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Wallago attu (Freshwater shark) culture in pond: Prospects for farming in Manipur

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Wallago attu *(locally known as Sareng) is a highly valued culinary delicacy in Manipur, northeast India. In view of its cultural and economic relevance, this study focused on developing culture techniques and seed production protocols to support farming of this vulnerable species. Broodstock were raised in ponds (0.2–0.5 ha) at Laphupat Tera, Imphal, using wild-caught juveniles. To promote maturation, the brooders were fed with live carps and tilapia spawn and fry, achieving maturity within just over a year. Induced breeding of selected broodfish (average 5080 g for females and 1024 g for males) was successfully conducted using a synthetic hormone combination (sGnRH analogue + Domperidone) at dosages of 0.8 ml/kg for females and 0.4 ml/kg for males, which triggered spawning within 6–8 h. Fertilized eggs (1.8 ± 0.2 mm) hatched within 18–24 h at 26.2–26.8°C. Nursery rearing of the cannibalistic larvae, were fed with live zooplankton and carp spawn, resulted in fry attaining lengths of 3.8–5.42 cm and weights of 2.0–2.8 g within 15 days, with 65–70% survival. Grow-out trials in ponds (0.02–0.75 ha) showed that stocking 20-day-old fingerlings (100–120 mm) at 2000–3000/ha, with regular size segregation and feeding of live fish, allowed marketable harvest within 5 months. The findings highlight that periodic segregation of fry and fingerlings is essential to reduce cannibalism and ensure successful culture of this commercially important species, contributing to both aquaculture development and conservation.*

Keywords: Cannibalism, Commercial farming, Induced breeding, Synthetic hormone, Sareng

Wallago attu is a large freshwater catfish found in rivers, reservoirs and connected watersheds across the Indian subcontinent, including India, Pakistan, Bangladesh, Nepal, Burma, Sri Lanka, Thailand, Vietnam, Kampuchea and Indonesia. This bony fish is commonly known as freshwater shark, belonging to the family Siluridae, grows to about 2 m, weighing over 45 kg,with a calculated lifespan of about 10 years. Its rapid growth, majestically elongated and silvery body and highly nutritious flesh encourage investigation into its aquaculture potential. The present decline in yield from wild fisheries lists *W. attu* as an endangered species. It was assessed for the IUCN Red List of Threatened Species in 2019 and listed as Vulnerable under criterion A2d. Increased consumer demand is stimulating the development of intensive aquaculture for this species in Asian countries. Methods for induced spawning and successful hatching of eggs were successfully performed by various, however, a major constraint in successfully rearing *W. attu* larvae is the high mortality rate due to intense cannibalism during early life stages. Known as "Sareng" in Manipuri, *Wallago attu* is a highly preferred and royal delicacy. In Manipur, a grand feast is generally considered incomplete without Sareng. However, capturing Sareng in Manipur have virtually ceased and the population of this species has been drastically reduced. Consequently, a huge quantity of frozen Sareng is imported from other states. Very recently, the Chief Minister of Manipur declared the revival of Sareng in the state, the need of the hour. In this regard, the ICAR Research Complex for NEH Region, Manipur Centre, has worked closely with dedicated fish farmers to develop culture and seed production technologies of Sareng.

Wallago attu is a bottom feeder with nocturnal habits, feeding at night and exhibiting highly carnivorous behavior. In the wild, it feeds on fish such as *Channa* species, *Parambassis* species, other small fishes and


Brood fish selection for breeding


Injecting hormone


Examining of eggs

prawns. The feeding frequency in the adult stage is higher in all months except July and August. It has an enormous mouth and a deep fissure extends far behind its eyes. Jaw teeth are arranged in broad rows with two small patches of vomerine teeth. *Wallago attu* generally breeds in its natural habitat during the rainy season. Seeds are available from June to August in the rivers and tributaries of the Barak River at Jiribam and can be collected from breeding grounds.

Brood stock development

Wild *Wallago attu* specimens weighing 45.2±1.2 g were procured from the Borobekara River (24°37′57.1″N; 93°05′57.4″E) in 2022. They were stocked @2000/ha in a pond at Lafupat Tera, Imphal West district, Manipur (24°30′17.3″N; 93°52′30.7″E) on June 3, 2022. The fish were fed with spawn of common carp, Tilapia, *Labeogonius*, etc. @10–15 lakh every 10 days, followed by 10–15 lakh fries of carps and tilapia every 15–25 days.

Brood stock pond

The broodstock rearing unit is an essential component for the successful captive breeding of any fish species. The ideal pond size for rearing *W. attu* is between 0.2 and 0.5 ha with a water depth of 1.0–1.5 m. The adult fish prefer to eat live fish or aquatic organisms. Proper feeding is required for optimal growth and to maintain a healthy fish population, especially for brood fish. The fish were fed with live fish at 1.2–2% of their body weight per day. Live fish, including tilapia, grass carp, common carp and silver carp fingerlings, were added to the pond to ensure a steady food source. *W. attu* matured in 1+ years. Water quality was maintained at pH 7.0–7.5, dissolved oxygen 5.0–8.2 ppm and total alkalinity 72.5–89.2 ppm.

Selection of brooders

It usually breeds in June-August in the valley of Manipur. Efforts towards the induced breeding has been made by the ICAR Research Complex for NEH Region, Manipur Centre, Imphal. The fish were observed to be fully mature during the first half of July 2024, showing distinct secondary sexual characteristics in males and females. Ripe males and females can be easily distinguished: The male has an elongated and pointed genital papilla near the anus, while female has a spherical, tubular-shaped reddish vent. A swollen abdomen in the female indicates readiness to spawn. The maturity of the female can be examined by gently inserting a soft, flexible catheter into the vent.

Induced breeding

Synthetic hormones such as Ovatide, Ovaprim or Wova-FH can be used for induce breeding of *Wallago attu*. A fully mature pair comprising two males (average body weight 1024 g) and one female (5080 g) was selected from the rearing pond for induced breeding. The brood fish were acclimatized in a circular tank (10′ diameter, 1.2 m water depth) for 10 prior to hormonal injection. An injection of salmon gonadotropin-releasing hormone (sGnRH) analogue (20 mg) and Domperidone (10 mg) in propylene glycol IP was administered at 0.8 ml/kg body weight for the female and 0.4 ml for the males in the evening.

The injected fish were released into a circular spawning tank (10′ diameter, 1.2 m water depth) with a water flow rate of 2.5 L/sec. Spawning was observed 6–8 h after hormone injection at a water temperature of 26.5°C. Fertilized eggs were slightly yellowish-green, spherical, demersal and sticky while unfertilized eggs were paler and opaque.

Hatching operation

Fertilized eggs were transferred to a series of hatching trays. Water was dripped over the hatching trays from an overhead tank through a perforated PVC pipe. The fertilized eggs hatched 18–24 h post-fertilization at temperatures of 26.2–26.8°C. The freshly hatched larvae were slender, straight and transparent, gradually tapering towards the tail and measured 4.5 mm long and weighed 1.5 mg. They do not take exogenous food for about 12–24 h at 26°C. The yolk sac is fully absorbed on the 2nd day after hatching, by which time the hatchlings grow to 7.5–9.0 mm long. The spawn can be kept in the incubation unit until the yolk sac is absorbed and then shifted to separate tanks for nursery rearing.

Nursery rearing of *Wallago attu*

The early larval stages are the most critical and vulnerable in the life cycle of *Wallago attu*. Once the yolk sac is fully absorbed on the 2nd day after hatching, it is referred to as a post-larva. The post-larva starts feeding on exogenous food. The young fish begin

Wallago attu nursery

Wallago attu fry harvest for segregation

12 days old *W. attu*

feeding on minute zooplankton such as *Moina, Daphnia* and copepods. *Wallago attu* seed is generally classified into three categories: Spawn, fry and fingerling stages. For nurseries, small ponds of 0.02–0.10 hectare with a water depth of 1.0–1.2 m are ideal, while fry production can take place in larger areas up to 0.25 ha. The ideal stocking density in a nursery pond is 10–12 lakhs/ha. In nurseries, spawn is stocked after acclimation to the new environment, ideally in the morning or evening. At stocking, the water depth should be below 40 cm and can be increased after 4–5 days. A low initial water depth is beneficial for *W. attu* spawn. Plantain leaves can be placed on the water surface to protect the juvenile fish from predators like birds and intense sunlight. *W. attu* fries exhibit cannibalistic and highly predatory tendencies. Therefore, a plentiful food supply in the nursery is crucial.

Small fish, such as the spawn of carp, tilapia, and silver barb, are provided as feed. *Wallago attu* fry grows at an incredibly fast rate in the first 10–15 days under these conditions. Every seven to eight days, the fish are sorted and separated into groups of comparable size to avoid cannibalism. The fish reach a length of 3.8–5.42 cm and a weight of 2.0–2.8 g in 15 days, with a survival rate of 65–70%.

Water quality of nursery pond

They prefer naturally occurring plankton, which is promoted by pond fertilization. After removing unwanted predatory and weed fish, nursery ponds are limed according to soil pH. The ponds are then fertilized with chemical fertilizers and organic manures such as raw cow dung, chicken droppings or both. The most successful combination is 200 kg of poultry droppings, 750 kg of semi dry cow dung, 3–5 kg of urea and 2–3 kg of single superphosphate. A high manure dose should be avoided just before stocking. To improve water quality, Green AQ (Green Biotech Ecosolution) was also applied at 4 L/ha.

Wallago attu farming

Varying production levels have been achieved using packages of practices developed by the ICAR Research Complex for NEH Region, Manipur Centre, in collaboration with two progressive farmers. *Wallago attu* was cultivated in ponds ranging from 0.02–0.75 ha in area and 1.5–2.0 m in depth across different locations in the Manipur valley. The management techniques for *W. attu* culture can be broadly categorized into pre-stocking, stocking and post-stocking activities, involving biological and environmental modifications.

Ponds are cleaned, treated with lime, filled with fresh water, manured as needed and stocked with fish spawn prior to stocking *Wallago attu*. Fingerlings over 100 mm in size are recommended for stocking in grow-out culture ponds. *W. attu* is a cannibalistic bottom feeder that primarily preys on smaller fish. However, the urge to prey on other fish or engage in cannibalism is reduced when the stomach is full. Suitable, nourishing feed is required for complete growth and good survival rates in captivity. Effective feed management and stocking of equal-sized fish can mitigate cannibalism during the rearing phase. Fingerlings (100–120 mm or 20 days old) may be stocked at densities of 2000 per hectare for non-segregated rearing and 3000 per hectare for segregated rearing. Periodic segregation is advised for higher

20 days old fingerling

A harvest of *Wallago attu* seed for sale

Wallago attu seed harvest at S. Rohendro's Farm

stocking densities. Depending on the availability of fish seed, *W. attu* stocked in June, July and August can be harvested after 5 months of rearing, based on consumer demand.

SUMMARY

The study demonstrated that *Wallago attu* (Sareng), a culturally and economically significant fish in Manipur, which can be successfully bred and farmed under controlled conditions. The results highlighted the feasibility of captive broodstock development, induced breeding and seed production, which together provide a strong foundation for large-scale aquaculture of this vulnerable species. Despite challenges such as cannibalism during the early life stages, appropriate management practices such as regular size segregation, proper feeding and careful nursery and grow-out rearing proved effective in ensuring survival and growth. The successful outcomes not only open avenues for commercial farming but also contribute to the conservation and revival of this species in Manipur. It is recommended that wider adoption of these protocols by farmers, supported through training and extension works will enhance local production, reduce dependence on imports and help to safeguard the long-term sustainability of *W. attu* in its native waters.

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