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AN ASSESSMENT OF THE PENAEID PRAWN SEED RESOURCE OF THE GODAVARI ESTUARY AND THE ADJACENT BACKWATERS

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ABSTRACT

Prawn seed resource of the Godavari estuary and the adjacent backwaters was studied during the years 1969-'71 based on the catches of push nets, drag nets and stake nets. Push net catches at Neelapalli were better in April-June while they were better in March-October at B. V. Palem. Drag net and stake net catches at B. V. Palem were better during April-May and November-December. Seed represented were of the species of *Metapenaeus monoceros, Penaeus indicus, M. dobsoni, M. brevicornis, P. monodon, M. affinis* and *P. merguiensis* in the order of abundance. Assessment of the species-wise seed resources for the entire estuarine system was based on catch and effort and gear census of the 21 villages spread over the area. 203 crores of prawn seed are annually harvested from this estuarine system which is enough to stock 21,800 ha of prawn farms of which 3,770 ha can be stocked with prime species like *P. monodon, P. indicus* and *P. merguiensis*.

INTRODUCTION

In recent years there has been a growing interest in prawn culture in brackishwaters. Andhra Pradesh, endowed with vast areas of backwaters and estuarine mud flats, offers an ideal environment to develop prawn culture on a commercial scale. The most important input for any sort of farming is the availability of seed near the proposed prawn farms. Though significant breakthrough has been achieved in the spawning and rearing of penaeid prawns in hatcheries by the Central Marine Fisheries Research Institute and other agencies, large scale production of prawn seed for commercial purposes is yet to be achieved. Till such time the hatchery reared larvae are made available to meet the demand for quality seed, greater utilization of wild stocks of postlarvae and juveniles of prawns has to be made. The Godavari estuary and the adjacent backwaters are very rich in juveniles of commercially important penaeid prawns. However, lack of information on the seasonal abundance and magnitude of the seed resource may become a great bottleneck in exploiting the resource for aquacultural purposes. Hence an attempt is made in this report to assess the quantity of the exploited postlarval and juvenile resources of the penaeid prawns of the Godavari estuary and the Kakinada backwaters.

A number of gears are operated in this area to catch juvenile penaeid prawns. The effective gears are *Pakkidevu vala* (drag net) *Thoka vala* (Stake net) and *Dobbudu vala* (Push net). Fabrication and mode of operation of these nets are described by Ramamurthy and Muthu (1969). Rao (1975) has reported on the

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exploited prawn fishery resources of the Kakinada backwaters by stake nets and drag nets. In this communication the seasonal availability and magnitude of the seed prawns harvested by these three types of nets are presented.

Material and Methods

Data were collected fortnightly for pushnets at Boddu Venkataya Palem (B. V. Palem) and Neelapalli (Fig. 1) and weekly for drag nets and stake nets at B. V. Palem. B. V. Palem being in the middle of the backwater net work represents the backwater fishery while Neelapalli located in the river mouth represents the typical estuarine fishery. Data on the numbers of units operated and the seed caught were recorded on observation days and a random sample of the catch was brought to the laboratory. The sample was analysed into the constituent species and specimens of each species were measured and weighed. Monthly estimates were arrived at depending on the number of fishing days and the number of observation days. From these data, numbers of seed were worked out for all the species in that month. As it was difficult to get correct information about the actual fishing time in hours, a fishing day is taken as a unit of effort. C/E is given as number of seed caught per unit per day. Only juveniles measuring less than 50 mm are considered as seed and the rest are excluded for the estimation of seed from the stake net and drag net catches as prawns larger than 50 mm are not suitable for stocking because of various management problems.

Distribution of catch and effort

Push net fishery

Push net fishery for prawns is only of a subsistence nature and hence the operation of the gear in different years is highly erratic. At Neelapalli, push net fishery season is from November-June and is suspended during the flood season. The push net fishery at B. V. Palem is also highly erratic and depends mostly on the operation of the other gears.

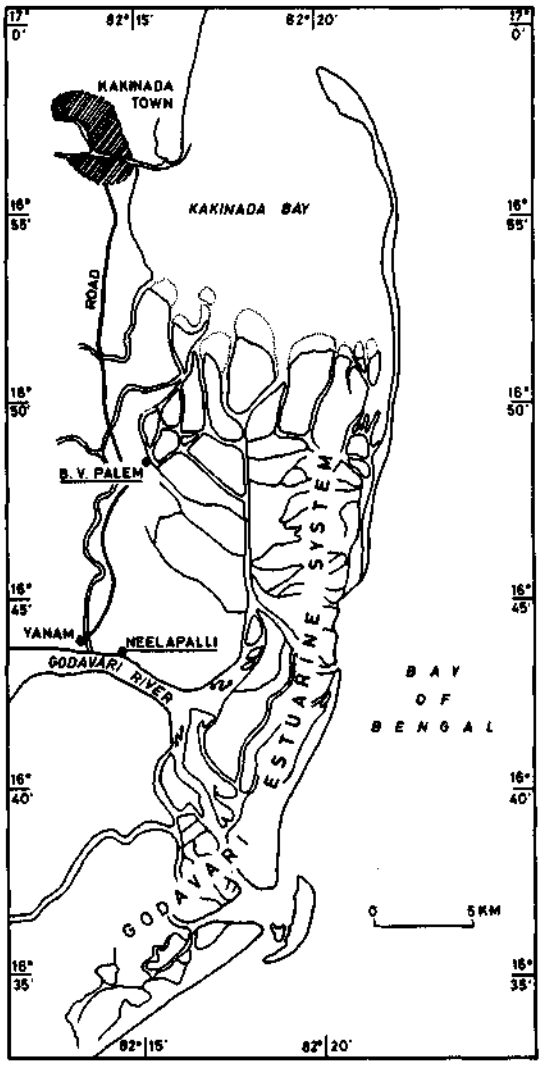

Fig. 1. Map of the study area showing eleven sampling stations.

TABLE 1. *Estimated numbers (in thousands) of seed prawns landed at Neelapalli by push nets during 1969 and 1970*

Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Nov.	Dec.	Total	%	C/E
Year : 1969												
P. indicus	450	116	151	133	102	164	25	57	11	1,209	17.5	0.96
P. monodon	90	—	120	616	387	6	3	274	446	1,942	28.2	1.54
P. merguiensis	—	10	10	24	32	2	—	—	—	78	1.1	0.06
M. monoceros	96	311	156	147	134	709	31	17	—	1,601	23.2	1.27
M. affinis	—	67	66	122	59	27	—	8	3	352	5.1	0.28
M. brevicornis	—	142	37	45	365	187	22	31	6	835	12.1	0.66
M. dobsoni	—	20	80	45	—	—	—	657	71	873	12.7	0.69
Total catch	636	666	620	1,132	1,079	1,095	81	1,044	537	6,890	100.0	5.46
Effort in push net days	132	168	126	220	216	96	60	90	154	1,262		
Year : 1970												
P. indicus	20	847	162	126	157	198	—	127	—	1,637	22.6	1.27
P. monodon	125	24	6	160	209	23	—	893	—	1,440	19.9	1.12
P. merguiensis	30	—	14	25	7	2	—	146	—	224	3.1	0.17
M. monoceros	75	365	425	554	174	557	—	96	—	2,246	31.0	1.74
M. affinis	5	65	61	10	24	15	—	10	—	190	2.6	0.15
M. dobsoni	5	113	24	—	39	40	—	87	—	308	4.3	0.24
M. brevicornis	10	—	600	266	227	39	—	57	—	1,199	16.6	0.93
Total catch	270	1,414	1,292	1,141	837	874	—	1,416	—	7,244	100.0	5.61
Effort in push net days	300	204	168	180	208	132	—	99	—	1,291		

Only the fishermen who could not get a chance to fish with other types of gears conduct push net fishing. Push nets are mainly for catching *Acetes* species in the backwaters and the estuary. Along with *Acetes* species incidently a number of post-larvae and juveniles of penaeid prawns are caught. However, a few push nets are specially designed to catch only juveniles of penaeid prawns.

At Neelapalli, 18 push nets were in operation. They expended an effort of 1,262 push net days and caught 6,890 thousands of seed prawns in 1969. On an average, each push net caught about 5,460 seed prawns per day. Much of this catch was landed during the April-June period in 1969. In 1970, they expended an effort of 1,291 push net days and caught 7,244 thousand seed prawns with an average catch of 5,610 seed prawns by each push net per day. Estimated numbers of seed prawns (species-wise) caught at Neelapalli in the years 1969 and 1970 are presented in Table 1.

At B. V. Palem, 21 push nets were in operation in 1970; they expended an effort of 1,003 push net days and caught an estimated 14,245 thousand prawn seed with an average catch of 14,200 prawn seed per push net day. In 1971, push nets caught an estimated 11,635 thousand prawn seed for an effort of 1,133 push net days with an average catch of 10,270 prawn seed per push net day. Maximum catches were observed in March-August

period in 1970 and March, August and October in 1971 (Table 2).

Drag net and Stake net catches

At B. V. Palem 97 drag nets and 67 stake nets were in operation during 1970. Particulars of seed caught by drag nets and stake nets at B. V. Palem are furnished in Table 3. Stake nets caught 77,421 thousand seed prawns for an effort of 4,671 stake net days in 1970. On an average about 16,570 prawn seed were caught per stake net day. Drag nets caught 1,600 lakhs of prawn seed for an effort of 17,510 dragnet days in 1970 with an average catch of 9,140 seed per drag net day. Seed catches were better in April-May and November-December by drag nets whereas in stake nets, the seed catches were good in May-July and October-December. Poor prawn seed catches were observed in August and September by both the nets.

Species Composition and Relative Abundance

Analysis of samples has shown that juveniles and postlarvae of seven species of penaeid prawn were of importance. The species observed in the catches in order of

Table 2. *Estimated numbers (in thousands) of seed prawns landed by push nets at B. V. Palem during 1970 and 1971*

Species	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct@.	Total	%	C/E
Year : 1970													
P. monodon	48	8	9	8	22	32	44	9	1	90	271	1.9	0.27
P. indicus	252	98	65	121	66	362	191	78	75	236	1564	11.0	1.56
P. merguiensis	42	8	10	5	10	43	50	5	—	49	222	1.6	0.22
M. monoceros	135	49	84	93	671	920	1,222	1,022	65	6,002	10,263	72.0	10.23
M. affinis	14	43	18	34	21	50	—	—	7	—	187	1.3	0.19
M. dobsoni	5	47	26	42	174	120	99	43	19	51	630	4.4	0.63
M. brevicornis	12	34	301	54	152	74	321	20	—	140	1108	7.8	1.10
Total catch	508	287	513	357	1136	1,605	1,927	1,177	167	6,568	14,245	100.0	14.20
Effort in push net days	78	96	104	65	104	117	132	90	81	136	1003		
Year : 1971	Jan.	Feb.	Mar.	Apr.*	Sept.	Oct.	Nov.	Dec.			Total	%	C/E
P. monodon	27	8	116	30	29	250	101	198			759	6.5	0.67
P. indicus	207	122	82	81	255	133	214	572			1,666	14.3	1.47
P. merguiensis	13	11	—	—	32	20	29	7			112	1.0	0.10
M. monoceros	27	80	3,042	3,448	462	143	337	109			7,688	66.1	6.79
M. affinis	46	8	—	—	—	45	11	—			110	0.9	0.10
M. dobsoni	46	32	67	170	67	408	33	110			933	8.0	0.82
M. brevicornis	195	49	16	—	42	39	26	—			367	3.2	0.32
Total catch	601	310	3,323	3,729	887	1,038	751	996			11,635	100.0	10.27
Effort in push net days	98	105	169	200	168	162	121	110			1,133		

@ No fishing during November and December, 1970.
* No fishing during May to August, 1971.

TABLE 3. *Estimated numbers (in thousands) of seed prawns landed at B. V. Palem during 1970*

Species	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	%	C/E
							DRAG NETS								
M. monoceros	7,924	12,203	2,222	34,655	13,226	9,882	5,652	2,195	3,168	8,049	11,251	13,649	1,24,076	77.5	7.09
M. affinis	102	460	252	282	254	68	91	64	46	79	84	277	2,059	1.3	0.12
M. dobsoni	524	606	855	2,733	4,473	269	998	214	165	427	1,588	450	13,302	8.3	0.76
M. brevicornis	—	424	433	1,062	402	66	55	70	538	509	422	204	4,185	2.6	0.24
P. monodon	29	171	168	11	163	136	83	10	86	109	204	175	1,345	0.8	0.08
P. indicus	1,075	2,545	428	4,239	2,106	407	505	259	96	445	2,070	376	14,551	9.1	0.83
P. merguiensis	59	17	17	—	118	59	104	—	11	—	40	59	484	0.3	0.03
Total catch	9,713	16,426	4,375	42,982	20,742	10,887	7,488	2,812	4,110	9,618	15,659	15,190	1,60,002	100.0	9.14
Effort in drag net days	1,304	1,356	1,521	1,692	1,778	1,456	2,058	1,104	1,035	1,351	1,475	1,379	17,510		
							STAKE NETS								
M. monoceros	4,224	1,682	275	1,508	2,700	8,562	6,886	2,279	855	7,506	5,123	6,970	48,570	62.7	10.40
M. affinis	—	230	74	—	78	191	252	—	—	138	51	226	1,240	1.6	0.27
M. dobsoni	152	3,712	1,443	1,881	6,103	2,174	1,374	173	87	200	1,257	212	18,768	24.2	4.02
M. brevicornis	—	131	160	156	263	388	134	106	37	364	406	129	2,274	2.9	0.49
P. monodon	27	14	28	54	274	334	170	7	1	114	127	64	1,214	1.6	0.26
P. indicus	304	477	119	186	799	399	586	188	10	372	1,177	141	4,757	6.1	1.02
P. merguiensis	108	—	—	—	80	138	197	30	—	—	24	21	598	0.8	0.13
Total catch	4,815	6,426	2,099	3,785	10,297	12,186	9,598	2,783	990	8,694	8,165	7,763	77,421	100.0	16.57
Effort in stake net days	320	280	240	153	378	500	520	423	120	783	504	450	4,671		

abundance were *Metapenaeus monoceros, Penaeus indicus, M. dobsoni, M. brevicornis, M. affinis, P. monodon* and *P. merguiensis.*

In the push net catches at Neelaplli, *P. monodon,* was observed in most of the months during the period of observation. *P. monodon* was better represented in the catches during April-May and November-December. Maximum catch of 893 thousand seed was recorded in November, 1970. The seed catch was better in 1969 fishing season (1,942 thousand) as compared to 1970 season (1,440 thousand). This species formed about 28.2 and 19.9% of the penaeid seed catches of push nets in 1969 and 1970 respectively. Average of 1,540 and 1,120 seed of *P. monodon* were caught per push net day in 1969 and 1970 respectively.

At B. V. Palem also *P. monodon* was caught throughout the year by push nets, annual estimated numbers being 271 and 759 thousand seed in 1970 and 1971 respectively. The catches were erratic and did not give any seasonal trend in abundance. However, the peak represented in October, 1970, and October-December, 1971 appears to be a regular feature. *P. monodon* formed about 1.9 and 6.5% of the seed catches of push nets in 1970 and 1971 respectively with an average catch of 270 and 670 numbers of seed per push net day. An analysis of annual length- frequency distribution indicated that estuarine push net catches at Neelapalli were predominated by postlarvae whereas in the backwater catch at B. V. Palem juveniles of 21-38 mm in total length (TL) dominated the catches (Fig. 2).

In the drag net catches at B. V. Palem in 1970, 1,345 thousand seed of *P. monodon* were caught with three peaks of abundance, February-March, May-June and October-December, whereas in the stake net catches 1,214 thousand seed was caught with a primary peak in May-July and a secondary peak in October-November. On an average 80 and 260 numbers of *P. monodon* seed were caught per day of drag net and stake net respectively.

In the push net catches at Neelapalli and B. V. Palem seed of *P. indicus* was represented in almost all the months of observation. At Neelapalli the catches were better in the January-June period in both the years of observations whereas at B. V. Palem there appears to be no regularity in the abundance of this species. At Neelapalli estimated catches of 1,209 and 1,637 thousand seed were caught in 1969 and 1970 respectively forming about 17. 5 and 22. 6% of the prawn seed catches. On an average, each push net at Neelapalli caught about 960 and 1,270 numbers of seed per day, during 1969 and 1970 respectively. At B. V. Palem estimated catches of 1,564 and 1,666 thousand *P. indicus* forming about 11. 0% and 14. 3% of the prawn seed were caught in 1970 and 1971 respectively. On an average, each push net at B. V. Palem caught about 1,560 and 1,470 *P. indicus* seed per day during 1970 and 1971.

An analysis of the size distribution of the seed prawns indicated that seed of 16-40 mm length formed 91 and 86% of the *P. indicus* seed of push nets at Neelapalli and B. V. Palem respectively. During 1970 an estimated catch of 14,551 and 11,757 thousand *P. indicus* seed were caught by drag nets and stake nets with an average catch of 830 and 1,020 numbers of seed per day respectively. *P. indicus* formed about 9. 1 and 6. 1% of the drag net and stake net seed catches respectively. Seed of 36-50 mm length formed the bulk of the seed catches (Fig. 2). The abundance of *P. indicus* in drag net and stake net catches indicated three peaks. In the drag net catches these peaks were observed during January-February, April-May and November

whereas in stake nets they were observed in January-February, May-July and November.

Though erratic in occurrence, *P. merguiensis* formed about 1. 1 and 3. 2% of the prawn seed catches of push nets at Neelapalli in 1969 and 1970 respectively. On an average, each push net per day caught about 60 and 170 numbers of seed in 1969 and 1970. At B. V. Palem also the occurrence of *P. merguiensis* was erratic in the push net catches. Estimated catch of 222 and 112 thousand forming 1. 6 and 1. 0% of the seed were caught in 1970 and 1971 respectively. The catches of this species by drag nets and stake nets at B. V. Palem also were poor.

M. monoceros formed an important item of the estuarine and backwater prawn seed catches by drag nets, stake nets and push nets in all the years. At Neelapalli, push nets operating in the estuary caught 1,601 and 2,246 thousand in 1969 and 1970 forming about 23. 2 and 31. 0% of the prawn seed catches. Each push net on an average caught 1,270 seed in 1969 and 1,740 seed in 1970 per day. The seed catches were better during February-June of both the years. Push nets at B. V. Palem caught 10,263 and 7,688 thousand seed forming about 72. 0 and 66. 1% of the prawn seed in 1970 and 1971 respectively. A peak in the abundance was observed during July-October in 1970 whereas in 1971 catches were better in March and August. An analysis of the length frequency distribution indicated the predominance of seed of 16-35 mm TL and of 21-40 mm TL in the estuarine push net catches at Neelapalli and backwater push net catches at B. V. Palem respectively.

Drag nets and stake nets caught enormous quantities of *M. monoceros* seed throughout the year. Two peaks of abundance, one in April-May and the other in October-February were noticed in the drag net catches. In the stake net catches the first peak was observed a little later than for the dragnet catches. Estimated catches of 12.4 and 4.9 crores of seed were caught in 1970 with an average catch of 7,090 and 10,400 per unit day by drag nets and stake nets respectively. Seed of 31-50 mm formed bulk of the seed catches of these nets (Fig. 2).

M. affinis was poorly represented in the catch of push nets, drag nets and stake nets at Neelapalli and B. V. Palem. Of the 352 and 190 thousand seed caught in 1969 by push nets at Neelapalli much of it was caught during February-June. This species formed about 5. 1% and 2. 6% of the estuarine push net catches at Neelapalli in 1969 and 1970. At

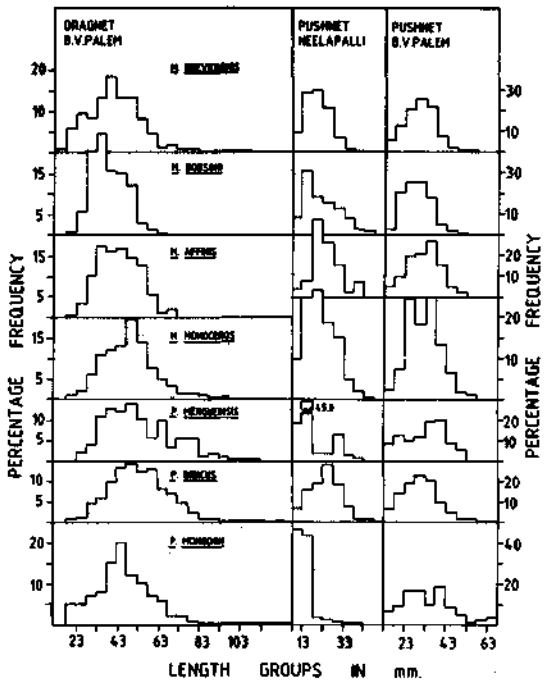

Fig. 2. Length - frequency distribution of seed of penaeid prawns in Godavari estuary.

B. V. Palem push nets caught 187 and 110 thousand seed of *M. affinis* forming about 1. 3 and 0. 9% of the penaeid seed catches in 1970 and 1971 respectively. Length frequency distribution indicated preponderance of bigger size groups in the backwater catches than in the estuarine catches. Bulk of the estuarine catch was composed of seed of 21-35 mm in TL whereas in the backwaters, seed of 21-40 mm predominated the catches (Fig. 2). Drag nets caught about 2,059 thousand seed forming about 1. 3% of the total prawn seed caught during 1970, with an average catch of 120 seed per net day. The catches were better during December. Seed of 31-50 mm TL formed the bulk of the seed catches of drag nets. This species was not observed in the stake net catches in most months of 1970.

M. dobsoni formed an important component of the estuarine push net catches at Neelapalli forming about 12. 7% of the seed catches in 1969. Much of it was caught in November, the catches being poor in the other months. With 308 thousand seed caught, it formed only 4. 8% of the seed catches in 1970, much of it being caught in February and November. In the backwater, push net catches at B. V. Palem, *M. dobsoni* was represented thoughout the year forming about 4. 4 and 8% of the seed catches in 1970 and 1971 respectively. There appears to be a prolonged season of abundance (May-December) for this species in the backwater push net catches. Annual length- frequency distribution did not indicate any difference in the contribution of different size groups to the estuarine and backwater push net catches. This species was well represented in the drag net and stake net catches at B. V. Palem in 1970 forming about 8. 3 and 24. 2% of the seed catches respectively. There appears to be a primary peak during February-July and a minor peak in November. Seed of 16-35 mm TL formed bulk of the catches of push nets while seed of 26-50 mm TL dominated the catches of drag nets and stake nets (Fig. 2).

In the estuarine push net catches *M. brevicornis* formed about 12 and 16% of the seed catches in 1969 and 1970 respectively. March-June appears to be the best season for this species in the estuary. In the backwater push net catches, this species formed about 7. 8 and 3. 2% of the prawn seed caught in 1970 and 1971 respectively. The two peaks, one in March-July and the other in October observed in 1970 were not defined in 1971 indicating a random fluctuation in different years. In the estuarine push net catches seed of 11-30 mm TL formed about 91. 3% of the seed whereas in the backwater pushnet catches seed of 16-35 mm TL contributed 80. 1% of the total *M. brevicornis* seed (Fig. 2). In the drag nets an estimated 4,185 thousand forming 2. 6% of the total seed was caught in 1970, with an average of 240 seed per net day. In stake nets this species formed about 2. 9% of the total seed with an average of 2,090 seed per net day. In drag net and stake net catches this species was found to have two well defined peaks, during February-July and September-November. Seed of 31-50 mm formed bulk of the seed catches of drag nets and stake nets (Fig. 2).

Assessment of the Seed Resources

At B. V. Palem, push nets land at different spots. Catch and effort data were collected at one spot where about 21 push nets delivered the catch. In the backwaters a total of 454 push nets are operated in twelve different villages. The estimated values for these 454 push nets operated in backwaters were derived from the data available for 21 push nets at B. V. Palem. An estimated 29. 1 crores of seed prawns were harvested by these push nets in 1970 (Table 4).

TABLE 4. *Estimated numbers (in thousands) of seed prawns landed from Godavary estuary and the Kakinada backwaters during the year 1970*

Species \ Nets	Push nets (Estuary)	Push nets (Backwaters)	Drag nets	Stake nets	Total	%
P. monodon	10,480	5,336	8,264	11,014	35,294	1.74
P. indicus	11,914	31,950	89,406	43,158	1,76,468	8.68
P. merguiensis	1,630	4,535	2,974	5,425	14,564	0.72
M. monoceros	16,346	2,09,658	7,63,364	4,40,650	14,29,018	70.31
M. affinis	1,383	3,820	12,651	11,250	2,9105	1.43
M. dobsoni	2,242	12,870	81,732	1,70,272	2,67,116	13.14
M. brevicornis	8,726	22,635	25,714	20,631	77,706	3.82
Total	52,721	2,91,004	9,83,105	7,02,400	20,29,230	

Seed resource exploited by drag nets

Data are available for 97 drag nets operating from B. V. Palem. About 596 drag nets were operating from 21 villages distributed in the area. The total number of seed harvested by these 596 drag net units was derived from the data available for the 97 units at B. V. Palem. An estimated 98. 3 crores of prawn seed were harvested by drag nets in 1970 (Table 4).

Seed resource exploited by stake nets

Data were available for 69 stake net units that land their catches at B. V. Palem. A total of about 626 stake net units were operating from 14 villages of the area. The estimated seed resource harvested by these 626 units was derived from the data available for the 69 units at B. V. Palem and presented in Table 4. An estimated 70.2 crores of prawn seed were harvested by stake nets in 1970.

The total seed resource exploited and the specieswise estimates for 1970 are presented in Table 4. From Table 4 it is evident that about 203 crores of penaeid prawn seed were harvested in 1970 from the Godavari estuary and the adjacent backwaters.

TABLE 5. *Anticipated utility of the prawn seed available in the Godavary estuary*

Species	Seed resource in thousands	Stocking density	No. of crops per year	Area of prawn farms in hectares
P. monodon	35,294	30,000	2	588
P. indicus	1,76,428	30,000	2	2,940
P. merguiensis	14,564	30,000	2	243
M. monoceros	14,29,018	50,000	2	14,290
M. affinis	29,104	50,000	2	291
M. dobsoni	2,67,116	50,000	2	2,671
M. brevicornis	77,706	50,000	2	777
Total	20,29,230			21,800

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