Information for farmers on yellow tail catfish, *Pangasius pangasius*, for easier captive production

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Haul of P. pangasius for broodstock selection.

Production from wild capture fisheries, both inland and marine, are reducing with the time. But people's demand for fish is increasing day by day as they become more aware of the health benefits of fish consumption. Increasing demand for fish has encouraged researchers to give more thought to captive production of favoured fish species for consumers in different regions of the globe, to help meet requirements.

The ICAR-Central Institute of Freshwater Aquaculture, a leading research institute, has worked extensively on many carp, catfish and air-breathing fishes to develop technology for farmers under the programme of species diversification for aquaculture, and to promote adoption of new practices through training and demonstration.

The yellow tail catfish, *Pangasius pangasius*, a large Indian catfish, is one of the species that has been studied. Yellow tail catfish is found in different river systems of the Indian sub-continent. The initial work on captive breeding of *P. pangasius* was carried out by researchers from our institute during the early 90's. The present article will provide updated information on the captive production of *P. pangasius*, which will be of use for farmers and entrepreneurs in increasing culture of this fish.

About yellow tail catfish

P. pangasius (Hamilton, 1822) is distributed through the river systems of the Indian sub-continent. Many other species of this genus also occur in Asian countries. It prefers to stay in deep areas of the river and moves in groups. It migrates in search of food and searches for suitable breeding grounds during monsoon months. It matures during the third year of its life and is a monsoon breeder. It is a highly fecund fish with from 160,000-180,000 eggs reported in a one kilogramme

female. While the adults are omnivorous, the larvae subsist on plankton, but shift their habit to feed on both plant and animal matter as they grow. Molluscs are eaten during the juvenile stage onwards, and for this reason it is recommended as a bio-control species for molluscs in pond culture systems. Feeding intensity is high during post winter to the pre-breeding season. It is reported to reach 1.2-1.5 metres in length.

Captive production

Yellow tail catfish breed during the monsoon months. The fish begin to aggregate for spawning after one or two showers during the wet season, when muddy water flows into the river. They migrate to shallow areas from the main river stretch or tributaries to lay eggs. Seed of this catfish are often encountered in these areas after the river floods. People catch the seed along with other species after flood for grow out.

Broodstock development

Transporting the larger fish from the river is problematic and mortality often occurs even when using oxygenation. Hence collection of juveniles in large numbers during pre-winter is a bit easier with a lower mortality rate. Juveniles of 70-80 g collected from river are reared in earthen ponds for 2-3 years to obtain broodstock. Yellow tail catfish readily accept compound feed of floating or sinking nature during captive rearing. It is better to give floating feed to observe their degree of consumption, which will enable the ration size to be adjusted appropriately. Usually 28-30% protein bearing feed at 3-4% of body weight is sufficient to maintain the fish. This ration is usually reduced to 2% or less during the winter months when the water temperature remains >20°C. Overfeeding not only leads to increased cost of production, but also impacts the water quality due to decay of uneaten feed, which may cause blooms in the pond. This fish is sensitive to low oxygen levels. Settling of excess feed in the pond may create ammonia and hydrogen sulphide gas. Hence it is necessary to replenish the water after netting through the pond, which reduces the bloom density and ammonia content of the water. The fish usually grows to around 500 g by the end of the first year, rearing from 80 g, and subsequently they grow to 1-1.5 kg during the next two years, after which are ready for breeding operations.

Induced breeding

As it is a monsoon breeder, around July-August the broodstock will become gravid showing sexual dimorphism. The females have a bulging abdomen due to developed ovary and males show free oozing with a little pressure on the vent region. There is no sexual differentiation between male and female fish based on genital papilla as occurs in *Clarias batrachus*. The maturity of eggs can be verified by catheter during broodstock selection. The broodstock are transported to the hatchery in canvas stretcher bags with water from the rearing pond to reduce stress. Both sexes are kept separately in holding tanks. The females are injected with a synthetic hormone such as Ovatide, Wova-FH, or Gonopro @ 1 ml/kg body weight in a single dose. Repeated injections does not improve stripping success. The males do not need any hormonal injection during peak breeding season. However, the above hormones may be administered to males @ 0.5ml/kg body weight towards the end of the breeding season to

Use of a catheter to verify egg maturity.

Stripping milt from a male fish to fertilise eggs.

obtain a higher quantity of milt. We have observed that spent males can can be re-used for breeding if at least two weeks is allowed to pass. The successful ovulation and stripping of eggs from female fish is conducted 13-14 hours after hormone injection. Stripped eggs are fertilised with the milt before incubation in hatching devices. The eggs are slightly milky in colour and range in size from 1.09-1.28 mm.

Hatchery for egg incubation

The eggs become very sticky after contact with water during the fertilisation process. Hence many farmers use a special type of soil collected from the forest to reduce the stickiness. Washing of fertilised eggs with the prepared solution of tannic acid @ 1 g/l of water will also reduce the stickiness of the eggs and allow them to separate from each other. The eggs can be incubated in circular or glass jar hatcheries as they move independently in the water current like carp eggs. The eggs are demersal, but they rotate or float in water if current increases. There is no certain hatchery design to incubate the eggs, but operators typically use glass jar or circular hatcheries after destocking them, which allow them to rotate with the flow of water. This system ensures good water quality due to frequent renewal. Some farmers also incubate fertilised eggs in the hatchery before they become sticky and the flow of water rotates them in the water column, but they may still stick on the wall or bottom. Usually, farmers do not collect the hatchlings from the circular hatchery until yolk sac

Jar hatchery bearing coconut thread as a substrate for eggs.

absorption has occurred, after which they are collected and released into plankton rich pond or tanks. In the case of glass jar hatcheries, the hatchlings flow out continuously and are collected in a plankton hapa fixed on the holding tank, which allows them to subsequently be released in indoor rearing tanks until yolk sac absorption. Afterwards, they are released either in a plankton rich system or reared in indoor tanks for growing to fry or fingerlings. The eggs hatch after 22-24 hours of incubation, when the hatchlings are 3.0-4.5 mm in size. The larvae are transparent in appearance and show feeble swimming movement after hatching.

Larval rearing

The yolk sac of the larvae serves as a food supply until the third day of life during indoor rearing. Live feed such as mixed zooplankton or artemia nauplii are well accepted. The larvae fed with artemia show better growth and survival. We have also observed that more mortality is found in zooplankton fed tanks. It may be that the larger plankton can damage the larvae. Hence it is always advisable to sieve it frequently to get smallest possible plankton during feeding. The 8–10-day old larvae can also be fed tubifex in chopped form, after proper cleaning. The larval rearing tank is usually aerated. The larvae will aggregate in certain areas of the tanks as they do not have much free-swimming capability during their first days of life. They are seen to rotate even in medium aeration, which may be stressful for the tiny larvae leading to mortality. Hence a very slow air flow may be given to avoid the stress.

The mouth of larvae initially remains open after hatching. There is a possibility of injury due to teeth in the lip region of larvae damaging others in the crowded areas, leading to high mortality. Jaw movement or closure of mouth is seen in

Cement tanks for raising fingerlings.

7–8-day old larvae, which results in reduced early mortality. Some farmers are also of the opinion that heavy aeration does not allow the larvae to aggregate in hatchery conditions, which reduces mortality as the larvae remain separated. While rearing the larvae in indoor systems, the bottom of the tank should be cleaned periodically to remove dead larvae, unutilised live feed, and faecal matter, which may degrade water quality, and water renewed with light aeration provided to keep conditions good. After 11-12 days the larvae may be provided with compound feed in the form of dough. Our institute has developed a larval feed "Starter Pangas", which is a dust feed. This feed is moistened little and formed into balls which are placed in the tank. The larvae grow 20 to 30 mg during their first 2-3 weeks of rearing, after which they are shifted to ponds or larger cement tanks for fingerling production. A lot of *P. hypopthalmus* seed is produced in a few provinces of India. The farmers release yolk sac absorbed larvae in the prepared nursery for fry/fingerling production. The motivation for this activity might be due to the availability of plenty of live feed in the rearing environment for the larvae and their dispersal over a larger area may reduce interactions and losses as observed in indoor rearing. The farmers also provide dust feed after 7-8 days of release to avoid a feed shortage in the pond. Some farmers have also adopted a similar pattern for *P. pangasius* seed rearing.

Fry to fingerling rearing

Usually cement tanks and ponds are in use for limited and mass production of seed, respectively. Fry of 15-20 days age produced from indoor larval rearing are shifted to cement tanks for on growing to fingerling stage. A density of 100-150/ m^2 may be ideal for good growth during this period. The fry and fingerlings swim continuously. Fry readily accept compound feed as they are weaned during the late part of indoor rearing. This acclimatisation to formulated feed ensures higher survival later on. It is advisable to provide crumbled feed considering the mouth gape of fry, which may be increased as the seed grow. The feed must be spread in the tank to avoid competition and encourage even growth. It is also better to provide sinking crumbled feed to fry just after their release to cement tanks, but this feed type may be changed to small floating feed after 3-4 weeks of rearing. However, the seed accept both sinking and floating feed during their rearing in this system. They are fed at liberty until they reach early fingerling stage. They may feed voraciously, but the ration size should be reduced on the next day, if fed more on the previous day. Experimental results on fingerling feeding of this species indicates that the ideal feed consumption is less than 3% of body weight. Providing more is not beneficial. This is a valuable management tip that can reduce feed wastage and reduce the cost of production.

A lot of unused feed and faecal matter is expected in the rearing environment, which degrades water quality. The seed are very sensitive to low oxygen levels, which can be reflected by surfacing behaviour during early morning in tank conditions. Hence it is essential to renew the water to reduce stress.

Algal blooms may occur in tanks due to rich nutrient supply from unused feed and sunlight penetration in shallow rearing tanks. If these occur, they should be netted out at regular intervals to avoid adverse changes in water quality and to give scope for the free movement of seed.

Haul of P. pangasius fingerlings.

Application of floating feed.

Farmers are not satisfied with low production in tank systems. Hence many farmers opt for stocking of yolk sac absorbed larvae in prepared nurseries for late fry or early fingerling production. As discussed earlier, the larvae subsist on natural feed followed by dust feed and crumbled feed at their necessity. The farmers start selling them at the age of thirty days, and continue until sixty days. The seed purchased by farmers are directly stocked in grow out ponds. Many farmers also rear the fry to late fingerlings before stocking them to grow out ponds. Seed grow to 3-4 g after 4-5 weeks and >50-60 g after 20-24 weeks, which are then stocked for grow out.

Grow out culture

The grow out culture of this catfish is feed based. Small water bodies are not suitable as this species is a long-distance swimmer. Water bodies should also be perennial since the culture period can be lengthy. Early fingerlings of 4-5 g or juveniles up to 100 g are stocked for pond culture. Small seed are more prone to predation by water birds and take more time to reach harvestable size. These problems are not seen if juveniles are stocked. Slow growth during the winter season is also observed. Hence the culture period may be enhanced to give adequate scope for growth of the fish, which is best when the water temperature persists around 28-32°C. It is always beneficial to provide floating feed to get an estimation of their daily consumption and to allow the fish to be observed as to their health status. Yellow tail catfish are voracious feeders and become very active when feed

Harvest of P. pangasius

is added to the pond. It is advisable to spread the feed over a larger area to give scope for uniform feeding by the fish. Although the feeding is vigorous, farmers should exercise discipline and maintain the ration at a maximum 3% of their body weight to avoid wastage. The provision of feed may be reduced during winter months as consumption falls with lower water temperature. There is also a tendency for this fish to vomit after a few hours of feeding if it has consumed an excessive amount. Over feeding may lead the pond water to turn green because of uneaten feed and faecal matter of the fish fertilising the water body leading to plankton blooms. Water may be renewed in this situation to avoid sudden oxygen depletion associated with a collapsing bloom and to provide a congenial environment for higher growth of fish. This catfish does not perform well in high densities, unlike *P. hypothalamus*. Hence stocking of seed @ 10,000-15,000/ha may be best for harvesting 600g - 1.3kg fish after a one year culture period.

Health management

Light red patches near the snout and fin region and slow feeding may be indications of infection. Water renewal at the beginning of this observation may resolve the problem. However, fish health should be checked 3-4 times a year.

Red patches seen during grow-out indicate onset of disease.

Partial haul to check health.