

# Development of quality captive broodstock of giant river prawn *Macrobrachium rosenbergii*



हर कदम, हर उमर  
किसानों का हमसफर  
आज की कृषि, कल के जीवन का आधार

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## Introduction

Giant freshwater prawn *Macrobrachium rosenbergii* is one of the most important cultured freshwater prawn species in the world over. India is the third largest producer of this species after China and Thailand. Aquaculture



production of *M. rosenbergii* in India has recorded a phenomenal increase from the mid-nineties till 2005, however, since 2006 production has been declining. Reduction in productivity in major culture areas is one of the main reasons for the decrease in production. Poor quality seed is thought to be responsible for the declining productivity.

Broodstock is one of the most critical production components that is directly responsible for the quality of seed. Healthy and good quality broodstock ensures good quality seed. In practice most of the hatcheries world over source broodstock either from grow-out ponds, or from its natural habitat (rivers, canals, backwaters etc). In many cases it is not possible to collect sufficient number of berried females of the same ripeness from grow-out ponds. In addition the nutritional requirement of broodstock is specific and may not be met by normal grow-out feeds. When broodstock is collected from grow-out ponds there is a possibility of deterioration in the egg quality, in turn affecting egg viability. The availability of broodstock from the wild is also dependent on season and there is a danger of introducing unknown pathogens when we use wild broodstock. Thus development of captive broodstock is essential to ensure the quality of seed.

### Factors affecting quality of captive broodstock

- The genetic makeup of the animals is one of the most important factors affecting the quality of broodstock as they determine the fitness and adaptability of organisms.
- Good quality formulated pellet feed having a crude protein content of 35-40% and lipid content of 8-10% is essential to ensure good quality eggs and seed. The protein source of the feed should include both plant and animal protein (oil cakes and fish meal). Similarly the lipid source of the feed should preferably include lipids from both plant and animal origin (vegetable oil and fish oil).
- Provision of optimum environment that do not cause stress to the animals are also very important for the success of captive broodstock development. Low stocking density, maintenance of minimum depth of water, provision of aeration facility, prevention of predation and competition and routine water quality analysis to maintain optimum water quality are important to achieve this goal.

### Broodstock ponds

- Freshwater ponds are ideally suited for the development of captive broodstock. The size of the



pond depends on the seed production target of the hatchery. The requirement of grey-berried females for one cycle of operation may be calculated to decide on the size of the pond.

- A prawn hatchery with a production target of 10 million seed per annum and operating in four cycles producing 2.5 million seed per cycle require around 150-180 grey-berried females of 50-60 g. As approximately 5 to 10% of the females only will be in berried condition at any given time at least 7,200 female prawns need to be stocked to provide 180-berried females in 5 to 6 months (50% survival, 5% of female spawning at any given time). Along with the females 1,800 male prawns would also be required for successful breeding. This system would support a continual supply of grey-berried females for seed production. At 2/m<sup>2</sup> stocking density the area requirement for broodstock pond is 4,500m<sup>2</sup> (0.45 ha). It is advisable to have two ponds of 0.22 ha or 0.25 ha each than having one 0.45 ha pond.

### Preparation of Ponds

- Broodstock ponds should be well prepared prior to stocking following the standard pond preparation practices of drying, liming, filling and fertilizing.
- Sufficient numbers of hides in the form of earthen pipes (45 cm length: 10cm diameter) or similar materials may be provided in the pond as shelter for moulting prawns.
- The addition of substrates in the form of nylon nets planted vertically or horizontally in the pond also has been found to improve survival.
- Since predation by birds is a major cause of low survival in prawn ponds, large mesh nylon nets may be tied above the pond surface to prevent bird entry.
- Once the pond is ready for stocking (a week or 10 days after fertilization) it should be stocked with fast growing advanced juveniles (>5 g) at a male female ratio of 1:4.



### Feed and feeding

- Freshwater prawns are omnivorous bottom feeders, mainly consuming bottom living plants and animals. They also feed on dead and decaying organic matter

- Prawns will accept a variety of food items including grain, worms, mollusc flesh, crustaceans and fish under captivity.
- Broodstock should be fed with specially formulated broodstock diet preferably in pellet form (crude protein – 35-40%, lipid – 8-10%) twice daily @ 10% of the biomass for the first two months and subsequently at rates ranging from 3-5% of the biomass.
- Feed should be spread evenly along the peripheral area of pond.
- Use of check trays placed at different locations in the pond will be helpful to check the consumption rate and for managing the feeding rate.
- Since the prawns are more active during night feeding should be done during late evening and early morning.
- Daily observation regarding the consumption of feed should be the main criteria for deciding the quantum of feed to provide.



## Water quality management

- Giant river prawn being a tropical species grows best at temperature ranges of 28-31°C. Temperature plays a major role in growth as well as timing and intensity of spawning. Colder temperatures (<26°C) reduce the growth rate, prolong the embryonic period and appear to promote fungal growth on eggs.

Water quality parameters	Optimum range
Temperature (°C)	28 - 31
pH	7.0-8.5
Total hardness (mg/l)	40-100
Dissolved oxygen (mg/l)	> 4
Calcium (mg/l)	50-100

- Dissolved oxygen is also a very critical environmental parameter affecting survival of prawns in ponds. Hence it is preferable to provide aerators in the ponds to prevent any oxygen related mortality.
- Water may be exchanged at 25-30% on a monthly basis to maintain better water quality in ponds.
- Daily monitoring of important water quality parameters such as temperature, dissolved oxygen and pH is preferable to properly manage water quality.
- The visibility and colour of the pond water gives a visual assessment of the condition of the pond ecosystem.
- Ideally, visibility should be maintained in the range of 30-40 cm to avoid water quality deterioration. In unproductive ponds the water

may be clear with visibility extending to the bottom. In highly eutrophic and/or turbid ponds the visibility may only be a few centimetres (<10 cm). Water depth may be maintained at 3-4 feet by frequent water addition.

## Sampling of prawns

- Regular monthly sampling with cast nets or small mesh seine nets should be done to assess the growth of prawns. The prawns attain maturity in four to six months and females bearing grey eggs can be collected from these ponds regularly for the seed production purpose.

## Collection of berried females for seed production

- Berried prawns for seed production are usually selected based on the apparent ripeness of eggs and clutch size.

- Newly spawned eggs are bright orange in colour and as the eggs undergo development, the colour of the eggs gradually changes from orange to yellow and then to deep grey. The embryonic period is usually 19-21 days at 28-31°C and grey eggs usually hatch within a span of 24-48 hours.



- Females with grey eggs can be selected to bring into the hatchery. Post hatch fecundity of the female prawns range from 600-1,000 larvae per gram body weight of the females. As the number of eggs produced per spawn is proportional to female size, selecting the larger grey-berried females available for seed production helps in reducing the number of prawns required for seed production.
- Selecting broodstock as early in the production cycle as possible has been suggested to enhance the growth rate of future progeny.
- Active and well pigmented berried prawns with a full clutch of eggs, with apparently no injury or appendage loss only should be selected.
- Prawns should be carefully examined for any apparent infection and for presence of external parasites.
- It is preferable to screen the selected berried prawns for viral pathogens especially that of white muscle virus using latest available diagnostics.

## Transportation of broodstock

- Broodstock can be transported in open containers for short distances, but for long distance transportation they should be packed in double polythene bags under oxygen pressure.
- The polythene bags should be kept inside insulated boxes. Ice can be used to maintain lower temperature. The prawns should

be fasted for 24 hours prior to transportation so that their fecal matter does not pollute the media.

- The pointed rostrum and telson can be made blunt by cutting the tips; further the rostrum can be inserted in a plastic tubing to prevent damage to polythene bags.
- The optimal temperature for transportation is 19-20°C.
- Broodstock should be disinfected upon arrival to the hatchery by placing them in freshwater containing 30-50 ppm formalin for 30 minutes. Aeration should be provided during this period.
- After disinfection the prawns may be screened for the presence of virus (noda virus) using latest available diagnostic kits. The berried females may be stocked in hatching tank or larval rearing tanks.

## Conclusions

Quality of broodstock depends on the genetic make up of the animals, feed and environment they live in. Thus selecting fast growing juveniles from a reliable source, providing a highly nutritious feed and maintaining them in a good environment are important while developing captive broodstock. As the life span of prawn is nearly three years we need to replace the broodstock every alternate year. One year plus females are found to be most suitable for breeding purposes. Very young or very old females are not good as the quality of their eggs may not be very good.



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