

Culture of Hilsa (*Tenualosa ilisha*) with formulated feed in brackishwater pond at North-East coast of India



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ICAR-CIBA

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hours for the eggs to hatch out and hatchlings were reared in a controlled environment. Rearing trial at different salinity revealed that larval survival was better (53.33%) at 1.5 ppt salinity. It has been observed that the mouth of Hilsa larvae opens after 7-8 days of hatching and different digestive enzymes appear in the gut from 5th day. Hatchlings attain 1.13 g (52 mm) in two months in laboratory condition.

Future prospects and strategies

In the first rearing attempt of Hilsa in brackishwater pond by ICAR-CIBA, the fish attained more than 400 g in two and half years which is about 30 % less than that of the growth seen in nature. The species has potential as an aquaculture candidate in near future. Once these efforts to produce Hilsa brooders in captivity are successful, a new horizon would open up and pressure on natural stock of Hilsa will decline. The present effort may also lead to breeding of pond reared Hilsa followed by sea ranching to enhance natural stock. Once protocol for captive breeding is standardized, a flagship programme could be taken for selective breeding of Hilsa for faster growth in pond culture system, provided the life cycle gets closed.



Hilsa (*Tenualosa ilisha*) is associated with the culture and tradition of the Bengalis throughout the world. In spite of the huge demand, production of Hilsa is limited to around 72000 metric tons of which India produces only 15-20%. Most of the production comes from Bangladesh and Myanmar. Production of Hilsa is declining due to over exploitation and pollution in the natural environment. According to the scientific reports, Hilsa from wild are mostly captured before they attain first maturity and before they get a chance to breed even once. Hence conservation and management of the stock need immediate attention. Understanding this important issue Government of West Bengal has imposed a ban on marine fishing for two months during April-June and three weeks (5 days pre & post full moon) during September-October for conservation of Hilsa.

Indian Council of Agricultural Research (ICAR) has taken up a project entitled; Stock characterization, captive breeding, seed production and culture of Hilsa with financial support from National Agricultural Science Fund (NASF). ICAR-Central Institute of Brackishwater Aquaculture (CIBA) through its Kakdwip Research Centre (KRC) located in West Bengal is playing a pivotal role in standardization of protocol for rearing Hilsa in brackishwater pond and feed development. The results are encouraging.

Seed collection and Transportation

Hilsa fry captured in bag nets were collected and transported to the pond site immediately in oxygenated polybags or aluminium vessels fitted with aerators. Salinity was maintained as of source water from where seed/fry were collected. Supplementation of glucose @ 0.8 to 1 % (W/V) increases survival of fry during transportation. Packing and transportation trials showed that pond acclimatized hilsa kept in oxygenated polythene bags survived for

24 hours without any visible stress.

Preparation of Pond

To augment plankton bloom, manuring was done with urea (20 Kg/ha), SSP (20 Kg/ha), farm yard manure (2 t/ha) and mustard oil cake (200 kg/ha). Hydrated lime and dolomite were applied to maintain water quality. Paddle wheel aerators and centrifugal pumps were used to create water flow in the pond and to maintain desired oxygen concentration.

Livestock culture

Gut content analysis of hilsa of different size groups were carried out to understand the preferred food of the fish and it was found that copepods, rotifers, diatoms (i.e., *Pleurosigma* sp., *Coscinodiscus* sp.), algae (i.e., *Spyrogyra* sp., *Ulothrix* sp.) were some of the preferred food items for all growth stages of hilsa. Indoor experiments with live feed confirmed that mixed zooplankton consisting of copepod (*Apocyclops dengizycus*), rotifer (*Brachionus plicatilis*) and mysid (*Mysidae* sp.) resulted in higher growth and survival of hilsa fry. A live feed culture unit has been established for providing live feed to hilsa. Protocol for laboratory and mass culture of preferred live feeds like copepods, rotifer and microalgae has also been standardized.

Grow-out culture

Seeds were acclimatized with pond water for 1 to 1.5 hrs, to reduce the stress due to temperature and salinity change, and released in nursery rearing pond. Fry were reared for two months before stocking in grow-out culture pond. The fry were released in grow-out pond at a stocking density of 8800 nos/ha. Formulated feed along with live feeds like copepods, rotifer and microalgae produced at live feed unit at KRC were provided. Sampling was carried out monthly for monitoring growth and health. Hilsa fingerlings (1.37 g, 52.97 mm) attained 330-423 g (320-350 mm) in 31 months. Considerable gonadal development (up to stage - V condition in female and sperm development in male) has been

noticed in pond reared Hilsa after one year of culture. Scientists are putting concerted efforts for development of Hilsa broodstock in brackishwater ponds. Initially, transportation of live Hilsa fry/fingerlings from natural environment to pond and subsequent rearing was a big challenge. With the persistent efforts, it has now become possible to maintain live Hilsa in pond for long periods and even in fiber glass tanks for over 90 days without any mortality. This has enabled to study nutritional requirements of Hilsa and consequent feed development.

Hilsa feed development

Hilsa fingerlings were reared in Recirculatory Aquaculture System (RAS) where live feeds were gradually replaced by freeze-dried zooplankton powder and thereafter by floating pellets. Hilsa fingerlings were completely weaned to floating pellets within 45 days. Different wet lab trials have been carried out to find out protein and lipid requirement of Hilsa. Proximate composition, fatty acid profile and amino acid profile of hilsa muscle at different growth stages have been analysed. The results revealed that arginine, methionine and threonine content were significantly higher in muscle of hilsa fry compared to sub adult and adult hilsa. Level of poly-unsaturated fatty acids decrease and saturated fatty acids increase as the fish grows. All these observations were taken in to consideration in formulation of Hilsa feed. Formulated floating feed (crude protein 35%, lipid 12 %) is being fed at the rate of 2-5% of estimated fish biomass in pond culture.

Breeding of Hilsa

Breeding of Hilsa has been successful through dry stripping using naturally collected brooders from Hooghly River at Godakhali area of South 24 Parganas and fertilization was carried out on boat. Fertilized eggs were transported in oxygenated polythene bags to the laboratory and incubated at 23-25°C temperature. It took 17-24