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Breeding and Seed Rearing of Climbing Perch (*Anabas testudineus,* Bloch) Using Farmer Friendly Innovative Technology at Farmer's Field: A Case Study

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ABSTRACT

Climbing perch (*Anabas testudineus*), a high valued indigenous fish species both nutritionally and commercially was bred at farmers field during May, 2016 in Nalbari district of Assam. An innovative breeding system was developed and used for induce breeding. It was found that about 490-810 numbers of eggs were laid by the fish per gram body weight basis where fertilization rate was about 92±3%. The mating process was found polygamy. The eggs as well as fertilized eggs were floating in water surface. The fertilized eggs were hatched after 22 hours of fertilization. The three days old spawn were reared in earthen tank where the survival rate after a period of one month culture was observed about 40%. The proficient low cost breeding and seed rearing technique was found farmer friendly as the initial cost was very low and can be carried out in a small area.

Keywords: Pre monsoon, Hatchling, Climbing perch, Farmer friendly

Climbing perch (*Anabas testudineus*, Bloch) locally known as Kawoi is one of the most demanded indigenous fish species of Assam. This air breathing fish species is found in oxbow lakes, swamps, estuaries, medium or large rivers, flooded fields and stagnant waters in most tropical and sub tropical Asian Countries (Talwar and Jhingran, 1992). Recent studies have shown that *A. testudineus* is iron and copper which is essential elements for hemoglobin synthesis (Sarma *et al*. 2010) and a valuable source of Docosahexaenoic acid (DHA) and Ecosapentaenoic acid (EPA) which are essential elements for human brain development, fat metabolism and its role in preventing atherosclerosis, dementia, Alzheimer's disease and so forth (Mohanty, *et al.* 2016). Like other indigenous fish species the natural population of this species is also apparently on a decreasing trend during the recent years which may be due to habitat degradation for anthropogenic activity although it is listed as data deficient in IUCN Red list (www.iucnredlist.org). In contrast, nutritional quality coupled with the ethnic believes on this fish species as medication of prolong anemic condition etc. leads to a high demand in market. Thus the progressive fish culturists of Assam are encouraged to culture climbing perch on commercial scale. This in regard demands high availability of fish seed and through understanding of the fish habit and its reproductive biology *viz.* natural habitat, feeding habit, natural mortality rate, preference to supplementary feed etc. of the species. There are reports of success of induced breeding and seed production of climbing perch in different Asian countries *viz.* Bangladesh, Malaysia, Sri Lanka etc. (Sarkar *et al.* 2005; Zalina *et al.* 2012; Perera *et al.* 2013) but the efficiency of induce breeding and seed production is yet to reach farmer's field in India.

Keeping these facts in the ground, breeding methodology was developed using locally available low cost materials and breeding operation was standardized for easy adoption at farmer's field. Therefore, the present communication has been

made to document the success of induced breeding, seed raising and economics of breeding of climbing perch in farmer's field which may be adopted by the fish breeders of India.

MATERIALS AND METHODS

Research Area

The study was carried out at three different locations *viz.* Sandha village, Dihjari village and Paikarkuchi village of Nalbari district (N26^{0}22.830′- N26^{0}22.830′ latitude and E091^{0}24.620′- E091^{0}24.620′ longitude) of Assam, India.

Biology of the species

A. testudineus is bisexual and matures in six months (Jacob, 2005). The fish naturally breeds once in a year but the breeding season varies from place to place (Perera *et al.* 2013). In Assam climbing perch matures during March to June with a peak from April to May, which is similar in most of the fish species of the region (Gogoi *et al.* 2013). Fish having a size of 30-80gm of same age group was selected for the purpose**.**

Brood stocking management

Brood stocks were raised at the farmer's pond (0.1-0.25 ha) from February onwards following the recommended management practices. Fishes were fed with high protein pelleted feed @ 3% of body weight. The feed was formulated and prepared using an assembled manual pelletizing machine with ingredients consisting that of fish meal, rice polish, mustard oil cake, wheat flour and mineral mixture (Table 1).

Table 1: Composition of feed ingredient in the formulated feed

Sl. No.	Feed ingredient	Percentage
1	Fish meal	30%
2	Rice polish	50%
3	Mustard oil cake	15%
4	Wheat flour	4%
5	Mineral mixture	1%

Water quality parameters *viz.* pH, DO, alkalinity etc. were estimated at fortnight intervals by following APHA in order to maintained for congenial environment. Shelters were provided with floating aquatic weeds for brood fishes to minimize external disturbances in the pond environment. The brooders were netted regularly at 15 days interval to check their gonad maturity status.

Selection and conditioning of brood fish

Matured brood fishes were selected on the basis of secondary sexual characteristics. Altogether, one kilogram of brood fishes were collected in equal proportion of male and female and conditioned in separate tanks under mild shower for two hours prior to breeding.

Method developed for the breeding

From previous observations, it could be observed that brooders of climbing perch have a habit to feed upon its own eggs. By the time mating is completed, they start eating their own eggs. This causes in drastic reduction of the number of fertilized eggs in the breeding tank. Therefore, to prevent this egg eating behaviour of the fishes, an innovative arrangement was developed in which the fertilized eggs are enabled to come out of the hapa automatically by water turbulence as soon as fishes start spawning. This innovation was developed by using locally available materials (Fig. 1) by digging a small shallow tank (2.5m × 1.8 m × 0.30 m) in an elevated area of the fish farm. Two layers of HDPE sheet was laid in contact to soil bed of the tank to retain the water.

Fig. 1: Newly developed low cost innovative farmer friendly hatchery

The depth of the tank was made about 30cm and was filled with plankton free water. A hapa (2m × 1.5m × 0.4 m) made up of nylon net of 2 mm mesh size and closed on all six sides except one opening

on one side (on the wider side of the top cover) to facilitate introduction of fish (Borah *et al.* 2014) was installed in the middle of the tank. Showering provisions were made using small plastic pipes at the top as well as water outlet for overflow of water from the tank in the system. Water outlet pipe was guarded with plankton free net to protect escaping of hatchlings. The entire complex was covered by shed to protect from heavy rainfall and direct sunlight.

Fig. 2: Administration of inducing agent/hormone

Breeding operation

At around 4.30 pm the conditioned brooders were injected with synthetic hormone Gonopro @ 2cc (after diluting it with 8cc distilled water) per kilogram and released in the hapa. Mild showers were given to create a rainy condition. After eight hours of hormone administration the fish starts mating. The process of egg laying continues for about 2-3 hours. After completion of egg laying process brood fishes were taken out along with the hapa carefully.

RESULTS AND DISCUSSION

Breeding

The mating process was found polygamy. The eggs as well as fertilized eggs were floating in water surface, a phenomenon rare in most of the fresh water fish species. A similar characteristic was also reported by Zworykin (2012) in Vietnam. It was estimated that the fishes lay within a range of 490-810 eggs per gram body weight basis. The fertilization rate was about 92±3% which was found similar as reported by Zalina *et al.* 2012 and Perera *et al.* 2013. The fertilized egg started hatching from 22 hours of fertilization (Fig. 3). The water temperature during the period was in the range of 26-31^{0}C. The newly hatched ones turn black in colour and develops fin within two days. Hatchling sustains upon its yolk sac till third day and is transferred to nurseries for further rearing.

Fig. 3: Newly hatched spawns of Climbing perch

Nursery management

Small earthen tanks of size 100m^2 area were taken for nursery rearing of the young ones. All the necessary management practices were adopted in the nursery ponds for adequate zooplankton production to provide natural food to the spawns. The initial preparation was by treating the nurseries with lime (Agricultural lime, $CaCO_3$) @ 5kg followed by application of cow dung compost @ 75kg after one week of liming. Probiotics namely *Pond biotic* was applied @ 30gm per 100m^2 area mixed with an equal amount of molasses at the same time. Water depth of 15-20cm was maintained in each of the nurseries. The tanks were inoculated with plankton from nearby earthen pond which is manured with cow dung and spawn were stocked after 6-7 days of preparation, with a stocking density of 4000-5000 spawns per square meter water area. The spawn turns to a size of 1.5 cm and weight 15-20 mg (Fig 4) in ten days of culture period. Supplementary feeding was applied after ten days in the form of formulated dust feed having 35% protein content, along with natural plankton and tubifex worm. One month old fry in the nurseries attain a size of 4 cm with a weight of 3-4 gm (Fig. 5) accounting a survival rate of 40%. The survival rate of the spawn

was found slightly low as mentioned by Sahoo *et al.* 2010 in case of Asian catfish (50-60%) another air breathing fish for same percentage of stocking density. This may be due to the tiny spawn size of the climbing perch. The results indicate scope to enhance the survival rate of spawns by the application of efficient and modern day enclosed seed rearing technique viz., indoor intensive system. The month old fish seeds were sold and transported for stocking in culture ponds of practicing farmers.

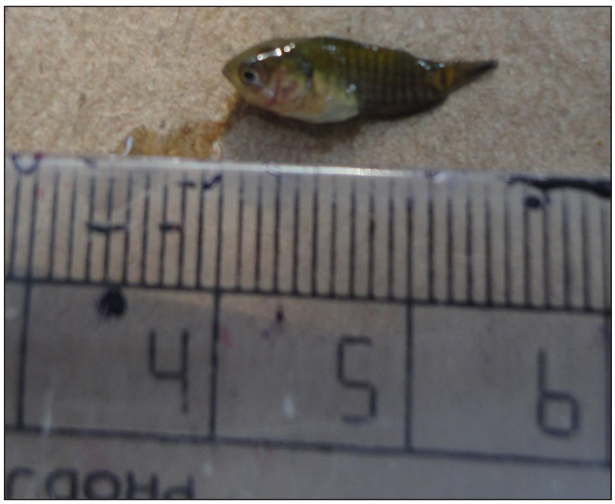

Fig. 4: Ten day old Climbing perch seed

Fig. 5: One month old Climbing perch seed ready for stocking

Economics

The complete economics of the initial seed production trial was done and listed in Table 2. The computed benefit cost ratio was found 3.56, which indicates a high return from the cost involved.

Table 2: Economics of the single operation of seed production of Climbing perch

Particulars	Cost (₹)
Fixed Cost	
1. Running water system with water reservoir tank of 1000 liter capacity.	10500.00
2. Water lifting motor pump (1Hp)	4000.00
3. One hapa	600.00
4. Plastic sheet	700.00
5. Digging and system setup	1500.00
6. A small room made up of locally available material (Bamboo)	6800.00
A. Total fixed cost	**24100.00**
Operational Cost for one operation	
1. Brood fish (1kg)	1000.00
2. Synthetic hormone	80.00
3. Labour charge for pond preparation, brood harvesting, feeding and other activity (35 man days @250/man days)	8750.00
4. Electricity charge	100.00
5. Cost for plankton production and nursery management	1400.00
6. Cost for formulated supplementary feed (50kg)	2000.00
7. Miscellaneous including other unseen cost	1100.00
8. Depreciation of fixed cost (10% of fixed cost)	2410.00
B. Total operational cost per operation	**16840.00**
C. Production per operation	
Number of seed produced 60000 nos	
Monetary value of produced seed (Re1/no)	**60000.00**
Return from one operation of climbing perch breeding (C-B)	**43160.00**
BC Ratio	**3.56**

CONCLUSION

From the study, it could be concluded that a suitable technology can be developed to breed the indigenous fish species *Anabas testudineus* in an efficient way, involving a little innovation. The standardization of the breeding procedure of climbing perch based on induce breeding may be recognized as a breakthrough for propagation of this species at farmers' field. Further research in the food and feeding, fish biology and habitat can lead to much improvement of the whole structure. The achievement made in the study is expected to encourage fish breeders and farmers of all categories to adopt and diversify this potential candidate

fish species in aquaculture systems. Moreover, production of seeds in one's own farm will reduce the dependency on seed availability.

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