SOME ASPECTS OF PRAWN CULTURE IN THE SEASONAL AND PERENNIAL FIELDS OF VYPEEN ISLAND

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ABSTRACT

Prawn culture is extensively practised in the paddy fields (seasonal fields) and other low lying areas (perennial fields) of Vypeen Island. Though the seasonal fields are found to be more productive, the perennial fields, which are available for prawn culture throughout the year, are not less important. Prawns stay for longer time and attains larger size in this type of fields. The average annual production of prawns is 903.3 and 838.6 kg|ha in the seasonal and perennial fields respectively. The month-wise catch rates show that higher catch rate is generally observed in January-March period. Four species of penaeid prawns, *Metapenaeus dobsoni, M. monoceros, Penaeus indicus* and *P. monodon* constitute the culture fishery of which *M. dobsoni* contributes more than 50% of the catch. It is observed that *M. dobsoni* in the perennial fields grow at an average rate of 10.0 mm per month. Although, the total expenditure to run the seasonal field is higher than that of the perennial fields, the net income realised from the seasonal field is always found to be better. It is therefore concluded that the paddy field prawn culture is more profitable than the culture of prawns in perennial fields.

The possibility of *M. dobsoni* breeding in the brackish water of the perennial field is suggested.

INTRODUCTION

In India, the prawn culture practices in the low lying fields along the banks of backwaters of Kerala and the bheris of West Bengal are in vogue from ancient times. Most of the commercially important penaeid prawns of the country enter the estuaries and backwaters in their early life and spend a part of the life in this environment. In this stage, they are trapped and cultivated in the fields prepared and maintained for this purpose supporting a lucrative seasonal fishery and contributing substantially to the overall prawn production of the country.

Some aspects of the prawn culture practices of Kerala have been dealt with by Panikkar (1937), Menon (1954), Gopinath (1956) and Kesteven and Job (1957), while Pillay (1954) reported on the culture of prawns in the

bheris of lower Bengal. Recently George, Mohamed and Pillai (1968) conducted a series of experiments on the culture of prawns in paddy fields and concluded that better catches of large sized prawns could be obtained by culturing juvenile prawns for about a month.

The culture fishery for prawns is extensively carried out in the paddy fields and other low lying areas of the Vypeen Island, near Cochin, Kerala and it plays an important role in the economy of the island. The present paper deals with the studies carried out on the prawn production and its seasonal fluctuation, species and size composition of the cultivated species and the economics of the fishery as observed in the seasonal and perennial fields of this area.

The Study Area

Vypeen is a coastal island located along the latitude 9° 58′ — 10° 11′ N, longitude 76° 10′ — 76° 15′ E in the central part of the Kerala State, South India (Fig. 1). It lies parallel to the main land and is separated from it on the eastern side by northern extension of the Vembanad lake (Cochin backwater). The Cochin and Azhikode bar mouths form the southern and northern boundaries of the island, while on the western side is the Arabian sea. The island is about 25 km long, wider near the middle and narrow at the southern and northern regions, and has a total area of 69.63 sq. km.

The island is provided with extensive marshy low lands, paddy fields and net work of tidal canals. The low lands have thick mangroove vegetation. The fields are shallow with predominantly muddy soil and are protected on the seaward side by long sand spits parallel to the coast. Originating from the main backwater, there are 13 canals, each 10 — 12 metre wide, running across the island and parallel to one another. Many of them extend upto the sea shore and are interconnected with narrow subsidiary canals. The main backwater which reclaims the land drainage from the river Periyar, opens to the Arabian sea at Cochin and Azhikode. Through these permanent openings, the sea water enter the backwater and associated canals and fields during high tides. Due to this tidal influence and the influence of land drainage, as well as monsoon rains, the hydrological features of these waters are typically estuarine. During the active south west monsoon period (June — September) the salinity remains low due to the inflow of large amount of fresh water. From October to February, the salinity gradually rises to reach the maximum in March — April. The temperature of these waters ranges from 25.7°C to 32°C; being lowest in July|August and highest in April|May (George, 1958; Mohamed and Rao, 1971). The environmental features and the high productivity of the backwaters (Qasim *et al.*, 1969) offer favourable conditions for the prawns to live and grow. About 1170 ha of fields distributed all over the island are at present utilised for prawn culture. Most of these fields are situated adjacent to the canal system with which they are connected with proper sluice gates. Some of the fields open directly to the main backwater.

Based on the extent of culture practices carried out, the fields can be grouped under two categories, namely, the seasonal fields and perennial fields. The seasonal fields are of various sizes about ½ to 40.5 ha, ½ — 1½ m deep, and

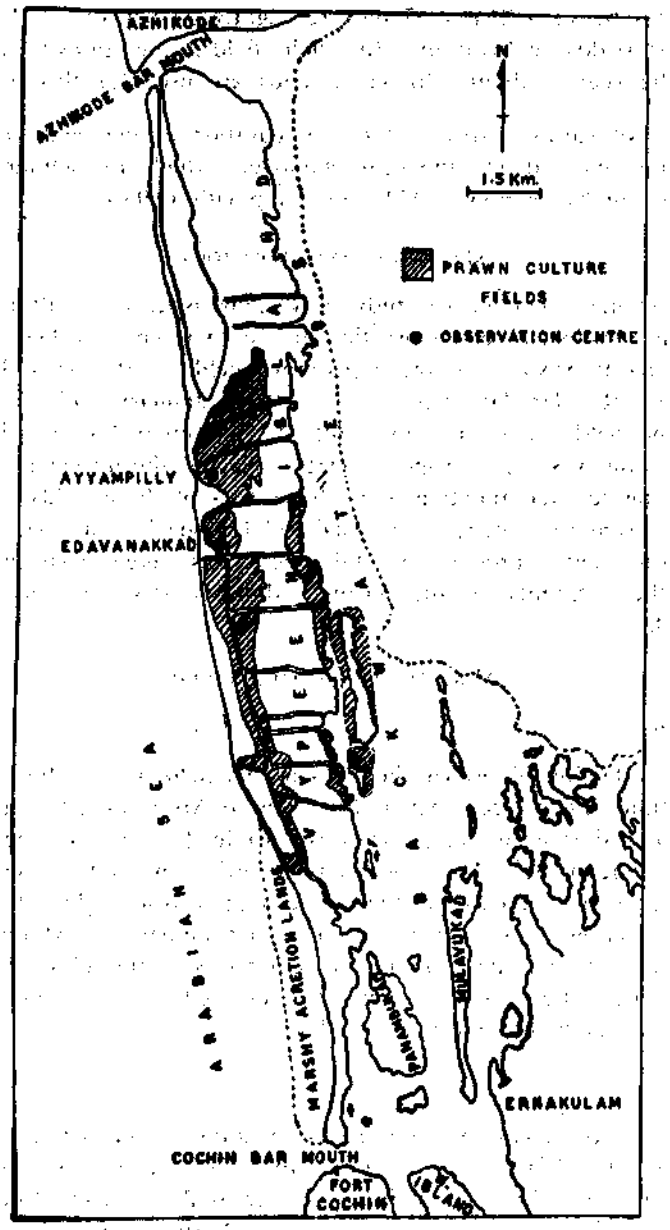

FIG. 1. Location of prawn culture fields in Vypeen Island.

are utilised for paddy cultivation during May — October, when the water in these fields become fresh. After the paddy cultivation, these fields are leased out for prawn culture from November to April. About 1040 ha of fields are at present subjected to paddy-cum-prawn culture. The perennial fields, the size of which varies between 2 and 75 ha, are slightly deeper (1 — 3½ m) and are unsuitable for paddy cultivation. In such fields, the prawns are cultured throughout the year. About 130 ha of fields are used for this purpose.

Details of various aspects of the preparation of the field for prawn culture, the fishing method and the gear employed, which are similar in both the fields, were given by Menon (1954) and Gopinath (1956).

Material and Methods

For detailed comparative study of various aspects of culture of prawns, their yield and biological characteristics in the two types of fields, a seasonal field of 40.5 ha at Ayyampilly and a perennial field of 60.7 ha at Edavanakkad were selected. Regular data were collected from January 1970 to April 1972, by visiting the fields once in a fortnight at each lunar phase. Estimation of prawn production was made from the data collected during each visit and also from the fishing register maintained by the lessees of these fields. Prawn samples obtained from the catches were analysed for species and size composition. Length measurement expressed in total length was taken from the tip of the rostrum to the extremity of the telson. Maturity stage of each prawn was also recorded.

Magnitude of the Yield

Seasonal field

The production of prawns in the seasonal field, where the fishing season generally commences in December and extends to April, varied from 783 tonnes to 1100 tonnes during the three seasons (Table 1), the average yield being 938 tonnes. The highest production was recorded in 1969-70 season and its magnitude declined gradually in the succeeding seasons. In all the seasons, increased production of prawns was seen during January — March. The rate of production of prawns per ha in this field varied from 35.6 to 352.9 kg in different months. The monthly catch rate increased from December to March, the peak value being in February — March.

Perennial field

Table 1 also gives the monthly production of prawns in the perennial field from January 1970 to April 1972. In 1970, the estimated total production of prawns was 97.6 tonnes and this increased to 115.9 tonnes in 1971. In 1972, the period of observation was upto April when the total yield was 43.9 tonnes. As in the seasonal fields, the prawn catches were generally better

TABLE 1. *The total prawn catch and catch/ha (kg) from the seasonal and perennial fields of Vypeen Island.*

Month	Seasonal field (1038.0 ha)						Perennial field (131.5 ha)					
	1969—70		1970—71		1971—72		1970		1971		1972	
	Total catch	catch/ ha	Total catch	catch/ ha	Total catch	catch/ ha	Total catch	catch/ ha	Total catch	catch/ ha	Total catch	catch/ ha
Dec.	89775	86.5	52582	50.7	36936	35.6	4877	37.1	3584	27.2	No data	
Jan.	194401	187.3	158209	152.4	196556	189.4	12085	91.9	10515	80.0	7680	58.4
Feb.	334425	322.2	355971	342.9	254961	245.6	17041	129.6	13916	105.8	13605	103.4
Mar.	366359	352.9	276866	266.7	215434	207.5	11830	90.0	15152	115.2	12967	98.6
Apr.	114912	110.7	86308	83.1	79425	76.5	5319	40.4	6428	48.9	9627	73.2
May							5924	45.0	9661	73.5	No data	
June							7176	54.6	17663	134.3	do	
July							5791	44.0	4032	30.7	do	
Aug.	Paddy cultivation period.						9782	74.4	5328	40.5	do	
Sept.							5074	38.6	7850	59.7	do	
Oct.							7564	57.5	18059	137.3	do	
Nov.							5089	38.7	3705	28.2	do	
Total:	1099872	1059.6	929936	895.8	783312	754.6	97552	741.8	115893	881.3	43879	333.6
Average total catch					937707						106722	
Average catch/ha.					903.3						838.6	

during February — March, but in 1971, exceptionally good production of prawns was recorded in June and October. This was mainly due to the operation of other gears such as cast nets and gill nets in addition to the usual sluice nets during these months. The rate of production of prawns in these fields was 741.8, 881.3 and 333.6 kg/ha in 1970, 1971 and in the first 4 months of 1972 respectively; the average being 838.6 kg/ha. A comparison of this figure shows that the production of prawns is better in the seasonal fields.

Species Composition

The culture fishery of both the fields was mainly supported by four species of penaeid prawns, namely, *Metapenaeus dobsoni* (Miers), *M. monoceros* (Fabricius), *Penaeus indicus* H. Milne Edwards and *P. monodon* Fabricius. Other species like *P. semisulcatus* de Haan, *M. affinis* (H. Milne Edwards), *Macrobrachium idella* (Hilgendrof) and *M. equidens* (Dana) were encountered only in lesser quantities. Apart from these prawns, the portunid crab, *Scylla serrata* (Forskal) also occured in appreciable quantities. Fishes like *Mugil* spp., *Etroplus suratensis, E. maculatus, Ambassis* spp., *Anchoviella* spp., *Thrissocles* spp., *Platycephalus* sp., and *Muraenosox cinereus* also occured in smaller numbers.

The percentage composition of the four main species of prawns in the seasonal field for different months is given in Table 2. In all the seasons, when the operations commenced in December, *M. dobsoni* was the principal species contributing to over 80% of the catches. It continued to dominate in January and February also, although its percentage contribution declined considerably. In the last two months of the season, the species formed less than 50% of the prawn catches. It was also observed that the percentage contribution of the species in the season's catch was 56.4 in 1969-70 and it gradually decreased in the subsequent seasons.

P. indicus ranked second in order of abundance. In December, this species contributed only 4.0 to 11.3% of the prawn catches. However, as the season advanced, it became more abundant and the peak landings in all the three seasons occurred in March, when it formed over 55% of the catches. It is interesting to note that in the percentage composition of the various species in the catches for different seasons, *P. indicus* showed increasing representation from 1969-70 to 1971-72.

M. monoceros, although obtained throughout the season, formed only a minor element of the prawn catches of the seasonal field. Its percentage contribution varied between 1.4 to 9.0 and it was more common in the catches landed during the last three months of the season. Like *M. dobsoni,* the average percentage contribution of this species was highest in 1969-70 and thereafter it declined and its average percentage contribution during the different seasons was more or less similar.

P. monodon contributed to less than 1% of the prawn catches in the seasonal field and its average percentage contribution during the different seasons was more or less similar. In December and January, they were generally less abundant and thereafter their number increased slightly.

The general trend of the distribution of different species and their abundance in the perennial field was similar to that of the seasonal field (Table 2). *M. dobsoni* was the dominant species in the catches landed during January — March and September — December, while *P. indicus* predominated in April — August. *M. monoceros* was caught in appreciable numbers from April to July. *P. monodon*, as in the catches of seasonal field formed only a minor portion of the landings and they were more common during March — May.

As observed in the catches of seasonal field, the percentage contribution of *M. dobsoni* and *M. monoceros* in the perennial field showed decreasing trend in the overall catches in 1970 and 1971, while there was a general increase in the case of *P. indicus*. *P. monodon*, however, did not show much year to year variation in the average percentage contribution in the catches.

Size Composition

M. dobsoni

The size of the species caught in the seasonal field ranged from 36 mm to 70 mm. The length frequency distribution of the species in different months show a unimodal distribution, the modal size ranges between 50 mm and 60 mm (Fig. 2).

Monthly length frequency distribution of this species in the perennial field is given in Fig. 3. The species in this field is represented by the sizes varying from 16 mm to 110 mm and the majority between 45 mm and 85 mm. Although, the estimation of the growth rate by following the progression of modes in length frequency curves is rendered difficult due to the immigration of juveniles and frequent fishing, it is clear from the quick progress of modal sizes seen during some months that the juveniles grow at a faster rate in this field as has already been found for Cochin backwater by Mohamed and Rao (1971). When the fishing commenced in January 1970, the modal size of the species was at 55 mm and this progressed to 65 mm in February. In March and April the modal size of the species were seen at a slightly lower size group indicating recruitment of younger juveniles into the fishery. In May, the principal size of the species was at 50 mm. This mode gradually shifted to 80 mm by August, thereby showing a growth of 30 mm in three months. The mode observed at 65 mm in September 70 progressed to 85 mm in November, recording a growth increment of 20 mm in two months. During December 1970 to February 1971, the modal size was at 70 mm. The length frequency curve of March 1971 showed two modes, a principal mode at 65 mm and a smaller secondary mode at 30 mm. The principal mode could be traced

TABLE 2. *Month-wise percentage composition of different*

1. Seasonal field

Species	December				January				February		
	1969	1970	1971	Average	1970	1971	1972	Average	1970	1971	1972
M. dobsoni	93.4	86.5	86.1	89.0	73.7	58.5	49.7	60.6	63.5	64.8	49.1
P. Indicus	4.0	11.3	8.7	8.0	21.6	38.6	47.9	36.0	27.6	32.4	48.3
M. monoceros	2.5	2.1	4.2	2.9	4.4	2.8	2.2	3.1	8.1	2.2	1.6
P. monodon	0.1	0.1	—	0.1	0.3	0.1	0.2	0.2	0.8	0.6	1.1

2. Perennial field

	January				February				March		
	1970	1971	1972	Average	1970	1971	1972	Average	1970	1971	1972
M. dobsoni	86.9	77.0	65.5	76.5	86.9	72.7	57.0	72.2	73.4	75.8	49.0
P. indicus	9.7	19.5	30.6	19.9	10.4	24.8	39.5	24.9	22.0	19.4	47.0
M. monoceros	2.8	3.0	3.6	3.1	1.7	1.6	2.0	1.8	2.7	3.1	2.5
P. monodon	0.6	0.5	0.3	0.5	1.0	0.9	1.5	1.1	1.9	1.7	1.5

	July			August			September			October	
	1970	1971	Average	1970	1971	Average	1970	1971	Average	1970	1971
M. dobsoni	45.8	35.9	40.8	42.8	55.6	49.2	75.9	88.8	82.4	91.9	79.1
P. indicus	47.5	47.8	48.1	54.3	36.3	45.3	16.8	7.7	12.2	4.5	14.3
M. monoceros	6.1	15.3	10.7	2.7	7.6	5.1	5.8	2.8	4.3	3.3	6.4
P. monodon	0.6	1.0	0.8	0.2	0.5	0.4	1.5	0.7	1.1	0.3	0.2

species of prawns in the culture fields of Vypeen Island.

	March				April				Yearly Average			Grand
Average	1970	1971	1972	Average	1970	1971	1972	Average	1969-70	1970-71	1971-72	Average
59.1	35.1	35.7	40.9	37.2	45.1	47.0	48.9	47.0	56.4	54.6	48.9	53.3
36.1	58.8	61.9	55.8	48.8	44.6	50.4	45.8	46.9	36.8	42.7	48.1	42.5
4.0	5.3	1.4	2.5	3.1	9.0	1.7	4.5	5.1	6.1	2.0	2.4	3.5
0.8	0.8	1.0	0.8	0.9	1.3	0.9	0.8	1.0	0.7	0.7	0.6	0.7

	April				May			June			
Average	1970	1971	1972	Average	1970	1971	Average	1970	1971	Average
66.0	26.8	49.7	50.5	42.3	20.7	33.9	27.3	20.1	14.6	17.4
29.5	63.9	37.1	43.8	48.3	73.1	60.1	66.6	74.9	83.0	78.9
2.8	7.4	8.8	3.2	6.5	3.8	4.7	4.3	4.6	2.0	3.3
1.7	1.9	4.4	2.5	2.9	2.4	1.3	1.8	0.4	0.4	0.4

	November			December			Yearly Average			Grand
Average	1970	1971	Average	1970	1971	Average	1970	1971	1972	Average
85.5	86.1	61.4	73.7	85.8	68.7	77.2	65.9	59.7	55.5	60.4
9.4	8.9	10.2	9.6	11.5	8.5	10.0	29.6	33.7	40.2	34.5
4.8	4.4	28.1	16.2	2.3	22.1	12.2	3.5	5.7	2.8	4.0
0.3	0.6	0.3	0.5	0.4	0.7	0.6	1.0	0.9	1.5	1.1

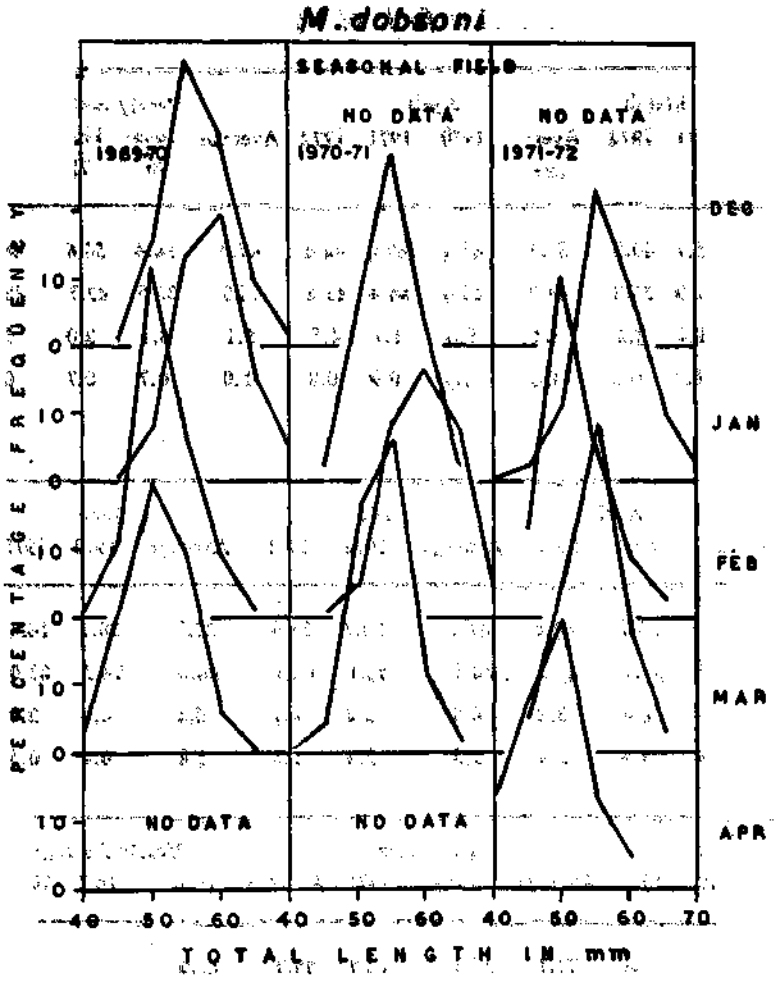

FIG. 2. Length frequency distribution of *Metapenaeus dobsoni* in the seasonal field, 1969 to 1972.

at 85 mm in May, the latter to 80 mm in August, thereby indicating a growth of 20 mm and 50 mm in 2 and 5 months respectively. From September 1971, smaller specimens with modal size at 65 mm and below contributed the fishery. From these, it would appear that the species in this field grow at an average rate of 10.0 mm per month. Menon (1951) found an average growth rate of 8.34 mm per month by rearing juveniles in the laboratory while Mohamed and Rao (1971) observed a growth rate of 9.88 mm per month in the open backwaters.

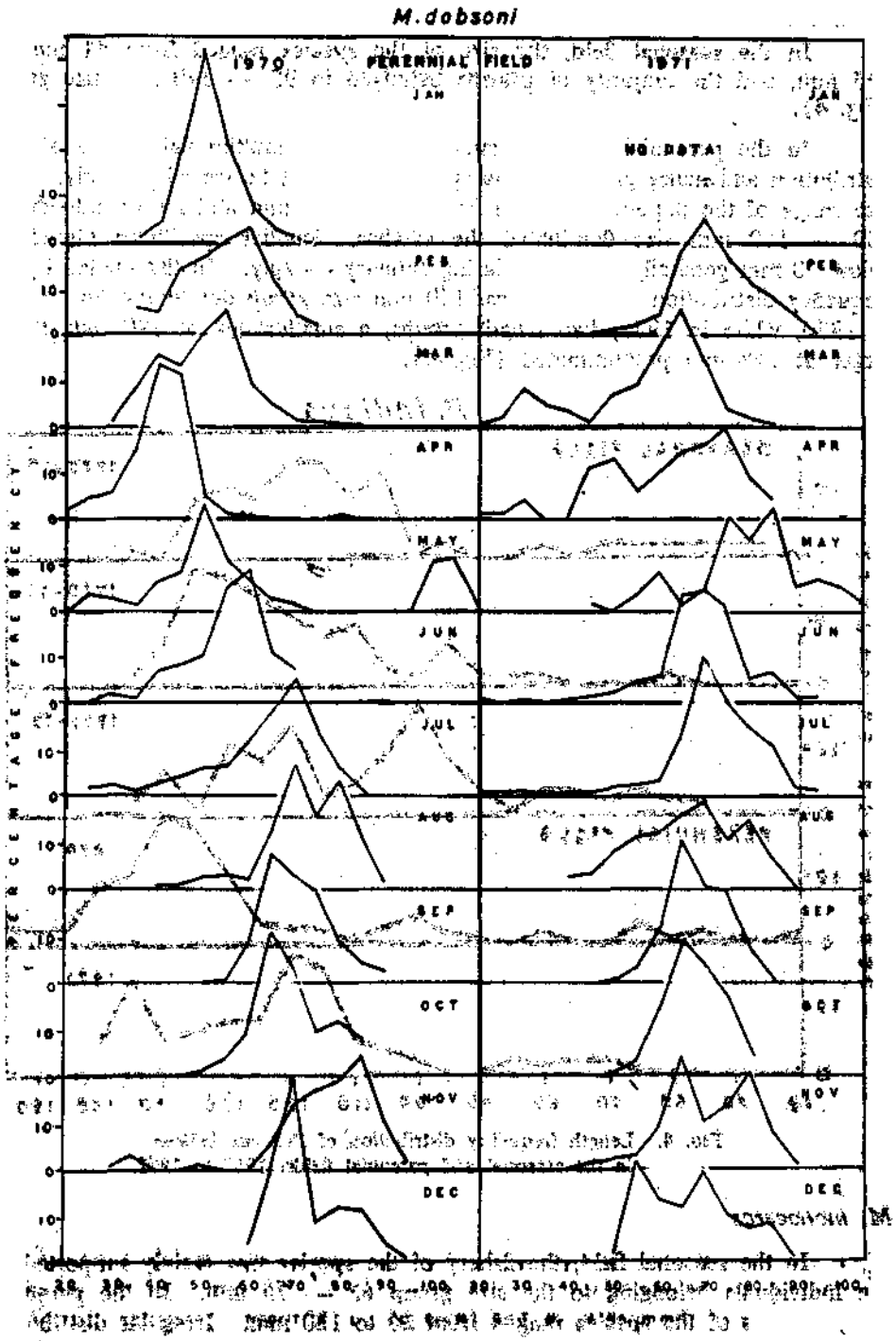

FIG. 3. Length frequency distribution of *Metapenaeus dobsoni* in the perennial field, 1970 and 1971.

P. indicus

In the seasonal field, the size of the species ranged from 41 mm to 145 mm, and the majority of prawns belonged to 95 — 140 mm size group (Fig. 4).

In the perennial field the species showed a multimodal nature of size distribution and hence growth of the species could not be traced properly. The size range of the population varied from 36 to 165 mm and larger individuals, 100 — 150 mm size dominated the catches. Smaller specimens measuring below 60 mm generally appeared during January — July. In the pooled length frequency distribution of the species, 140 mm size group dominated the catches in 1970, while in 1971, two length groups, a smaller one at 120 mm and a larger at 145 mm predominated (Fig. 4).

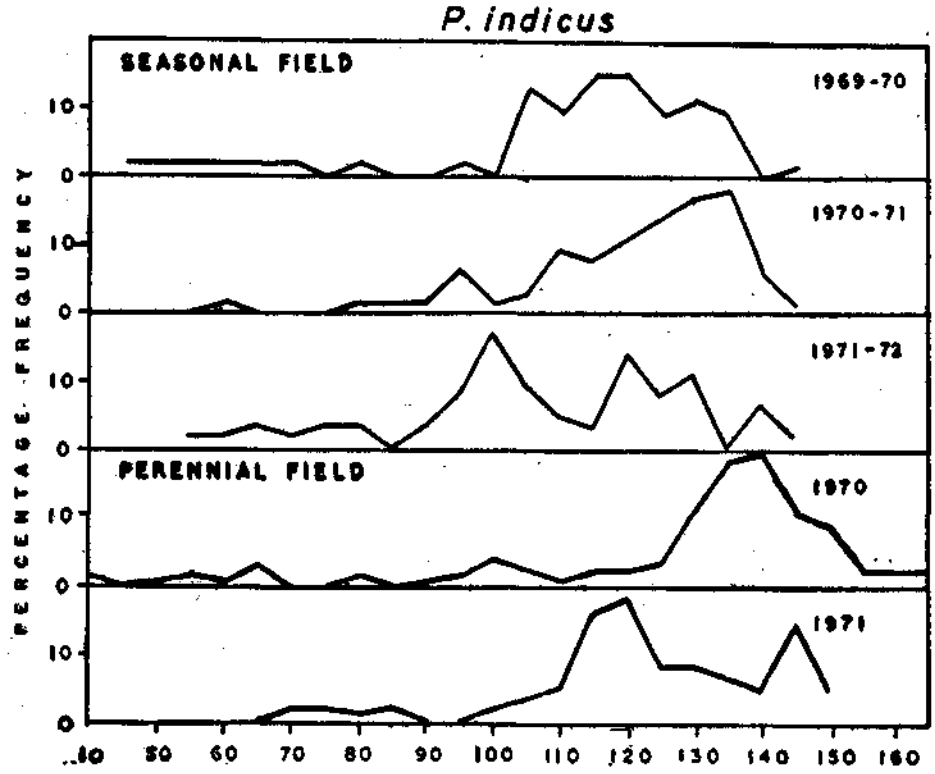

FIG. 4. Length frequency distribution of *Penaeus indicus* in the seasonal and perennial fields, 1969 to 1972.

M. monoceros

In the seasonal field, the fishery of the species was mainly supported by the individuals belonging to the size group 65 — 75 mm. In the perennial field, the size of the species ranged from 26 to 120 mm. Irregular distribution

of modes in the monthly size frequency curves made it difficult to estimate the growth rate of this species. In 1970, the modal size of the species remained steady at 71 — 75 mm during January — June. In July, slightly larger prawns, 81 — 85 mm size group dominated the catches and in August, this

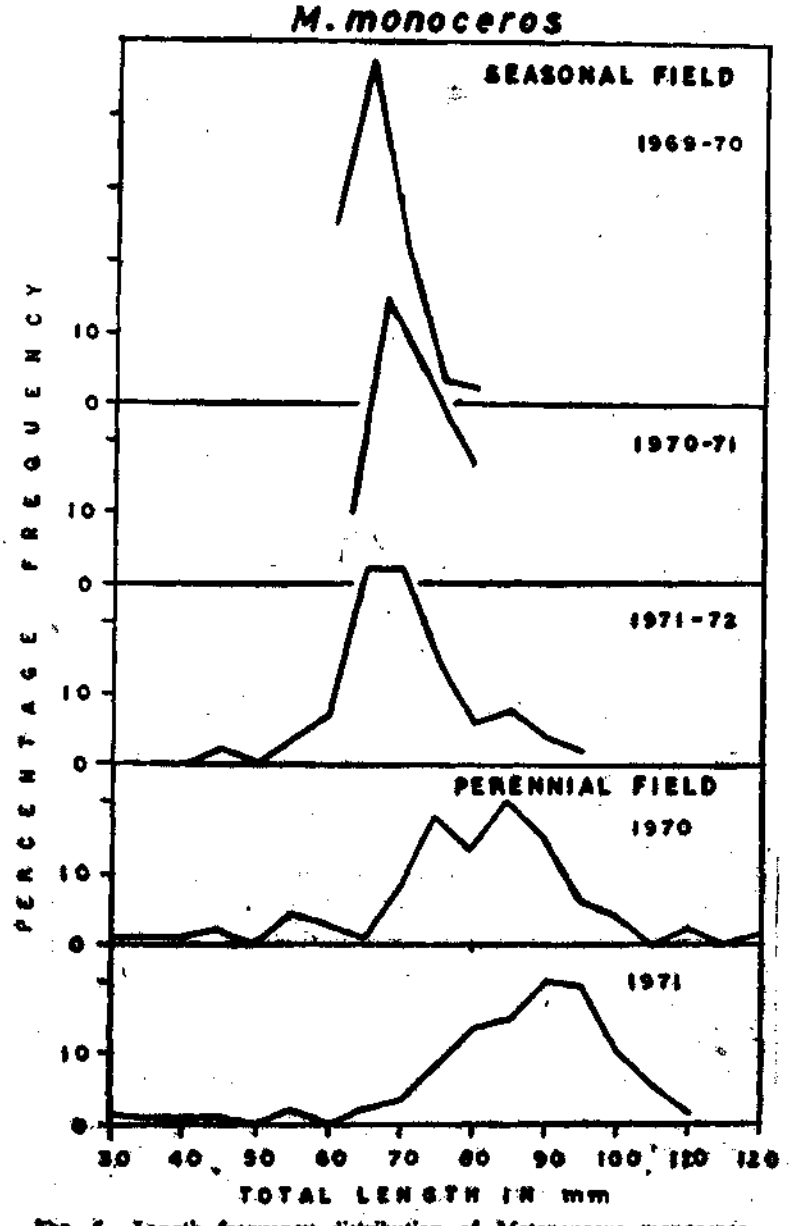

FIG. 5. Length frequency distribution of *Metapenaeus monoceros* in the seasonal and perennial fields, 1969 to 1972.

modal size progressed to 86 — 90 mm. In this month, smaller prawns measuring 35 — 45 mm in size also contributed to the fishery. These prawns obviously represent the fresh recruited ones to the field. During the remaining period of the year, larger prawns belonging to 85 — 95 mm size group dominated the catch. The monthly length frequency distribution of the species for the year 1971 showed more or less a similar trend. During February — June, prawns measuring 75 — 85 mm contributed the major portion of the catches. In July — August, the newly recruited smaller prawns (30 — 35 mm) as well as the larger ones (91 — 95 mm) were represented in the fishery. In other months, 91 — 95 mm size group was predominant in the catch (Fig. 5).

Relatively larger sized prawns are generally encountered in the perennial fields, obviously because the prawns that enter these fields could stay for longer period, whereas in the seasonal field they could remain only for a maximum period of six months and are subjected to frequent fishing.

The following table gives a comparison of the size distribution of the above species in the seasonal and perennial fields during the period of study.

Species	Seasonal field		Perennial field	
	size range (mm)	modal size (mm)	size range (mm)	modal size (mm)
M. dobsoni	36 — 70	51 — 55	16 — 110	66 — 70
P. indicus	41 — 145	126 — 130	36 — 165	136 — 140
M. monoceros	41 — 95	61 — 70	26 — 120	86 — 90

Although the prawn catches of both the culture fields are generally composed of immature prawns, mature females of *M. dobsoni* frequently occur in small numbers. During the present investigation, mature females of *M. dobsoni* were encountered in the catches of the perennial fields, during February — May of both the years. The occurrence of relatively larger individuals of the species and such matured specimens during this period, indicate the possibility of these prawns spawning in this ecosystem. It is also interesting to note that while the juveniles of *M. dobsoni* between 16 and 35 mm size are generally absent in the seasonal fields they are found to occur in the perennial fields.

Economics

The yield of prawns and their value obtained from the seasonal and perennial fields are given in table 3. Although the prawns are cultured for relatively shorter period in the seasonal fields, the catch of prawns/ha is found to be higher than that of the perennial fields. In the seasonal fields, paddy is also cultivated during May — October and the average total income from paddy as well as from prawns amounts to Rs. 4278/ha. The average total

amount in case of prawns alone from the perennial fields is estimated to be Rs. 2871|ha. The average annual expenditure for the maintenance and management of the seasonal and perennial field works out to be Rs. 2,847|- and Rs. 1,474 respectively. Although the total expenditure to run a seasonal field is higher than that of the perennial field, the net income realised from the seasonal field is always better. It would thus appear that the paddy-cum-prawn cultivation is more profitable than the culture of prawns alone.

Discussion

Although, the fishing operation and culture practices carried out in the seasonal and perennial fields are similar, the differences in the yield of prawns obtained from these fields is evident from the data collected, and it is always higher in the seasonal field in all the years of observation. Raman and Menon (1963) have shown that physical characteristics such as the area of the field, size and number of sluice gates, location etc. have no influence on the annual yield of prawns from these fields. The present observation supports this view, as the catch per unit area for the perennial field, which is larger in area and provided with larger number of sluice gates, is relatively less than that of the seasonal field. The higher yield rates in the seasonal field may be attributed to the higher productivity of the fields. The stumps of paddy help to increase the organic production (Menon, 1954) in the field and offer better biological environment for the juvenile prawns.

In the percentage composition of the species in the catches for different seasons, *M. dobsoni* and *M. monoceros* showed a gradual decreasing trend while *P. indicus* exhibited increased representation from season to season. This is obviously due to the poor recruitment of the early juveniles of the former two species during the period. Studies carried out on the abundance of larvae and post-larvae in the inshore and adjacent backwater region of Cochin also showed decreasing recruitment of larvae during the period (Anon., 1969, 70 and 71).

In both the seasonal and perennial fields, the production of prawns varies considerably from year to year. Menon (1954) has estimated an average annual production of 1079 kg|ha during 1951-53 in the seasonal fields of Vypeen Island, while Gopinath (1956) has observed slightly higher production rate of 1184 kg|ha during 1952-55 in the same area. But the production figure for the year 1965-66 given by George *et al* (1968) for the seasonal fields at Mulavukad works out to 574 kg|ha. During the period of present observation (1969-72), the annual prawn yield rate amounted to 903 kg|ha. These variation appears to be largely due to the fluctuations in the recruitment of juvenile prawns into the field.

Though the seasonal fields are found to be more productive, one of the obvious advantages of the perennial fields is their availability for prawn culture

TABLE 3. *Approximate annual expenditure, income and net income*

EXPENDITURE

Seasonal field (40.5 ha)

Prawn culture practice	1969—70 Rs.	1970—71 Rs.	1971—72 Rs.
Maintenance of bund	800.00	1000.00	1200.00
Maintenance and fixing of sluices	1000.00	1300.00	1300.00
Nets	1400.00	1600.00	1600.00
Rent towards boat	675.00	675.00	675.00
Shed	800.00	1000.00	1000.00
Wages	8400.00	9600.00	10,200.00
Miscellaneous	500.00	500.00	500.00
Total	13,575.00	15,675.00	16,475.00
Prawn culture/ha	335.00	387.00	407.00
Paddy cultivation/ha	741.00	741.00	865.00
Interest at 10% on the land value	1544.00	1667.00	1853.00
Total/ha	2620.00	2795.00	3125.00

INCOME/ha

	Paddy	*M. dobsoni*	*M. monoceros*	*P. indicus*	*P. monodon*
1969—70					
Quantity (kg)	1730	597.4	64.8	390.0	7.4
Market value (Rs/kg)	0.72	0.75	1.75	5.00	9.00
Income (Rs)	1246.00	448.00	113.00	1950.00	67.00
1770—71					
Quantity (kg)	1500	489.5	18.0	382.9	5.4
Market value (Rs/kg)	0.90	0.90	2.25	6.00	11.00
Income (Rs)	1350.00	441.00	41.00	2297.00	59.00
1971—72					
Quantity (kg)	1300	368.2	18.2	363.1	5.1
Market value (Rs/kg)	0.96	1.50	2.75	8.00	13.00
Income (Rs)	1248.00	552.00	50.00	2905.00	66.00

NET INCOME/ha

	1969-70 (Rs)	1970-71 (Rs)	1971-72 (Rs)	Average (Rs)
Annual income/ha	3824.00	4188.00	4821.00	4278.00
Annual expenditure/ha	2620.00	2795.00	3125.00	2847.00
Net income/ha	1204.00	1393.00	1696.00	1431.00

*For one year

from the seasonal and perennial fields of Vypeen Island.

Perennial field (60.7 ha)		
1970 Rs.	1971 Rs.	1972 (Jan-Apr) Rs.
1200.00	1500.00	600.00
1950.00	2400.00	2400.00*
2100.00	2400.00	800.00
1350.00	1350.00	450.00
1000.00	1200.00	1200.00*
22,000.00	25,000.00	10,000.00
1000.00	1000.00	350.00
30,600.00	34,850.00	15,800.00
504.00	574.00	221.00
—	—	—
741.00	988.00	412.00
1245.00	1562.00	633.00

Total income/ha							
Prawn	Prawn & Paddy	*Year*	*M. dobsoni*	*M. monoceros*	*P. indicus*	*P. monodon*	income/ ha
		1970	489.2	25.8	219.7	7.1	
			0.85	2.25	7.00	11.00	
2578.00	3824.00		416.00	58.00	1538.00	78.00	2090.00
		1971	526.2	50.4	296.8	7.9	
			1.00	2.75	7.25	13.00	
2838.00	4188.00		526.00	139.00	2152.00	103.00	2920.00
		1972 (Jan-Apr)					
			182.5	8.9	137.1	5.1	
			1.75	3.00	9.25	15.00	
3573.00	4821.00		319.00	27.00	1268.00	76.00	1690.00

1970 (Rs)	1971 (Rs)	1972 (Jan-Apr) (Rs)	Average (Rs)
2090.00	2929.00	1680.00	2871.00
1245.00	1562.00	633.00	1474.00
845.00	1358.00	1057.00	1397.00

throughout the year. Prawns would stay long here and attain larger size. Apart from this, no additional expenditure is involved in the perennial fields as in the preparation of seasonal fields for prawn culture after harvest of paddy.

As mentioned above, the production of prawns in these fields largely depends on the strength of the recruitment of juveniles into the fields, as at present, neither wilful stocking of seeds nor feeding or artificial culturing is practiced. The prevailing view is that the breeding and early development of all the commercially important penaeid prawns of India take place in the open sea. However, the occurrence of mature female specimens of *M. dobsoni* from February to May and the early juveniles of 16 — 35 mm size from March to July in the perennial fields as against their absence in the seasonal fields together with the recent report of the collection of mature females of this species in the Cochin backwaters in the month of March and their subsequent breeding in the brackish water aquarium (Rao and Kathirvel, 1973) appear to suggest strongly the likelihood of breeding taking place in the brackish water medium of the perennial fields. If this could be established through collection of planktonic eggs and larvae in future studies from the same environment, it would have far reaching significance in developing mariculture techniques for augmenting prawn resources.

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