Culture of Giant Freshwater Prawn

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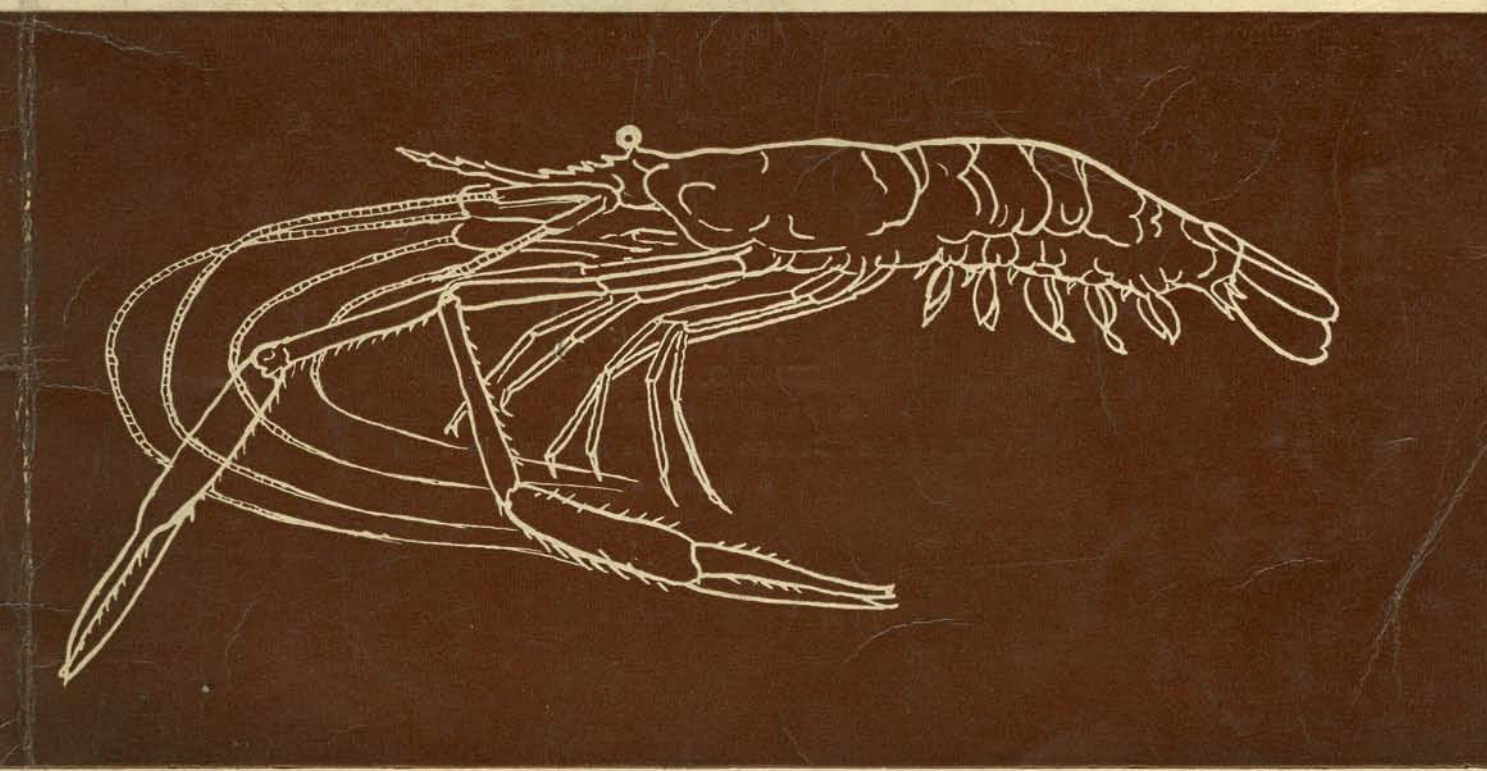

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C U L T U R E

of

GIANT FRESHWATER PRAWN

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KAKINADA

Bulletin No. 57

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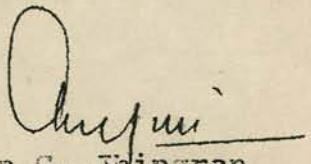
Foreword

Many species of the freshwater prawn (Genus : Macrobrachium) are found in the tropical and sub-tropical waters; of them the giant freshwater prawn (M. rosenbergii) is the largest which is currently being studied in many developed and developing nations since it possesses all the essential attributes of a cultivable species : fast growth, high nutritional value, high market demand and favourable foreign exchange value.

Since the pioneering work by Dr. S.W. Ling in sixties, many researchers, both in the developed and developing nations, have concentrated their attention on the culture of the giant freshwater prawn in temperate, warm-temperate and tropical climates and identified it as one of the priority organisms for aquaculture research and development.

The Prawn Breeding Unit of the Central Inland Fisheries Research Institute developed an indigenous technology of giant freshwater prawn seed production in seventies. Subsequently, laboratory-produced prawn seed were utilized in a number of pond culture experiments in diverse environments both in the private and public sectors. The prawn seed were also supplied to the private farmers. The promising results obtained through this stratagem prompted many private individuals, far and near, to take up prawn culture on a commercial scale.

For a profitable freshwater prawn culture venture it is imperative that it props on a sound knowledge of conceptual and constructional details, operational procedures and judicious management strategies. The accompanying pages cover these aspects with the hope and scope for further improvement in these phases through the propagation of freshwater prawn culture practices in the forthcoming years.



Arun G. Jhingran
Director

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INTRODUCTION

The Giant freshwater prawn (Macrobrachium rosenbergii) culture sensu stricto is a recent innovation after the technological breakthrough in seed production and propagation to both developed and developing nations. The traditional method is to collect wild seed from tidal freshwater stretches of rivers and stock them in village ponds, tanks and other types of impoundments alongwith major carps or exotic carps. The breakthrough in seed production is a step forward to improve the current status of freshwater prawn culture through the selection of favourable sites for pond construction. Culture (growth) periods are, however, longer in a tropical climate when compared to the temperate. The basic principles of pond culture are same for the fish and prawn, but special attention will have to be paid for the habitat improvement of the prawn.

SITE SELECTION

The prawn, Macrobrachium rosenbergii, is widely cultured in tropical and subtropical climates where the culture period (growing season) is long, while in warm temperate climate, cultivation is possible for a short period only. The selection of site, therefore, depends on the climatic conditions.

The main factors for site selection are the topography of the area, soil type, freshwater source, water quality and period of availability.

Any site which has a perennial pollution-free freshwater source (preferably running water) and facilities to fill and drain the pond, is the best choice for prawn culture. Where ground water is the only source of freshwater, and hard waters containing high carbonate, sulphate or chloride are not suitable. Depending on the height of the site in relation to the height of the water source, bunds are to be erected on plane sites, without disturbing the bottom, where the water source (rivers or canals) is at a higher level ponds are excavated at a lower level. In situations where the ground water is the only source of freshwater, either elevated or excavated ponds are constructed depending on the soil topography. Slightly brackishwater areas (0.25-0.75 ppt salinity) are also suitable for prawn culture.

Soil texture should be sandy-loam or sandy-clay loam or silty-clay or silty-clay loam with 85% water retention. The seepage rate should be minimum particularly in the case of sandy-loam or sandy-clay loam substrata.

Sites with high carbonate, sulphate and chloride [illegible] content in their soils are not desirable.

Organic fertilisers, technical help, cheap labour and information on predators should be readily available within a reasonable radius from the selected site.

The site soils should be tested for any residual pesticides and it is desirable to know the history of the site, particularly when it has been used for any type of production purpose.

Water temperature and dissolved oxygen are the most important factors affecting prawn production. Sites with many cloudy days and strong winds often lower the pond water temperature due to low solar incidence on pond surface. Low wind velocities and longer periods of higher solar radiation, with a mechanism to manage dissolved oxygen crisis periodically, appear to be the deciding factors for site selection.

Sites with heavy rain fall and dilute calcium levels to a significant degree, with no measure to remedy the situation, resulting in the production of leathery prawns or total mortality. Such sites are not desirable or a mechanism should be developed to overcome such situations.

Any site with a natural gradient to facilitate filling and draining is ideal for pond construction.

POND CONSTRUCTION

Traditional freshwater prawn culture is practised in many types of ponds whose size, shape and depth are highly variable.

Rectangular ponds with their long axes oriented in the direction of the prevailing wind are desirable for prawn

culture. Ponds 0.1-0.2 hectares in area with a sloping plane bottom (2%) and a sump at the deeper end for harvesting the prawn crop are efficient to manage. Still larger ponds are constructed (upto 1.5 hectares) but total prawn harvest is a problem in such ponds. A length-width ratio of 2.5 : 1 is desirable. The pond depth can be within a range of 0.75-1.5 meters. The pond levees are sloped in the ratio of 2.5-3:1 so as to provide shallow areas along the water line of the pond. On the outer side, the slope should be 1.5-2.0:1. Pond bunds should be at least a meter wide for the movement of per personnel and materials. Compaction of bunds and bottom is necessary to prevent water seepage. The bund top should be at least half to one meter above the water surface to check inundation during floods or rains. The bund slopes may be covered with grass to prevent erosion.

Water filling and draining through gravity is the most economical method. The water intake through the inlet pipe at the shallow end should pass through a gravel-sand filter in order to supply sediment-free water and prevent entry of small fish, eggs, etc., into the pond. The outlet pipe at the deeper end is covered with a nylon-mesh screen to prevent escape of prawns. The inlet pipe is permanently kept in communication with the source of water supply and the drained water will not be allowed to re-enter the pond.

Elevated ponds are easy to drain and dry. They are less prone to monsoon damage or flooding. In excavated ponds, complete drying is a problem. They are prone to flooding and monsoon damage.

Water quality is of vital importance for prawn culture. Hence the source should be analysed thoroughly for toxic chemicals etc. Perennial rivers are the most reliable source of pond water; however, it should be ascertained from concerned circles whether there are any future plans to degrade the water quality. Change in water quality is not desirable.

Some of the water quality criteria are :

Total dissolved solids	less than 300 ppm
Temperature	24-34°C
Salinity	0.25-0.75 ppt
pH	6.5 - 10
Dissolved Oxygen	more than 3.0 ppm
Calcium	Less than 100 ppm
Phosphorus	less than 1 ppm
Nitrates	less than 1 ppm

Before filling the pond with water, grass should be allowed to grow at the bottom. Aquatic plants (Hydrilla, Ipomoea, etc.) are introduced in the marginal areas of the pond covering 10% of the pond area.

Prawns exhibit territorialistic behaviour. Hence increase in the surface area provides space for increased stocking and reduces competition for space. Cut branches of trees viz. Acacia, tamarind, etc., submerged and driven into the substratum, hanging nylon screens, pigeon-hole type multi-tier brick or wooden structures and any other ingenious devices are suitable for this purpose.

Pond drying facilities (through draining or pumping) maintain substratum hygiene.

NURSERY PONDS

In ideal situations, with plenty of water and availability of other inputs and with a short or long growing season, nurseries are provided in the farm for growing post-larvae to juveniles (small 1.0 cm seed into 2.0-3.0 cm seed). Nurseries may be earthen ponds, reinforced concrete cisterns or even plastic pools. The shape and slopes of the ponds are the same as the culture ponds, but the sizes are small ranging from 50 sq. meters to 200 sq. meters (20M x 10M x 0.75M or 10M x 5M x 0.75M or intermediate sizes between them). Concrete cistrerns and plastic pools 50 sq. meters in area and 60 - 75 cm deep, are also suitable for this nursery practice.

For a 10 hectare farm, each rearing pond measuring 0.1 - 0.2 ha, 12 nurseries each of 200 sq. m area or 48 nurseries each of 50 sq. ma area are required. The nurseries are are stocked at the rate of 200/m^2. If a hatchery is also in operation, as an adjunct to the farm, with a production target of one million seed, 7-8 brood stock ponds of 200 sq. m area should be maintained. The percentage ratio of breeding ponds, nursery ponds and rearing ponds should be 1.4 : 2.4: 96.2 respectively.

STORAGE

For a large farm, with a pond-complex described earlier, a small shed should be constructed to store dry feeds, nets, etc., and the same also serves as shelter to the farm workers.

TRANSPORT

Provision should also be made for a garage, if trucks are allowed into the farm for transport of raw materials, seed, prawns, etc.

PROTECTION

A barbed wire fence may be installed on the boundary line of the farm to prevent poaching or entry of cattle and other grazing animals.

PROBLEMS

Despite stability measures, natural calamities do occur. Severe cyclonic storms may erode the bunds or inundate the ponds. High summer temperatures deteriorate the water quality. In shallow ponds, weed infestation depletes oxygen. To a limited extent, human endeavour can surmount such natural calamities through ingenious devices and intelligent management.

CONCLUSION

Pond design and construction are location specific. A rigid rule of the thumb does not fit in all locations. Slight modifications are necessary to suit the situations.

Selection of site and construction of ponds, even if they are done in good faith, the expected results from such well prepared ponds rely upon the operational methods and practices.

POND CULTURE

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INTRODUCTION

The giant freshwater prawn (Macrobrachium rosenbergii) is the largest freshwater prawn known in the world and has been identified as one of the priority organisms for aquaculture research and development. The assets in its favour are rapid growth rate, high nutritional value and high export market value. The commercial culture of this prawn is well established in several developed and developing nations.

The culture of the giant freshwater prawn is not so well developed as fish culture for two reasons: adequate numbers of seed cannot be obtained from rivers and inquiries reveal that such seed are quite expensive (Rs.500-600/1000 nos. seed in West Bengal and Rs.250/1000 nos seed in Andhra Pradesh). Seed are believed to be available in large numbers in Maharashtra and Gujarat, but no authentic information on their cost and quantity is available. The other reasons is that no commercial hatcheries have come up to produce large numbers of seed.

The Prawn Breeding Unit of the Central Inland Fisheries Research Institute, Kakinada (A.P.) produces seed of this prawn on an experimental scale and distributes them to the farmers and governmental agencies. The pond culture results are so promising that the demand for seed has increased in recent years.

There is a vast potential for the development of freshwater prawn culture in the maritime States of India. Large scale production of seed, by establishing commercial prawn hatcheries in each State, will prompt the promotion of freshwater prawn culture in India.

FERTILISATION AND LIMING

Pond fertilisation is a delicate process. For newly constructed ponds, after filling with water 5-10 tons/hectare cattle shed manure and 250-500 kg/ha lime are added, depending on the water quality, and aged for about fifteen days. An organic base on the bottom and slopes increases the fertility of the pond. In village ponds, no organic manures are added as the village cattle are cleaned in the pond water and are allowed to wade through the water. During this process, the cattle drop dung and urine directly into the water. Their daily sojourns maintain pond fertility and make it a productive pond. Generally, the smaller and older the pond, the higher is the production. However, such ponds require liming from time to time, since dung and urine lower the pH of water and may encourage the growth of undesirable plankton. To prevent such phenomenon, dried cattle shed manure mixed with lime is added in instalments, during the culture period, in ponds which do not have direct access for the entry of cattle and other domestic animals. Liming alone is sufficient in organically rich ponds to maintain desirable pH and pond hygiene. Dragon fly nymphs and other carnivorous insect larvae are destroyed by lime treatment.

STOCKING

Fifteen days after fertilisation and liming, prawn seed are stocked in the morning hours in weedy areas along the margin of the pond. The seed in the container are acclimatised to the pond water temperature by holding it in the pond water for about 10-15 minutes. Often pH differences between pond water and container water occur, resulting in mortality of prawn seed. In such cases, the seed are acclimatised to the pond water before transporting to the farm site.

Seed should not be stocked when the water temperature is below 20°C. The optimum temperature for stocking is 22-24°C.

After release into the water, the seed disperse in all directions and settle at the bottom and on the submerged vegetation. In monoculture, a stocking density of 40,000 ± 10,000 per hectare is desirable, depending on the age and condition of the pond. In the developed nations, the stocking density is much higher (2,50,000/ha). In polyculture, the stocking density is reduced to 50%. Compatible fish fry viz. Catla, rohu, silver carp, grass carp etc., are stocked before stocking the prawn seed. Fish fingerlings and prawn seed may be stocked at the same time. Bottom feeding or bottom dwelling fish viz. common carp, mrigal, etc., are not a good combination. Fish stocking upto 1500-3000/ha is a desirable limit. The presence of frogs or their introduction is beneficial. They feed on predatory larvae and tadpoles or juveniles which serve as food for prawns. /which

While stocking older ponds, a check on predators is necessary before stocking of the prawn seed.

In unfed ponds, the stocking density of prawn seed may be reduced to less than 15,000/ha.

Export and foreign exchange earnings are the main criteria behind the cultivation of this prawn. Hence stocking practices are oriented towards this goal.

Normally, newly metamorphosed postlarvae or juveniles are stocked in ponds. In areas with a short growing season, juveniles are stocked. This practice involves a nursery phase where the postlarvae are grown to juvenile size in about 1-2 months. By this practice, the survival rates increase in culture ponds. In areas with a long growing season, introduction of nursery phase, reduces the growing season in culture ponds, thereby increasing the number of prawn crops in a year. It is possible to raise three crops in a year in areas with a long growing season, subject to the availability of water, other inputs and favourable climate.

In freshwater nurseries, the postlarvae are stocked at a density of 35-230/M^2 and the survival rates range between 50 and 94%. In brackishwater the postlarvae are allowed to grow in the same larval rearing medium without acclimatisation to freshwater, the survival rate is poor (36%) when the postlarvae are stocked at a stocking density of 180/M^2 and the growth rate is also poor. In other countries, the stocking density of postlarvae varies between 300&1500/M^2 and some reports show a survival rate of 70% in the nursery phase.

FEEDS AND FEEDING METHODS

In earthen ponds, natural feeds produced through biological cycle will be available. The prawns feed actively at night and rest during the day hiding under shelters and shades. They are detritivorous in habit and feed on a variety of feeds that come across them while scavenging on the margins of the pond. Pond fertilisation and liming help to maintain this natural productivity. In commercial operations, the natural productivity is not sufficient and highly variable to promote growth (and thereby production of prawns) as the animals are raised at higher stocking densities for increased production. It is, therefore, essential to provide supplementary feed to hasten growth.

Locally, available cheap feeds *viz.* crushed rice and rice products, coconut oil cake, smoked tapioca root, small shrimp (*Acetes* sp.), foot of apple snail, trash fish, bivalve meat, prawn waste from freezing plants etc., are provided as supplementary feed. Farm pig manure is also used as food, since the prawns are also coprophagous. Supplementary feeding often pollutes the water through metabolites and left over food. Blooms develop may deplete dissolved oxygen at night. To tide over such situations, water quality is maintained by draining and refilling the pond (total or partial exchange), if water is available. If water is not readily available, water quality is maintained through controlled stocking and feeding methods. Foot of apple snail, other molluscan meat and small shrimp (*Acetes* sp.) promote excellent growth of young prawn. Despite provision of sufficient accepted feeds, prawns resort to cannibalism during ecdysis. Marginal vegetation and artificial shelters control cannibalism to a great extent in the pond.

It is always better to use both vegetable and animal feeds separately or mixed together in the ratio of 1:3 with a protein content of 20-25%.

Commercial chicken broiler starter with a protein content of 23% is used in some countries but some of the ingredients may be toxic to prawns. Water stable compounded pellets used in salt-water prawn nutrition are also suitable, but their availability, cost of production, self life and dependability are some of the factors yet to be understood throughly, before they are introduced in freshwater prawn nutrition.

The feeds are given in powder form or in small pieces for the first two months, followed by large pieces for the rest of the growing period. This procedure is particularly applicable in case of tapioca root, foot of apple snail, trash fish, etc., which are procured in large sizes. Crushed rice and coconut oil cake are soaked in water before feeding.

Prawn feeding grounds are situated in the shallow areas. Feeds are normally placed in wide containers (earthen troughs or similar contrivances) set up at several points along the margin of the pond during the evening. The containers are examined the next morning/evening and the quantum of feed to be offered, is then increased or decreased depending on the rate of consumption. Through trial and error, the quantum of feed to be offered is determined. This is the best method to feed prawns without wastage. There is much wastage when the feed is scattered freely in the shallow pond. When fish are also stocked, they compete with the feeds offered for the prawn. A method is yet to be evolved to check this competition.

In monoculture, feed conversion ratio is 10-18 : 1 when raw (wet and dry) feeds are fed and with compounded feeds the ratio is reported to be 2-3 : 1. The conversion rate is reduced when the culture period for prawns is extended beyond eight months. In polyculture, the feed conversion ratio is found as 1-8 : 1. It is, therefore, economic to raise fish also in the same pond for better conversion of feeds.

GROWTH AND SURVIVAL

Growth (conversely production) and survival depend on a number of factors viz. food, stocking density, water quality, climate, pond size, etc. Prawns grow fast under optimum conditions. Their growth in the pond should be watched at intervals using a cast net or any type of prawn trap. If they are not growing well, the pond culture operation methods should be reviewed in detail to determine the factors responsible for slow growth.

The main object of any prawn culture operation is to produce maximum crop with minimum investment. This is possible when prawns are grown to an optimum marketable size (av. weight 30-50 g), when the quantity of prawns and their survival rate are normally high. If the prawns are allowed to grow to a maximum size (average weight 100-150 g) the quantity of prawns and their survival rate decrease considerably. The culture period for prawns is normally 6-8 months when postlarvae are stocked and when juveniles are stocked the period is reduced to 4-5 months while the prawns reach an average size/weight of 15-17.5 cm/35-68 g (30-60 tails/kilogram). It is

not advisable to grow prawns for longer periods since the feed conversion and survival rates are reduced.

The survival rates during the optimum growing season vary between 50&90%, depending on the nature of the stocking material (postlarvae or juveniles).

In tropical and sub-tropical climates with a year round growing season, growth is faster (39-49 g/4.5-6 months) compared to the same in warm-temperate (21-44 g/5.5 months) and temperate (11-18 g/5 months) climates with a short growing season (4-6 months). There is not much difference in survival rates between these climatic zones.

HARVESTING

All prawns do not grow at the same rate even if the seed of the same age are stocked. A very wide disparity in size appears at the harvest time. This is particularly noticeable in males. Hence prawn growth and optimum size for harvest will have to be checked from time to time with an experimental cast net of 0.5-1.0 cm mesh size. Sex ratio disparity is another factor. Female prawns out number the males during the breeding season. Once the prawns reach marketable size, irrespective of their sex, they should be harvested.

Three methods of harvesting are in vogue. The first method is to use a drag seine with a 4-5 cm mesh, so that only large prawn and fish (if stocked) are caught. By this method the bottom is disturbed and the smaller prawns do not feed actively for a few days. Some smaller prawns may also die due to injuries caused during seining, in foot prints and soft substratum.

The second method is to drain the water through the outlet pipe (screened) and remove the prawns and fish (if stocked) by hand or by cast net. If draining is not possible, the water is bailed out by pumping. In this method smaller prawns and fish are also gathered and transferred to another growing pond. In ponds with a bottom slope and sump in the deeper end, draining results in the congregation of all prawns and fish in the sump and sump area. They are scooped out with the help of a hand net. Some prawn and fish mortality is also reported in this method.

The method of trapping large prawns from ponds is practised in some parts of West Bengal. Although this method involves capture over an extended period of time, since all large size prawns cannot be caught in one or two days, it offers a method for daily supply to market or restaurants without any damage to the pond environment (bottom).

Harvests from identical ponds differ, despite following uniform methods. Again some ponds produce good crops consistently while others in the same area produce little. The reasons for these differences are not yet clearly understood.

Harvesting is a labour intensive and slow operation. Partial water draining may be done at night. Harvesting should start early in the morning and should be completed before noon. Birds are a menace during harvesting time and they sould be scared away. In case of total drainage, the water heats up rapidly on hot days, if the harvesting time is extended till the evening then all the prawns may be on the bed due to heat stress and low oxygen

the evening then all the prawns may die on the bed due to heat stress and less oxygen. Surveying all these problems, trapping appears to be a safe method but time consuming.

Immediately after harvesting, the pond should be filled in case of partial drainage. When the pond is completely drained out, it is advisable to dry the pond bottom and then prepare the pond for next filling and stocking.

SOME PRODUCTION RELATIONSHIPS

Food factor: Fertilisation and liming maintains water quality and provides nutrition to seed prawns initially, while supplementary feeding promotes growth and production. Without supplementary feeding the survival and production are poor. Successful prawn culture, therefore, relies upon supplementary feeding in addition to the natural feeds available in the pond. A well fed pond produced 578 kg/ha with 89% survival, while an unfed pond produced only 40 kg/ha with 41% survival. As far as possible, locally available cheap feeds should be provided. In areas where such cheap feeds are not readily available, suitable substitutes are to be found.

Stocking density : Prawn production is directly related to stocking density. But with increasing stocking density the average size of the prawn at harvest time is much smaller. The production ranged from 284 kg/ha (average size 17.48 cm/ 68.3 g) to 1929 kg/ha (average size 13.25 cm/24.7 g) when the seed stocking range was from 5700 to 1,12,000/ha. For a developing nation, the average size at harvest is a very important criteria for expert. The optimun stocking density for

a profitable export oriented commercial venture is 40,000 ± 10,000 seed per hectare, depending on the age and condition of the pond. The yield ranged from 709 to 1640 kg/ha (average size 14.95-15.9 cm/34.93 g). High stocking densities are followed in developed nations, where the main concern is censumption and quantity, while the developing nations need to export large tails to earn foreign exchange.

Polyculture : The freshwater prawn may be cultured in combination with carp to gain additional production and profit; however, the bottom feeding fish are not compatible. When prawns were grown in combination with common carp or mrigal, the fish production was normal but the prawn production, both in size and volume, dwindled considerably(prawns 85-171 kg/ha; fish 1149-1667 kg/ha), while the prawn was found satisfactory when culture with the column and surface feeding major carps (prawns 709-1929 kg/ha;/1572-2750 kg/ha). /fish

Water blooms: Planktonic blooms (flagellate blooms) and water scarcity interfere with the production of both fish and prawn (prawn: 67 kg/ha; fish; very poor-not estimated), hence availability of water is a prerequisite for successful prawn culture. This phenomenon occurs specially in summer months when water is generally scarce in many parts of the country.

Substratum : The bottom of the pond appears to be a determining factor in the production of prawns. Sandy substratum is an ideal habitat for the freshwater prawn, also such ponds not only pose many problems but are not easily available for prawn culture. Ponds with a muddy substratum r retain water and such substrata with a silt fraction are also

suitable for prawn culture. Shallow ponds promote growth of bottom vegetation and are not suitable for prawn culture. Ponds in rural areas have different substrata and receive drainage water, seepage water and cattle droppings. This natural fertilisation increases the productivity of the pond. Prawn production in such a pond with sandy-loam substratum was very high (654-715 kg/ha; stocking 11,000-25,000 seed/ ha). Ponds with a silty-clay substratum were also productive, but overcrowding with extraneous fish, reduced the prawn production in one pond (390 kg/ha; stocking 26,000 seed/ha). In another pond with silty-clay loam the production was found good (709 kg/ha; stocking density 30,000 seed/ha). Another pond with clayey-loam substratum and water snake infestation was foundand poor in production (208 kg/ha; stocking density 31,300 seed/ha). A shallow pond with silty-clay substratum, thick bottom vegetation and extraneous fish, was least productive (124 kg/ha; stocking density 24,500 seed/ha) in the experimental ponds.

Survival : The survival rates depend on a number of variable factors viz. subs ratum,feeding, initial stocking size etc. In ponds stocked with early postlarval prawns,the survival rates was ranged between 58 and 69 percent, while the survival rates were found high in ponds stocked with 2-4 months old juveniles (72-90%). Heavy mortality of prawn was noticed in unfed ponds (mortality 59%).

Nursery system : The development of nursery system in pond culture is profitable through increased production in places with a short growing season. In areas with year round favourable climate, such nursery systems help to raise 2-3 crops in a year, thereby increasing the total production.

OTHER TYPES OF PRAWN CULTURE

Freshwater prawns are grown in various ways; some times, they are incidental to the main crop viz. paddy or fish.

Paddy-cum-prawn culture: Incidental to paddy crop, fish, freshwater prawn and brackishwater prawn are also harvested from the paddy-fields fed by the Hooghly river system, through which prawn seed enter the paddy fields directly. They are trappped at night and marketted next morning. Prawns also grow in water bodies around the paddy-fields. Experiments conducted by the Central Inland Fisheries Research Institute proved beyond doubt that prawns grow well in such water bodies fertilised by sewage water.

Cage and pen culture : These practices are not yet effective for commercial enterprises. The problems are many in these types of culture; daily feed supply, less of prawns through the screens damaged by their own chelipedes or external sources, poaching, entr of predators and unwanted fish through the damaged screen etc.

CONCLUSION

Freshwater prawn culture is still at an experimental stage. Depending on the availability of good quality freshwater sources prawn production in areas with a year round growing season will be very profitable.

POND MANAGEMENT

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INTRODUCTION

Management of freshwater prawn ponds is a herculean task as the prawn is delicate, susceptible to environmental and climatic stresses. Management principles, however, are more or less the same as those of fish, while management approaches differ from individual to individual.

Under excellent management, prawn farming should produce largest quantity or crop, with majority of the individuals attaining marketable size at the lowest possible cost. Experience in prawn growth characteristics is, therefore, necessary to determine the stocking density, fertilisering and feeding for each pond so as to produce a good harvest within a reasonably shortest period of time and with minimum expenditure. The first few harvests are only trials, through which the management gains experience. Management with practical experience is an asset to any prawn farmer.

From a large number of prawn rearing trials, conducted both in public and private ponds, the management principles of freshwater prawn culture are evolved and presented here.

POND MANAGEMENT

Pond management involves care of the animals, their environment and advance precautionary measures to counter any external threats or natural calamities.

Pond soil : Pond soil should normally be alkaline, but some pond soils are acidic(pH less than 6) and require heavy lime treatment. Reclamation process invloves flushing and draining over a long period. This is a time consuming and expensive process, so it is always safer to avoid such soil types.

Pond soils with a very high pH (9-10) can be improved through ageing. Such ponds should be filled with water and in a month the biological cycles reduce the pH to a desirable level and make them fit for culture.

It is always safe to dry the pond during the post-harvest period.

Pond water : Pond productivity improves if a feeble flow of water current is maintained during the growing season. If enough water is not available, this flow may be maintained at night to overcome dissolved oxygen stress. In stagnant water, ponds with no facility to maintain feeble flow, partial or total water exchange is necessary when the water quality deteriorates. The flowing water from canals or borewells should be examined periodically for any change in water quality. Pesticides in water phase decrease pond productivity. So a check is necessary on the toxic biocides into the watershed areas supplying water to the ponds. Pond water with a high copper content is not suitable. Toxicity test should be conducted before water release in such ponds.

In areas where evaporation is greater than precipitation, the density of water increases with dissolved organic and inorganic nutrients, resulting in blooms and oxygen depletion at night. This is particularly noticeable in summer months when the water supply is cut off from canals or the ground water level falls far below the level of pumping. These blooms also raise pH levels to a very high degree. If water scarcity during a particular season, is an annual feature, then the culture period should be restricted to the period of water availability only.

Water temperature : Prawns grow faster at higher temperature (28-32°C). Such temperature regimens are common in tropical areas and is a major factor to be taken into consideration for pond construction. Regulation of temperature is a difficult process in larger water bodies. The prawn culture period should, as far as possible, synchronise with warm temperatures. If necessary, stocking practices may be suitably altered to match with the favourable growing season.

Dissolved oxygen: Heavy organic load, water scarcity and water blooms often deplete dissolved oxygen in the pond. This is particularly noticeable before sun-rise. The prawns become lethargic and found to crawl out of the pond margins and remain immobile till sun-rise. This crowding along the edges exposes them to predators and passers-by. After sun-rise, with the gradual rise in dissolved oxygen, many of them retreat and disappear under water. This phenomenon is common in summer months. A quick remedy is to pump or release water into the pond. Through watch and ward and admitting feeble flow of water into the pond after mid-night such phenomenon can be averted. In case of water scarcity in summer months, the water surface should be stirred to create small waves by spraying water

over it. These techniques increase oxygen content in water during the night are very important at times of greatest oxygen demand.

Predators : The entry of predatory fish through intake water should be checked by screening or filtering the water before release into the pond. A small fence around the pond prevents the entry of turtles, snakes, and other land predators. The impact of local birds on prawn culture should be examined.

If a pond is already infested with predatory fish and carnivorous insect larvae, even before stocking the seed, the pond should be drained and the predators destroyed. If draining is not possible, short-lived fish poisons, such as Endrix or lime (calcium oxide or calcium carbonate) should be added to the water. After eradicating the predators, the pond should be filled with filtered or screened water.

Parasites : Bopyrid parasites are found to harbour in the gill region of prawns. In ponds, however, these parasites are not encountered. Their entry into the pond environment is possible only when parasite infested individual is introduced accidentally into the pond. A check on parasites is necessary before any new introduction.

Vegetation and algal blooms : Excessive growth of vegetation along the shallow areas should be culled from time to time. Grass should be grown around the pond to reduce erosion of embankments during rainy season. Phytoplankton blooms in summer months should be controlled by increased water flow. Fertilisation should be stopped altogether temperarily. Sometimes surface plant scum covers the entire pond area and this

will reduce the amount of oxygen in the water at night and may produce toxic materials. If such conditions appear in warm months, all the prawns may die or the resulting stress may retard their growth. On such occasions, scum removal and partial or total water exchange is the only remedy.

Increase in surface area : The habitat of prawn is limited to the pond bottom and marginal slopes. In pond culture, the stocking density is normally high and correspondingly, the surface area should be increased by putting wooden branches, nylon screens, brick layers, pipes or similar contrivances. This additional surface area also protect the prawns from predators. These introductions, however, form obstructions at the time of harvest. They have to be carefully removed at the time of harvest.

Liming and fertilisation : Excessive liming slows down growth rate and encrustations of other organisms appear on the body of the prawn. The water quality should be examined and liming, if necessary, should be controlled. In any case the dose should not exceed the recommended levels (less than 100 ppm). The actual dose should be determined after soil analysis.

Excessive fertilisation results in water blooms. Fertilisation should be stopped just before the warm period and should be resumed after the summer season. When supplementary feeds are provided to the prawns, fertilisation levels can be minimised or even stopped to maintain the good water quality.

Supplementary feeding : Feeds should not be provided indiscriminately. Prawns do not feed actively when the water quality deteriorates or when the pond is disturbed while it is

drained and filled. During breeding season, feed consumption by prawn is irregular. Both biological and environmental activities should be taken note of while providing supplementary feeds. The feed conversion is found low after the prawn reach maturity and marketable size. It is economic to harvest them at marketable size. It is, therefore, necessary to watch the prawn growth before offering the feeds. When it is observed that there is little increase in prawn growth, but consumption remains the same and no other factor is operating for retardation of growth rate, the management should take a decision to harvest the crop immediately.

Growth rate and survival : As stated earlier the prawn growth rate slows down after reaching marketable size and the survival rates also fall, if the culture period is extended. The prawns are harvested immediately after they reach marketable size. A survival rate of 50% is expected from any commercial operation, leaving margin for mortality and left overs in the pond, since the entire crop can never be harvested in large farms.

Harvesting : Harvesting should be commenced at sun-rise and should be completed before noon. The harvested crop remains alive for a short while out of water, however, if the same is moistened or kept under water in a net enclosure, the injured prawns may succumb while many healthy prawns keep alive for 3 - 4 hours. The smaller prawns should be returned to the pond immediately after capture for further growth. If the pond is to be restocked for another crop, the smaller prawns may be transferred to another pond. Immediately after harvesting the crop, it should be processed (be-heading) for the market.

Marketing : The processed prawns should be marketed (sold to the freezing plants) within 2 - 3 hours, as otherwise putrefaction starts and spoils the whole lot.

Reconditioning of ponds : Immediately after harvesting a crop, the pond should be set right for raising next crop. If any remedial measures are necessary, they should be attended to immediately. Meanwhile, the inputs for another crop should be get ready.

Culture-cum-hatchery management : The management should plan well that the time of seed production synchronises with the correct stocking time in ponds. Seed produced at odd times should be taken care of in nurseries until the approach of favourable growing season in ponds. Likewise, brood stock for a hatchery should be readily available in the culture ponds for commercial seed production with the approach of larval rearing season.

RECORD KEEPING SYSTEM

Records of all processes involved in the production of prawns will provide the necessary information for a quantitative analysis of all material inputs and other factors. This is needed to assess costs with improvements in production technology. Man-hour requirements for each category of work may be recorded to estimate total man-hours.

Pond-culture: The stocking density, final harvest (number and weight), culture period, weight of fertilisers and feeds, and volume of water used must be recorded. These determine the production, food conversion, rate and thus demonstrate the

commercial viability of freshwater prawn culture in the country.

Marketing : The value of tails of different counts in the export market, cost of whole prawns in the local market and other parts of the country should elucidate foreign exchange earning and the profitability of freshwater prawn culture for the farming community as a whole. There will be a ready market for the fish produced in conjunction with prawn culture, and the sale of this fish can offset the cost of supplementary feed for the prawns.

CONCLUSION

Management is an individual talent and can be acquired through practical experience in the field. The management should keep abreast the latest trends in production technology, far and near, to utilise fully the potential available in a farm.