INLAND PRAWN FISHERIES OF INDIA AND THEIR DEVELOPMENT

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[The magnitude and disposition of the inland prawn fisheries resources of the country have been described. The lack of adequate knowledge of the capture fisheries resources has been pointed out and the necessity for an organised survey of the resources and research to formulate measures for their proper management emphasised. The existing methods of prawn farming in the country have been described and the need for research for maximising yields from culture fisheries of prawn has been highlighted. Measures for immediate development of prawn fisheries of the country have also been discussed.]

Prawns have, in recent years, assumed considerable importance by virtue of the great demand for them in markets abroad, particularly in the United States of America. This has spurred a growing interest in the sources of supply, methods of exploitation and magnitude and disposition of their fisheries. However, it is a patent fact, that our knowledge about the inland prawn resources of India is meagre and even the available information is scattered and not easily obtainable. No reliable statistics of production exist, partly due to the diffuse nature of the industry, primitive methods of collection, assembling, transportation and marketing as also due to lack of conscious effort to collect such statistics. As notable exceptions may be mentioned the detailed statistics collected in respect of prawn fisheries of the Hooghly estuary and Chilka lake by the Central Inland Fisheries Research Institute (Anon. 1960-'64). An essential preliminary to the development of any fishery is a knowledge about the abundance of the component species, their distribution and statistics of production. Hence an attempt has been made here to compile the available information and present as cogent an account as possible on the inland prawn fisheries of the country.

Fresh water

1. *Macrobrachium rosenbergii*
2. *M. malcolmsonii*
3. *M. villosimanus*
4. *M. rudis*

Prawns are available, practically, in all the inland waters, rivers, lakes, estuaries and brackish water areas, though their distribution and abundance is by no means uniform. In some areas, prawns are abundant and can or do support commercial fisheries of considerable magnitude. On the other hand, there are other vast areas where prawns are so scarce and scattered that profitable operation of a commercial fishery is rendered impossible. Similarly, certain inland habitats exist, which, despite their suitability for supporting crops of commercially important prawns, are at present barren and could be developed as important fisheries centres.

It is well known that generally palaemonids, with the exception of some *Leander spp.*, contribute to the fisheries in freshwaters and penaeids in brackishwater regions From the available records it appears that production from inland water constitutes only a small fraction of the production realised from the sea. However, the available statistics cannot be accepted at their face value since a major part of inland production goes unrecorded.

Species representing the commercial catch: Important species that contribute to production in inland waters are listed below, habitat wise.

	Max. sizes attained
..	310 mm.
..	230 mm.
..	140 mm.
..	104 mm.

Brackish water

5.	*Penaeus indicus*	.. 200 mm.
6.	*P. carinatus*	.. 305 mm.
7.	*P. semisulcatus*	.. 305 mm.
8.	*Metapenaeus brevicornis*	.. 127 mm.
9.	*M. dobsoni*	.. 124 mm.
10.	*M. monoceros*	.. 180 mm.
11.	*M. affinis*	.. 165 mm.
12.	*Parapenaeopsis sculptilis*	.. 152 mm.
13.	*Leander styliferus*	.. 100 mm.
14.	*L. tenuipes*	.. 74 mm.

The above species are among the more important prawns that contribute to the commercial catches in the country. There are distinct differences in size among these species. *M. rosenbergii* and *P. carinatus* are large varieties which grow to over 300 mm. in length. *M. malcolmsonii, M. villosimanus, P. indicus, M. monoceros* and *P. affinis* can be classified as medium-sized varieties which grow to lengths ranging between 140-230 mm. while the rest which may be categorised as small vaireties, do not attain lengths of more than 130 mm.

Geographic Location of The Fisheries

While there are a few areas where prawn fisheries are exploited to a more or less adequate degree, resulting in considerable landings there are several others where the fisheries have not been developed to their commercial potential. Among the more important centres of production in the country where statistics of fisheries are available, are the following.

	Total annual estimated production	
i)	Hooghly estuary	.. 900 tonnes
ii)	Mahanadi estuary	.. 100 tonnes
iii)	Chilka lake	.. 1,100 tonnes
iv)	Godavari estuary	.. 1,100 tonnes
v)	Kolleru lake	.. —
vi)	Pulicat lake	.. 1,000 tonnes
vii)	Kerala backwaters	.. 10,000 tonnes

Among the known centres of production of inland prawns, Kerala backwaters and connected canals contribute maximum landings. It is estimated that a total of approximately 10,000 tonnes of prawns are landed in this region, annually (Shetty, 1963). It appears that the area is being fully exploited by the commercial fishery which is constituted, principally, by *M. rosenbergii, P. indicus, P. carinatus, M. dobsoni, M. monoceros and M. affinis.* Dip nets and stake nets are the main types of gear used in the exploitation of prawns.

Chilka lake prawn fishery ranks second in the order of abundance of landings which account for nearly 1.100 m. tons, annually. *P. indicus, P. semisulcatus* and in certain years *M. monoceros* form the principal species representing the catches in the lake (Jhingran, 1963). Mainly basket traps and drag nets are used for catching prawns in this region. The relatively wide fluctuations in the fishery and the higher mean size of different species that contribute to the catches may be indications of a scope for increase in the fishing effort and utilisation of more modern methods of fishing.

The production of prawns from the Godavari estuary is, more or less, equal to that of the Chilka lake. *L. tenuipes, P. monodon, M. affinis* and *P. sculptilis* are the more important prawns that contribute to the fishery in this estuary. Mainly bag nets contribute to the prawn landings in the estuary where considerable scope exists for increasing the quantity and efficiency of effort (Anon., 1963). The riverine region of the Godavari between the Dowleshwaram and Dummugudem anicuts affords a fairly important prawn fishery accounting for a catch of 200 tonnes annually, comprising chiefly of *M. malcolmsonii.*

Pulicat lake which contributes nearly 1,000 tonnes of prawns, annually, is a potentially rich, under-exploited prawn fishery ground. At present, fishing operations are done on a

more intensive scale only in about 1/5 of the lake. The northern part of the lake affords opportunities for more intensive exploitation. *L. styliferus, P. carinatus, P. indicus, P. semisulcatus* and *M. monoceros* are the more important species that contribute to the catches in the lake (Chacko, 1953).

Prawn landings from the Hooghly estuarine system account for 900 tonnes, annually. *M. rosenbergii, M. malcolmsonii, M. rudis, P. indicus, P. carinatus, M. brevicornis* and *L. styliferus* contribute to the landings in this area. The main fishing grounds in the estuarine system are the lower Sundarbans, and the upper and gradient zones of the Ichamati and the Hooghly (Anon., 1960-'64). The main type of gear used in the upper zones of the Hooghly is traps. Bush fishing is also resorted to in restricted areas. In the rest of the estuary, prawns are caught mainly by bag nets and haul seines.

The Mahanadi estuary yields a total of 100 tonnes of prawns of different species, annually. The relatively shallow stretches of water areas partially enclosed by bars, like the Hookitala bay and 'Jatadharmohan lake' are the important fishing grounds for prawns. The species that contribute to the catches in this area are *M. brevicornis, M. dobsoni, L. styliferus, P. carinatus, P. indicus, M. monoceros, M. rudis* and *M. rosenbergii* (Anon. 1960-'64). There are reasons to believe that there is considerable scope for intensifying prawn fishing in this area where the total landings appear to be only a fraction of the yields achieved in similar estuaries.

In addition to above, there appear to be several other areas which are relatively under-exploited. Kolleru lake is reported to be rich in prawns, though statistics of production are not readily available. *P. indicus, P. carinatus, M. monoceros, M. rosenbergii* and *M. malcolmsonii* are the species that contribute to the catches in various sections of the lake.

The area of the Ganga between Buxar and Lalgola is a potentially rich ground for prawns. In this region where no special efforts for fishing prawns are made, they are caught in large numbers in nets which are primarily meant for fishes. *M. malcolmsonii* and *M. lamarrei* are the principal species that contribute to the landings in this region. There is considerable scope for intensification of prawn fishing in this area where the use of traps, drag seines and bush fishing should considerably enhance the yields. River Rapti, a tributory of the Ganga, is also reported to be a potentially important prawn fishing area. It is reported that large quantities of prawns become available during monsoon months in this river. Systematic exploitation of this area should yield useful results.

In addition to the areas mentioned above, about which some information is available, there are likely to be several areas which afford scope for exploitation. Thus a systematic exploration of all Inland water areas will afford useful information regarding unexploited but exploitable prawn fishing grounds.

Species Represented in Commercial Fisheries

The Giant Freshwater Prawn (*M. rosenbergii*) : This is the largest sized species of prawns, probably in the whole world, and forms a lucrative fishery in Kerala backwaters, and the upper and gradient zones of the Hooghly and the Ichamati. This species needs access to estuaries or brackish water areas for spawning which takes place only in waters having a salinity range of 6 to 17‰. Thus, the fresh-water zones of estuaries and streams emptying into brackish water lakes should afford a good fishery of the migrating adults in the pre and post-spawning months. Since the young of the year return to their freshwater habitats when they grow to a size ranging between 30 to 60 mm., they contribute to the fishery in the post-spawning months. Further, the spawning grounds, which are the gradient zones of the estuary or the brackish water lakes, afford lucrative catches of spawning adults. Thus, in the Hooghly and the Ichamati fishing is carried out only in the freshwater zone and thus only the maturing and spent adults and the young of the year contribute to the catches. Hence, nearly 30 miles stretch of the Hooghly and and 20 miles stretch of the Ichamati which represent the gradient zones (and spawning grounds of the species) are unexploited. It is felt that use of haul seines and shrimp trawls, particularly during the months April to July should afford good catches of mature adults. It may be necessary, if spawning grounds are intensively exploited to enforce such management measures as closed seasons to ensure escapement of sufficient spawning

stocks. Hence, research to realise this objective has to be simultaneously carried out. The habitat type suitable for the growth of this population occurs practically in all the estuaries and brackish water lakes of the country. However, the abundance of populations of this species varies widely from region to region as reflected in its representation in commercial catches. Hence, it is reasonable to postulate that population controlling factors other than the limiting abiotic features of the environment may be responsible for keeping the populations at low levels of abundance in all the estuarine and brackishwater regions of the country except the Hooghly estuarine system and Kerala backwaters. A probable factor which restricts the abundance of these populations in the Godavari, Krishna and Cauvery may be the anicuts which bar the access to the spawning grounds, of adults. In the Chilka and Kolleru also, the species has not attained the level of abundance to be expected in such highly productive, shallow lakes. Biotic environmental factors, such as, particularly, predators or inter-specific competition, may be responsible for this. Investigations on this aspect might yield fruitful results and may result in the establishment of remunerative fishery of this important species in all these areas by the introduction of proper management measures like controlling predators and competitors by selective fishing.

M. malcolmsonii : This prawn occurs in freshwater regions of rivers, particularly, immediately above the estuaries. As far as is known, access to the estuaries is not essential for successful spawning in the species. As pointed out, there is immense scope for intensifying exploitation of this species particularly in rivers like the Ganga and the Mahanadi. Exploring other important rivers might afford useful information on the availability of this species and the suitability of levels of abundance of population for commercial exploitation.

P. villosimanus and *P. rudis* : These prawns live in the same habitat type as *M. malcolmsonii* and have similar habits. Exploitation of *M. malcolmsonii* will yield catches of these species also.

L. styliferus and *L. tenuipes* : These prawns migrate in large numbers into stratified and salt wedge type of estuaries during monsoons and into non-stratified systems during winter months. Thus, *Leander spp.* form a good fishery in the Hooghly, in winter and in the Godavari and the Mahanadi during the monsoons. Operations of shrimp trawls in monsoons in salt wedge and stratified estuaries and in non-stratified systems in winters should considerably enhance the production of these species.

Penaeids : Generally, penaeids enter into estuarine and brackish-water areas as juveniles and by the time they become mature adults they migrate into the seas. Hence, penaeid fishery in estuarine and brackish-water areas is constituted by young and small prawns. Chilka lake is one known source of relatively big sized penaeids, particularly *P. semisulcatus* and *P. indicus*, the mean sizes represented in the fishery being 150 and 100 mm. respectively.

Enhancing Production through Transplantation

Construction of several hydroelectric and irrigation projects in the country has made available large areas of lacustrine habitat which can be utilised with profit for propagation of commercially important prawns. A species that grows to large sizes, grows well in a lucustrine habitat and can spawn in fresh water is the most suitable for transplantation into these areas.

M. malcolmsonii, which satisfies all these requirements, can thus be introduced into these reservoirs, resulting in, it is believed, very lucrative fishery of the species. The Central Inland Fisheries Research Institute has already initiated experimental introduction of the species in the Thungabhadra reservoir and results of this experiment will throw considerable light on the success of such introduction. If this measure succeeds it is hoped that the production of this species can be enhanced immeasurably.

M. rosenbergii is not recorded from the Pulicat lake which affords a habitat type suitable for the existance and multiplication of the species. Hence, it is possible that transplantation of the species into this area may result, in the near future, in the establishment of remunerative fishery for the species in this lake.

Improving Production through Culture

Another avenue for increasing production of prawns is through prawn culture in the innumerable, partially enclosed, brackish

water areas around estuaries particularly on the east coast of India. There are several such backwaters around the principal estuaries, particularly the Godavari, the Krishna, the Mahanadi and the Penna. In addition, culture of fresh water prawns also could be taken up in a large measure in suitable inland areas. An essential preliminary to take up large scale prawn culture is the charting out of areas of availability of fry, for introduction. In large water areas like backwaters and impoundments, it is not feasible to introduce fry by collecting them from remote areas, and hence it is necessary to resort to 'Bhasabada' type of stocking. This involves the letting in of the water either from the estuary or the sea during high tides, during a season of the year when the young of the important species of prawns are available in large numbers. Later on, the bars could be closed to prevent ingress of undesirable varieties of fishes and prawns and egress of the desirable ones.

As far as fresh water prawn culture is concerned only two species, *M. rosenbergii* and *M. malcolmsonii* could be recommended for culture, since they grow to attractively large sizes. It is necessary in the first instance to explore areas of availability of young of these species for introduction into ponds. Investigations at the Central Inland Fisheries Research Institute have revealed that it is possible to collect in large numbers young of both these species. It is also possible to induce them to spawn in confinement by providing the necessary environmental factors like salinity and temperature in case of *M. rosenbergii* and temperature in *M. malcolmsonii*.

Experience elsewhere has clearly demonstarted that production of prawns can be increased considerably by cultivating them in impoundments. Undoubtedly, further research is required to develop more suitable methods of artificial feeding and manuring to enhance porductivity per unit area.

References

Anon., Annual reports of the Central Inland Fisheries Research Institute, Barrackpore, (1960-'64).

Anon., An integrated master-plan for developing the fishing industry in Konaseema area of East Godavari District. *The Konaseema Fishermen Cooperative Central Society Ltd.*, Amalapuram, (1963).

Chacko, P. I., *Contr. Freshw. Fish. Biol. Sta. Madras.*, *8*, (1953).

Jhingran, V. G. *et al.*, *Bull Centr. Inl. Fish. Res. Inst.*, No. *1*, (1963).

Shetty, H. P. C., *Survey Report* No. *2*, Central Inland Fisheries Institute, Barrackpore, (1963).