MESH REGULATION IN BACKWATER PRAWN FISHING GEAR

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Size grade composition of different species of prawn caught by various back water fishing gear have been enumerated. 57 to 75% of *P. indicus* captured was less than 10 cm. in length. *M. dobsoni* and *M. monoceros* captured were less than 10 cm. in length. A cod end mesh size of 20-25 mm. has been recomended for stake nets for the capture of *P. indicus* of 10 cm. length along with other species.

INTRODUCTION

Consequent on the development of an organised frozen shrimp industry in Cochin area over a decade and more, the demand for commercially important species of penaeid prawns, both in quantity and quality, is ever on the increase. It is an established fact that larval development of the penaeid prawns available in this region is completed in two to three weeks time and the early post larvae or fry ascend into the creeks, estuaries and backwaters in large numbers, where conditions for their life and growth are presumably more favourable (Menon & Raman, 1961). The Cochin backwaters with the diverse net work of canals and paddy fields adjacent to them abound in the young and growing penaeid prawns which form an important resource for the industry and as such the need for its conservation arises. It is well known that the prawn fishery of India is a multi species fishery (Qasim, 1972). *Metapenaeus dobsoni*, *Metapenaeus monoceros*, *Metapenaeus affinis* and *Penaeus indicus* are the major species that constitute the prawn fishery of the Cochin backwaters. The fishing technique used have been described by Gopinath (1953), Menon (1955), Menon & Raman (*loc. cit.*) and George (1962).

As a preliminary step a survey was undertaken to (A) assess the size groups of prawns of different species taken by various types of fishing gear with different mesh sizes and the fishing economics, (B) determine the mesh size or the range of mesh sizes that will catch certain predetermined sizes of prawns and its effect on the economy of prawn fishing. The results of these investigations are presented respectively in Part A and B of this communication.

PART A

MATERIAL AND METHODS

Eleven centres, one in Vembanad lake

APPENDIX - I (a)

PERCENTAGE SIZE COMPOSITION OF PRAWNS CAUGHT IN STAKE NETS.

Name of species	Mesh size (mm.)	Size grade (cm.) 3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24
	8	—	—	8.4	22.3	59.1	10.2	—	—	—	—	—
P. indicus	11	—	—	—	77.1	22.9	—	—	—	—	—	—
	12	—	—	—	63.6	25.0	11.4	—	—	—	—	—
	8	19.1	73.1	7.8	—	—	—	—	—	—	—	—
M. dobsoni	11	53.5	46.5	—	—	—	—	—	—	—	—	—
	12	46.8	50.5	2.7	—	—	—	—	—	—	—	—
	8	—	14.8	80.0	5.2	—	—	—	—	—	—	—
M. monoceros	11	—	43.3	56.7	—	—	—	—	—	—	—	—
	12	—	21.5	70.0	8.5	—	—	—	—	—	—	—
	8	—	10.4	60.4	29.2	—	—	—	—	—	—	—
P. semisulcatus	11	—	—	33.3	44.4	22.3	—	—	—	—	—	—
	8	—	—	—	—	—	8.0	20.0	48.0	20.0	—	4.0
P.monodon	11	—	—	—	—	—	—	25.0	50 0	25.0	—	—

and the remaining ten in Cochin backwaters were selected for the investigation. At each centre the mesh size of the net (cod end meshes only in the case of stake net, paddy field filter nets and chinese dip nets) was measured. The catch from the individual net was also analysed for the species-wise composition, size grade composition in each species, total catch and the sale returns.

RESULTS

The centres selected for observation along with the gear observed in each centre are given in Fig. 1. The mesh size of different gear and the size group of different species of prawn caught in them are presented in Appendices I (a, b, c, d) and II (a, b, c, d, e).

STATISTICAL ANALYSIS OF THE DATA.

The data gathered were subjected to statistical analysis by forming length frequency distribution of different species of prawn *(P. Indicus. M. dobsoni, M. monoceros, P. semisulcatus* and *P. monodon.)* The mesh size of the cod end varied from 8to 12 mm. in stake nets 9 to 11 mm. in paddy field filter nets and 9 to 17 mm. in chinese dip nets. The mesh size in cast nets varied from 20 to 28 mm. and in gill nets from 30 to 35mm. In the stake net catches, on an average, 57% of *P. indicus* were below 10cm. in length, the modal length being 11 to12cm. In paddy field filter nets, on an average, 75% were less than 10 cm. In chinese dip nets 66% of *P. indicus* caught were below 10 cm. in length the modal length being 7 to 8 cm. In cast nets and gill nets the

APPENDIX – I (b)

PERCENTAGE SIZE COMPOSITION OF PRAWNS CAUGHT IN PADDY FIELD FILTER NETS

Name of species	Mesh size (mm.)	Size grade (cm.) 3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19-20
P. indicus	9	—	—	55.7	30.4	9.5	4.4	—	—	—
	10	—	—	54.6	34.0	9.4	2.0	—	—	—
	11	—	—	37.5	37.5	18.9	6.1	—	—	—
M. dobsoni	9	5.3	91.6	3.1	—	—	—	—	—	—
	10	6.1	93.9	—	—	—	—	—	—	—
	11	1·2	98.8	—	—	—	—	—	—	—
M. monoceros	9	—	55.6	33.3	11.1	—	—	—	—	—

PERCENTAGE SIZE COMPOSITION OF PRAWNS CAUGHT IN CHINESE DIP NETS

	Mesh size (mm.)	Size grade 3-4	5-6	7-8	9-10	11-12	13-14
P. indicus	9	—	2 6	42.1	39.5	11.9	3.9
	17	—	11.6	26.7	10.0	48.3	3.4
M. dobsoni	9	21.6	70.6	7.8	—	—	—
	17	—	88.7	11.3	—	—	—
M. monoceros	9	—	13.8	69.0	17.2	—	—
	17	—	17.8	68.9	13.3	—	—
P. semisulcatus	9	—	—	—	25.0	75.0	—
	17	—	—	100.0	—	—	—

percentage of those below 10 cm. length were respectively 64 and 62.

M. dobsoni and *M. monoceros* caught in all the nets were below 10 cm. in length. The modal length of *M. dobsoni* was 5 to 6cm., while that of *M. monoceros* was 5 to 10 cm. In stake nets about 75% of *P. semisulcatus* were below 10 cm. However, *P. monodon* caught in the stake nets were all above 10 cm.

George *(loc. cit.)* reported that there is no selectivity among mesh sizes in cast nets, stake nets, and chinese dip nets. He has attributed the difference in size grades

APPENDIX – I (c)

PERCENTAGE SIZE COMPOSITION OF PRAWNS CAUGHT IN CAST NETS.

	Mesh size (mm.)	Size grade (cm.) 3-4	5-6	7-8	9-10	11-12	13-14
	20	—	0.8	14.6	44.6	38.4	1.6
	21	—	—	18.4	69.0	12.6	—
	22	—	—	34.9	50.4	14.0	0.7
P. indicus	23	—	—	13.9	36.1	38.9	11.1
	27	—	—	4.8	45.2	45.2	4.8
	28	—	—	7.7	43.6	48.7	–
	20	38.6	49.1	—	12.3	—	—
	22	16.7	66.6	16.7	—	—	—
M. dobsoni	23	16.7	66.6	16.7	—	—	—
	27	—	—	72.7	27.3	—	—
	28	16.7	66.6	16.7	—	—	—
	20	—	25.8	67.7	6.5	—	—
	22	—	40.0	40.0	20.0	—	—
M. monoceros	23	—	—	—	100.0	—	—
	28	—	—	50.0	50.0	—	—
	20	—	25.2	63.3	11.5	—	—
	23	—	—	—	100.0	—	—
P. semisulcatus	27	—	—	—	100.0	—	—
	28	—	—	23.1	69.2	7.7	—

APPENDIX – I (d)

PERCENTAGE SIZE COMPOSITION OF PRAWNS CAUGHT IN GILL NETS

Name of species	Mesh size (mm.)	Size grade (cm.) 5-6	7-8	9-10	11-12	13-14
	30-35	...	...	83.3	16.7	...
	32	...	11.0	60.6	26.3	2.1
P. indicus	32-35	...	4.8	66.7	28.5	...
	33.5	...	6.0	60.0	32.0	2.0
	35	...	...	19.2	74.4	6.4
M. dobsoni	32	100.0	...	...	...	...
	30-35	...	50.0	50.0	...	...
M. monoceros	32	...	25.0	75.0	...	...
	35	...	...	100.0	...	...
P. semisulcatus	32-35	...	100.0	...	...	...

APPENDIX – II (a)

PERCENTAGE OF DIFFERENT SIZES OF PRAWNS CAUGHT IN VARIOUS NETS.

P. indicus

Type of net	Stake net			Paddy field filter nets			Chinese dip nets		Cast nets						Gill nets				
Size range / Mesh size in mm.	8	11	12	9	10	11	9	17	20	21	22	23	27	28	30 to 35	32	32 to 35	33.5	35
Below 10 cm. length	30.7	77.11	63.6	86.6	88.6	75.0	84.2	48.3	60.0	87.4	85.3	50.0	50.0	51.3	83.3	71.6	71.5	66.0	19.2
Above 10 cm. length	69.3	22.9	36.4	13.9	11.4	25.0	15.8	51.7	40.0	12.6	14.7	50.0	50.0	48.7	16.7	28.4	28.5	34.0	80.8

APPENDIX – II (b)

M. dobsoni

Size range	Type of net	Stake net			Paddy field filter net			Chinese dip net		Cast net				Gill net	
	Mesh size	8	11	12	9	10	11	9	17	20	22	23	27	28	32
Below 10 cm. langth		100	100	100	100	100	100	100	100	100	100	100	100	100	100
Above 10 cm. length		...	...	...	...	...	...	...	...	...	...	...	...	...	...

APPENDIX – II (c)

M. monoceros

Size range	Type of net	Stake net			Paddy field filter net	Chinese dip net		Cast net					Gill net		
	Mesh size	8	11	12	9	9	17	20	22	23	28	30 & 35	32	33.5	35
Below 10 cm. length		100	100	100	100	100	100	100	100	100	100	100	100	...	100
Above 10 cm. length		...	...	...	...	...	...	...	...	...	...	...	...	...	...

APPENDIX – II (d)

P. semisulcatus

	Type of net	Stake net		Chinese dip net		Cas net				Gill net
Size range	Mesh size	8	11	9	17	20	23	27	28	32 & 35
Below 10 cm. length		100	77.7	25	100	100	100	100	92.3	100
Above 10 cm. length		...	22.3	75	...	...	...	...	7.7	...

APPENDIX – II (e)

P. monodon

	Type of net	Stake net.	
Size range	Mesh size in mm.	8	12
Below 10 cm. length		...	...
Above 10 cm. length		100	100

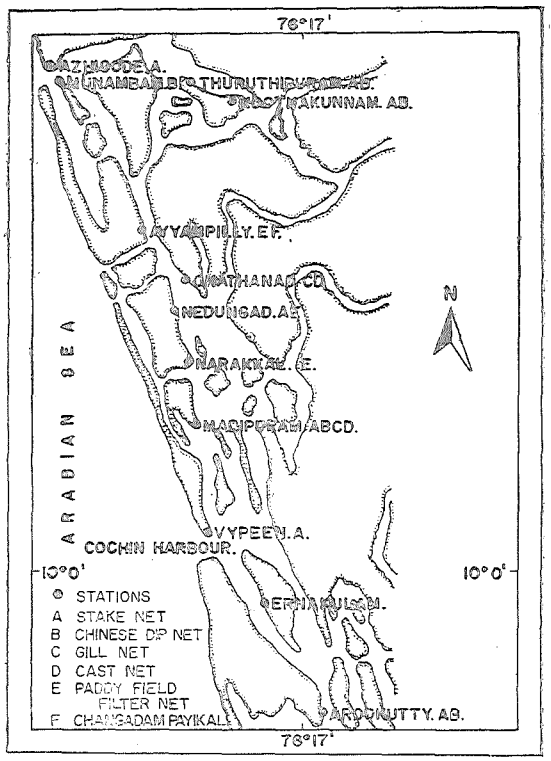

Fig. 1. VEMBANAD LAKE AND CONNECTED BACKWATERS.

to the method and time of operation of the gear combined with the behaviour of prawn. The analysis of the size composition of the catches in cast nets during the present investigation indicates that the size composition of *P. indicus* do change with increase in the mesh sizes of these nets.

All the above mentioned species of prawns migrate to the sea after attaining a particular size (Menon 1954, Menon and Raman *loc. cit.)*, George *(loc. cit)*. The size at which they migrate to sea was estimated to be 10 to 12 cm. for *P. indicus*, 4 to 8 cm. for *M. dobsoni* and 10 cm. for *M. monoceros*. Since *P. indicus* is economically the most important species in the fishery, it was decided arbitrarily to evolve suitable mesh sizes for stake nets and paddy field filter nets that would effectively catch *P.indicus* of 10 cm. and above along with other species.

A simple mathematical estimation of the mesh size to catch *P. indicus* of 10 cm. and above has resulted in an approximate cod end mesh size of 33 mm. for stake nets, 44 mm. for paddy field filter nets and 33 mm. for chinese dip nets. Since in the marine environments the suggested cod-end mesh size is 30mm. (Panicker & Sivan, 1965) it may not be proper to adopt bigger mesh sizes in backwaters. Hence a mesh size of 20 to 25 mm. for backwater nets (cod-ends) is therefore suggested as the first step.

By adopting this mesh size it is expected that about 75% of *P. indicus* of 10 cm. and above could be caught particularly by stake nets. The average size of *M. dobsoni* retained with such mesh size works out to 52 mm. The anticipated catch of this species will be 30%. With the existing mesh size the proportion of catch of *P. indicus* and *M. dobsoni* are in the ratio of 1: 10, by increasing the mesh size this proportion will change to 1: 4, but the quantity is likely to be reduced.

Considering the economic impact it could be seen that by increasing the mesh size there might be loss in the overall receipt in the initial years but at the same time a major portion of the undersized prawns can escape capture thereby contributing to the marine stock.

With the existing cod-end mesh sizes the average price realised for *P. indicus* is Rs. 6.00/-Kg. The net receipt on the basis of 1:10 ratio is estimated to be Rs. 16-00 per day. By increasing the mesh size to 25 mm. bigger *P. indicus* will fetch a minimum price of Rs. 10.00/-Kg. and *M. dobsoni* and others Rs. 1.75 per Kg. The net receipt is estimated to be Rs. 10.00. But from the second and third year one can expect a return of Rs. 17.00 per day.

PART B

In order to ascertain the effect of enchanced mesh size on the catch composition of different species of prawn and the economy, one set of experiment was conducted at Arookutty with stake nets and the results are indicated below.

MATERIAL AND METHODS.

The effect of mesh size on the size composition of prawn was studied using the cover cod-end method described by Panicker and Sivan *(loc. cit.)*. 8 mm. mesh was used as the cover cod-end with experimental nets having inner cod-end mesh sizes 12, 16, 20 and 24 mm. In addition to this an 8 mm. cod-end mesh net was operated as control. The experiment was conducted for eight days except the 24 mm. inner cod-end mesh net which was not operated for the first two days. Thus, in all, five nets *viz.* control net of size 8 mm. inner cod-end mesh net of sizes 12 mm, 16 mm., 20mm. and 24mm. were operated simultaneously. The catches from the control net, inner cod-end, outer cod-end were noted seperately for the total catch, species-wise composition and size grade. The proceeds realised for the catch in the inner cod-end and outer cod-end were also noted seperately.

RESULTS

The results of the experiments are tabulated in Tables I(a), I(b) and II which give respectively the percentage of *M. dobsoni* and *P. indicus* retained in the inner cod end of different mesh sizes and corresponding outer cod-end, the percentage size composition of *M. dobsoni* and *P. indicus* in the inner and outer cod-ends of experimental nets and the receipts from them.

TABLE - I. (a)

Percentage of prawn retained by experimental nets 24, 20, 16 & 12 mm. inner cod end corresponding outer cod ends of 8 mm.

Species	*P. indicus*								*M. dobsoni*							
Inner/Outer cod end	24	8	20	8	16	8	12	8	24	8	20	8	16	8	12	8
Date 30-6-72	...	...	100	...	100	...	100	...	...	...	58.33	41.67	57.14	42.86	93.96	6.04
1-7-72	...	...	98.74	1.26	75.30	24.70	100	...	...	...	94.45	5.55	59.61	40.31	100	...
2-7-72	49.29	50.71	67.16	32.84	79.03	20.97	100	...	41.84	58.16	38.06	61.94	61.67	38.33	77.14	22.86
3-7-72	58.39	41.61	49.06	50.94	61.34	38.66	100	...	52.99	47.01	61.24	38.76	70.00	30.00	100	...
4-7-72	62.33	37.67	61.90	38.10	47.62	52.38	92.85	7.15	50.51	49.49	52.85	47.15	100	...	93.54	6.46
5-7-72	22.22	77.78	66.04	33.96	62.07	37.93	100	...	7.00	93.00	59.50	40.50	80.71	19.29	100	...
6-7-72	25.00	75.00	27.77	72.23	63.63	36.37	100	...	...	...	44.19	55.81	83.35	16.65	100	...
7-7-72	30.00	70.00	37.50	62.50	100	...	100	...	12.49	87.51	51.19	48.81	85.96	14.04	94.52	5.48
Average/trip	51.10	48.90	70.50	29.50	69.65	30.15	98.51	1.49	39.76	60.24	59.41	40.59	68.66	31.34	95.52	4.48

TABLE - I (b)

Percentage size composition of prawns caught in experimental nets of 24, 20, 16 & 12 mm. inner cod end corresponding outer cod ends of 8 mm. and control net of 8 mm.

Species	*P. indicus*									*M. dobsoni*								
Size	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Control	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Control
grades	24	8	20	8	16	8	12	8	8	24	8	20	8	16	8	12	8	8
11-20	...	...	...	3.39	...	0.90	...	58.33	...	...	...	...	0.67	...	5.23	...	...	...
21-30	...	2.56	...	13.56	...	16.36	0.78	33.33	...	0.53	0.34	...	1.33	...	15.12	...	87.50	0.42
31-40	...	15.38	1.04	36.44	1.57	50.00	0.39	8.34	1.58	2.67	4.47	2.72	10.00	5.19	44.77	6.01	12.50	4.00
41-50	0.61	39.74	4.86	42.20	5.10	31.82	4.29	...	5.05	16.58	44.33	30.91	53.00	37.66	32.56	38.41	...	36.42
51-60	2.44	34.61	6.25	10.16	9.80	0.91	9.75	...	8.20	59.89	46.05	55.00	30.33	51.17	2.32	50.63	...	50.74
61-70	4.88	6.41	5.90	0.85	5.88	...	6.63	...	6.62	19.79	4.81	11.14	4.33	5.97	...	8.55	...	8.21
71-80	3.66	1.20	4.86	2.55	5.49	...	7.41	...	6.30	0.53	...	0.23	0.33	...	...	...	...	0.21
81-90	14.11	...	13.19	0.85	11.47	...	13.65	...	13.88	...	...	...	...	...	...	...	...	...
91-100	26.38	...	25.00	...	22.35	...	29.25	...	23.66	...	...	...	...	...	...	...	...	...
101-110	33.74	...	30.55	...	26.27	...	21.84	...	22.71	...	...	...	...	...	...	...	...	...
111-120	11.04	...	6.94	...	12.16	...	5.46	...	10.40	...	...	...	...	...	...	...	...	...
121-130	2.44	...	1.04	...	...	...	0.39	...	1.58	...	...	...	...	...	...	...	...	...
131-140	0.61	...	0.35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE - II

Receipts from the experimental nets 24, 20, 16 & 12 mm. inner cod end corresponding outer cod end and 8 mm. control net.

Inner/outer cod end	24 Rs.	8 Rs,	20 Rs,	8 Rs.	16 Rs.	8 Rs,	12 Rs.	8 Rs.	8 Control net
Date 30-6-72	...	...	0.37	0.06	2.12	0.08	0.62	...	0.67
1-7-72	...	...	2.91	0.10	2.95	0.16	2.16	...	4.37
2-7-72	0.75	0.30	2.87	0.58	2,11	0.16	8.63	...	2.11
3-7-72	0.14	0.16	19.59	0.14	13.56	0.34	1.33	...	10.85
4-7-72	4.31	0.43	0.29	0.07	2.19	0.39	0.10	...	0.16
5-7-72	3.27	3.01	3.09	0.28	3,95	0,08	5.86	...	10 31
6-7-72	0.45	0.24	2.26	0.15	2.32	0.07	1,61	...	1.43
7-7-72	3.03	0.36	5.03	0.57	3,07	1,11	1.31	0.02	3.01
Average	1,99	0.75	4.55	0.34	4.13	0.16	3.53	Nil	4.11

Discussion

From Table I(a) and I(b) it would be clear that an average 39.76% of *M. dobsoni* was retained by 24mm. mesh net, 59.41% by 20 mm. mesh net, 68.66% by 16mm. mesh net and 98.52% by 12 mm. mesh net. 51.1% of *P. indicus* was retained by 24 mm. mesh nets, 70.5% by 20mm. mets, 69.85% by 16mm. mesh nets and 98.5% by 12mm. mesh nets. The size of majority of *P. indicus* retained in the 24 and 20mm. mesh nets was better compared to 8, 12 and 16mm. mesh nets.

By enhancing the mesh size from the present 8mm. the average loss per fishing trip observed is Rs. 0.75 for 24mm. mesh nets, Rs. 0.34 for 20mm. mesh nets, Rs. 0.16 for 16 mm. mesh nets and practically nil for 12mm. mesh nets.

Summary

The size grade composition of prawns of different species caught by backwater prawn fishing gear of Kerala is described along with their relative economics. It has been shown that enhancement of mesh size has no adverse effect on fishing economics. The mesh size recomended for stake nets range from 20-25mm.

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