

Semi-artificial seed production

technique of *Anabas testudineus* (kawai) in pond

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Anabas testudineus, also known as the climbing perch, is an important air-breathing freshwater species distributed throughout India and other South-Asian countries. It fetches good market value, especially in West Bengal, Assam, Tripura and Bihar, because it contains easily digestible fat, essential amino acids and minerals. It is considered to be one of the most potential species for aquaculture in India. Recently, its population has drastically reduced from the natural water bodies and become a threatened species. However, culture practices of this species are not much popularised in India because of lack of proper knowledge in breeding behaviour, the non-availability of the quality seed and grow-out technology. In this current study, semi-artificial (induce) breeding of *A. testudineus* was conducted for the mass seed production of this species in an earthen pond.

Keywords: Aquaculture, Induce breeding, Kawai, Seed production

Climbing perch, *Anabas testudineus* (Bloch), locally known as Koi or Kawai, is an important air-breathing freshwater species. It is mostly found in lakes, ponds, low lying swamps, paddy fields, canals and marshy lands, and even estuaries. It is a self-recruited species and prefers to live in stagnant water bodies. It can tolerate extremely unfavourable ecological conditions, due to hardy in nature and presence of accessory air-breathing organs. It contains a high amount of physiologically available iron and copper, which are essentially needed for haemoglobin synthesis. Furthermore, it is well known for its lean meat, which contains easily digestible fat with a low melting point and a high concentration of essential amino acids.

It is a highly-priced fish, especially in West Bengal, Assam, Tripura and Bihar, and fetches a good value in the Indian domestic market. Owing to high consumer demand and price, and its ability to survive out of the water for extended periods in moist conditions, *A. testudineus* is

being considered as one of the potential candidate species for aquaculture in India. Though it is self-recruited species, but in recent times its population has drastically reduced from the natural water bodies and become a threatened species. This is mainly because of the wanton destruction of habitat and ecosystem in most water bodies, indiscriminate harvesting, drying of the shallow marshy water bodies and the menace of pollution. Though this species has all the potential characteristics to be a candidate fish species for aquaculture, but culture practices of this species are not

much popularised owing to non-availability of the quality seed and grow-out technology. In contrast to the Indian major carps, where fish are bred in hatcheries and seeds are sold in the open market, there are no large-scale seed production centres for *Anabas*. Lack of proper knowledge in breeding behaviour and non-availability of quality brood-stock are the major constraints for the less availability of the *Anabas* seed. In this case, an attempt was made for mass production of *A. testudineus* utilizing sympathetic breeding behaviour in natural shallow ponds.



Anabas testudineus mature brood female



Anabas testudineus mature brood male



Anabas testudineus' seed produced through semi-artificial breeding

Brood-stock management

The institute maintains approximately 300 healthy *Anabas* brood-stock in an earthen brood-stock pond (40 m × 20 m) with a centrally deeper portion of 10 m × 5 m × 1.2 m depth. The whole area was covered with aquatic weeds and rice plants. A peripheral steep dyke (embankment) was created (0.5 m) and the whole area was further surrounded by a fine mesh plastic net to prevent fish escapement. In the pond, fish were fed daily with commercial feed (22% protein) and fertilization of the pond was done with cow dung (1000 kg/ha/month) on regular basis. The ratio of female and male was assumed to be 1:1 ratio. The water level in the breeding ground was maintained at 15–20 cm (deeper portion was about 1.0 m). Usually, fish were allowed to remain in the same area to facilitate natural breeding.

Brood-stock conditioning, breeding and fry collection

A. testudineus is bisexual and matures in 6 months. The fish naturally breeds once in a year but the breeding season varies from place to place. The breeding season for climbing perch starts in April and continues until late August, with a peak in May-June. The adults of *A. testudineus* are solitary and aggressive, and they can grow up to 50–60 g in a year. Maturity occurs at the age of 1 year when the fish reach a size of 10–12 cm in total length. During the breeding season, *A. testudineus* exhibits more

sexual dimorphism. So, during the monsoon season, around 20 mature brooders were taken from the brood-stock pond and kept separately in cement cisterns. Brood fishes were selected based on their secondary sexual character. In the breeding season, females have a ventrally located genital papilla with a bulging abdomen and mature females ooze out ova even at gentle pressure. Mature males are slenderous, and white milt oozes out upon gently pressing. Healthy brooders were fed daily with a supplementary pelleted feed (35% protein) @5% of the total biomass. After 15 days of brooder conditioning in August, a semi-artificial induce breeding of *A. testudineus* was attempted. *A. testudineus* brooders were injected (0.1 ml per fish) using an intramuscular injection of Ova-FH hormone which consist of synthetic gonadotropin-releasing hormone analogue (SGnRH), domperidone and glycerol (Biostadt India Ltd, Aurangabad, Maharashtra, India) and released again into the earthen brood-stock pond's deeper portion. The average male and female injected were 18.50±0.29 g and 19.5±0.45 g respectively. Feeding and water level were maintained throughout the period. Both unfertilized eggs and fertilized eggs were floating on the water's top, which is unusual for most freshwater fish species. The newly hatched larvae of *A. testudineus* were seen after 24–26 hours of hormone injection. After 50 days water was drained out from the earthen pond. The fry of climbing

perch was first collected by fined meshed net and subsequently by hand pick. More than 5000 numbers of *Anabas* fry (36.23±0.41 mm and 0.83±0.04 g) were collected from the breeding ground. Similar to the present observation first two months of rearing seeds were attained a size of 35 to 40 mm.

Nursery management for *A. testudineus* in pond system

Three-days-old seed from induced breeding tanks can also be raised in small earthen ponds (100 to 500 m² surface area) as well as cement cistern. However, ponds have to be fertilized before hand with agricultural lime (CaCO₃) subsequently with cattle manure/poultry manure to ensure enough zooplankton production so the young ones in the nursery tanks have natural food. Pond probiotics may be used at a rate of 30 g/100 m², along with equal molasses, for faster natural food production. In each



Mature *Anabas testudineus* collected from the natural brood-stock pond



Inducing hormone injecting to mature *Anabas testudineus*

nursery, the water depth should be maintained between 1–1½ feet. After 6–7 days of preparation, 4000–5000 spawns per square meter of water area can be stocked. In 10 days, the spawn will grow to a length of 1.5 cm. After 10 days, the fish should be supplemented with a formulated feed containing 35% protein and natural plankton and tubifex worm. One-month-old fish in the facilities attain a length of 4 cm and a weight of 3 to 4 g, resulting in a 40–50% survival rate. The survival rate of spawns can be enhanced by applying efficient and modern-day enclosed seed-rearing techniques, viz. an indoor intensive system. The month-old fish seeds can be sold out and transported for stocking in culture ponds of practising farmers.

Grow out culture

Climbing perch can be grown in earthen ponds of around 0.05 and 0.2 ha in size. However, this species can also be cultured in cement cisterns/tanks for grow-out production. In cement cistern the escape of fish could be reduced significantly. In cement cistern a 15–20 cm soil substrate is recommended for the health and growth of fish. The general pond preparation and fertilization are same as those generally followed for Indian major carp culture. Since climbing perch migrate from one pond to another during rainy seasons, it is better to use a straight pond dyke rather than more slope, to prevent fish escape. Plastic net fencing can also be made around the pond, which will also help the entry of predators inside

the pond. Moreover, this species frequently comes to the surface to gulp atmospheric oxygen, so bird fencing should be installed to prevent this. The optimal stocking density in fish pond varies from 5 to 6 individuals per square meter; however, the growth rate can be enhanced by decreasing the stocking density. In cement cistern, aquatic vegetation, such as water hyacinth and water lettuce (*Pistia*), can be grown to occupy 30 to 40% of the tank's water surface to replicate the fish's natural environment and stocking density of fingerling can be 65 to 70 individuals per square meter. The *Anabas* is an active feeder and dietary supplements of 3 to 5% of body weight of good quality feed are essential for optimal growth. The parameters of water quality should be monitored regularly both in the cement cistern as well as in tanks. In general fish reach a marketable size of around 50 to 60 g (in a year in the earthen pond) or



Fertilized egg and newly hatched larvae of *Anabas testudineus* under microscope

when they attain that size can be harvested by complete dewatering of the pond. Climbing perch can also be raised in net cages. Very high stocking density (around 500 number per cage) can be maintained when cultured in cages. Here also good quality supplementary feed has to be applied with better protein levels to achieve better growth and survival. The fish within the cage culture may reach to marketable size within 4–5 months.

SUMMARY

Climbing perch, *Anabas testudineus*, is an important air-breathing freshwater species. The species is considered as a valuable dietary item for sick and convalescents, as it contains a high amount of physiologically available minerals. Due to high prices and consumer demand the wanton harvest of this indigenous species is going on and slowly becoming less and less available in the market and water bodies. This is a hardy species can tolerate wide fluctuations in water quality parameters and hence, can be incorporated as an important species in the polyculture system. However, quality seed is the major problem. At ICAR Research Complex for Eastern Region, Patna we have innovated semi-artificial breeding technique and through this large-scale seed production can be possible. The standardization of this breeding method may be considered a milestone for the propagation of this species at farmers' fields. It is believed that the findings of this article would motivate fish breeders and farmers of all categories of fish species in aquaculture systems. Besides, the generation of seeds at farmers' farms, this technique will reduce reliance on seed supply. It is also stressed the need of a more systematic research programme on food and feeding habits, reproductive biology and habitat preference of this species which can lead to much improvement in the whole structure of this species.

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