Fresh water prawn culture- UNIT 3- 6th semester

Fresh Water Prawn *(Macrobrachium malcolmsonii),* the second largest fast-growing prawn occurs commonly in Indian rivers, draining into Bay of Bengal. They are cultivated under monoculture as well as polyculture systems. Under monoculture systems production levels of 750-1,500 kg prawns/ha/ 8 months are achieved. Further, it is a compatible species for polyculture along with Indian Major Carps and Chinese carps, which may yield 400 kg prawns and 3000 kg carps/ha/yr. Since the seed requirement for the commercial farming of this species is not met from the natural resources, large-scale seed production under controlled conditions for year-round supply is extremely important. The technologies of large-scale seed production and grow-out culture have led to increased awareness of the farmers and entrepreneurs for diversification of their culture practice.

Broodstock Management

Broodstock and berried females are essential component for continuous operation for seed production. The gonadal maturation of the species differs greatly in nature depending on the agro-climatic conditions. In the Ganga, the Hooghly and the Mahanadi river systems, the maturation and breeding start from May and continue till the end of October, whereas in the Godavari, the Krishna and the Cauvery systems it commences from April and continue till November. Under pond conditions, sexual maturity generally occur after attaining a maximum size of 60-70 mm. Berried females are recorded year-round in most of the ponds. The ratio of berried females in total population is found to be higher during August-September and during this period they carry good quantity of eggs (8000-80,000). Prawns breed 3-4 times in a season. Successful community breeding and year-round seed production under captive conditions is possible by employing air-lift bio-filter re-circulatory system.

Spawning and Larval Rearing

Mating takes place immediately after pre-mating moult in matured female and spawning occurs few hours after mating. Incubation period of eggs lasts between 10-15 days depending upon the water temperature of 28-30°C. However, at lower temperature, the incubation period is prolonged to more than 21 days. Hatching of fully developed 1st zoea takes place through the body stretching of the zoea, which breaks the eggshell and comes out from the egg and starts swimming as plankton.

Different larval rearing technologies *viz.*, static, flow-through, clear or green water, closed or semi-closed, with or without circulation systems of larval rearing of prawn species under hatchery conditions have been developed with varying degrees of success. The green water technique has been claimed to increase the post-larval production by 10-20% over other techniques and provide a quality seed. But higher mortalities are generally encountered due to rise in pH and uncontrolled algal bloom. Further, increase in numbers of adult *Artemia*, due to abundance of feed in green water, contributes to accumulation of ammonia in the culture medium. The production of post-larvae (PL) in large numbers is possible following airlift bio-filter re-circulatory system. The larvae passed through 11 zoeal stages before attaining PL within a period of 39-60 days at salinity and temperature ranging from 18-20‰ and 28-31°C, respectively, with the production density of 10-20 PL/l.

Bio-filter equipped with air-lift re-circulation has shown promising results in maintaining favorable water quality in different rearing media with enhanced rate of post-larval production. The water quality parameter generally influences the growth, survival and metamorphosis of the developing larvae and it should be maintained optimally for getting better survival (Table.1).

Parameter		Range
Temperature	:	28-30°C,
pH	:	7.8-8.2,
Dissolved Oxygen	:	4.4 to 5.2,
Total hardness	:	3000-4500 ppm
Total alkalinity	:	80-150 ppm
Salinity	:	18-20‰
Ammonical nitrogen	:	0.02-0.12 ppm

Larval Feeding

Various feed items *viz., Artemia* nauplii, zooplankton especially cladocerans, copepods, rotifers, flesh of prawn and fish, molluscan meat, earthworms, tubificid worm, egg custard and cut pieces of goat/hen viscera are used during larval rearing. Among these *Artemia* nauplii have been recognized as an excellent larval food for the prawn larvae. At the beginning, freshly hatched *Artemia* nauplii are provided to the 1st stage zoea at 1 g/30,000 larvae twice daily up to 15 days or till they attain stage VI. Thereafter, the feed is given once daily along with egg custard and mussel meat/tubificid worm four times daily.

Harvesting of Post-larvae

Harvesting of post-larvae of prawn is rather difficult due to their crawling habit. Therefore, both turn-down and drain siphoning of water are commonly used for harvesting. But due to longer duration for attaining post-larval stage the above methods are neither useful nor safe. Further, the presence of post-larvae in the larval tank affects the growth and survival of advanced larvae due to competition for food and cannibalism. Hence, the need for an ideal device for regular harvest of post-larvae from the rearing unit is very much essential. String shell is therefore devised and is successfully used for phase wise harvest of post-larvae during larval rearing. Post-larval survival and production rates, following air-left bio-filter re-circulatory system, are in the range of 10-20 PL/l.

Post-larval Rearing

Optimum growth, production and survival of prawns can be achieved in grow-out ponds on stocking the nursery reared juveniles rather than stocking directly with the freshly metamorphosed post-larvae. Post-larvae slowly adopt themselves to freshwater. Optimum growth and survival of healthy juveniles during post-larval rearing is achieved at salinity of 10parts per thousand.

Post-larval rearing can be done both in well-prepared earthen ponds with adequate aeration facility and inside the hatchery following bio-filter re-circulatory system. Stocking density, feed and water quality management play the major role in raising healthy juveniles during rearing. Stocking density between 10-15 PL/l is ideal. Among various feed items, egg custard along with chopped freshwater mussel meat have been established to be more effective in maintaining good growth. Water quality parameters, *viz*., water temperature, pH, dissolved oxygen and dissolved ammonia in the ranges of 27.5-30ºC, 7.8-8.3, 4.4-5.2 ppm and 0.02-0.03 ppm, respectively are considered to be favorable for better survival.

Grow-out Culture

Grow-out system of prawn is normally comparable to that of freshwater fish farms. As the prawns can migrate from one pond to other due to its crawling habit, it is necessary to have the pond embankment 0.5 m higher from the water level. Sandy-clay pond bottom is considered to be favourable for better growth. Un drainable ponds may be treated with conventional pestcides for eradication of predatory and weed fishes. Stocking density of 30,000 to 50,000/ha is recommended for semi-intensive monoculture farming. Ponds with the facility of water exchange and aeration can be used for intensive farming where stocking density could be increased to 1 lakh/ha. Temperature is the most important factor which directly controls the growth and survival of prawns. Temperatures above 35°C or below 14°C are generally reported to be lethal and 29-31°C is optimal.

Male prawns grow faster than females. Mixture of groundnut oil cake and fish meal in the proportion 1:1 is used as supplementary feed. A production of 750-1200 kg/ha in six months of rearing are achieved under monoculture with the stocking density of 30,000-50,000. In polyculture, *M. malcolmsonii* at a stocking density of 10,000-20,000/ha along with carps at density of 2,500-3,500 nos/ha, a production of 300-400 kg prawn and 2000-3000 kg carps can also be raised.

Economics

Economics of Hatchery (2 Million Capacity)*

Sl. No.	Item	Amount (in Rupees)
I.	Expenditure	
A.	Fixed Capital	
1.	Construction of broodstock pond (0.2 ha, 2 nos)	50,000
2.	Hatchery shed (10 m x 6 m)	2,50,000
3.	Larval rearing tank (12 units cemented, 1000 l)	1,00,000
4.	Drainage system with PVC pipe	20, 000
5.	Bore-well	40, 000
6.	Water storage tank (capacity 20,000 l)	40, 000

7.	Electrical installation	30, 000
8.	Air-blowers (5 hp, 2 nos)	1,50,000
9.	Aeration pipe networking system	40,000
10.	Generator (5 KVA)	60,000
11.	Water pumps (2 hp) with pipelines	30,000
12.	1. Refrigerator	10,000
13.	1. Miscellaneous expenditure	30,000
	Sub-total	**8,50,000**
B.	**Variable Cost**	
1.	Broodstock development including feed	50,000
2.	Transportation of seawater	20,000
3.	Feed (*Artemia* & prepared feed)	2,30,000
4.	Chemical & medicines	10,000
5.	Electricity and fuel	40,000
6.	Wages (One Hatchery Manager & 4 skilled laborers)	2,10,000
7.	Miscellaneous expenses	50,000
	Sub-total	**6,10,,000**
C.	**Total Cost**	
1.	**Variable cost**	6,10,000
2.	Depreciation cost on fixed capital @ 10% yearly	85,000
3.	Interest on Fixed Capital @15% per annum	1,27,500
	Grand Total	**8,22,500**
II.	**Gross Income**	
	Sale of 2 million seed (@ Rs.500/1000 PL)	**10,00,000**

III.	**Net Income** (Gross income - Total costs)	**1,77,500**

Fluctuate according to the region and prevailing market price.

Economics of semi-intensive grow-out culture of freshwater prawn (1.0 ha pond)

Sl. No.	**Item**	**Amount (in Rupees)**
I.	Expenditure	
A.	**Variable Cost**	
1.	Pond lease value/ ha	20,000
2.	Fertilizers and lime	6,000
3.	Prawn seed (50,000PL/ha; Rs. 500/1000)	25,000
4.	Supplementary feed (@ Rs. 20/kg)	40,000
5.	Wages (1 labours @ Rs. 150/man-day) for 280 days	45,000
6.	Harvesting & marketing expenses	5,000
7.	Miscellaneous expenditure	5,000
	Sub-total	**1,46,000**