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APPLICATION OF MODERN TECHNOLOGY IN FRESHWATER PRAWN SEED PRODUCTION: A CASE STUDY AT CHANDRABHAGA PRAWN HATCHERY, KONARK, ODISHA

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Abstract: Abstract: At *P. monodon* hatchery at Chandrabhaga Coast (Konark), *P. monodon* seed production was taken up as a trial run during shut down period of hatchery in the rainy season due to sudden drop in salinity during 1997. Aim was that to standardize the seed production commercially during lean period. With little modification of the existing infrastructure production was taken up. Initial hindrance and constraints did not stand as obstacle by the management of experts. Production of hatchlings from 70% to 80% then stage1 larvae to Post-larvae above 50% has successfully produced commercially during *2005-2006*. It was noticed during the trial run that when brooders reared at 0ppt to 5ppt salinity and larvae reared at 0ppt to12ppt sanity recovery of Post Larvae was very good. During the larval rearing, water quality management and feed management were managed meticulously.

Key words: M. *rosenbergii*, Salinity, Berried Prawn, Brooder, Scampi

INTRODUCTION

The fresh water prawn culture, which is commonly called "Scampi culture" is gradually gaining momentum because of its large size, fast growth, good taste and high market demand both in domestic as well as foreign markets. Though the outlook of its growth is good still some constraints remained on production of "quality hatchery seeds". The recent spate of disease in penaeid shrimp culture forced shrimp farmers to switch over to fresh water prawn farming. Natural prawn seed resources are not sufficient to meet the demand and also they are not uniform in size. Their identification is a major problem. Economically viable hatchery is a need of the hour. Salinity is the most important factor in influencing factor in influencing mating, fertilization, incubation, hatching of Fresh water prawn (Jayalakshmi and Natrajan, 1996). The production aspects of both fresh water prawn seed as well as it's grow out system, although a subject of much attention, still the present scientist have overcome the constraints though not fully to standardize the production aspects commercially. For large scale production and to create confidence among hatchery and culture entrepreneurs', there is an imperative need for considerable research on larval and post larval rearing, their nutritional and health aspects &water quality managements.

At chandrabhaga shrimp (*P. monodon*) hatchery we have undertaken *M. rosenbergii* seed production in the shutdown period of hatchery in rainy season when salinity of the chandrabhaga coast drops on an experimental basis during 1997-1998. Successful attempt was made during 2003-2004, and we produced scampi seed by generating additional revenue for the hatchery (table. IV). subsequently though the production continued for few years, after which the hatchery turned out to a L. vannamei hatchery. Fresh water prawn hatchery technology was developed by Central Institute of Fisheries Education, Bombay, at its prawn breeding center, Kakinada in 1975. Central Inland Fisheries Research Institute, Barrackpur and Central Institute of Fresh water Aquaculture, Kausalyagang, Bhubaneswar, also gave new dimension for successful larval and post larval rearing of Fresh water prawn seeds to meet the high demand of prawn entrepreneurs by imparting short term training program at CIFE, Bombay.

Life history

M. rosenbergii has a peculiar life history in comparison to *P. monodon*, as the adult prawn inhabits in fresh water migrate to brackish water for breeding purpose. (Jhon Samuel, *et al.,* 1967). And berried prawns remain at low saline zone (usually confluence area) for spawning. They breed in low saline area where the larvae remained till they became post larvae. After Post larvae became 2 to 3 gm, they again migrate to fresh water area for growth and maturity. This type of life cycle is called "dual life cycle" shown in (fig. 1.).

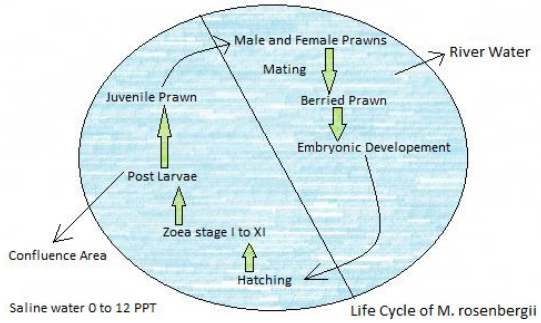

Figure 1: Dual life cycle of *M. rosenbergii*

MATERIALS AND METHODS

The habit of berried prawn to breed at low saline zone and rearing of larvae, post larvae at low saline area facilitated scampi seed production at Chandrabhaga shrimp hatchery complex with little modifications to the original hatchery complex during shut down period. An separate shed of 3000 Sqft area, FRP flat rounded tanks (30) nos having 1000l capacity, round the clock electricity with aerator facilities, 10 nos of separate bloodstock holding tanks, with well-equipped laboratory having zoom binocular compound microscope, pH meter, testing kits for measuring parameters like DO, CO_2, H_2S, NO_2, NO_3,

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hardness, photoperiod, storage tanks for chlorinated and dechlorinated water tank were taken.

Wild Brood stock Collection and Maturation process- Generally at the outbreak of monsoon berried females and healthy males were collected from nearby rivers, canals, and culture ponds and brought to hatchery. Brooders acclimatized in fresh water did not show any stress as they are already collected from fresh water and also hatched very well when they breed, (John Samuel, *et al.,* 1997). After acclimatization, they were disinfected with 25 to 30ppm formalin for 10 to 15 minutes before releasing into maturation tanks. They were fed with 5% of their body weights like clam meat, snail meat, crab meat, pelletized feed etc. The composition of feed content of the formulated feed and Artemia naupli were determined by using standard methods, like Protein, Carbohydrate, Ash, Moisture and Fat for brood stock and larvae. Generally male and female prawns were kept together at a ratio 1:4 for mating. Segregation was made seeing their colours from pink to grey then to deep grey. After mating of 8 to 10 hours spawning occurs. The extruded eggs deposited on the ventral side of the abdomen of the female prawn and the egg mass were firmly held by the pleopods. Female prawn matures in captivity 2 to 3times in a season. The interval between two successive puberty molt is about 20 to 30 days. In some female the next maturation process starts while the eggs were still incubating and in such cases the puberty molt occurred during 10 days.

Fecundity, Incubation and hatching: The fecundity of female prawn of 50 to 60gms can lay eggs from 20000 to 30000, (Reddy and Sahu, 2002 & 2003). The fecundity decreases from 1st cycle onwards. For incubation FRP tanks of 1000 liters were loaded with filtered chlorinated water. In one FRP tanks 3to 4 no berried prawns were stocked at 26 to 28 degree water temperature in (4 to6ppt salinity) for better hatching, (Soundarapandian *et al.,* 1995, John Samuel *et al.,* 1997). Generally during incubation; 18 to20 days the female prawn takes maximum care to ventilate the eggs by the movements of pleopods. Loss of eggs and proper ventilation is maintained in the tanks. Prawns carrying dark grey color eggs are transferred to separate tanks one in each tank. Hatching occurs in the 2nd day during midnight and continues for 2to3 days from single mother prawn. Female prawn dispersed the newly hatched larvae by pleopods. Spent females are transferred to separate tanks otherwise it will consume the un hatched eggs and newly hatched larvae. Hatching of eggs in batches was considered to be a common feature in M. *rogenbergii* species, (Katre & Pandian 1972, Jayalakshmy and Natrajan, 1996, Ranjeet and Kurup 2000)

Larval Rearing- Larvae of *M. rosenbergii* undergoes eleven distinct stages to metamorphoses into post larvae. Each of such stages has got its own typical morphological characteristics. Larval rearing period is very much crucial and susceptible to disease and needs round the clock supervision of-water quality management, feed management, temperature, and also climatic conditions. After hatching, no feed is given for two days as they thrive on yolk-sac. After 2days, stage I larvae stocked at ratio @ 100 to 200/liter They were fed with both phytoplankton (chlorella) and zooplankton (Artemia) till stage V & VI after which they were given egg custard, pelletized foods till they became post-larvae, The exact quantity of feed required in each meal cannot be prescribed since it depends on the consumption by the larvae and must be judged by the operator visually (New and Singholka, 1985). Generally from stage V to stage VII molting delayed for which mortality occurs. Daily microscopic observation reveals that infestation like, bacterial, fungal, and protozoan disease occurs due to bad water quality, settling decomposed feeds and high temperature. From stage II to stage XI salinity changes as per requirements mention in (table III). Some hatchery follows two phase post larval rearing before stocking in grow out ponds.

Water quality managements- Daily about 40 to 60% water exchange was done during after noon (5pm to 6pm) to maintain good water quality, cleaning the bottom by siphoning out the waste feeds. Salinity is maintained at 5 to12ppt as per requirement of stages mentioned in the chart (Lable III) Most of adults of *M. rosenbergii* migrate to brackish water for breeding purpose. In the present case we kept brooders in (4 to 6ppt salinity) shows better hatching than brooders kept in 0 ppt salinity in *M. rosenbergii* eggs (Jhon Samuel *et al.,* 1997, Soundarapandian *et al.,* 1995,). Usually chlorinated fresh water mixed with chlorinated saline water to prepare desire label salinity for daily larval rearing. This desire label saline water pass through a series of filters like-Sand filter, U.V. filter, finally one micron filter bags to enter into stocking tanks. Cannibilism in batch hatchings occurs, in the larvae that hatched out from brooders kept in 10, 15, 20ppt salinity (Jaylakhmi & Natrajan, 1996). Physical- chemical parameters like, temperature, pH, Salinity, Do, No2, No3, NH3, were checked round the clock to avoid causality.

Feed and Feeding- For better growth and survival, feeding is an important factor. Hatchlings thrive by consuming yolk sac. From 3rd day onwards freshly hatched Artemia naupli of small size were given 3 to 4 times /day. After stage V on wads till PL, artificial feeds like egg custards, pelletized feeds were given reducing artemia naupli. The importance of lipid as major metabolic energy source for growing Macrobrachium larvae.

RESULT AND DISCUSSION

From day to day observation, it was seen that growth and metamorphosis are mostly depending upon feed, temperature, and water quality managements. Larvae takes 2 to3 days to passes to each stages, subject to climatic conditions. From stage I larvae to XI stages it takes 25 to 30 days normally to became fully post larvae. Some important parameters like Do, temperature, salinity, pH, No2, No3, are most important for better survival (Reedy and. Sahu, 2002 & 2003). When post larvae became 2 to 3gms, they are ready to sold to the entrepreneurs for stocking in grow out ponds. Among various environmental parameters salinity plays vital role for hatching and survivalist of larvae and post larvae of *M. rosenbergii*, (Jayalakshmy and Natrajan, 1996). As reported by (Sundarapandia *et al.,* 1995), which

was also observed during the trial run in our hatchery, that seasonal variation in production of *M. rosenbergii* post larvae occurred due to rearing at ambient temperature, which was not congenial for larval rearing. Growth adversely affected when temperature dropped below 27 degree centigrade. Cannabilism also observed when larvae metamorphosed to post larvae, (Aquacop, 1977, Sundarapandian *et al.,* 1995, 1997 & 2002).

Table I: Physico chemical parameters.

Temp-29 to30c	Nitrate-NO_3-N<20ppm	Light-2000 lux power
pH-7.8 to 8.5	Ammonia-NO_3-N<1.5ppm	
Salinity- 0 to12 ppt	Total hardness<100ppm	
Nitrite-NO_2-N<0.1ppm	Iron-<2ppm	

Table II: Schedule of feeding with prawn larvae with Artemia & egg custard

Stage	Artemia naupli No fed per prawn larvae	Feeding in gems Per 10, 000 larvae with egg custards
II to III	12 to18	3 to 4gms
IV to V	18 to30	5 to6gms
VI to VIII	30 to45	6 to7gms
IX to X	45 to 55	7 to10gms
XI to PL	55 to65	10 to12 gms
PL to PL5	65 to80	12 to 15gms

Table III: Experimental production of *M. rosenbergii* in chandrabhaga shrimp hatchery.

Sl. No	Date	Different Stages of larvae	Temp in 0 C	Salinity in ppt	pH	Do in ppm	CO2	Larvae stocked	PL recovered In %
01	03.07.1997	0 to III	28 to 30	8 to 10	7.5	4.8	Nil	1 lakh	
02		III to IV	do	10 to 12	do	4.5	Nil	98, 800	
03		IV to V	do	do	do	4.9	nil	96, 600	
04		V to VI	do	do	do	4.6	nil	87, 300	
05		VI to VII	do	do	do	4.8	nil	86000	
06		VII to VIII	do	12 to 13	do	4.5	nil	80200	
07		VIII to IX	do	10 to12	do	4.4	nil	76700	
08		IX to X	do	8 to 10	do	4.3	nil	74000	
09		X to XI	do	8 to 4	do	4.7	nil	66300	
10	08.08.2005 32 days	XI to PL	do	4 to 0	do	4.9	nil	52100	
11	47 days	PL to PL15	do	0	do	4.6	nil	51000	Above50%

Table IV: *M. rosenbergii* seed production (year wise) in Chandrabhaga Prawn Hatchery

Year	Weather experimental commercial	No of prawns used	No of berried prawn pawned	Quantity of larvae produced	Quantity of post larvae produced	Quantity of post larvae sold	Remarks
1997-1998	Experimental run	16=12F+4M	8	1.2lacs	.525lacs	.182lacs	Due to delay in lifting, stock reduced
1998-2002	No expt/trial Run done	-	-	-	-	-	-
2003-2004	Trial run	32= 24F+8M	18	1.95	.9lacs	.245lacs	Variation of climatic condition &uncontrolled temperature reduce the stock.
2004-2005	Commercial run	252=190F+62M	164	16.35lacs	10.2lacs	4.103lacs	-
2005-2006	Commercial run	-	-	-	Production over 1.2lacs	-	

Table V: Nutritive value of Artemia

Sl. No.	Nutritive contents	%
1	Protein	62%
2	Carbohydrate	22%
3	Fat	15to28%
4	Ash	15 to29 %
5	Moisture	73.65 %

CONCLUSION

Following the intervention of Hi-tech procedure, both in hatchery as well as culture aspects of fresh water prawn *M. rosenbergii* by the fishery scientist after 1990 till date, would not only help to compensate the fishing losses to the farmers by changing over to *M. rosenbergii* farming, but also help the farmers to utilize the vast low saline water resource available in India. Inadequate infrastructural facilities, lack of proper information on advance technology to the farmers, insufficient communication channel by state as well as central govt., are some of the constraints, for encouraging cost effective, and environmentally sustainable production of fish and Prawns. Apart from this, a high standard (I.Q.F) of storage and processing facilities, a chain network of marketing of products are necessary to standardize the production of fish and prawn and also to make them sustainable.

The time for larval batch to metamorphose varied according to feed and environmental condition. Feed quantity and feed management would be an important factor for successful larval rearing. The exact quantity of feed cannot be prescribed, subject to consumption (New & Singholka 1985). Larvae in weak condition were sluggish, did not respond well to feed, could not swim properly, often bluish in color, often jumped out of water. Healthy larvae swim at surface water, fed actively, had reddish brown pigmentation and were not observed to cannibalize to each other. They swim head down and tail first and ventral side up.

Artemia naupli constitute the main live feed for larval rearing. It enhances the cost of production (Soundarapandia and Kanupandia, 2000). Therefore from the 5th day onwards, larvae were fed only once artemia naupli during night time, and prepared feed like egg custard & pelletized feed used as a substitute during day time subject to their label of consumption. Over feeding pollutes water, underfeeding causes malnutrition and cannibalism. Cannibalism was observed when the larvae metamorphosed into post larvae. (Aquacop, 1977).

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