

DEPARTMENT OF ZOOLOGY
B.N. COLLEGE BHAGALPUR
T.M. BHAGALPUR UNIVERSITY,
BHAGALPUR- 812007



Dr. Rajesh Kumar
Assistant Professor

Phone- 7677189610 (M)
7004072016 (R)
Email id- raju.km1987@gmail.com

B.Sc. Zoology Part I

ECONOMIC ZOOLOGY: PRAWN CULTURE

SYSTEMATIC POSITION

Phylum: Arthropoda
Subphylum: Crustacea
Class: Malacostraca
Order: Decapoda
Family: Palaemonidae
Genus: *Macrobrachium*
Species: *rosenbergii*

INTRODUCTION

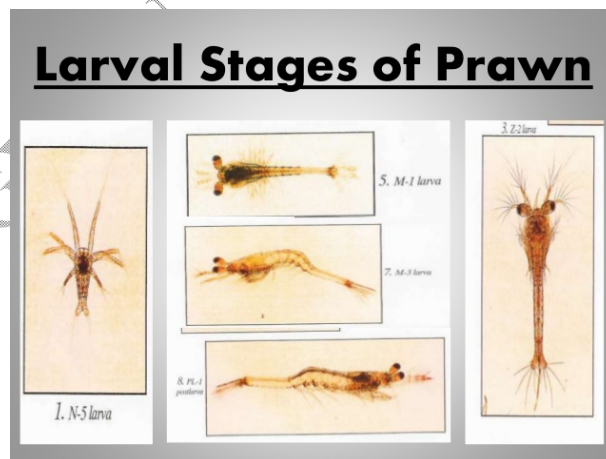
- The prawn production in India accounts for about 15% of the total world production of prawn and shrimps.
- For marine prawns, the percentage of Indian production to the world production is about 20%.
- The major commercial prawn species reared in India are *Macrobrachium rosenbergii* and *M. malcolmsonii*.



Fig: An adult Prawn

BIOLOGY

- *Macrobrachium rosenbergii*, also known as the giant river prawn of the giant freshwater prawn, is native to the Indo-Pacific and northern Australian Regions.
- The adult is found in freshwater, while its larval stages live in brackish water after the juvenile stage.
- During mating, the male attaches its **spermatophore** on the ventral side of the abdomen of female's body and the eggs coming out of female genital opening are fertilized by the sperms derived from spermatophores.
- The fertilized eggs are held in the brood chamber or egg basket, which is made by the interlocking **appendixinterna** of the **pleopods** and are aerated by vigorous movements of the swimmerets for 2-3 weeks.
- This is contrast of shrimps, whose fertilized eggs are released into the sea.
- Females can lay 80000-100000 eggs during one spawning and eggs take an average of 20 days at 28° C to hatch into larvae.
- After hatching, larvae are dispersed by the rapid movements of the abdominal appendages of the female.
- Larvae are planktonic and swim upside down actively with tail first posture and feed on small **planktons**.
- Larvae complete development in 15-20 days and metamorphose into post larvae, which resemble miniature adults and generally feed near bottom and then begin to migrate upstream into freshwater rivers within one or two weeks after metamorphosis and are soon able to swim against the rapidly flowing currents (**contranatant behavior**) and can also crawl over the stones in shallow waters.



HATCHERIES AND NURSERIES

- Freshwater prawn hatcheries need supplies for both freshwater and sea water; the latter can be drawn from areas where the salinity is 30 to 35 ppt.
- The brackish water derived from the mixture of seawater, brine or artificial sea salts mixed with freshwater should have salinity of 12-16 ppt. pH of 7.0 to 8.5 and dissolved oxygen level of 5 ppm.

The prawn farm site should also have the following facilities:

- A secure power supply to ensure that the components of hatchery, e.g. aeration, water flow etc. can continue to function uninterrupted.
- An uninterrupted access for incoming and outgoing materials by road.
- Access to the uninterrupted seawater and freshwater supplies.
- Farm should not be close to cities, mines and industrial centres or to other activities that may pollute the water supply.
- Farm should be situated in a climate where the temperature range of 28-30° C can be easily maintained.
- Food supplies for larvae should be easily procured when required.
- Should have access to biological and veterinary assistance whenever required.
- Should be close to other nursery facilities feed sites.
- Should be close to the market for quick selling after harvesting.

OBTAINING BERRIED FEMALE PRAWNS

- Berried females are those that carry fertilized eggs in their egg basket.
- They can be obtained from rivers, canals, lakes and estuaries, where they are most abundant in the beginning of rainy season.
- In the tropics, berried females can be obtained all the year round from farm ponds containing adult animals.
- Selecting fast-growing, berried females from ponds has a positive effect on the weight of prawns at harvest.
- In the tropics, where berried females are readily available, special brood holding facilities are not required but in temperate areas, indoor brood sticking facilities are essential.
- Brood stock is disinfected by placing into freshwater containing 0.2-0.5 ppm of [copper sulphate](#) or 15-20 ppm of [formalin](#) for about 30 minutes.
- Prawns should be fed daily at the rate of 1-3% of total biomass.
- Berried females can be collected from the holding system and placed in tanks where the eggs will hatch into first instar larvae, which are collected by netting.
- The hatching tanks should be covered to prevent bright sunlight to reach larvae for which the inner side of the tanks should also be painted with black epoxy-resin paint.

LARVAL REARING TANKS

- Different designs of containers can be used to grow freshwater prawn larvae, which may be circular flat-bottom tanks, circular conical-bottomed plastic tanks, plastic-lined wooden tanks, rectangular concrete tanks, concrete-faced brick tanks and earthen water jars.
- Good drainage system is essential as water has to be removed from tanks at harvesting time.

- Mixing tanks are also required for preparing the brackish water to be used in the hatchery as well as storage tanks.
- Aeration of water is also essential which can be done through PVC pipes, with holes cut at one foot intervals.
- Larvae should not be exposed to direct sunlight, for which 90% of the tank area should be covered and shady.
- Some natural light is essential for good larval survival, which can be provided through transparent roofs over the hatcheries.
- Physical filters that include sand filters, drum screen filters, and medium filters should be easy to clean and designed to minimize water loss.
- Water needs to be chemically treated before it can be used in rearing tanks and also should be physically filtered by passing through the sand bed before transferring it to another tank for treatment.
- Mix the seawater or brine with freshwater to form 12 ppt of brackish water. The optimum temperature range for *M. rosenbergii* is 28-31° C.
- Below 24-26° C the larvae will not grow well and the time taken for them to reach **metamorphosis** will be longer.

LARVAL FEEDING

- A wide range of feeding material is used by different hatcheries, which includes **Nauplius larvae** of shrimps, freshwater **cladocerans**, fish eggs, squid flesh, frozen adult *Artemis*, rotifer, fish flesh, egg custard, worms and commercial feeds available in the market.
- The quantity of food to be given depends on the utilization of feed by larvae that vary from place to place.
- The quantity of feed consumed will increase as the larvae grow.

HARVESTING POST LARVAE

- When post larvae are about 7-8 mm long, they can withstand transfer from 12 ppt water into freshwater.
- However, they should not be harvested from the larval tanks and transferred directly into holding tanks containing freshwater but should be acclimatized to freshwater in the larval tanks itself.
- When majority of larvae have metamorphosed, water level in tanks should be reduced to about 35 cm.
- Then gradually the tank should be flushed with freshwater over a period of 12 hours.
- The post larvae can then be collected and transferred or the larval tanks can be refilled to 70 cm with freshwater and the animals temporarily held in them.
- The best way to harvest post larvae from the larval tanks is to reduce the water level and then remove them by nets.



Fig: Harvested Prawns

HOLDING POST LARVAE BEFORE SALE

- Post larvae cannot be held in holding tanks for more than a week or two prior to stocking in nurseries.
- When the post larvae are in the holding tanks, the rearing water should be changed every 2-3 days to provide aeration.
- Post larvae can be stocked at densities of about 5,000/m² for one week, although survival increases by reducing the density.

REARING PONDS

- Pond size should be such that can be managed easily.
- Generally most farms have ponds of around 0.2-0.6 ha size.
- Large ponds are normally wider than 30 m and often drained for harvesting.
- The average depth of water in freshwater prawn ponds in tropical areas should be about one meter; with a minimum of 0.75 m and a maximum of 1.2 m.
- Dipper ponds are used in colder areas to maintain more stable water temperatures.
- The banks of the ponds or embankments or bunds must be high enough for the highest water level expected in the pond, which generally should be 1-2 feet higher than water level.
- The flow of water into each pond must be controlled by valves, stop-logs, or plugs.
- Paddle wheels are the most efficient method of increasing dissolved oxygen levels in the pond water.

STOCKING

- Stocking the ponds quickly reduces competitors and predators, which have less time to become established.
- Often post larvae that are a week or two old after metamorphosis are used to stock ponds, where they remain until harvesting.
- A stocking density of about 40,000/ha is recommended for the monoculture of *Macrobrachium rosenbergii*.
- Using larger juveniles for stocking increases the survival rate as well as the average weight of the animals by as much as about 30%.

FEED TYPE

- Natural productivity of the ponds generally gives small production from the ponds.
- Therefore, intensive farming must involve supplementary feeding to increase productivity.
- Some farms claim to rely on fertilizers, rather than feeding at the beginning of the rearing period, which stimulates algal bloom and lot of micro flora and fauna in the ponds.
- Others find that providing feed from the beginning of the rearing period improves performance and is cost-effective.
- Commercial feeds are the most productive and reliable to use but they are expensive and unaffordable to small farmers.

HARVESTING MARKETABLE PRAWNS

- Basically there are two methods of harvesting: **culling** and **draining**.
- The time of harvesting depends partly on the growth rate and partly on the size of animals for market requirements.
- Culling is used to harvest market-sized animals from the ponds to remove faster growing prawns which increase density quickly.
- In tropics culling usually starts 5-7 months after post larvae have been stocked to take out the market-sized animals for selling and keeping the smaller ones and soft-shelled animals in the pond for further growth.
- After about 8-11 months ponds are drained and all animals are sold.
- In cull harvesting, a seine net is pulled through the pond to remove market-sized animals, while in drain harvesting, a sump is installed in front of the gate or outside the pond, in which prawns will accumulate while water is being drained.

DISEASE CONTROL

- Several diseases affect freshwater prawn larvae as well as adults.
- Some hatcheries use formalin at the rate of 200 ppm daily as an effective remedy for protozoan and hydrozoan parasites and fungal diseases.

- Formalin can also be used at a lower level of about 30 ppm for longer periods, followed by water change after 24 hours.
- Larvae can also be transferred to disinfecting tanks every 5-10 days to get rid of diseases and parasites.
- Daily dip of larvae in Malachite green (0.2 ppm) for 30 min has also been used for treatment.
- Also, dipping in copper sulphate 0.4 ppm solution for 6 hours is recommended.
- Antibiotics and sulfa drugs are sometimes used to control filamentous bacteria and some hatcheries use lime (CaO) as a prophylactic measure.

ZOOLOGY, B.N. COLLEGE BHAGALPUR