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Jhora Fishery: Where Tradition Meets the Stream

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Introduction

Northern West Bengal is graced with numerous freshwater streams, locally known as "Jhora," a term derived from the Nepali language meaning "*spring water*" and "*jharna*" in Bengali. Fish raised in constructed tanks using water from the perennial springs of the mountains is known as Jhora fish farming. This coldwater aquaculture practice is exclusive to the snow-capped hills of the Darjeeling and Kalimpong districts of West Bengal in India. The cold temperate climate and year-round water availability in perennial Jhoras have fostered the cultivation of cold-tolerant exotic carps in this region. This is the first of its kind, traditional way of fish culture in India. A unit of Jhora pond is typically 1,500 square feet in size, with dimensions of 50 feet x 30 feet. The Jhora pond's depth ranges from 9.8 to 1.0 m, and its bottom outflow slopes at a rate of roughly 0.2%. Trees are generally not planted near embankments because their roots may allow water to seep through. Water flows gently and continuously through the perfect Jhora ponds. Culture of fish in hilly areas has been reported since time immemorial, though not on a commercial scale. In earlier times, people of the hills used to collect fingerlings from the rivers and streams and used to keep them in their backyard or kitchen pond as a hobby and for decorative purposes rather than for financial gains. The Department of Fisheries, Government of West Bengal, started popularising Jhora fisheries by employing scientific management procedures to meet the annual demand for fish for the highland people. In the Darjeeling district, the Jhora fishery was established in 1981-1982 as part of the Fish Farmers Development Agency (FFDA) Program.

Water Sources

The primary water sources of Jhora fishery are the perennial streams and rivers, which flow down the hills of Kalimpong and Darjeeling districts. Within every village,

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there lies a stream or Jhora, which is a tributary to some of the large rivers of the hills, like River Teesta, River Jaldhaka and River Rangpo.

Fish Varieties Raised

Fish species that can withstand cold temperatures are typically stocked and raised by taking advantage of the feeder Jhora's constant flow. This allows for the cultivation of fish throughout the year or for a portion of it with high stock biomass. The primary idea behind these units is to store Jhora (stream) water in a tiny ditch of any size by building a barricade from stone, sand, and soil to keep the water's dissolved oxygen level high (6-9 ppm). These bodies of water experience a broad spectrum of cold temperatures. Fishes that are commonly cultured include exotic species such as rainbow trout, brown trout, common carp, while the indigenous fish are: Mahseers (*Tor putitora* and *Tor tor*), and Schizotharacines (*Schizothoraichthys esocinus, Schizothorax richardsonii, S. niger* and *S. curvifrons*). Among these *Tor putitora, S. progastus* and *S. richardsonii* are preferred.

In India, the Jhora fishery is the first of its kind, which was introduced in the hills of Darjeeling, being a traditional way of fish culture in hilly cold-water streams, which are also used for irrigation. Since in Jhora ponds, water is continuously flowing, the problem of pollution and oxygen depletion seldom occurs, and only feed is required. ICAR-Directorate of Coldwater Fisheries Research (now called CICFR), Bhimtal, provides technical support for Jhora fish culture in the subdivisions of Kalimpong, Siliguri and Kurseong of West Bengal State. Chocolate mahseer and golden mahseer, have been attempted to grow and thrive well in pond conditions with the four artificial feeds developed by ICAR-DCFR. These species are also being propagated in “Jhora Fisheries Pond” in Kalimpong, West Bengal, along with grass carp for aquaculture production. However, the cultivation of fish in the Jhora has not been extensively researched, and stocking combinations and densities are often chosen on an ad-hoc basis. Most farmers tend to prefer monoculture when stocking indigenous fish species.

Site Selection

When choosing a location, topography, water supply, and soil quality are the primary factors to consider. A Jhora fishpond should be placed on level ground, or very close to it. The ideal location for Jhora ponds should have a modest, stable drainage system with little risk of flooding and landslides. Near a perennial Jhora or stream where water is directed into it is the ideal location for a Jhora pond. For dry conditions, alternative water supply arrangements should be made. In a Jhora pond, soil with a clayey-loamy texture is ideal for improved water

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retention since it is the most water-retentive, readily compacted, and leak-proof. The pond depth is very crucial, as extremely deep ponds can result in very low water temperatures, while very shallow ponds make fish more susceptible to predation. Additionally, the bottom of the pond should slope gently towards the outlet, typically at around 0.2%, to ensure proper water circulation and drainage.

Embankment

The embankment should be sturdy enough to remain stable in all types of weather and withstand intense precipitation without collapsing. The embankment's slope might be either 2:1 or 3:1. Trees should not be planted near embankments because their roots may allow water to seep in.

Types of Jhora Pond

Generally, four types of ponds are commonly found –

i. **All mud pond:** Where all the sides and bottom of the pond are made of mud.
ii. **Mud-bottom Pond:** These ponds have a muddy bottom, while the embankments on all four sides are made of concrete.
iii. **Concrete-bottom Pond:** All the sides are made of mud, but the bottom of the pond is made of concrete.
iv. **All concrete pond:** Where all the sides and bottom of the pond are built from concrete.

Stocking Density

The stocking density is usually about 15000–20000 fingerlings (6-8 cm) per ha, which is appropriate to increase the survival rate. Typically, the cultural period lasts from March to October. In regions with harsh winters, low temperatures below 6□C have a detrimental effect on growth. As a result, the stocking time must be modified to exclude the winter months, which are considered less temperate, from the culture period.

Post Stocking Management

Even after fertilization and manuring, the amount of natural food organisms in the fish culture ponds cannot be kept at the necessary level. Therefore, supplementing with diets that are higher in protein is essential for healthy fish growth; supplemental feeding with feeds enhanced with protein, carbohydrates, etc., is crucial. A nutrient-dense blend of supplemental feed with a higher growth rate and FCR that contains 25–30% protein and 30–40%

carbohydrates with a dietary energy level of 3.5-4 Kcal/g is appropriate. Other factors that influence the effectiveness of a diet include acceptability, digestibility, absorption, and

conversion efficiency. In the case of grass carp, it is generally fed with squash leaves and halhalla (a local herb – *Erchities valerio folia*), which is found in every household.

Feeding Management

In the Jhora fishery, there is a predominant focus on supplementary feeding rather than pond manuring, as commonly practised in traditional aquaculture setups. This supplementary feeding regime involves the utilisation of inexpensive and readily available waste products, such as slaughterhouse waste and grain waste. A feeding rate of 2-3 per cent of the body weight is recommended starting from the second day of stocking.

Harvesting

The fish are harvested at the end of October, after an 8-month culture period, because their growth is slowed during the winter months of November through February. Following nine to ten months of overseeing the cultural operation, table fishes weighing between 300 and 450 kg, which is regarded as relatively high in hilly settings, were gathered from each pond. The State Fisheries Department began to widely support this type of aquaculture system as a result of these positive outcomes. The recipients receive 50% financial help from the government.

Instead of draining the pond's water, fish are netted out during this type of harvesting.

Common Diseases of Fishes In Jhora Ponds

Fish from uplands exhibit signs of several diseases that fall into the following categories: viral diseases such as viral hemorrhagic septicemia (VHS) and infectious pancreatic necrosis (IPN); bacterial diseases such as columnaris, fin rot, furunculosis, and vibriosis; parasitic diseases such as ichthyophthiriasis, whirling disease, costiasis; and nutritional disorders.

Challenges

The primary obstacles encountered by Jhora farmers in the Darjeeling region include a lack of access to quality feed and seeds. Insufficient hatcheries in the area compel farmers to procure fish seeds from neighbouring districts like Jalpaiguri. Additionally, farmers lack modern knowledge and techniques in fish farming, leading to issues such as water seepage, maintenance difficulties, and high mortality rates. Transportation challenges, inadequate marketing facilities, and an erratic power supply further exacerbate infrastructural constraints. Predation by birds, snakes, and other animals poses a significant threat to small fish in Jhora ponds.

Government Support

The Department of Fisheries, Aquaculture, Aquatic Resources, and Fishing Harbour,

Government of West Bengal, now extends support in terms of providing fingerlings and fish feed. Furthermore, the Government of India has integrated the Jhora fisheries of the hill districts of West Bengal into the Blue Revolution scheme (2016) under the Central Sector Scheme on integrated development and management of fisheries, which is now part of the larger framework for fisheries development under PMMSY. A novel approach termed the 'Kalimpong model' emerged to mitigate fish mortality in Jhora farming. This model involved the construction of poly tank-houses made of iron bars and blue polythene sheets, housing PVC tanks within, which proved resilient.

Conclusion

The Jhora fishery, unique to the cold-water hilly terrain, stands as a pioneering endeavour in India's fisheries landscape. In conclusion, the Jhora fishery is more than just a source of food; it's the economic lifeline for countless families in the region. By embracing traditional methods and sustainable practices, the community has not only managed to preserve their ancestral way of life but has also built a resilient and profitable industry. The success of the Jhora fishery serves as a powerful example of how local knowledge, when combined with a deep respect for nature, can lead to both prosperity and environmental stewardship.

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