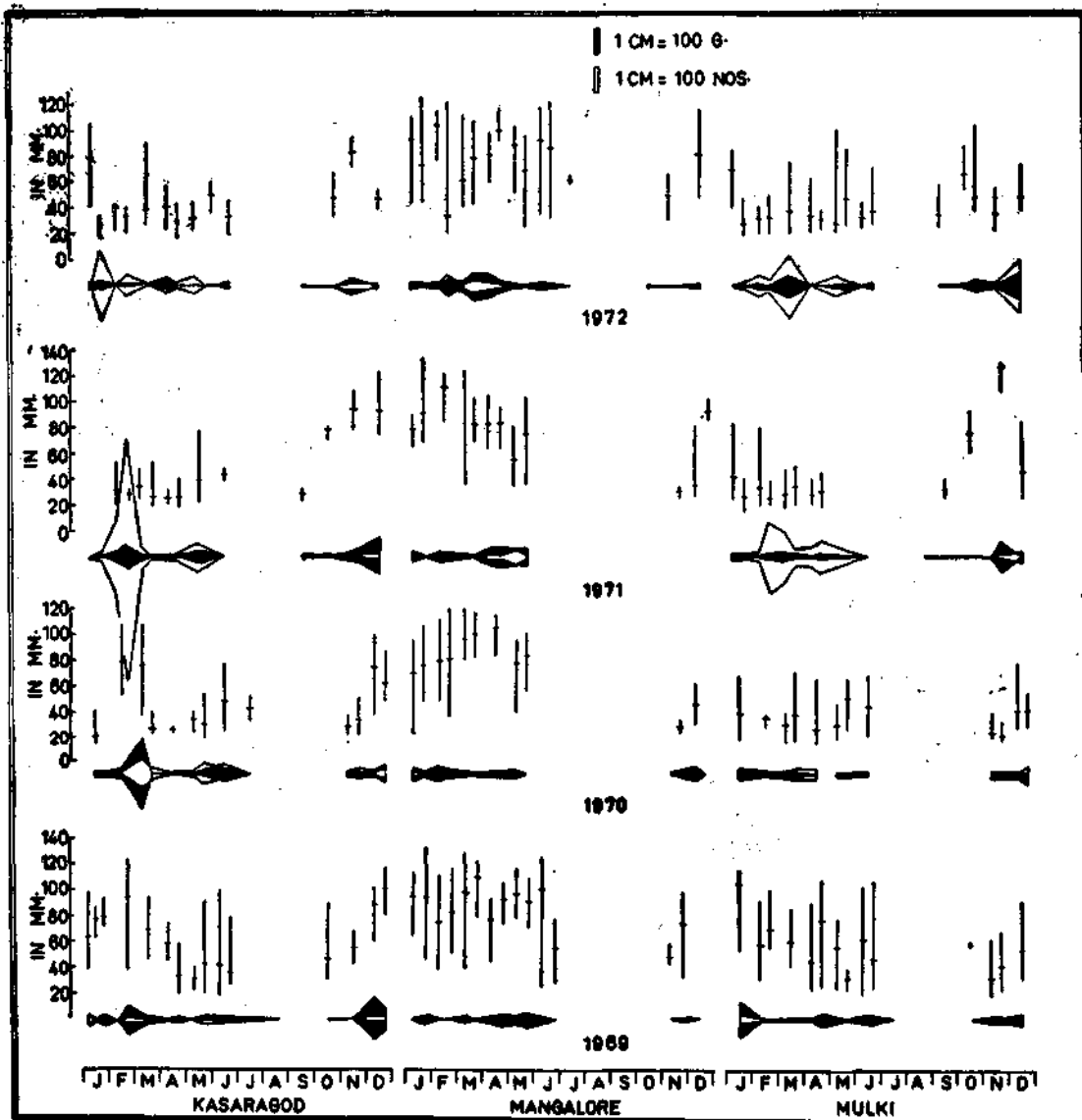


Fig. 3. Seasonal abundance of juvenile *P. indicus* in CPUE and size composition at different centres during 1969-72,

The peak period of prawn catch was generally in the post-monsoon period and was noticed in December, March, December and September

M. dobsoni was more common during 1969 and 1971. The period of abundance was September-December. During 1971, it was

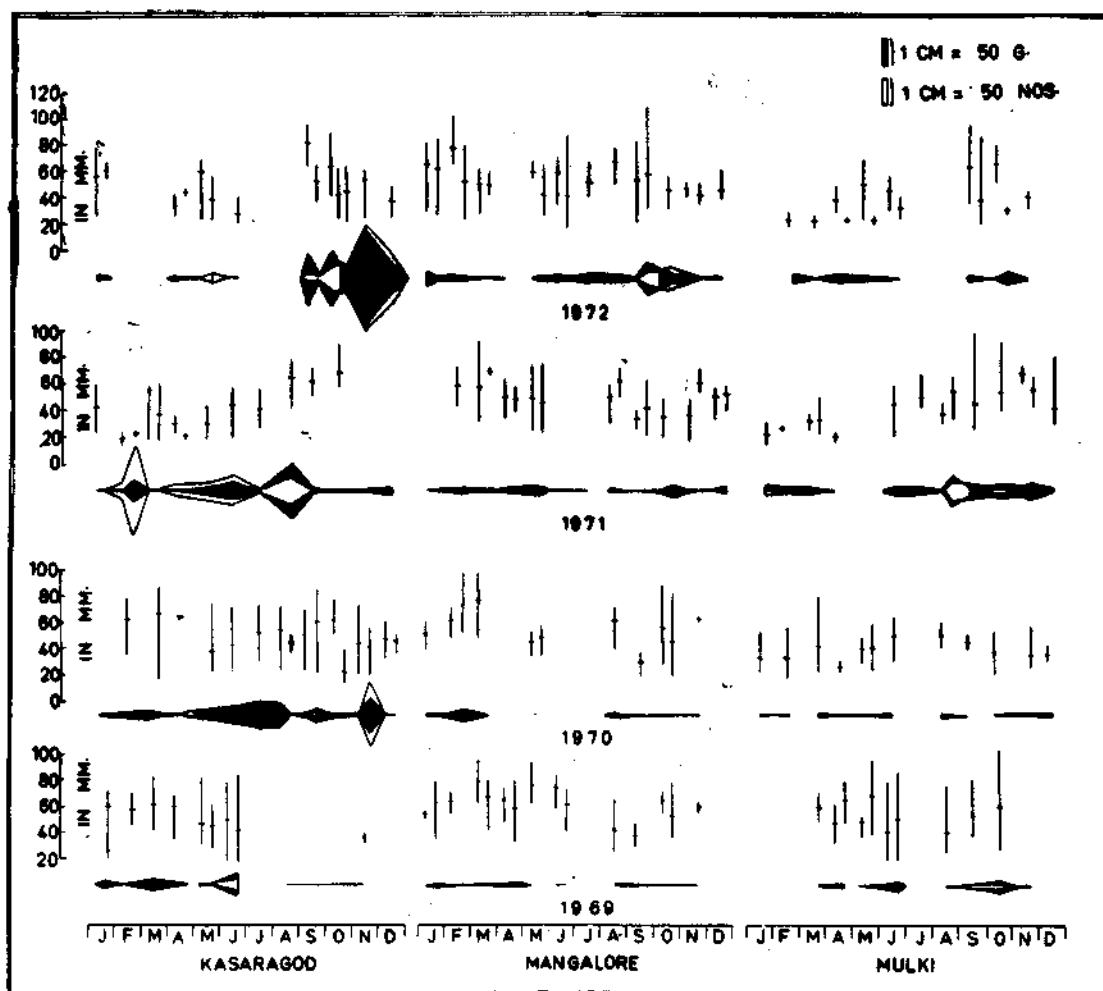


Fig. 4. Seasonal abundance of juvenile *M. monoceros* in CPUE and size composition at different centres during 1969-72.

respectively during the four years of study. The chief species was *M. dobsoni* followed by *P. indicus* and *M. monoceros*. However, during 1970, *P. indicus* was the predominant species.

abundant in February also. *P. indicus* was better represented during 1970 and 1971. The species was common during January-March and November-December. *M. monoceros* was rare in 1969. But it was of common occur-

rence during June, August and November in 1970, February-August in 1971 and September-November in 1972.

Mangalore: The prawn component varied from 2.7 to 44.3% of the total catch. The peak occurred during September, November, April and November during the four years respectively. The species composition was similar to that at Kasaragod. *P. indicus*, however, was the major species during 1969. Another notable feature was the occurrence of *P. merguensis* in appreciable quantities during this year.

M. dobsoni was poorly caught during 1969 and 1970. The peak occurrence was during September-November. During 1971 and 1972, this species was very common in April also. *P. indicus* was more common during 1971 and 1972. The peak was during March-May. *M. monoceros* was poorly represented except in 1972, when the peak was during September-October.

Mulki: The percentage composition of prawns in the total catch varied from 12.3 to 34.2. The maximum catch of prawns was noticed in December except during 1971 when it was in November. The catch composition was similar as before. However, during 1972, *P. indicus* outweighed *M. dobsoni*. *P. merguensis* was also well represented during 1969.

M. dobsoni was common in 1969 and 1971. The peak occurred during October-December. *P. indicus* had better representation during 1971 and 1972. The period of abundance was February-March and November-December. *M. monoceros* was caught in fair magnitude only during 1971, the peak period being August-October.

The resources characteristics of the three major species at the various centres are given in Table 2.

Among the species of lesser importance, *M. affinis* and *P. monodon* were caught more

frequently at Mangalore during January-May than at the other centres. The former ranged from 16 to 76 mm with mean length 25-45 mm being predominant. The latter measured 31-178 mm with mean length 45-80 mm being common. *P. semisulcatus* and *M. burkenroadi* were rare and occurred during February-June in the size range of 25-104 mm and 17-81 mm respectively.

DIURNAL VARIATIONS IN CATCH

The prawn catch was observed to be better in the evening than in the morning during January-February and vice versa during March (Tables 3, 4). The ebb tides were also lower in the evening than in the morning during the two months and vice versa in March. Thus it is evident that the prawn catch was better when the tidal difference was greater. There were, however, no significant differences in the catch and size composition of the species.

GENERAL REMARKS

One striking feature that has emerged from the present study is that the resource of juvenile penaeids in the various estuaries decreases from south to north along the coast. Thus the Kasaragod Estuary supports the most abundant resource and the Mulki Estuary the least abundant. The composition of the population has been, however, observed to be more or less identical at all the centres and akin to that of the Cochin Backwaters observed by Kuttyamma and Antony (1975).

Of the three major species viz., *M. dobsoni*, *P. indicus* and *M. monoceros* which occurred in the order of abundance, all except the second one were caught almost throughout the year, though variations were noticed in their abundance. *M. dobsoni* had the peak generally during September-December and occasionally during February-April and July. It is esti-

TABLE 2. Resource characteristics of penaeid species at various centres

Centre	Species	Range in maximum CPUE values		Size range in mm (Jan.-June)		Size range in mm (July-Dec.)	
		In Grams	In numbers	Total length	Common mean length	Total length	Common mean length
Kasaragod	<i>M. dobsoni</i>	180-841 (Dec. '70) (Dec. '69)	321-4214 (Dec. '70) (Feb. '71)	14-44	20-30	14-72	40-50
	<i>P. indicus</i>	64-286 (Nov. '72) (Mar. '70)	37-925 (Dec. '69) (Feb. '71)	14-124	20-40	21-124	80-95
	<i>M. monoceros</i>	40-129 (June '69) (Nov. '72)	38-200 (June '69) (Nov. '72)	14-84	20-50	13-96	40-65
Mangalore	<i>M. dobsoni</i>	119-600 (Sept. '69) (Apr. '71)	148-3750 (Sept. '69) (Apr. '71)	12-661	20-30	8-68	35-50
	<i>P. indicus</i>	52-92 (May '69) (Mar. '72)	12-81 (May '69) (Feb. '72)	20-134	70-90	20-118	20-50
	<i>M. monoceros</i>	12-56 (May '71) (Sept. '72)	8-42 (Feb. '70) (Oct. '72)	17-102	60-80	18-108	40-60
Mulki	<i>M. dobsoni</i>	30-267 (Dec. '70) (Dec. '69)	163-942 (Dec. '70) (Dec. '69)	8-57	20-30	12-62	25-45
	<i>P. indicus</i>	16-130 (Jan. '70) (Jan. '69)	28-266 (Jan. '69) (Feb. '71)	14-116	25-40	18-130	35-50
	<i>M. monoceros</i>	23-52 (Oct. '69) (Aug. '71)	10-40 (Oct. '69) (Aug. '71)	14-98	20-40	20-104	40-60

TABLE 3. Catch details of morning haul at Mangalore (CPUE in g and numbers in parenthesis)

Date	Lowest tide (m)	Fish	Prawns	Species of prawns							
				<i>M. dobsoni</i>	<i>M. monoceros</i>	<i>M. affinis</i>	<i>P. indicus</i>	<i>P. merguensis</i>	<i>P. monodon</i>	Others	
7.1.69	..	0.86	173.0	39.0	0.9(2)	0.5	—	8.0(1)	29.4(6)	—	0.2
Size range (mm)	..				34-54	51-57	—	64-113	54-104	—	—
Mean length (,,)	..				43.2	54.3	—	95.0	86.0	—	—
21.1.69	..	0.59	52.0	42.0	3.0(5)	2.0(2)	—	34.0(7)	—	1.0(1)	2.0
Size range (mm)	..				27-58	34-80	—	47-133	—	—	—
Mean length (,,)	..				47.0	63.0	—	94.0	—	52.0	—
4.2.69	..	0.76	202.0	10.0	0.3(1)	0.5	2.3(3)	1.8	4.4(1)	0.6	0.1
Size range (mm)	..				36-40	54-72	27-72	38-112	68-113	41-79	—
Mean length (,,)	..				38.0	63.0	44.0	75.0	80.0	70.0	—
17.2.69	..	0.64	109.0	10.0	—	0.6	0.2	3.0	6.2(1)	—	—
Size range (mm)	..				—	—	35-60	51-117	74-121	—	—
Mean length (,,)	..				—	—	—	83.0	100.0	—	—
6.3.69	..	0.47	219.0	66.0	—	2.1	0.4	20.4(4)	38.0(10)	2.4	2.7
Size range (mm)	..				—	63-95	28-54	38-125	72-115	75-95	—
Mean length (,,)	..				—	79.0	40.0	98.5	88.7	80.0	—
20.3.69	..	0.27	515.0	27.0	—	2.5(1)	0.3	8.5(1)	13.5(3)	2.2	—
Size range (mm)	..				—	41-80	—	78-128	70-105	—	—
Mean length (,,)	..				—	65.8	—	110.0	87.8	—	—

TABLE 4. Catch details of evening haul (CPUE in g and numbers in parenthesis)

Date	Lowest tide (m)	Fish	Prawns	Species of prawns						
				<i>M. dobsoni</i>	<i>M. monoceros</i>	<i>M. affinis</i>	<i>P. indicus</i>	<i>P. merguensis</i>	<i>P. monodon</i>	Others
7.1.69	0.35	215.0	82.0	20.0(35)	12.0(10)	2.0(2)	12.0(3)	36.0(11)	—	—
Size range (mm)				37-51	37-81	40-50	84-108	52-98	—	—
Mean length (,)				42.0	55.0	46.0	95.0	80.0	—	—
21.1.69	0.29	712.0	150.0	74.0(72)	7.0(4)	8.0(22)	15.0(5)	—	46.0(40)	—
Size range (mm)				42-61	57-80	24-53	34-122	—	21-74	—
Mean length (,)				52.0	66.0	37.0	70.0	—	43.0	—
4.2.69	0.33	137.0	27.5	0.2(1)	—	13.7(15)	4.2(1)	8.3(2)	0.3	0.8
Size range (mm)				33-40	—	25-92	100-112	73-84	29-65	—
Mean length (,)				37.0	—	48.0	107.0	79.0	47.0	—
17.2.69	0.24	120.0	155.0	18.0(112)	6.3(3)	42.5(64)	49.0(5)	22.5(4)	11.7(2)	5.0
Size range (mm)				19-39	61-104	21-71	99-136	82-104	74-91	—
Mean length (,)				28.0	74.0	46.0	118.0	94.0	80.0	—
6.3.69	0.55	218.0	56.0	0.1	0.7	0.7	22.0	15.8	16.7	1.1
Size range (mm)				20-24	37-61	28-60	67-121	68-104	31-170	—
Mean length (,)				22.0	47.5	46.0	99.1	81.1	105.0	—
20.3.69	0.62	246.0	23.0	—	4.3	0.5	8.1	5.9	0.7	3.5
Size range (mm)				—	47-93	55-62	50-108	68-103	48-70	—
Mean length (,)				—	71.4	58.5	93.4	89.4	59.0	—

mated from the present study that over eight lakh seeds/ha could be collected during the peak season at Kasaragod. *P. indicus* was of common occurrence during February-May and November-December. It was virtually absent during the monsoon when the salinity of the estuarine areas was reduced almost to fresh water condition due to influx of rain water. Nearly two lakh seeds/ha is the estimated potential at Kasaragod. Mulki appears to be the next best centre for seed collection of this species with a potential of over half a lakh seeds/ha. *M. monoceros* was the least abundant and occurred relatively more during August-October with a potential of 0.4 lakh seeds/ha at Kasaragod.

Despite the preponderance of *M. dobsoni* in the catches, this species is uneconomic for culture purpose since it grows to only 13 cm in the sea, the maximum size recorded in the backwaters being 9 cm (Menon and Raman,

1961). On the other hand, *P. indicus* attains a size of 14 cm in the backwaters and grows to a maximum size of 23 cm in the sea. In view of its comparatively faster rate of growth (George, 1975), *P. indicus* holds immense scope for aquaculture. Taking into consideration the stockable size, the best period for collection of fry is January-March (particularly on days when the tidal difference is greater) when juveniles of 2-4 cm long are available.

The Mangalore Estuary has a relatively better representation of *P. monodon*, the 'jumbo tiger prawn' which grows to 32 cm in the sea. In the backwaters, sizes upto 15 cm are known to occur (Subrahmanyam and Ganapati, 1975). Perhaps a more efficient method of collection as practised in Philippines (Bardach *et al.*, 1972) can be adopted to augment the seed requirements for culture of this species.

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