Native catfish culture - a technology package for fish farmers

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Freshwater aquaculture makes an important contribution to the national economy of India, as well as contributing to improved livelihoods and nutrition of rural people. Among freshwater fish species, murrels (snakehead) and catfish are favoured species in South East Asia and are amongst the most economically significant species. Worldwide there are about 2,500 catfish species belonging to 30 families, most of which are freshwater. In India catfishes form a significant component of capture fisheries.

Indian fish farmers often prefer the exotic catfish viz: the African catfish *(Clarius gariepinus)* and the Thai catfish *Pangasius sutchi* due to continuous supply of seed, their wider feeding spectrum, cheap dietary requirements, fast growth and short culture period[1]. These exotic catfish pose a heavy threat to native fish biodiversity and hence the Government of India put a ban on them, although farmers are still producing them due to favourable short term profits. It has become imperative to promote native catfish culture among fish farmers as an alternative to exotic fish culture for income generation and ultimately to conserve fish biodiversity.

Approach

The Indian subcontinent harbours 142 species of catfishes belonging 13 families and 43 genera[2]. Native catfishes that are larger in size (e.g. *Heteropenustus fossilis* (singhi)*, Clarius batrachus* (magur)*, Ompak bimaculatus, O. malabarichus*, *Mystus gulio, M. montanus, M. cavasius, Horobrachus brachysoma* and *Spiratus seenghala)* are widely preferred by consumers all over India. Among the freshwater catfish *Mystus* occupies a major role due to the greater numbers of species available in Indian rivers, reservoirs and brackish waters (Table 1). Moreover they play a major role in nutrition of socially weaker sections in India since they are both cheap and tasty.

The Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar has succeeded in breeding and hatchery management of singhi *(H. fossilis)* as well as magur *(C. batracus)*. CIFA has also promoted culture of *Mystus vitatus* and *Ompak pabo* in Bhubaneshwar. However, fish farmers throughout India are not very familiar with commercial native catfish culture due to want of breeding, feeding and culture techniques. Hence, Dr. M.A. Haniffa, Director of the Centre for Aquaculture Research and Extension (CARE) of St. Xavier's College and his research team have developed a technology package for native catfish culture with the financial assistance received from DBT. The technology package developed addresses the full cycle of culture from brood fish nutrition, seed production, larval rearing and commercial grow out.

Native catfishes like *Mystus* are increasingly becoming threatened (Table 1). Under the DBT sponsorship the CARE research team is providing catfish culture training for disadvantaged youth to assist them with income generation. Ten trainees have already implemented the techniques in their home localities and succeeded in the culture practices of catfishes especially *H. fossilis, M. montanus* and *M. gulio*.

Advantages of catfish culture

Catfish have several beneficial characteristics that make them advantageous for culture[3]. These include:

- Air breathing. They can survive in oxygen depleted waters by coming to the surface to gulp air.
- Thrive in all kinds of shallow freshwater habitats (marshes, rice fields, swamps, streams, lakes and irrigation canals).
- Tolerant of crowding and can be reared at extremely high stocking density.
- Accept pelleted diets.
- Fetch high market price due to tender flesh and delicious taste.
- Preferred all over South East Asia and have export potential.

Brood fish nutrition

The quality and quantity of feed as well as feeding regime are important for spawning as well as egg quality. The research team of CARE recommended chicken intestine (70% protein), fish waste (56% protein) or any artificial feed with 60% protein to be fed to *H. fossilis, M. gulio, O. malabaricus,* and *O. bimaculates* for a maximum spawning of 6,000-10,000 eggs with 90% fertilisation and hatching. A rectangular pond of 6m x 4m x 1m is suitable for brood stock rearing as well as for netting operations. A minimum depth of 1m is recommended since catfishes are air breathing.

Induced breeding and seed production

Most of the catfish show sexual dimorphism. Males show serrated pectoral fin and genital projections but may not ooze milt in most cases. Whereas females have soft and swollen bellies and a genital pressure on the belly will result in oozing of eggs. Catfish could be induced to spawn by injecting natural (pituitary, human chorionic gonadotrophin) or synthetic (ovaprim, ovatide) hormones intramuscularly (0.3-0.5 mg/kg). Among the different hormones tested at CARE ovaprim was recommended for *H. fossilis* and ovatide *M. gulio* and *O. malabaricus*[4].

Table1: *Mystus* species and categories of threat in Indian rivers and reservoirs (IUCN 1996).

Mystus Species	IUCN status	Ornamental / Food fish	Place
Mystus armatus	LRIc	Food fish	Bharathaipuzha (Reservoir), Kabbini (River), Chalakkudy(River)
Mystus cavasius	LRnt	Food fish	Bhavani sagar (Reservoir)
Mystus gulio	LRIc	Food fish	Periyar (Reservoir), Bharathaipuzha (Reservoir), Kabbini (River), Chalakkudy (Reservoir), Tambirabarani (River)
Mystus keletius	DD	Food fish	Travancore (Reservoir), Bhavani Sagar(Reservoir)
Mystus menoda	DD	Food fish	Achenkoil (River)
Mystus oculatus	LRIc	Ornamental	Kabbini (River)
Mystus bleekeri	VU	Food fish	Mahanadi headwaters and West Bengal, Kerala, Maharashtra Ombatta swamp, Moyar, Bhavani River, Godavari estuary
Mystus malabaricus	EN	Food fish	Western Ghats of Kerala, Karnataka and Maharashtra in India.
Mystus montanus	VU	Food fish	Tambirabarani (River)
Mystus punctatus	EN	Food fish	Kerala, Tamil Nadu and Karnataka in Western Ghats, Cauvery river drainage in southern India
Mystus vittatus	VU	Food fish	Eastern Punjab, Bihar, Uttar Pradesh, Assam, West Bengal, Orissa Bhavani River, Tamil Nadu
Sphereta seenghala		Food fish	Bhavani Sagar (Reservoir)

LRIc – Lower risk least concern, LRnt – Lower risk near threatened, VU – Vulnerable, EN – Endangered, DD – Data deficient

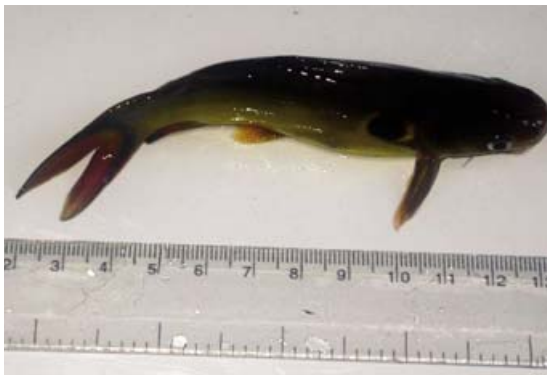
Each breeding set consisted of one female and two males irrespectively of species. Immediately after intramuscular injection of the hormone, the breeding set was introduced into breeding tank (3m x 3m x 2m) containing well aerated water (DO 5.0± 0.5 mg/l; pH 7.2±0.3; temperature 27°C). Aquatic macrophyte *Hydrilla verticillata* was introduced into to the tank for the purpose of providing cover. After 6-12 hrs of injection, breeding behaviour could be noticed in most of the catfish species. Mating will be preceded by courtship by the active male chasing the female until spawning[5]. It is better to remove the parents after spawning, since the young ones do not require any parental care in the case of catfish, contrary to murrels.

The eggs of *H. fossilis* were submerged on the floor of the breeding tank whereas they were adhesive and attached to the aquatic macrophyte in the case of *M. montanus* and *M. gulio*. The eggs usually hatch within 24 hrs in most of the catfish species. The hatchlings were acclimatised in the breeding tank by providing aeration with least disturbance. Water quality parameters were recorded and everyday freshwater was supplied by changing at least 50% of water from the tank. Yolk sac absorption will take three days and the major constraint will be the larviculture since post larvae will succumb heavy mortality unless otherwise water quality is monitored, nutritionally adequate food and pathogen and predator free environment is provided. Even then mortality may be a common occurrence during larval rearing. It is better to feed the post larvae with plankton (*Daphnia*, *Cyclops* and *Moina*) for a period of one week and after that suitable supplementary diets like minced chicken liver, macerated yellow yolk and fish waste powder until they reach the fry stage, when they will be capable of taking pelleted feed and survival will be greater[6]. A flow through system will always be preferred for better survival of the post larvae. The fry could be reared in large cement tank (3m x 1m x 1m) up to the fingerling stage. Once they reach the fingerling stage they are suitable for commercial culture.

Fingerlings of Mystus gulio.

Commercial culture

To popularise commercial catfish culture among fish farmers, earthen ponds (15m x 5m x 1m) available at the CARE Aquafarm were used. One of our trainees attempted singhi culture in an open well (12m x 7m); cow dung, thumbai plant, indigo plant and tapioca leaves were cut into pieces and placed in a sack, introduced into the well and allowed to decay. After a few days the decomposed materials had completely mixed with the soil at the bottom. In addition waste water from adjacent household was allowed to enter the well. Once per month fish waste was chopped into pieces and mixed with waste rice collected from nearby marriage halls and put into the well. During a seven month culture period the farmer harvested about 125 kg singhi (each 75 – 250 g) translating to a yield of around 800 kg/ha[1].



Horobragus brachysoma

Heteropenustus fossilis.

Another fish farmer excavated two culture ponds (30m x 20m x 1.5m) and introduced 2,000 fingerlings of *M. montanus* (length: 1.5-2.5 cm and weight: 1.3-1.5 g) into each culture pond. He mixed chicken manure with rice bran, corn flour and ragi malt in the ratio of 19:2:2:2 and the mixer was taken in a tray and water was added little by little. After six hours the feed paste was made into balls and were kept in a tray and slowly immersed into the pond. The tray was kept undisturbed for two hours till the fingerlings got a good meal and after that they were removed from the pond. The fingerlings were fed twice (9.30am and 4.30pm) every day. After 4 months the entire pond was drained and *M. montanus* were harvested. The weight of the harvested catfish ranged between 150-250 g and the total weight of the fish harvested was around 300 kg/pond translating to a yield of 5,000 kg/ha over a culture period of four months. They were sold to the nearby market at the rate of Rs 130/kg (= Rs 40,000/ pond or Rs 70,000/ha) (Table 2).

With regard to feeding of catfish fingerlings, the fish farmers can supply chicken intestine/fish waste or any formulated feed according to the availability of the ingredients with protein content of at least 50%. From our past experience it is possible to suggest that minimum six months culture period may be adequate for singhi and *Mystus* farming. An unemployed youth can earn a sum of more than Rs. 100,000/year according to availability of area for commercial catfish culture. If they do not have land and water resources they can utilise the neglected water bodies of their area by establishing cooperative groups.

Commercial culture of M. montanus.

Conclusion

The striking feature of this technology package is that breeding; larval rearing and culture can be practiced independently by fish farmers. Those who have undertaken catfish culture training at CARE have already succeeded in seed production and larviculture independently. Unemployed youth and fish farmers can practice commercial catfish culture for income generation. A minimum area of at least 50 m^2 is essential for catfish culture. Water can be supplied from bore well or any other sources nearby. Biowastes like chicken intestine/ fish waste or commercial feed can be supplied. Women folk may be encouraged to start catfish culture in a minimum area of 50m^2 (12m x 5m x 1m) in their backyards.

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Table 2: Estimated costs and returns of *M. montanus* culture.

Costs	For two ponds
Capital cost	
1. Construction of ponds (2 ponds of 30m X 30m X 1.5m each) Rs.10,000 per pond	Rs. 20,000/-
2. Fingerlings 2,500 / Pond	Rs. 5,000/-
Operational Cost	
1. Labour 1,500 per month	Rs. 6,000/4 months
2. Fish Feed 1,500 per month	Rs. 6,000/4 months
3. Fertilisers and Manures	Rs. 3,000/4 months
	Rs. 40,000/-
Income after 4 months	
Fish harvested: 350 kg/pond	700 kg/2 ponds
Fish sale price Rs.130/kg	Rs. 91,000/-
Net income after 4 months (Rs. 91,000-Rs. 40,000)	Rs. 51,000/-
Net income per year (Rs. 51,000 x 3)	Rs. 153,000/-
Net income for every subsequent year (Rs. 91,000-Rs. 20,000 x 3)	Rs. 213,000/-

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