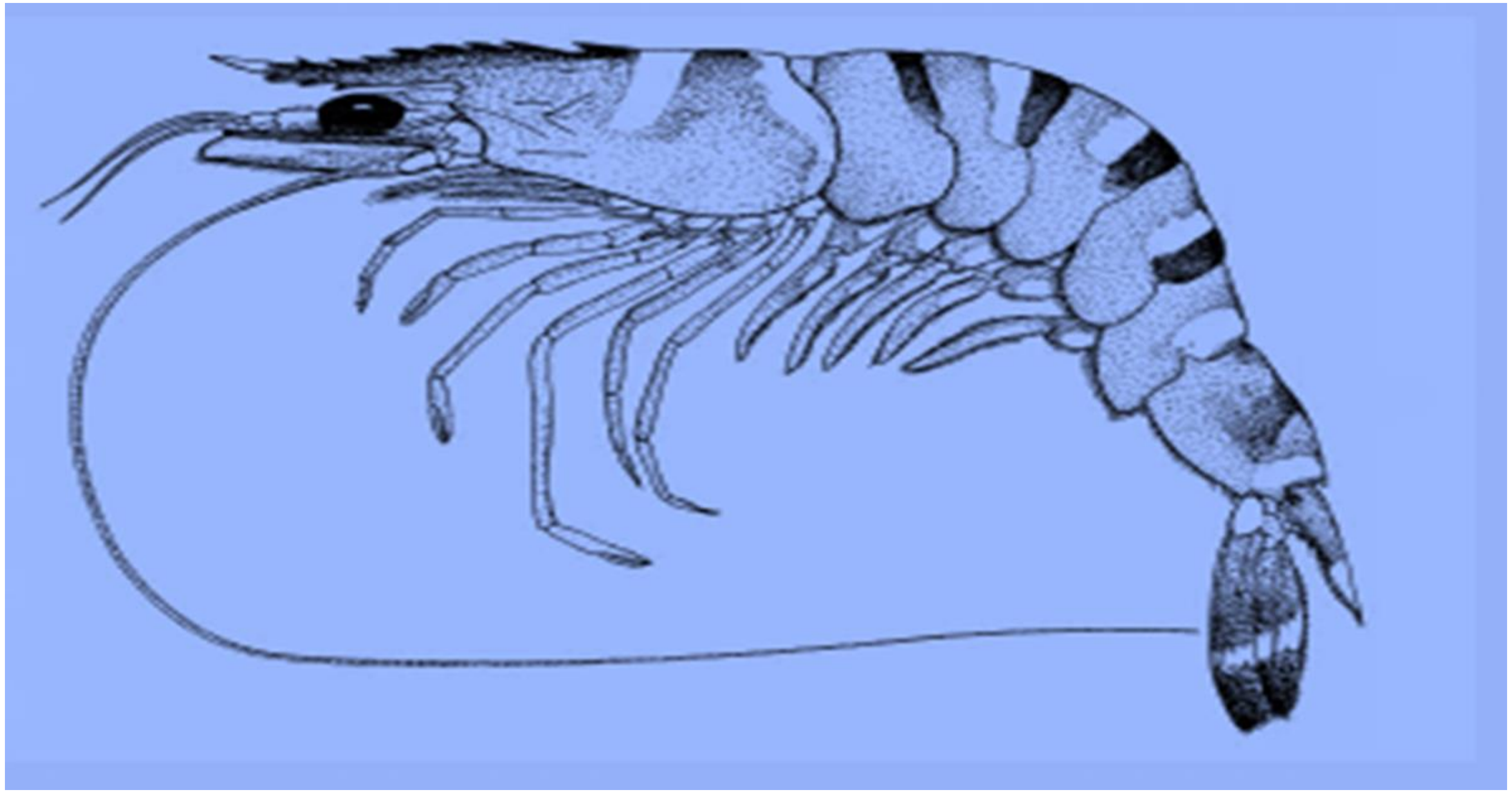
Breeding of Tiger Prawn

(*Penaeus monodon*)
part –III



Feeding

- Nauplius- not feeding stage
- **Both Protozoea and mysis are filter feeder**.
- The **maxillae has numerous close set setae** on the endopodite. Each seta has fine setule. This form **filtering apparatus.**
- Unicellular algae ***are the choice food of*** Protozoea and mysis.

Protozoea I prefer Isochrysis
Protozoea II prefer Chaetoceros & Cylindrotheca
Protozoea III prefer Platymonas & spirulina
During mysis stage larvae feed on **unicellular algae and also on zooplankton like brine shrimp nauplii.**

Post larvae

- Mysis metamorphose into post larvae.
- Transformation in mouth: mandible develop sharp cutting edge in place of loose serrated teeth. Maxilla loses the filtering setae, endopodite become highly reduced. Protopodite of 1st maxilliped develop stiff bristles.
- Chela on pereopod become functional.
- Later five pairs of pleopods get fully developed and are used for swimming.
- Uropod's assist in balancing.
- Pereopods are used for walking and grasping.

Characteristic larval behavior

Attraction toward light

Nauplius: attracted toward light

Protozoea: attracted toward light

Mysis: not attracted toward light

Post larvae: not attracted toward light

Locomotion

Nauplii remain with ventral side up in water. They swim with help of antennule, antenna and mandible.

- **Protozoea is a very active swimmer and it swims with dorsal side up**
- **During mysis stage, it is relatively sluggish**
- **Post larvae swim horizontally because of plumose (feather like structure) setae on pleopods.**

Habitat:- **in nature, the larvae remain in the bottom layers upto mysis stage. They come to surface only in the post larval stage. They gradually drift towards the coasts carried by water current. They become euryhaline and are found in coastal water creeks, estuaries and lagoons.**

HATCHERY DESIGN AND CONSTRUCTION

- Basically, there are two hatchery systems being adopted.

The large-tank hatchery which was developed in Japan is still the popular system applied in many Asian countries such as Taiwan, Thailand, Philippines and Indonesia.

The small tank hatchery **which originated from Galveston USA, has been applied in the Philippines and to same extent in Malaysia and Thailand. Recently a modification of the above systems has been developed which combined the beneficial characteristics of both systems**

Hatchery technology

- Hundinaga (1935), a Japanese scientist, was the first to successfully breed and rear the larvae subsequently under controlled conditions in the laboratory.
- After this a series of development have been taken place in different parts of the world as a follows up of the above works which helped in the commercial production of shrimp seed for farming. The hatchery system for prawn culture are primarily of two types.
- **Japanese system/community culture/fertilised system/ large-tank hatchery**
- **Galveston system/ small tank hatchery**

Japanese system/ large-tank hatchery

- In this system spawning, hatching and larval rearing are done in the same container.
- In this system, **large cement concrete tanks of 60 to 200 ton capacity** provided with aeration and rotating agitators were used.
- Tanks were cleaned, dried and filled with **fresh sea water to a height of 0.4 meter.**
- Spawner were introduced **@ one spawner per m3 of tank capacity in cage nets**. After spawning, spawner are removed with cage nets, leaving the eggs and hatched out larvae in the tank.

- Rearing of the larvae is done in the same tank.
- water regularly fertilized with nutrients to promote bloom of diatom (this provide ideal food for Protozoea).
- Vigorous aeration is carried out.
- On the second day diatoms bloom (5000 to 2000 cell/ml concentration).
- From the I mysis to 4th day of post larvae, fresh seawater is pumped into tank every day until the water level is raised to two meters. For mysis, **supplementary feed in the form of artemia eggs are used.**
- For post larvae crushed and washed clam meat was also given.

This system is not practiced at present because of following disadvantages:

- due to lack of control over the **production of desired species of phytoplankton at the appropriate time.**
- **frequent development of bloom** of undesirable species of planktonic organism such as dinoflagellates leading to mass mortality of larvae.
- poor survival rate, **due to water pollution resulting** from the accumulation of metabolites produced by larvae and feed residue.
- Greater proportion of **food added to the system remain unutilized.**

Galveston system/ small tank hatchery

- This system was developed in the Galveston laboratory, USA (cook and Murphy, 1966).
- rearing of brood stock, spawning, hatching, larval rearing and live feed culture are done separately in separate containers.
- Spawning is carried out in small indoor plastic pools. Newly hatched nauplii are transferred to larger (2000 litre capacity) plastic pools @ **50 nauplii/litre of water.**
- Simultaneously separate cultures of mixed phytoplankton predominated by chaetoceros and culture of rotifer (Branchionus) and cladocerans (moina) were under taken in lab

- **Sea water of 32±2 ppt were pumped into large containers** where it is filtered through 60µ mesh cloth before use in operation.
- From second day after spawning i.e. last nauplius stage onwards, 200 litres of mixed phytoplankton culture, predominantly Chaetoceros (2 lakh cells/ml) is pumped into culture tank after reducing equal quantity of water from it every day as Protozoea feed on phytoplankton.
- From mysis stage, in addition to the above feed, frozen branchionus @ 100 rotifer/larvae/day is given.

- When it metamorphose into post larvae feeding on diatom is discontinued and moina @20 /larvae/day is given.
- Throughout the rearing periods, vigorous aeration of water is provided. Constant check is made on the quality of seawater and slow exchange of 15 to 25% of water is made after the larvae reaches mysis stage.

- **Water should be clean unpolluted sea water free of suspended impurity and planktonic organisms**
- **Temperature (28°c ±2) is found to be most suitable. Lower temp retard growth of eggs and larvae. Avg. (24-32°c) suitable for development of penaeid larvae**
- **Salinity (27-34ppt) is suitable.**
- **pH should not exceed 8.2-8.5**
- **Ammonia and nitrite level should not above 0.1mg/l and 6.5mg/l respectively**
- **Dissolved oxygen maintained through continuous aeration**

Modern shrimp hatchery:

A modern shrimp hatchery should have the following essential units

a) Brood stock rearing/maturation unit

b) Spawning unit

c) Hatching unit

d) Larval rearing unit

e) Artemia cyst hatching unit

f) Algal culture unit

Brood stock rearing/maturation unit:

- If from wild, the breeders are brought in hatchery through transportation in 40-50 liters of water @ 4-6 no per bag. Then acclimatized to the hatchery condition. Any disease sign dip treatment in antibiotic (50ppm oxytetracycline/erythromysin/perfuran) for 10 minutes. Such healthy breeder are then transferred to maturation tank.
- The major constraint in hatchery operation of tiger shrimp is the limited supply of Spawners from the wild. Hence, eyestalk ablation techniques can be used the scarcity of spawner supply.

- The shape of maturation tanks can either be circular, rectangular or oval. The tank capacity may vary from 5 to 40 tons with depth ranging from 1.2 to 2 meters.
- If the shrimps are kept for less than 5 weeks, bottom substrate is not needed in the tank.
- The tank is installed with an inlet pipe from the wall and a double cylinder standpipe at the centre for drainage. This system facilitate continuous flow-through of sea water.

Brood stock maintenance:

- **Water: should be clean, clear and free of pollution; Water height- 60 to 100 cm;**
- **Water flow rate- 10 litre/minute; DO- at saturation level;**
- **Salinity- 30 to 36 ppt;**
- **Temp- 21 to 31°C; pH- 8 to 8.5 (should not be less than 7.3 as it affect the calcification of cuticle and normal moulting process).**

- **Light:** reduction in intensity of light to 10 to 40% of the natural day light is reported to have **beneficial effect on growth and maturation of gonads.**
- For this purpose, fluorescent lights covered with dark blue acrylic sheets are used in maturation division. Photoperiod regime can be 12 hr light-12 hr dark.
- **Feeding:** meat of squid/mussel/clam @ 12-15% of the body weight are used for good result.
- pelleted feed containing 50% protein and 10% PUFA(EPA, DHA & arachidonic acid) @ 2% of the total bodyweight are stated to enhance gonadal maturation. Feeding can done 4 time a day.

Spawning tanks:

- Spawning tanks should be circular with a flat or conical-shaped bottom(more preferred)
- Water holding capacity may vary from 50 liters to 1.5 tons. The tank can be made of fiberglass, Plexiglass, plastic or marine plywood.
- The tanks are used to temporarily hold the gravid females until spawning. A perforated plastic sheet is kept at the junction of conical and cylindrical part for resting the spawner.
- During spawning, released eggs sink to the conical part but female cannot enter the same for eating eggs.

Larval rearing tanks:

- Two types
- In Japan and Taiwan, larger tanks with a capacity of more than 50 tons are being used.
- In Southeast Asia, most of the hatcheries use smaller larval rearing tanks of about 3 tons capacity.
- Hatchery operators called the latter system of larval rearing as the Small-Tank Hatchery System which originated from the Galveston Laboratory in the USA and the former system as the Large-Tank Hatchery System which originated in Japan.

Small Tank System

- tank may be circular, rectangular or oval in shape with tank capacity ranging from 0.8 to 3 tons.
- The bottom of circular tanks may either be flat or conical. Rectangular or oval-shaped tanks always have flat bottom.
- The circular tank is usually 1.8 m in diameter and 1.2 m in depth with a central double cylinder standpipe drainage system which can be used for continuous flow of sea water.
- when the larvae reach mysis or post larval stage. Rectangular tank is about 1.5 × 5 × 1 m in size.
- The drainage pipe is set at the side of the tank. The drain pipe is also used for harvesting.
- In all types of tanks, sea water is delivered into the tank through an inlet pipe installed at the top of the tank.

Big Tank System

- rectangular or square in shape with capacity varying from 50 to 2000 tons or more (5 × 5 × 2m or 20 × 50 × 2m).
- The tanks can either be located outdoors or if located indoors, transparent roofing should be provided to allow for sources of sunlight.
- In a big tank system, spawning, hatching and larval rearing operations are done in the same tank.
- The larvae are reared for 35–40 days