Captive Breeding of Peacock Eel, *Macrognathus aculeatus*

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World trade of ornamental fishes has reached more than one billion dollars and is growing rapidly at around 10% per year.

India currently exports only around Rs. 30 million (US$650,000 million) of ornamental fish. However, the northeast of India has many species of fish that have great potential in the ornamental trade and many of which are attractive to foreign markets. There is great potential to expand the local industry.

In Assam there are several native species suitable for the ornamental fish trade. These include *Botia dario*, *Channa stewartii*, *Channa barca*, *Gagata cenia*, *Hara hara*, *Garra* species, *Mystus* sp. *Somileptes gongata*, *Nemacheilus botia*, *Macrognathus aculeatus*, *Mastacembelus pancalus*, *Rasbora* species, *Danio* species and many others. In Assam there is no organized trade at present. Only a very few people are supplying these fishes to the exporters in places such as Kolkata and Chennai. Since, they are not directly involved in exporting they are always deprived of the actual price prevailing in the global market. Those who are supplying ornamental fishes endemic to this region normally collect the fish from the wild through their contact fishermen. Therefore, there is always an uncertainty in the availability of a particular species of ornamental fish. A preliminary survey on the export of ornamental fish reveals that about 20 different varieties of ornamental fish of this region are exported annually.

Considering their potential, a few fish species have been recently short-listed for research on captive breeding under a National Agriculture Technology project in the Assam Agricultural University at College of Fisheries, Raha. The project has so far been successful in captive breeding of 5-6 local species of ornamental fishes of Assam. However, more research activities are required in this direction to conserve our natural resources and fish bio-diversity. It is expected that in near future, the dependency on nature for ornamental fish collection will decline.

The peacock eel (M.aculeatus) broodstock

Captive Breeding of Peacock Eel

The "standard" spiny eel, *Macrognathus aculeatus*, is commonly referred to as the porthole eel or the peacock eel. The species belongs to family Mastacembelidae. The body is long and eel-like with a long fleshy snout and a rounded tail fin that is separated from dorsal and anal fins. The body color is brownish to yellowish ventrally and marked with two long dark bands on either side. There are 3-11 ocelli (false 'eye' spots) at the base of dorsal fin. Both the dorsal and caudal fins have several fine streaks. During our survey in Assam we have so far recorded a maximum size of 24.5 cm weighing 56 grams.

Peacock eels are distributed in India, Pakistan, Sri Lanka, Bangladesh, Nepal and Myanmar. It is locally known as Tourah or Tora or mud eel in Assam and Ngaril in Manipur. They have a medium food value and fetch about Rs.120-140 per Kg (US$2.50-3.00) in the local markets of Assam. The IUCN list this fish in the 'lower risk-near threatened' category. It is in high demand as an ornamental fish in the export market due to its beautiful body shape, coloration and playful behavior.

A preliminary survey conducted by the Marine Products Export Development Authority under Ministry of Commerce, Government of India found that *M. aculeatus* is increasingly being exported in greater numbers as an ornamental fish.

We collected peacock eels from the wetlands of Assam and reared them in captivity for 3-4 months until they matured. Peacock eels seem to have nocturnal feeding habits, prefering to hide by burying themselves in the substrate or under rocks during the day. They come out at night and early morning to feed. We feed them on a mixture of *Tubifex* worms, mosquito larvae and boiled egg yolk. Since they prefer to hide, We provide shelters such as pieces of bamboo of diameter 4 cm and 25 cm long, submerged aquatic weeds and pebbles to create a congenial environment for breeding.

Determining sex

Al Castro (2003) in Aquarium Fish Magazine reported that the peacock eel grows to about 33cm, but spawns after it has reached about 18cm in length. We have found that a size of around 16-20 cm in length is suitable for induced breeding. It is difficult to determine the sex of the fish when they are young. In general the females are slightly larger than males of the same age. During the breeding season the females develop a swollen abdomen with a greenish tinge, while the males will ooze milt when gentle pressure is applied to their abdomen.

Induced spawning

In Assam, the breeding season starts with the onset of monsoon in the month of April and lasts till August with peaks in June-July. We conducted our breeding trials in April and May. We provided 4cm thick layer of small marble stones on the bottom of the tank and about half a kilogram of cleaned water hyacinth as substrate for spawning. Both male and female *M. aculeatus* received a small dose of Ovaprim hormone (0.025-0.05 ml).

We conducted our breeding trials in a small glass aquarium (75cm x 30cm x 45cm) with a water depth of 10 cm. We maintained the water temperature between 28-30C, pH 7.6-7.8, dissolved oxygen 8-9 mg/L and hardness of about 1.5 mol/L. The water should be completely iron free. We maintained a mild flow of water with the help of an electrical filter and also used an aerator and water heater.

Courtship behaviour

Spawning response varied from 8-10 hours. Courtship begins with the male chasing the female and swimming in a tight circle. Later, the pair encircle each other around the water hyacinth for spawning. The eggs stick to the roots of the water hyacinth. The male releases sperm as the eggs are laid. The eggs are round, green in color, adhesive in nature and about 1.25 mm in diameter.

Larval rearing

The yolk is fully absorbed in around 96 hrs. The free-swimming fry hide among pebbles, plants and in other substrate. The results of the experiment have been summarized in Tables 1, 2 and 3. Larval feeding is very crucial. Once the yolk is absorbed we fed fry at liberty with infusoria, zooplankton and boiled egg yolk.

Spiny eel larvae are very susceptible to bacterial and fungal infections. We find the highest mortality of the larvae during the second week. The poor survival of the larvae in our trials was primarily due to fungal attack and lack of appropriate larval food.

This fish can be reared in community aquarium tank as they are generally peaceful in nature. Initially, we had problems in feeding the fish under captive conditions. However, once acclimated in the glass aquarium, they slowly started feeding on tubifex worms and egg yolk. and attained full maturity in the month of early April.

There is little information on captive breeding of spiny eel. This was our first attempt to breed this fish under captive conditions. More trials are required to refine the larval rearing techniques to improve the survival of the young.

Acknowledgement

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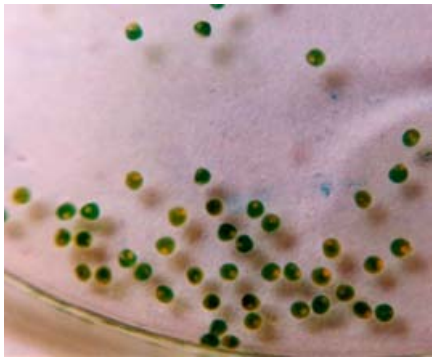
The Adhesive eggs attached to roots of water hyacinth.



The green colour eggs of M.aculeatus.

The Hatchlings of M.aculeatus.

Larval measurement of *M. aculeatus*

Life Stages	Size Range (mm)
Hatchling	2.9-3.1 mm
5-day old	3.8-4.2 mm
7-day old	6.0-6.5 mm
10 –day old	7.0-7.5 mm
21-day old	9.2-9.6 mm
30-day old	10.4-10.8 mm

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beneficial microbes. The presence of a small quantity of pathogenic microbes in the water and animals is normal and acceptable. If we try to totally eradicate pathogens we will disrupt the micro ecological balance, which may induce loss of physiological balance of the stock, leading to proliferation of pathogens and disease.

- Controlling farm volume and implementing rotational farming practices with fallowing of culture areas is a highly effective disease control measure. As the number of farms in an area grows more disease problems are experienced. Limiting the number and area of farms helps to prevent major disease problems and provides the best benefit and consistent development of freshwater shrimp and crab aquaculture. Since some pathogens are specific to a particular host, allowing farming areas to rest between crops can keep pathogen numbers down and maintain the safety of products, quarantine risk and impact on the environment.
- Implement health management centered on disease prevention and protection of the environment, while not rejecting responsible drug usage as a useful tool. At present, "health management" is a resounding slogan in aquaculture and key to successful culture. Health management includes scientific breeding, farming, water usage, and feeding and drug usage.
  Appropriate drug usage requires the following: A diagnosis must be made in order to select an appropriate drug and treatment regime. Other factors contributing to the disease, such as environmental conditions or nutrition must be addressed simultaneously. Drugs that are potentially harmful to humans or the environment should not be used, withdrawal periods must be applied to allow drug residues to be eliminated.
- Effectively apply disease quarantine procedures and monitor in order to bring large-scale epidemics under control. Emphasis should be placed on investigating disease epidemiology including season, area and condition in order to identify important factors and times. Quarantine measures should be established and their effectiveness monitored; and appropriate regulatory and institutional controls implemented.
- Develop and make use of biological products and techniques. Biological products include vaccines and toxoids, high-immune serum, interferon, antitoxins and other treatment products. Recent developments in these areas have great potential for aquaculture.

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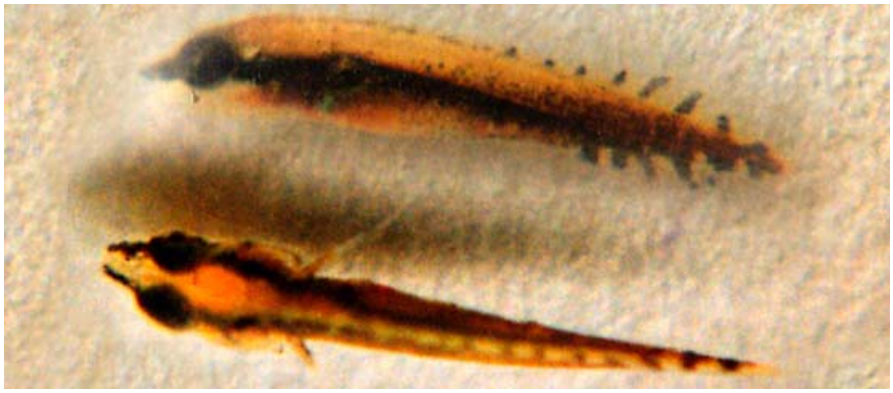

The 3 weeks old young fry of M.aculeatus

Captive breeding of *M.aculeatus*

Set	Size of Brood Fish	Water	Spawning	Survival
1.	Male: 17.5cm (15.4 g) 19.2 (17.0g) Female: 18.0cm (19.50g) 20.30cm (21.20g)	29.5^{0}C pH 7.9	Fertilization: 88% Hatching: 48% Incubation time: 30-33 hrs.	12 % (at 30 days)
2.	Male: 18.5cm (16.6g) 18.3cm (16.0g). Female: 20.0cm (20.90g) 19.10cm (19.50g)	29^{0}C pH: 8.2	Fertilization: 92% Hatching: 35% Incubation time: 36-38 hrs.	9 % (at 30 days)
3.	Male: 17.3 cm (10.60g) 16.50cm (8.0g) Female: 18.50cm (13.5g).	28.3^{0}C pH: 7.6	Fertilization: 85% Hatching:60% Incubation time: 40- 42 hrs.	14 % (at 30 days)

Fecundity and Gonado-somatic Index of *Macrognathus aculeatus*

Fish (g)	Ovary (g)	GSI ratio	Sample (g)	No.of eggs	Eggs/g fish
11.9	1.40	1:8.50	0.40	164	48
16.6	1.80	1:9.20	0.20	75	40
15.9	1.70	1:9.30	0.40	179	47
35.0	3.30	1:10.60	0.40	320	75
25.8	2.80	1:9.20	0.30	172	62
21.0	**2.20**	**1:9.36**	**0.34**	**182**	**54.40**