Raising Quality Fish Seed in Floating Nurseries in India*

In 1976, the Allahabad Substation of the Central Inland Fisheries Research Institute (CIFRI) launched a program of cage culture in lentic waters to open new vistas for enhanced fish production by utilizing the already existing culturable waters. The program aimed to evaluate the feasibility of rearing carp spawn in floating nurseries (cages) in lentic waters to fry stages and evaluate the feasibility of rearing carp-fry in floating nurseries (cages) in lentic waters to fingerling stage.

A village tank of about 2.5 acres at Jari, 35 km away from Allahabad was selected for the experiments. The tank was 2.4 to 3 m deep. Water for the tank was drawn from a nearby canal when needed besides getting rain water from the catchment area. The cages were floated in the deepest area of the tank.

For rearing of hatchlings, fry and early fingerlings, frames of thick and sturdy bamboos of about 70-100 mm in diameter were made which proved ideal as they were light, durable and could float easily at the required depth. The bamboos, making the frame, were fixed with iron nuts and bolts, enabling easy assembly, dismantling and transport. The dimension of the frames is such that nylon hapas of size 2.20 x 1.60 x 1.45 m could easily be fixed inside. Polyethylene floats of about 100 mm in diameter were fixed in bunches of 10-12 on each vertical bamboo of the cage frame. The location of floats on bamboo frame was so adjusted as to keep the cages submerged in water to a depth of about 1.10 m to 1.20 m. As required, the number of cages were increased by tying long ropes in between and the extreme two cages were tied to sinkers at the two ends with long thick ropes. This allowed scope for movement of cages.

Advance fingerlings were reared in cages made of wood and tubular iron pipes with galvanized iron mesh of 1/5" around. Cages made from tubular iron pipes proved more handy but required regular enamel painting. The size of these cages was also standardized to 2 x 1.5 x 1.5 m to have a surface area of 3 sq. m. Each frame of these cages can be separated before transport by removing the nuts and bolts.

Riverine spawn, having a good percentage of major carp was collected from the river Yamuna. The spawn was acclimatized in plastic pools for about a week on artificial feed.

The acclimatized spawn was transported to the site and released in floating nurseries prepared with 1/40" mesh nylon hapas. Two such nurseries were stocked each with about 30,000 hatchlings. Close observations on the behaviour of spawn in these prepared nurseries was kept and dead hatchlings were removed. Regular feeding with artificial feed was continued the day after the release of spawn. The nylon hapa cages were changed every fortnight.

Observations

The hatchlings started moving in shoals immediately after their release in cages. The behaviour of hatchlings in these floating nurseries was almost normal and within two to three days they were conditioned to take feed. The hatchlings of one nursery attained an average length of 45.6 mm within a period of 28 days from an average size of 7.8 mm. The other nursery was stocked later and over 21 days of rearing, the fry attained an average length of 30.2 mm from an average size of 6.5 mm at stocking.

The survival at this stage was estimated at 25%. The hatchlings during transfer of cages were given 3% sodium chloride and 0.1 ppm Acriflavin solution. Aquatic plants such as Hydrilla and Vallisneria were submerged inside the cages in bunches with the help of nylon twine. This provided nibbling material to the growing fry and a distraction to the shoaling movement. This method found successful in earlier trials at Getalsud Reservoir by Natarajan (1976) proved effective in controlling the mortality noticed at this stage of fry in cages.

The young fry were transferred after one month to cages having 1/8" mesh nylon mosquito netting hapa cages. The number of fry of each of the two nurseries was distributed equally into two cages each having about 2,500 fry. Within a period of about 3 months from the young hatchling stage the fry grew to fingerling size attaining an average length of 121.8 mm in one cage and 103.6 mm in the other cage, the actual period of rearing being 89 days and 82 days, respectively.

Conclusion

The experiments conducted by setting up floating nurseries, proved successful in terms of (a) rearing carp spawn in floating nurseries (cages) in lentic

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From the paper, "Experiments on raising quality fish seed in floating nurseries and its role in aquaculture in India" by A. V. Natarajan, R. K. Saxena and N. K. Srivastava, CIFRI Research Substation, Allahabad.

waters to fry stage and (b) rearing carp fry in floating nurseries (cages) in lentic waters to fingerling stage.

In the experiments, 30,000 hatchlings were stocked for every cage of 35 sq m area which is equivalent to 8,500 hatchlings/sq m or 85,000/ha. Even after allowing for escape and mortality, this is about three times more, in terms of stocking rate, than has been reached in pond nursery management. The growth is also comparable to any pond rearing stock as within 28 days fry measuring about 46 mm were available.

For fry, a maximum density of 2,550/cage or 700/sq m area (7,000,000/ha) was tried. This is about 35 times more than the stocking density achieved for fry rearing in ground nurseries. The fingerlings in our experiments attained stocking size of over 100 mm by the middle of November.

It is significant to note that the diverse and scattered character of ponds, tanks and reservoirs in India reinforces the need for floating nursery as this not only dispenses with elaborate nursery management but renders each pond, tank, etc. a production unit without having to set up a nursery or rearing pond.

Summary

One of the important constraints encountered in the development of fisheries in ponds, tanks, reservoirs and lakes in India is limited availability of nurseries for raising major carp stocking material. The floating nurseries composed of units of floating cages (made of wooden framework and internal lining of nylon cloth of 1/40 mesh/inch appear to hold great promise as reflected by studies carried in a large tank at Allahabad and Getalsud reservoirs. The nylon mesh of 1/40 mesh/inch was used for rearing hatchlings to fry, 1/8 mesh/inch from fry to finger-

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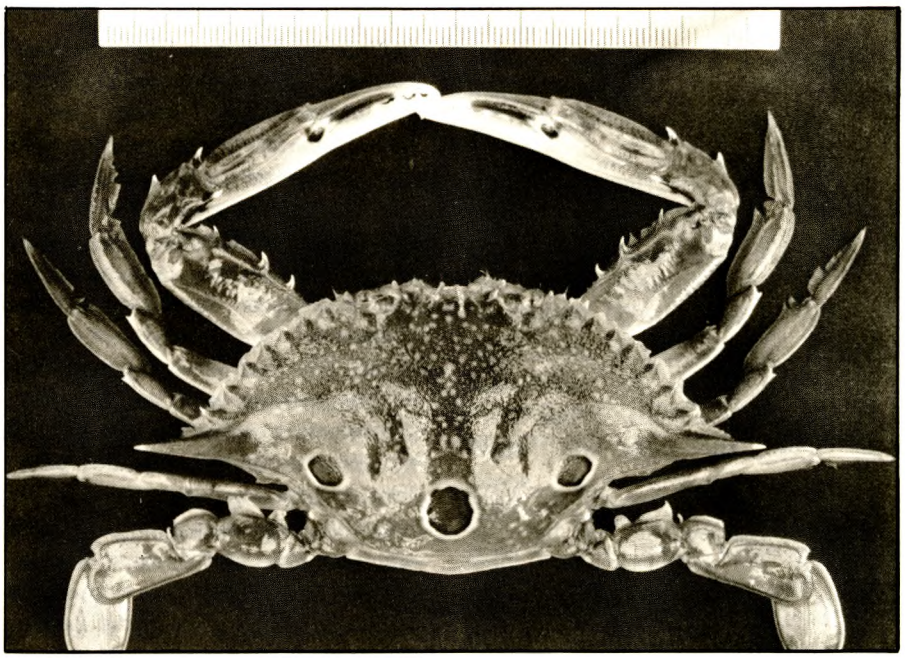
Edible Crustaceans in the Philippines*



Portunus sanguinolentus **(HERBST)**

English name: Blood-spotted swimming crab, Blue swimming crab, Sand crab or Blue swimmer.

Philippine name: Alimasag (Tagalog), Suga-suga (Cebuano), Bansaway (Ilocano) or Kagang (by Muslims).

The carapace attaining some 6 cm in length is smooth, slightly convex and covered with small granules, and marked on its lateral border by a pair of very sharp spines. Antero-lateral border is armed with nine teeth, which are not sharply pointed. The posterior half of the carapace is marked by three large conspicuous red spots fringed with white circles.

This species lives on sandy and sandy mud bottoms mostly along the shoreline.

The crab which has lesser commercial value due to poor population and its smaller size than *P. pelagicus* is mainly caught with beach seines.

They range from Hawaii southward Polynesia, westward, through Micronesia, to Japan, China and the Philippines and East Indies and further to the Indian Ocean, the Red Sea, and the coast of Africa.

This edible crab is locally offered for sale in the market at P25/kg.

(Scale represents 10 cm)

*** by H. Motoh, 9th in a series**

How to Test Hatchability of *Artemia* Cysts*

Hatchability of a given sample of cysts has been mostly expressed as hatching percentage — or the number of live nauplii hatching out of 100 cysts. This criterion does not take into account the degree of purity of the product. In other words, it does not consider the quantity of debris included in the batch of cysts. In this regard, the concept of hatching percentage is misleading since a figure of 90% hatching may indeed be correct despite the fact that the product may carry a significant amount of debris.

Since *Artemia* cysts are always sold on a weight basis, the important criterion for the customer is the number of live nauplii which he will get from the total quantity of product purchased.

The following simple procedure can be applied to determine the weight of product which, under standard conditions of incubation, will yield one million nauplii:

a. Three samples of 250 mg are taken at random from the batch of cysts to be analysed.

b. Cysts are hydrated in 100 mL graduated cylinders in 80 mL natural seawater at 30°C and are kept in suspension by a continuous aeration from the bottom of the cylinders.

c. After one hour, the water volumes are increased to 100 mL with seawater and 5 subsamples of 0.250 mL each are taken from each cylinder with a glass pipette or preferably with an automatic micropipette.

d. Each subsample is pipetted into a small plastic tube (5 mL content); the pipette is cleaned with seawater in the same tube and the water level in the tube is finally brought to 4 mL with seawater.

e. Since at the end of the hatching period a total count will be made on each tube, the volume of seawater in the tubes may vary in function of the type of the tube used (minimum 4 mL).

f. The tubes are closed with a cap and clamped into a rotating axle at 5 rpm; the whole set up is incubated at 30°C in continuous light conditions.

g. After 48 hours, the content of each tube is fixed by addition of a few drops of Lugol's solution (the solution stains the nauplii dark) or with another fixative.

To prepare Lugol's solution:

1. Dissolve 10 g neutral KI and 5 g I_2 sublimate in 50 mL boiling water
2. Dissolve 5 g Na-acetate in 50 mL distilled water
3. Mix solutions 1 and 2.

h. The total number of nauplii hatched in each tube is determined by filtering the suspension on a small gauze filter, placing the filter in a petri dish and counting the nauplii under a dissection microscope. The average number of nauplii produced per gram of cyst product is then calculated. This number can also be expressed more practically as the quantity of product that has to be incubated to produce one million nauplii.

i. In summary —
* 250 mg product in 100 mL seawater
* 5 subsamples of 0.250 mL giving mL giving n_1 n_2 n_3 n_4 n_5 nauplii or average $\bar{n}$ nauplii in 0.250 mL
* number of larvae per gram product $= \bar{n} \times 4 \times 100 \times 4$
* weight of product needed for the production of one million nauplii

$$= \frac{1{,}000{,}000}{\bar{n} \times 4 \times 100 \times 4}$$

*From "The culture and use of brine shrimp, Artemia salina, as food for hatchery-raised larval prawns, shrimps and fish in Southeast Asia," by Patrick Sorgeloos. The report was submitted by Dr. Sorgeloos, in his capacity as consultant, to the National Freshwater Prawn Research and Training Center of the Freshwater Fisheries Division, Thailand. The document's series no. is THA: 75/008/78/UP/3.

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lings. For further rearing 1/5 mesh/inch was used. The feed was made of soya bean powder, ground nut oil cake and rice polish in 1:1:1 ratio. The stocking rate was 10,000/m^2 for spawn to fry and 2,800/m^2 for fry to fingerlings. The material used for the study was *Catla catla, L. rohita, C. mrigala* and *L. bata. C. catala* showed great promise for culture in cages.

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