STOCK ENHANCEMENT OF SHRIMP RESOURCES THROUGH SEA RANCHING

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1. Introduction

Sea ranching is referred as method of stock enhancement. It involves mass release of juveniles of the selected species into the marine environment where, they can feed on natural prey and grows. The sea ranched stocks become recaptured and add biomass to the commercial fishery. Sea ranching was carried out mainly for stock improvement or enhancing the production or conservation of natural resources. The sea ranching programme was originated in USA as early as 1870's and sea ranching of red and Pacific salmon was carried out since 1964. In Japan, Sea ranching was started during 1975, for Kuruma Shrimp, *Penaeus japanicus* and also for other 45 species to supplement the natural stock. In India, ICAR-CMFRI, Mandapam was carried out sea ranching of green tiger shrimp *Penaeus semisulcatus* seeds PL 15-20 size 7.0 lakhs numbers per annum in the Pillaimadam lagoons of Palk Bay during 1985-92. Sea ranching of Pearl oyster *Pinctada fucata* spats of 1.02 lakhs was carried by CMFRI, Tuticorin during 1985-90. Sea ranching of clams *Meretrix casta*, *Anadara granosa*, *Paphia malabarica* was carried out and released 72,500 numbers of seeds in the back waters of Asthamudi Lake, Munambam during 1993.

Penaeid shrimps contributes a total of 24345 tonnes from TamilNadu (2018, CMFRI) with the value of about Rs.600 crores. Green tiger shrimp (*Penaeus semisulcatus*) is one of the major fishery all along the coast of Gulf of Mannar and Palk Bay. It contributes about 69% of total shrimp landings in Ramanathapuram district. *P. semisulcatus* is exploited mainly by the trawl net operated in mechanized boats. This species is globally distributed in the Indo west Pacific region, Red sea, East and South east Africa to Japan, Korea, the Malay Archipelago and Northern Australia. It is a bottom feeder inhabiting the intertidal sea grass beds as well as sub tidal algal beds at a depth of 7-13 m. The size at maturity is 23 mm carapace length and majority attains maturity at 31-32 mm carapace length. Mature female available throughout the year with maximum availability from June to October and January to March. Fecundity ranges from 2 lakhs to 6 lakhs for the size range of 40 to 65g respectively. Male shows a growth rate of 2 mm carapace length per month and female shows 3.5 mm carapace length per month.

The sea ranching involves different steps such as, Breeding, larval rearing, Nursery rearing, releasing of seeds in the suitable sites and monitoring the released stock for impact assessment on fishery.

2. Breeding and seed production

2.1. Brood stock collection and spawning

The healthy matured brooders for the breeding can be collected from shrimp trawls or Gill nets with full appendages and the brooder size varies from 165 to 200 mm in length and 37.0 to 64.5 g in weight. The brooders were given immersion bath in of 100 ppm potassium permanganate (KMnO4) or liquid povidone (PVP) iodine for 30-60 seconds. The male to female ratio of 1:2 is optimum with feeding of protein rich diets, Polycheate worms and squid meat would be ideal for captive maturation and spawning. Gravid female can be identified by observing the gonadal development from the dorsal exoskeleton of the shrimp. Gravid female

is released into 150-500 litres circular FRP tank with 1 ppm EDTA and 0.1 ppm treflan as chelating agents for spawning. Spawning will takes place after 12-14 hours with a temperature range of 28-32ºC. After Spawning the incubation period would be 12-14 hours for hatching. The larval stages consist of six Nauplii (N-I to N-VI), three Protozoea (PZ-I to PZ-III) and three Mysis stages (M-I to M-III). The duration of nauplius to post larval production is about 12-14 days based on the water temperature.

2.2. Larval rearing

Nauplii can be stocked in larval rearing FRP tanks of 2-5 ton capacity @ 100 numbers per litre and feeding starts with protozoeal stage. Larvae from protozoea I to Mysis III are to be fed with *Chaetoceros* spp at the concentration of 50000 Nos. per ml and also supplemented with the micro encapsulated larval feeds @ 4 times per day. Post larvae 1 to post larvae 20 are to be fed with combination of rotifer, *Artemia* naupli and encapsulated larval feed. Larval survival of 32 to 52.5 per cent can be obtained during hatchery rearing. The water quality parameters such as salinity, temperature and pH were maintained at 34-36 ppt, 27-29ºC and 8.2-8.4, respectively. The growth and development were monitored by sampling of larvae and observed under microscope.

2.3. Health management during larval rearing

2.3.1. Swimming activity and Phototaxis

The healthy larve in zoeal stages swim rapidly and consistently usually in circles, Mysis swim backwards with intermittent flicks of their tails and post larvae swim rapidly and consistently. Zoea larvae swim strongly towards the light, Mysis and post larvae not showing attraction towards the light.

2.3.2. Condition of the hepatopancreas and gut contents

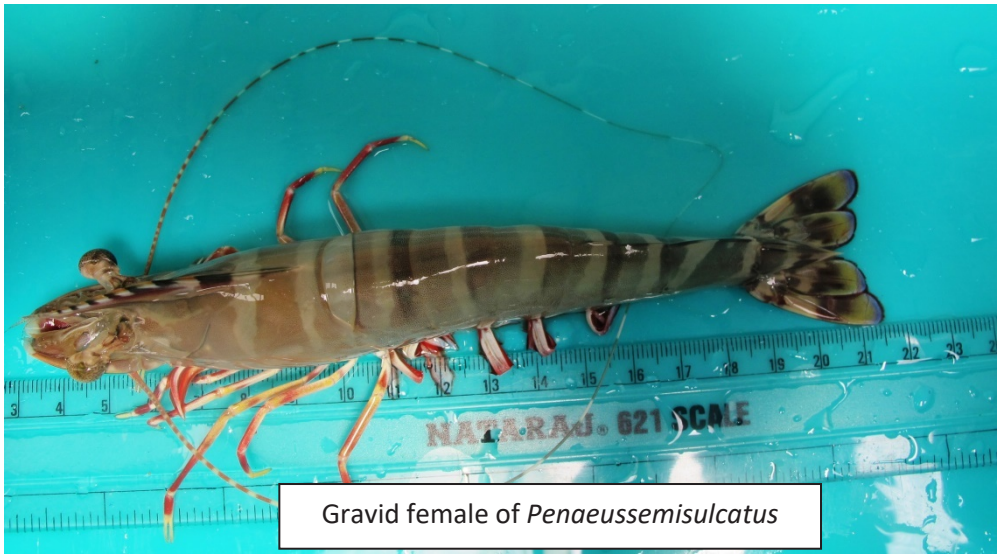
The larvae observed under microscope at a magnification of 100- 400X for the condition of hepatopancreas and presence of gut contents. The healthy larvae showing active feeding and digestion, mid gut with full of small digestive or lipid vacuoles and presence of strong peristalsis in the intestine. If the hepatopancreas appears empty or pale, without lipid vacuoles indicates that the larvae are either underfed or diseased. Proper diagnostic and treatment procedure can be adopted to treat the larval health problems.

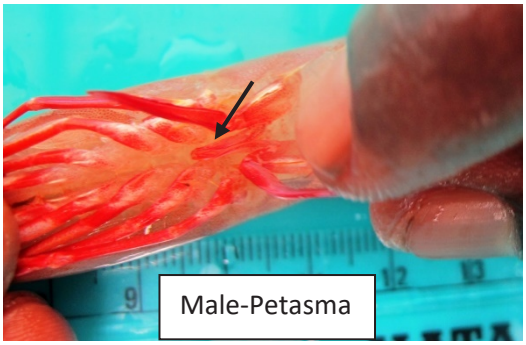
2.3.3. Necrosis and Deformities

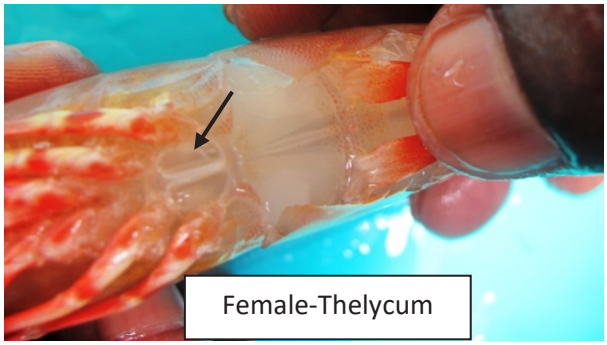
Necrosis of the larval body and appendages indicates that the larvae in severe cannibalism or bacterial infection. The poor nauplius and water quality results in occurrence of larval deformities such as, appendages, rostrums and antennal bending, broken or missing appendages, tail bending and termination of the gut before the anus.

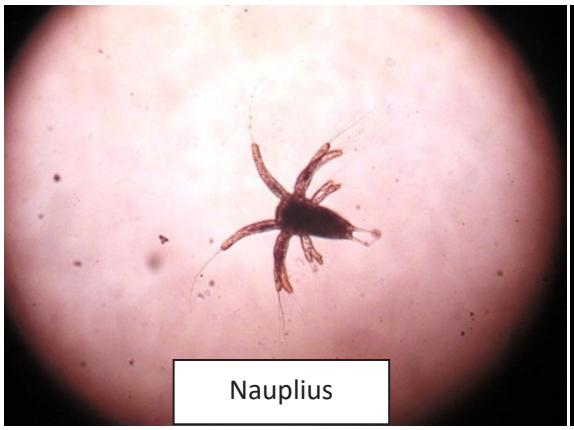
2.3.4. Epibiont fouling

The larvae may become host for the range of fouling organisms such as, bacteria, fungi and protozoans. These organisms will attach to the appendages, exoskeleton and particularly around the gills. Where the infections are light, the next moult may remove the fouling without further problems. If severe fouling persists indicates the poor water quality and application of 20-30ppm of formalin with high aeration for one hour is recommended.

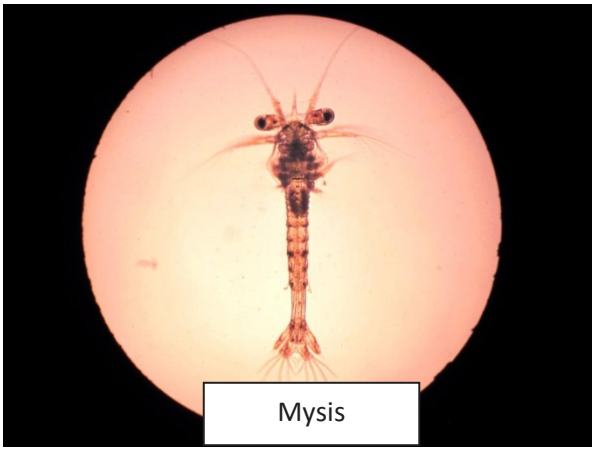

Gravid female of *Penaeussemisulcatus*


Male-Petasma


Female-Thelycum


Nauplius


Protozoea

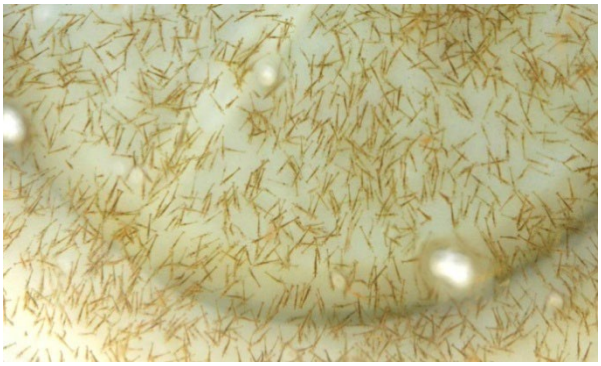


4. Sea ranching of green tiger shrimp *P.semisulcatus*

Sea ranching programme is being reinitiated during 2016-17 by Mandapam Regional centre of CMFRI to enhance the brood stock population in the wild and for the replenishment of natural stocks. It is also useful to increase the shrimp production and promote the livelihood of fishermen in this region. Post larvae of 15-20 can be used for sea ranching after a larval rearing period of 30-35 days. During the period of 2017-19 a total of 8.725 million numbers of *P. semisulcatus* shrimp seeds of PL 15-35 were released in Gulf of Mannar and Palk Bay in the sea grass beds of the coastal waters. As a result the shrimp landings were increased during the year 2018-19 as reported by the fishers and data collected from landing centres. The fishermen associations also expressed that the sea ranching of *P. semisulcatus* is very useful in replenishing the shrimp resources of the region.

The details of successful sea ranching programmes carried out during 2017-19 in Gulf of Mannar and Palk Bay by Mandapam Regional Centre of CMFRI.

Date of Seeds released	Number of green tiger shrimp seeds released	Place of Sea ranching
11.05.2017	2.0 Lakhs (PL 35)	Thonithurai, Palk Bay
05.08.2017	10.0 Lakhs (PL 10)	Pamban, Palk Bay
13.03.2018	5.0 Lakhs (PL30)	Thonithurai, Gulf of Mannar
28.12.2018	5.0 Lakhs (PL 15-30)	Kunthukal, Gulf of Mannar
31.01.2019	9.0 lakhs (PL 15-35)	Sangumal, Olaikuda, Palk Bay
07.03.2019	11.0 lakhs (PL15-25)	VillundiTheertham, Palk Bay
29.03.2019	8.0 Lakhs (PL12-15)	Thonithurai, Palk Bay
04.05.2019	10.0 Lakhs (PL20-35)	Thonithurai, Palk Bay
03.08.2019	7.5 Lakhs (PL 15)	Thonithurai, Palk Bay
04.09.2019	2.75 Lakhs (PL 30)	Thonithurai, Palk Bay
08.12.2019	12.0 Lakhs (PL15)	Thonithurai, Palk Bay
08.12.2019	5.0 Lakhs (PL20-35)	Munaikadu, Palk Bay



Seeds of green tiger shrimp

Sea ranching of green tiger shrimp at Pamban, Palk Bay

Searanching of shrimp seeds by Shri. K. Veera Raghava Rao, District collector, Ramanathapuram at Villunditheertham, Palk Bay

Sea ranching at Kunthukal in Gulf of Mannar


Searanching at Sangumal, Olaikuda in Palk Bay


Sea ranching at Thonithurai in Palk Bay


Release of seeds at Thonithurai in Palk Bay


Release of seeds at Munaikadu in Palk Bay

Further Readings

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