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# SEED REQUIREMENTS FOR INTENSIVE CULTURE OF PENAEID PRAWNS IN COASTAL WATERS, PARTICULARLY IN KERALA

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## Abstract

The extent of estuaries and brackish waters in Kerala is estimated at about 0.243 million ha. Of this, 1,21,600 ha could be utilised for penaeid prawn culture. At present, prawn culture is being practised only in 5117 ha following the traditional practice of filtration. The prawns are harvested at regular intervals during the lunar phases, without allowing them to attain suitable sizes. *P. indicus* and *P. monodon* are the most suitable species for intensive culture, the former being the most abundant. The seed requirement of *P. indicus*, for stocking in the existing fields and the additional 5000 ha to be progressively brought under culture at a rate of 500 ha per year by the tenth year, will be 1317.5 million and on full development of 1,21,600 ha, it is estimated at 18,240 million. The potential estuarine and brackishwater resources of India is estimated at 1.7 million ha, of which 30,000 ha are currently used for traditional prawn culture practice mainly in Karnataka, Kerala and West Bengal. The seed requirement is estimated at about 5238 million for the existing fields as well as 500 ha to be converted into prawn fields immediately by each of the maritime states. If additional area

of 500 ha is brought under culture by each of the states every year, the seed requirement, by the tenth-year will be 11,364 million. The urgent need for perfection of techniques of large scale seed production under controlled conditions to meet this enormous quantity of seed and of training research, technical and managerial personnel as well as operatives and fish farmers is stressed.

## Introduction

Culture of prawns in impoundments adjoining the estuaries and backwaters of both Central Kerala and West Bengal is well-known since very early days. Prawn culture in brackish water fields is also being practised to some extent in Goa and Karnataka. The practice, though prevailing over the years, has neither undergone any change in its efficacy during its long history nor extended appreciably to other regions. However, with a wealth of information coming forth on the potential and prospects of prawn culture employing modern technologies, considerable interest is being evinced to bring in more and more areas into the fold of this aquaculture. The availability of prawn seed as and when required by

the farmers is, naturally, the most essential pre-requisite for the successful operation of prawn culture in extensive areas. In this context, an assessment of the seed requirements for the development of intensive culture of penaeid prawns in our coastal waters is attempted.

### Extent of Coastal Waters in Kerala

The long stretch of coastal waters with bays, lagoons, estuaries and brackish waters comprise of the water resources available for prawn culture. However, the bays and lagoons, though they are highly productive and together constitute an important part of this resource, are not considered in the present study as the problems of prawn culture in these areas are more complex.

There are 44 rivers in the State, of which 41 flow towards west. A number of these rivers, such as the Pampa, the Periyar, the Bharathapuzha, the Valapattanam, the Korapuzha, the Dharmadam, the Pazhayangadi and the Payyannar open into the sea. The embouchures and the lower reaches

within the tidal influx of these rivers, the brackish water lakes, the backwaters and the adjacent low-lying fields, and the mangrove swamps constitute the estuarine and brackish water resources of the State, the extent of which is estimated at about 0.243 million hectares. The brackish water lakes occupy an area of 1347 ha, the most important of which are the Vembanad, the Kayamkulam and the Ashtamudi. The other important brackish water lakes of the state are the Kavery, the Kottapuzha, the Valapattanam, the Korapuzha, the Valiangode, the Crangannore, the Paravoor, the Edvanadayara, the Anjengo, the Kadinamkulam and the Veli. The lakes such as Ashtamudi, Vembanad and Crangannore have permanent confluence with the sea into which others open only seasonally during the monsoon period.

All these estuarine and brackish water resources are not immediately suitable for penaeid prawn culture. It is estimated that about 1,21,600 ha, distributed in various regions as indicated in Table 1, could however be reclaimed and utilised (Anon., 1978).

TABLE - I

Extent of brackishwater area which could be Reclaimed and used for brackishwater prawn culture.

Region	Area (ha)
Kuttanad	49,000
Shertallai	4,900
Cochin - Kanayannur	5,700
Parur	10,000
Trlchur District	10,000

Vaikom	10,000
North Kerala	32,000
Total	1,21,600

At present, about 5117 ha of low-lying fields adjacent to the estuaries and backwaters in the districts of Ernakulam (4000 ha), Trichur (597 ha) and Alleppey (353 ha), are being utilised for prawn culture. In most of these fields, a variety of paddy resistant to slight saline conditions, is cultivated during the rainy season (June-September) and in the other season (October-April) prawns and other brackishwater fishes are raised.

#### Cultivable Species

Five species of penaeid prawns, namely, *Penaeus indicus*, *Metapenaeus dobsoni*, *M. monoceros*, *M. affinis* and *Parapenaeopsis styliifera* support the marine prawn fisheries of Kerala. Small quantities of *P. monodon* is also caught occasionally. All these penaeid prawns breed in the sea and have protracted breeding season extending almost throughout the year. The eggs and larval stages like nauplius, protozoa and early mysis develop in the sea. As they grow to late mysis and post-larval stages, the larvae, except those of *P. styliifera*, move towards shallow inshore waters and thence into the available estuaries and backwaters. These immigrating young ones form the seed for the present culture operations. The incoming tidal currents along with these young ones of prawns, fishes and various other organisms are let into the field through sluice gates. To maximise

the entry of these, a kerosene lamp is generally hung during nights above the sluice gates. Escape of the thus trapped seed during the alternating ebb tides is prevented by barricading the sluice mouth with bamboo screens. This operation of trapping the seed in the fields is a continuous process throughout the culture season. It is interesting to note that the commencement of this culture operation in the seasonal fields in October/November, after the harvest of paddy, coincides with a peak period of abundance of postlarvae in the backwater region, thus facilitating an effective supply of seed. In the post larval penaeid population in the Backwaters of Cochin, *M. dobsoni* constitutes 68.7%, *P. indicus* 17.9% and *M. monoceros* 13.4% (George, 1962.)

#### Intensive Culture

The traditional culture operation, though is a simple indigenous technique involving very little input, is nevertheless limited in its efficacy. The production is often low in quality as well as in quantity, obviously due to the indiscriminate stocking of both desirable and undesirable species brought in by the tide, and to the short period of impoundment during which no appreciable growth is possible. After a careful evaluation of this process, it is now suggested that intensive culture, which entails voluntary stocking of selective species of fast growing prawns and

regular monitoring, would enhance the quality and quantity of production.

Among the commercial penaeid prawns occurring in Kerala, *P. indicus* and *P. monodon* are found to be ideally suitable for intensive culture. These grow fast in impoundments, fetch high price and are in great demand. Of these two species, *P. indicus* occurs in the wild in greater abundance, and hence the following assessment of seed requirements for intensive prawn culture in Kerala relate to this species only.

#### Assessment of *P. indicus* Seed Requirement

Although, it is indicated that an area of 1,21,600 ha of brackish water is available for prawn culture in different regions of the state (Table-1), it may not be possible to utilise the entire area immediately for culture, as it requires detailed surveys, reclamation, construction of farms etc. It is envisaged

that a minimum of about 500 ha of water area could be converted into prawn farms every year.

The prawn seed (*P. indicus*) requirement for stocking one hectare water area varies from 50,000 to 2 lakhs depending on the productivity of the field, quality of the water supply and method of culture operation followed. At an average stocking density of 1.5 lakhs seed per ha for 3 culture operations in an year, the progressive requirement of prawn seed is given in table II.

The requirement of prawn seed for stocking 5117 ha of the existing field and 5000 ha of additional field to be reclaimed by the end of the ten-year period at a rate of 500 ha per year, will be 1517.5 million. These seed can be obtained from two sources, namely, from the wild stock or from the hatcheries established for the purpose. The Central Marine Fisheries Research Inst-

TABLE - II

Seed requirement for intensive culture of *P. indicus* in the brackishwater of Kerala.

Area (ha)	<i>P. indicus</i> Seed requirement (million)
5000	750
10,000	1,500
20,000	3,000
30,000	4,500
40,000	6,000
50,000	7,500
60,000	9,000
1,21,600	18,240

itute has located several potential seed grounds of prawns in the surf region and in certain areas of estuaries and backwaters. From these grounds the seed can be collected by velon screen drag nets. However, it is well-known that the availability of seed in nature fluctuates widely from season to season and from year to year, and depends largely on the spawning success and the corollary survival of larvae and postlarvae. It is envisaged that about 70% of the above seed requirement could be met from those available in nature. To meet the balance requirement, it is essential to set up seed production centres.

Seed production in hatcheries includes the techniques of procurement of spawners of the selected species, their spawning and culture of eggs and larvae to stocking size under controlled condi-

tions. While commercial hatcheries have been established in the countries like Japan, Taiwan, Philippines, Republic of Korea and United States of America, such hatcheries are yet to be established in our country.

#### Prawn Seed Requirement of India

The potential salt water resources of the country available for prawn culture comprise of numerous lagoons, bays, creeks, estuaries, and brackish waters in the coastal zone. The total extent of estuarine and brackish water resources is estimated at 1.7 million hectares, the state-wise distribution of which is given in table III. At present, a total of about 30,000 ha are utilised for a commercial brackish water prawns and fish culture in Gujarat, Karnataka, Kerala and West Bengal (Table III).

TABLE - III

State-wise distribution of estimated potential estuarine and brackishwater areas available for prawn culture.

State/ Union Territories	Potential area (million ha)	Area currently under commercial brackishwater/fish prawn culture (ha)
Gujarat	0.376	88
Maharashtra	0.081	--
Goa	0.019	NA
Karnataka	0.008	4,800
Kerala	0.243	5,117
Tamil Nadu	0.080	--
Pondicherry	**	--
Andhra Pradesh	0.200	--
Orissa	0.299	--
West Bengal	0.405	20,000
Total	: 1.711	30,005

\*\*840ha; NA - Not available.

The penaeid prawn fishery of the country is supported by about 15 species belonging to the genera, *Penaeus*, *Metapenaeus*, *Parapenaeopsis* and *Solenocera*. Although all these prawns are suitable or potentially suitable for culture, only 8 species, namely, *P. indicus*, *P. monodon*, *P. merguensis*, *P. semisulcatus*, *M. dobsoni*, *M. mono-*

*ceros*, *M. affinis* and *M. brevicornis* are important at present on the basis of the available information on the biology, distribution, and availability of seed of these species. Table IV furnishes the distribution and abundance of seed of different species of prawns in various maritime states (Rao, 1972; Rajyalakshmi, 1973; Jhingran, 1977.)

TABLE - IV

Distribution and abundance of prawn seed in different regions.

Region	Species	Season for abundance
Gujarat	<i>P. indicus</i>	February - April
	<i>P. merguensis</i>	
	<i>M. kutchensis</i>	February - September
	<i>M. brevicornis</i>	March - April
Maharashtra	<i>P. merguensis</i>	October - December
	<i>M. monoceros</i>	
	<i>M. affinis</i>	
Goa	<i>P. monodon</i>	July - August
	<i>P. indicus</i>	February - May
	<i>P. merguensis</i>	February - May
	<i>M. dobsoni</i>	February - April - May
	<i>M. monoceros</i>	September - December
Karnataka	<i>P. merguensis</i>	December - March
	<i>P. indicus</i>	December - January
	<i>P. monodon</i>	October - April
	<i>M. dobsoni</i>	
	<i>M. monoceros</i>	
Kerala	<i>P. indicus</i>	October - May
	<i>M. dobsoni</i>	October - January - August
	<i>M. monoceros</i>	October - December
	<i>M. affinis</i>	October - December

SEED REQUIREMENTS FOR INTENSIVE CULTURE

Tamil Nadu	<i>P. monodon</i>	March - May, September - December
	<i>P. semisulcatus</i>	January - April, June - October
	<i>P. indicus</i>	February - May, August - September
	<i>M. monoceros</i>	March - September
Andhra Pradesh	<i>P. monodon</i>	September - April
	<i>P. indicus</i>	October - December
Orissa	<i>P. monodon</i>	April - May, November - February
	<i>P. indicus</i>	April - July, November - January
West Bengal	<i>F. monodon</i>	April - May, August - September
	<i>M. brevicornis</i>	July, October - December
	<i>P. indicus</i>	February - April

It is only recently that different maritime states have evinced interest in prawn culture and hence the level of development varies from State to State. The basic information on the ecological diversity, productivity of waters, differential distribution and quantitative estimations concerning seed is also scanty. In the absence of these data, estimation of prawn seed required for immediate development may not be pragmatic. However, to provide some indication of the seed requirements to base the developmental programmes, an attempt is made here on the basis of empirical knowledge. It is assumed that the water areas available in different maritime states are moderately productive, and that they may sustain a stocking density of 50,000/ha, under a crash programme, each of the states could convert a minimum of 500 ha of

water area for prawn culture every year. At a stocking rate of 1.5 lakh seed for 3 culture operations per ha per year, the seed requirement to stock 500 ha by the States Gujarat, Maharashtra, Goa, Tamil Nadu, Pondicherry, Andhra Pradesh and Orissa where there are very little commercial prawn culture activities at present, will be 525 million. For intensive culture of prawns in the existing areas in Karnataka (4800 ha), Kerala (5117 ha) and West Bengal (20,000 ha) and for the additional 500 ha to be brought in under intensive culture immediately, the quantity of seed required is 4713 million. Thus, the total immediate prawn seed requirements of all the maritime States is estimated at about 5238 million and by the tenth year, 11363.5 million (Table. V).

TABLE - V

Immediate seed requirement for intensive culture and the projected figure for tenth year.

State	Area (ha)	Immediate seed requirement (million)	Area to be developed by the tenth Year (ha)	Seed requirement (million)
Gujarat	500	75.0	5000	750.0
Maharashtra	500	75.0	5000	750.0
Goa	500	75.0	5000	750.0
Karnataka	5300	795.0	9800	1470.0
Kerala	5617	842.5	10117	1517.5
Tamil Nadu	500	75.0	5000	750.0
Pondicherry	500	75.0	840	126.0
Andhra Pradesh	500	75.0	5000	750.0
Orissa	500	75.0	5000	750.0
West Bengal	20,500	3075.0	25000	3750.0
Total	34,917	5237.5	75757	11363.5

### General Remarks

During the last five years, considerable advancement has been made in the technology of prawn culture in the country. The Central Marine Fisheries Research Institute made remarkable progress in the field of seed production. Seven species of culturable penaeid prawns, namely, *P. indicus*, *P. monodon*, *P. semisulcatus*, *M. dobsoni*, *M. monoceros*, *M. affinis* and *P. stylifera*, spawned under controlled conditions and their larvae were reared to stocking size under different conditions. Considerable progress was also made in tackling the problem of larval feed. Similar studies have been reported on *P. merguensis* (Raje and Ranade, 1972)

and on *M. brevicornis*. Encouraging results have been obtained on mass production of seeds of *P. indicus* and *M. dobsoni* with fairly good survival rate which would lead to the development of hatcheries (Silas and Muthu, 1977) However, considering the need for such an enormous quantity of seed that the nature may not be able to provide, immediate perfection of techniques of large-scale production of seed of selected species has become an urgent necessity.

In intensive prawn culture, selection of species plays an important role. The criteria such as the availability, growth rate, resistance to diseases, cost of culture and the ease with which the

species could be raised on a large scale determine the suitability of the species. It is already mentioned that among the species that occur in our waters and suitable for culture, *P. indicus* and *P. monodon* are the most important. These species have all-India distribution; they grow to large size in enclosed waters, and are in great demand. However, from the point of view of the capacity to produce relatively large number of eggs, faster rate of growth and hardiness, *P. monodon* is more preferred. But they are less abundant in the fishery than *P. indicus*. In the context of hatchery production of seed, procurement of their spawners poses a real problem. Endeavours are made at the Central Marine Fisheries Research Institute to induce maturation of ovary and spawning of these species as well as to domesticate them under controlled conditions. Mention may be made here of the successful domestication of one of the penaeid prawns, *Metapenaeus dobsoni* in the field laboratory at Narakkal (Silas and Muthu, 1978).

As prawn culture is in an early stage of development in most of the states training of personnel at various levels to properly develop the field is imperative. The Central Marine Fisheries Research Institute is already imparting training to prawn farmers under the Krishi Vigyan Kendra, Narakkal, in

various aspects of prawn and fish culture, and also in the collection, identification, and transportation of seed. Under the regular programmes of the institute, short-term advance training is also being offered to research, technical and managerial personnel. As a large number of skilled operatives are required for the procurement of seed, it is necessary to forthwith strengthen these training programmes.

The prawn seed available in nature is composed of multiple species that co-exist in the same ground. This being so, there is likely to be considerable wastage of seed, particularly of the less important species, should a large scale collection of prawn seed from the wild be undertaken by untrained personnel. This would not only result in an imbalance of the natural population, but also would affect adversely our capture fisheries. In order to avoid this situation, proper educational facilities must be extended to the fish farmers and seed suppliers on the conservation of this valuable resources.

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