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Management of Reservoirs in a Legally Plural Scenario

Thankam Theresa Paul*, Tanuja Abdulla and Deepa Sudheesan

ICAR-Central Inland Fisheries Research Institute, Kochi, Kerala (682 018), India

Corresponding Author

Thankam Theresa Paul

✉: thankamtheresa@gmail.com

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Abstract

Kerala, despite being a maritime state, possesses 31 reservoirs covering 29,635 ha that remain under-utilized for fisheries. The state has a per-capita fish consumption of 27 kg and 80% of its population depends on fish for their protein requirements. The state's marine catch of 5.81 lakh tonnes remains insufficient to meet their dietary requirements and hence there is a huge scope for harnessing reservoir resources. Reservoir fisheries in Kerala are marked by legal pluralism involving departments of Forest, Irrigation, Tourism, Water Authority and Fisheries. Fisheries of a reservoir are influenced by two dimensions: (i) indigenous fish diversity, which ensures ecological resilience and (ii) production derived from stocking, which supports livelihoods. A differential management scheme is presented in this article to tackle the legally pluralistic scenario in Kerala reservoirs. Sustainable development requires science-based management, improved monitoring, expansion of cage culture, participatory governance and conservation of native species. These management schemes ensure Kerala's substantial reservoir potential for supporting fisher livelihoods.

Keywords: Indigenous fish diversity, Kerala, Reservoir fisheries, Sustainable fisheries management

Introduction

Rivers, lakes, ponds and reservoirs are the major inland fishery resources of India. Of these the fishery potential of reservoirs has been recognised only two decades ago. Various enhancement strategies has increased India's inland fisheries production from 0.22 million tonnes in 1951-52 to 13.91 million tonnes in 2024-25, of which 0.98 million tonnes came from the inland capture sector.

Although Kerala is primarily a maritime state, it possesses considerable under-utilized inland resources, particularly reservoirs, which present a large opportunity for boosting inland fisheries. Kerala's per-capita fish consumption is 27 kg and about 80% of its 27.84 million people regularly consume fish. Yet, the state's annual marine catch of 5.81 lakh tonnes is insufficient to meet this demand. The increasing gap between demand and supply, along with the lack of alternative fish production systems, led to consideration of rivers and later shifted focus to reservoirs due to environmental degradation in rivers. In 1992-93, the average fish productivity in Kerala's reservoirs was estimated at 23.38 kg $ha^{-1}year^{-1}$. To exploit this untapped resource, the state initiated several reservoir-based enhancement programs, such as stocking fingerlings and selecting high-yield species. The state's reservoir resource area is about 29,635 hectares, contributed by 30 reservoirs, of which 21 are small, 8 are medium and one large reservoir. Idukki is the only large reservoir.

Status of Reservoir Fisheries in Kerala Reservoir

Fisheries in Kerala originally developed primarily to support relocated tribal communities whose livelihoods had been disrupted by the submergence of their forest homes. With government backing, these tribal groups formed cooperative societies that were granted user rights and fishing privileges in the state's reservoirs. Since most of Kerala's reservoirs lie within the Western Ghats biosphere, all related activities fall under the supervision of the Forest Department. Meanwhile, several government departments, including Public Works, Drinking Water Supply, Irrigation and Hydroelectric, play a dominant role in decision-making regarding reservoir management, often marginalizing the reservoir fishers, who are the primary stakeholders. This dynamic of legal pluralism is detailed in Albin Albert *et al.* (2021).

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This system of legal pluralism has adversely affected both the cooperatives and the livelihoods of the reservoir fishers. In Kerala, about 14 reservoirs are extensively used for culture-based fisheries. The Forest Department and the Fisheries Department are the key involvers in managing biotic aspects of reservoir fisheries. A preliminary survey indicated that around 17 reservoirs are managed by the Irrigation Department, 11 by Hydro-Electric Power, 13 by the Forest Department, 6 reservoirs by the Water Authority, 19 reservoirs by tourism and 13 reservoirs by the Fisheries Department.

Dimensions of Reservoir Fisheries

Reservoir fisheries have three dimensions in present scenario. Fisher livelihood in a reservoir depends critically on both fish diversity and fish production. In this study, we conceptualize diversity primarily as a function of the indigenous fish stocks naturally present in the reservoir, while production is largely driven by the stocks that are deliberately stocked (*i.e.*, fingerlings or hatchery-reared fish introduced for culture-based fisheries) (Figure 1).

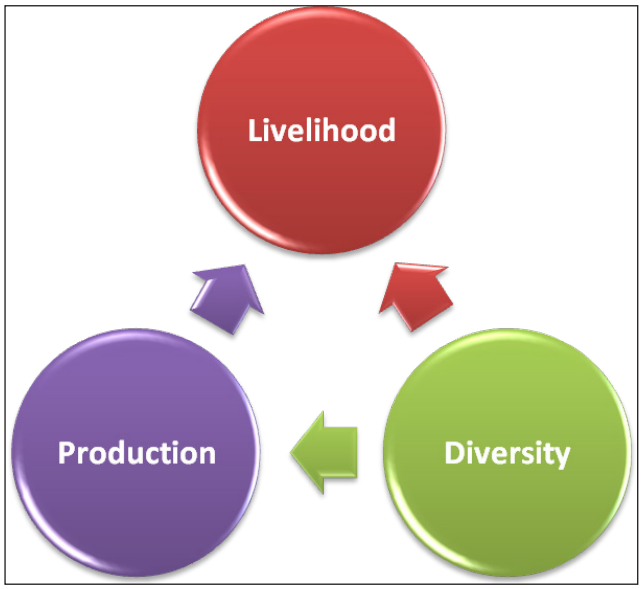

Figure 1: Dimensions of reservoir fisheries

The indigenous fishery contributes to ecological stability and supports more sustainable ecosystem function. These native species often form an important part of local fishers' diets, social identity and traditional livelihoods of reservoirs. Fish production is an enhancement strategy used by fisheries managers to increase yield and thereby improve the incomes of fishers. Culture-based fisheries (CBF) programs introduce species like Indian major carps at scientifically determined stocking densities to augment natural fish production.

Species stocked in reservoirs compete with indigenous fishes and reduce the native diversity over time. Therefore, we have to consider both diversity and production for assessing the reservoir- based livelihood of fishers. A balanced strategy that supports indigenous fisheries and stocked fish is the need for reservoir fisheries.

Characteristics of Reservoirs under Legal Plural Scenario

A matrix has been prepared to understand fishery scenario in reservoirs supported by stocking and diversity alone.

Fishery Scenarios

Reservoirs differ in their management priorities, depending on whether diversity or production (or both) are prioritised (Figure 2).

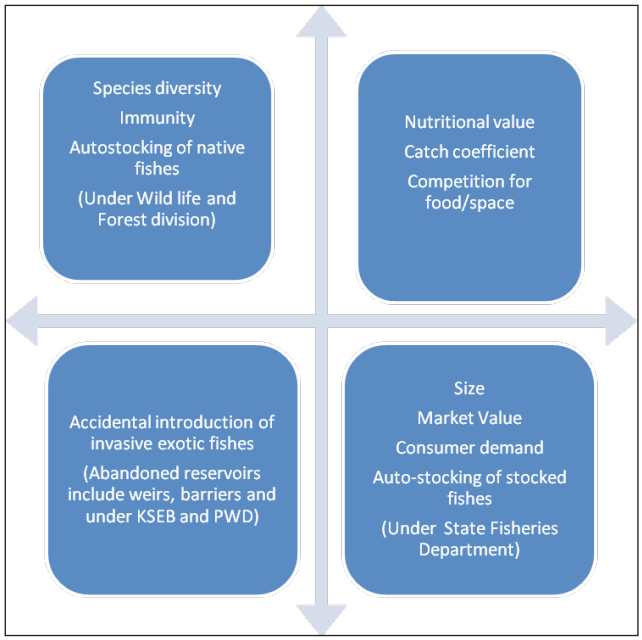

Figure 2: Management priorities in Kerala reservoir

Scenario 1: In reservoirs where both diversity and production are equally important, the high catch coefficient and rich nutritional value of the fish can be considered characteristic of the reservoir fisheries.

Scenario 2: In reservoirs, managed by the forest department, diversity is a priority and production is less emphasized. Here, the species richness is high and fish tend to be disease-resistant wild stocks. Such reservoirs are usually stocked by auto-stocking or by breeding of indigenous species (Albin Albert *et al.*, 2021).

Scenario 3: Some reservoirs are managed with production as the main priority, with less concern for diversity. Such reservoirs are managed by the state fisheries department. The stocking strategy, focusing on fast-growing or high-value species and ensures a relatively uniform catch size (often using gillnets). These stocked fishes typically fetch high market prices and consumer demand is strong. *E.g.*: stocking of Tilapia in reservoirs (Albin Albert *et al.*, 2021).

Scenario 4: There are reservoirs where production is not prioritized at all and diversity is adversely affected, these include abandoned reservoirs or those with accidental introductions of exotic invasive fish species, such as in neglected weirs or barrier-impounded waters.

Strategies to Improve Fishery in Four Different Scenarios Considering the Prospects

Following figure 2, different fishery management strategies adopted for each fishery scenarios based on the relative emphasis on diversity and production are discussed below.

1. High Diversity - High Production (Scenario 1)

Strategy: Stocking of Stunted Fishes in Cages

This represents an integrative model where both ecological diversity and production enhancement are targeted. Stunted fingerlings (often carps grown under controlled density to induce stunting) are introduced into cages to achieve rapid growth when released later. Since cage culture is contained, it minimizes ecological disturbance while increasing output.

Benefits:

- High yield without compromising diversity.
- Allows controlled feeding and growth.
- Ideal for reservoirs within sensitive ecosystem.

Challenges:

- Requires investment in cages and feed.
- Needs regular monitoring.

2. High Diversity - Low Production (Scenario 2)

Strategy: Auto-Stocking of Natives and Stocking Hatchery-Bred Indigenous Fishes

This scenario prioritizes conservation of native fish diversity over maximizing fish production. Reservoirs under this management scenario rely on natural recruitment (auto-stocking) of indigenous species from upstream rivers. Supplementary stocking is done only using hatchery-bred indigenous species to enhance natural populations.

Benefits:

- Maintains ecological integrity.
- Protects native fish fauna.

Challenges:

- Lower short-term yields.
- Less economic return for fishers.

3. Low Diversity - High Production (Scenario 3)

Strategy: IMC and Tilapia in Biosecurity can be Stocked

These reservoirs increase fish production by stocking fishes such as Indian Major Carps (IMC) and tilapia under biosecurity measures. This strategy prioritizes economic yield and not biodiversity of the reservoir.

Benefits:

- High fish production.
- Strong market demand for stocked species.
- Economic benefits for cooperatives and fishers.

Risks:

- Tilapia can become invasive if biosecurity fails.
- Reduction in native biodiversity.
- Ecosystem changes due to competition and habitat alteration.

4. Low Diversity - Low Production (Scenario 4)

Strategy: Removal of Species by Uninhibited Fishing by Locals

This scenario is used for unmanaged fishery reservoirs. Overfishing by local communities with no restrictions leads to the decline of native species and low overall productivity.

Characteristics:

- Declining diversity due to unregulated fishing pressure.
- Reduced catch rates.
- Possible dominance of unwanted or invasive fish.

Consequences:

- Ecological imbalance.
- Poor livelihood support.
- Hard to revive without intervention.

Conclusion

The study indicates the need to balance indigenous biodiversity with enhanced fish production through stocking and responsible practices. Strategies such as cage-culture, biosecurity measures and regulating fishing activities are essential for diversity conservation and livelihood security.

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References

Albin Albert, C., Paul, T.T., Das, V.G., Manoharan, S., Sudheesan, D., Meharoof, M., Das, B.K., 2021. Reservoir Fisheries in Kerala - An unmined resource. *Biotica Research Today* 3(3), 176-180.