Biotica Research Today

Vol 3:3 176/180

2021

Reservoir Fisheries in Kerala - An Unmined Resource

Albin Albert C.[1], Thankam Theresa Paul[1*], Vandana Gokul Das[1], S. Manoharan[1], Deepa Sudheesan[1], Mohammed Meharoof[3] and B. K. Das[2]

[1]ICAR- Central Inland Fisheries Research Institute, Research Centre, Kochi, Kerala (682 018), India

[2]ICAR- Central Inland Fisheries Research Institute, Kolkata, West Bengal (700 120), India

[3]ICAR- Central Institute of Fisheries Education, Mumbai, Maharashtra (400 061), India

Open Access

Corresponding Author

Thankam Theresa Paul

e-mail: thankamtheresa@gmail.com

Keywords

Fisheries, Kerala, Legal Pluralism, Reservoirs

Article History

Received in 19th March 2021

Received in revised form 22nd March 2021

Accepted in final form 23rd March 2021

E-mail: *bioticapublications@gmail.com*

How to cite this article?

Albert *et al.*, 2021. Reservoir Fisheries in Kerala - An Unmined Resource. Biotica Research Today 3(3): 176-180.

Abstract

Reservoirs in Kerala with a combined area of 29,635 ha were primarily built for irrigation, power generation and water supply. The fishery potential of the reservoirs have somewhat remained under-utilized to an extent due to the legal pluralism associated with it. So far, only few of the reservoirs are regularly stocked and managed, based on the Culture-based Fishery strategy. However the use of enclosed culture practices such as cage and pen culture as well as making use of the three prong strategy can be made use to realize the unmined potential of Kerala reservoirs.

Introduction

Reservoirs, huge sleeping giants in a fisheries perspective were primarily built for irrigation, water supply, power generation and flood control. The fisheries potential in the reservoirs were only realized in the earlier 50's. Reservoirs as an alternate potential fish production centre were realized by Kerala only recently. The reservoir resource of the state with a combined capacity of 29,635 ha is mainly contributed by 31 reservoirs out of which 21 are small and 9 are medium reservoirs. Idukki is the only large reservoir of the state.

Status of Reservoir Fisheries in Kerala

Reservoir fisheries in Kerala originated basically as a means to support the relocated tribal people who had a living associated with submerged forest regions. The relocated tribes with the support of state government formed fishery cooperatives which were given users and fishing rights to operate in Kerala reservoirs. Most of the reservoirs in Kerala are encompassed in the Western Ghats biosphere where any activity related to reservoirs comes under the surveillance of the forest department. Further, governmental departments such as Public works department, Drinking and water supply department, Irrigation department and Hydro-electric department have a prominent role in decision making of reservoirs which play down the role of primary stakeholder mainly the fishers associated with reservoirs. The influence of legal pluralism in Kerala reservoirs is explained in Table 1. This system of legal pluralism affected the existence of fishery Cooperatives and the livelihood of fishers in most reservoirs.

In Kerala, nearly 14 reservoirs are utilized for culture based fisheries in a major way. This is enlisted in Table 2.

Species for Reservoir Fisheries

The species commonly preferred for stocking in the reservoirs include high yielding native herbivores, planktivorous fishes such as Indian major Carps

Table 1: Important reservoirs of Kerala with status of fisheries and role of other departments

Reservoir	River Basin	Stake holders involved	Location (District)	Area (Ha)	Type of reservoir
Anayirankal	Periyar	F, I, H, For, D	Idukki	433	S
Aruvikkara	Karamana	Tou, I, D, F	Thiruvananthapuram	258	S
Bhoothathankettu	Periyar	Tou, I, F	Idukki	608	S
Chulliar	Bharathapuzha	F, For, I, Tou	Palakkad	159	S
Idukki	Periyar	F, H, T, I, For	Idukki	6160	L
Kakki	Pamba	Tou, H, I	Pathanamthitta	1800	M
Kallada	Kallada	Tou, H, I	Kollam	2590	M
Kanjirampuzha	Bharathapuzha	F, I, For, Tou	Palakkad	512	S
Karapuzha	Karapuzha	F, I, Tou, For	Wayanad	855	S
Kundala	Periyar	H, Tou	Idukki	230	S
Kuttiyadi	Kuttiyadi	I, Tou, For, H, F	Kozhikode	1052	M
Maduppatty	Periyar	H, For, Tou	Idukki	324	S
Malampuzha	Bharthapuzha	F, Tou, I, D	Palakkad	2313	M
Manglam	Bharthapuzha	F, I, Tou, For	Palakkad	393	S
Meenkara	Bharthapuzha	F, I, Tou, For	Palakkad	259	S
Nerimangalam	Periyar	H, Tou	Idukki	413	S
Neyyar	Neyyar	F, I, For, Tou	Thiruvananthapuram	1500	M
Pamba	Pamba	H, Tou	Pathanamthitta	570	S
Parambikulam	Bharthapuzha	I, Tou, For	Palakkad	2092	M
Pazhassi	Periyar	I, D, F, For	Kannur	648	S
Peechi	Karuvannoor	F, Tou	Thrissur	1263	M
Peppara	Vamanapuram	D, For	Thiruvananthapuram	582	M
Peringalkuthu	Chalakkudi	I, For, H, Tou	Thrissur	263	S
Periyar Lake	Periyar	For, Tou	Idukki	2890	M
Ponmudi	Periyar	Tou, H, I, D	Idukki	260	S
Pothundy	Bharthapuzha	F, Tou, I, D	Palakkad	363	S
Sengulam	Periyar	Tou, I, H	Idukki	33	S
Sholayar	Chalakkudi	For, H	Thrissur	870	S
Thunakadavu	Bharthapuzha	F, I, For	Palakkad	283	S
Vazhani	Keecheri	F, I, Tou	Thrissur	255	S
Walayar	Bharthapuzha	F, I, D	Palakkad	259	S
		Total		**29635**	

[H - Hydelpower, Tou - Tourism, F- Fishery, For - Forest, I - Irrigation, D – Drinking water]

(*Catla catla, Labeo rohita*), *Puntius pulchellus*, *Horabagrus brachysoma*, *etc*. Tilapia was clandestinely introduced into the reservoirs of Kerala although not officially stocked by the state fisheries department. Stocking of genetically modified variants of Tilapia was recommended by NFDB in (2016), but the recommendations were not enforced by the Kerala government.

Production Details from Reservoir Fisheries

The yield from Kerala reservoirs has been estimated as a meagre 2.22 tonnes for the year 2016-17 (DOF, 2017) compared to the estimated potential of 384 tonnes per year during the Indo-German Reservoir Development Project

Table 2: Regularly stocked reservoirs in Kerala

District	Reservoir	District	Reservoir
Palakkad	Pothundy	Thrissur	Peechi
	Mangalam		Vazhani
	Meenkara	Idukki	Mullaperiyar (Thekkady)
	Malampuzha		Idukki Reservoir (Kulamavu area)
	Kanjirappuzha	Wayanad	Karappuzha
	Chulliyar	Thrissur	Peechi
	Walayar		Vazhani

(Source: Department of Fisheries)

(Sugunan *et al.*, 1997). The average yield from the small reservoirs of Kerala is estimated as 53.50 $Kg^{-1}ha$ compared to the 4.80 $Kg^{-1}ha$ of medium reservoirs (DOF, 2017; Sugunan *et al.*, 1997). However the production from Kerala reservoirs is much below the national average of 250 $Kg^{-1}ha$. This indicates a need for increasing the production from these reservoirs to meet the increasing demand for fish for consumption for the state. Culture based fisheries (CBF) may be considered as a suitable method for enhancing fisheries from reservoirs.

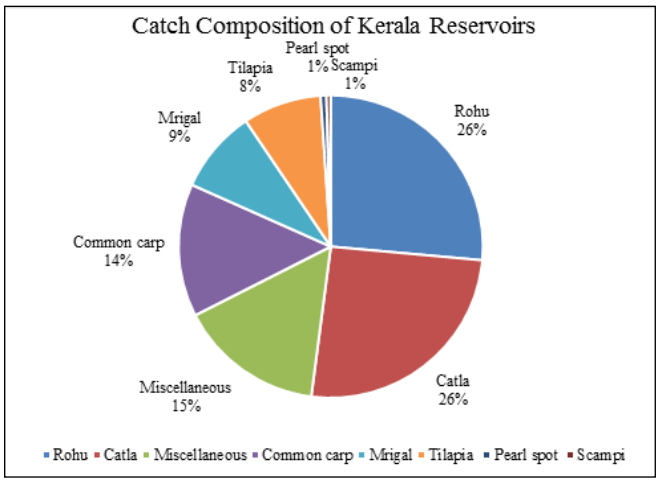

Figure 1: Catch composition of Kerala reservoirs

Catch statistics of Kerala reservoir indicate that IMC (Catla, Rohu and Mrigal) contributed to nearly 61% followed by Common carp (14%). Tilapias were also a sizable contribution to the catch from the reservoirs (DOF, 2017).

The fishery of the reservoirs are contributed by *Gibelion catla* (Catla), *Labeo rohita* (Rohu), *Cirrhinus mrigala* (Mrigal), *Ctenopharyngodon idella* (Grass carp), *Cyprinus carpio* (Common carp), *Oreochromis mossambicus* (Tilapia), *Etroplus suratensis* (Karimeen), *Hypselobarbus* sp. (Kurali), *Mastacembelus armatus* (Aral), *Labeo dussumieri* (Pullan), *Systomus sarana* (Mundathi), *clarias dussumieri* (Mushi), *Wallago attu* (Aattuwala), *Ompok bimaculatus* (Thonniwala), *Channa diplogramma* (Vakavaral), *Dawkinsia filamentosa* (Poovali), *Sperata seenghala* (River catfish) and Prawn *Macrobrachium rosenbergii* (Aattukonju).

Culture Based Fisheries (CBF)

CBF is the main strategy adopted and promoted as a sustainable fishery enhancement strategy for reservoir fisheries. CBF includes pen and cage culture techniques and species specific enhancement programmes. Pen culture using CIFRI HDPE pens have been found successful in Kerala in Vazhani reservoir for raising fish fry to fingerlings for stocking. Pen culture in the reservoir ensures the high survival of fish seeds which will be later released into the fishery for fishery enhancement.

Cage culture activities are also taken up in Malampuzha and Pazhassi reservoirs of Kerala on a participatory management basis. Cage culture is appropriate for a wide range of inland freshwater systems particularly reservoirs of Kerala due to their signature steep profile, small area along with the faster water usage rate and multiple user status. The minimal polluting nature of the reservoirs makes it ideal for maintaining the ecological health of the reservoir.

Major Hindrances in Reservoir Fisheries in Kerala

Mismanagement of Reservoir Stocking

Fish stocking has been proven one of the most successful methods of managing the fisheries of the reservoirs. The reservoirs in Kerala are stocked with native species which can effectively utilize the ecological niche of the reservoirs. Despite the several efforts by the state and the central government and projects like Indo-German Reservoir Development Project, the reservoir fishery of the state has remained in an infant stage, mostly under-utilized due to the many constraints which include multiple user rights surrounding the resources.

Legal Pluralism-Many Stakeholders

The majority of the reservoirs of the state are multi-purpose which are controlled by multiple stakeholders such as KSEBL (a public sector power generation company), Kerala Water Authority (KWA), Kerala water resource department, Irrigation department, Forest department and Fisheries department. The state fisheries department lacks proper mandate or technical expertise for the proper management of reservoir fisheries in the initial phase of introducing stocking in reservoirs negatively impacted reservoir fisheries in the state.

Political Influence on Cooperative Society

Reservoir fisheries is managed and practiced under SC/ST fishermen cooperatives in Kerala state so as to support scheduled castes (SC) and scheduled tribes (ST) living

around the reservoir area who were primarily agricultural labourers and minor forest produce collectors and who were drawn into the reservoir fisheries due to the availability of fishery resources. The current cooperative society ensures that the organized fishermen carry out fishing operations "legally" where in the inputs such as gears and crafts are contributed by the government on behalf of the SC/ST fishermen. However, the politicalization of the cooperatives has stalled the development activities in the reservoirs one way or another due to the political interests and severe factionalization in the cooperative societies.

Lack of Fishing Inventories

The fishery cooperatives have purchased inventories such as coracles and dug-out canoes for fishers along with fishing gears such as gillnet of appropriate mesh sizes in order to ensure a sustainable fishery from reservoirs during the initial days of IGDP. Later on, in order to ensure economic cooperation among the fishers, which was a requisite for fisher's cooperatives, the societies contributed to only half of the fishing expenses incurred by the members. The current scenario of lack of fishing inventories in the reservoirs forced the fishermen to adapt to inventory sharing mechanisms.

Unscientific Management Practices

The unavailability of reliable and accurate catch statistics and yield estimates in reservoirs is a major constraint for scientific management strategies for Indian reservoirs. The poor data management of reservoir fisheries may be attributed to legal pluralism, ineffective cooperative setups and lack of trained manpower for scientific collection of catch data. Physical condition of reservoirs (frequent sedimentation), climatic interferences (low rainfall) and bio-environmental constraints such as eutrophication, degradation of water quality and decline in indigenous catches affect the fishery productivity were not assessed scientifically in the state, which caused the under utilization of reservoirs of Kerala.

Future for Reservoir Fisheries

The marine capture fisheries in the state have been stagnating since the 1980's. With the revised potential from the inland waters, the scope for enhanced fish production to meet the demands of the fish eating population of the state lies in sustainable improved reservoir fisheries. With the new pandemic situation and the rising food security concerns the government has announced 'Subiksha Keralam" which plans to increase the food production of the state with special focus on reservoir based fisheries. The development of the reservoirs in turn means the development of the Tribal community living in and around the reservoirs.

Implementation of Location Specific Conservation and Recreational Programmes

In reservoirs, location-based management systems may be implemented to classify and protect the breeding and nursery grounds of indigenous species. Most of the reservoir fish have their nursery grounds near the lotic region, which is an ecotone in reservoirs between riverine and lacustrine areas. Several diversity studies have shown maximum diversity towards the lotic zone, suggesting the need for these areas to be protected. Reservoirs offer huge potential for sport fishing and tourism growth in Kerala. The recent boom in the rise of sport fishing activities has to be addressed in a manner with regulations and guidelines that can be used to provide employment to the tribal youth.

Utilization of Reservoirs for Intensive Fishery Enhancement Schemes

Reservoirs with surplus water level all around the year can be taken up for intensive fishery enhancement schemes. Cage culture practices in such reservoirs can be taken up with the help of co-operatives societies and sufficient technical help from the research organizations along with the subsidies from the state department. A strategy to develop an intensive culture of high-valued fish using the discharged water below reservoir dams needs to be explored.

Development of Markets for Reservoir Fisheries

Reservoir fisheries in coordination with marine trawl ban will ensure a better opportunity for expanding the marketability of the reservoir fishes. The reservoirs can be stocked in such a way that the fishery will overlap with the monsoon trawl ban ensuring fish availability even during monsoon season across the state. Fair pricing in reservoir fisheries should be the buzz word in reservoir fisheries. Opening up of new kiosks and fish stalls exclusively for reservoir fisheries would ensure economic efficiency from reservoir fishery. Staggered harvesting in reservoirs would ensure sustained supply of fishes and thereby a sustained income for fishers. Linkages of reservoir based fish production centers with Self Help Groups (SHGs), state based line departments, financial institutions, credit and insurance providers, service sectors, fish vendors, wholesale dealers and National and state level fishery funding organizations would ensure smooth functioning of the fisheries.

Inter-Institutional Coordination Units for Resolving Legal Pluralism

An inter-institutional agreement to coordinate the production of reservoir fisheries with the other partners concerned will ensure better cooperation between the interests of various stakeholders and further an easy and productive management of reservoir fisheries.

Revision of Licensing System in Reservoirs

The State Fisheries Departments currently offer fishing rights to individual fishermen. A separate licensing scheme shall be implemented including the segregation of reservoirs for fishery enhancement and conservation programmes. Reservoirs taken up under conservation programs may be tied to licensing schemes structured on

quotas. Licenses can be advocated for reservoirs under fishing enhancement schemes if fishermen or cooperatives adopt good fishing practices.

Promotion of Focused Research

The lack of quality research and data in the reservoir fisheries management is crippling the further development of the resources. Research organizations should focus their research themes on finding relation between different fisheries production modes and environment. New techniques for improving ecological and economic benefit of reservoir fisheries should be strengthened. Scientific management of such segregated reservoirs would ensure high fish yields without deteriorated water quality and proper conduct of other functions of the reservoirs. Research should focus on species other than conventional Indian Major Carps which have similar feeding regimes. Introduction of indigenous species to reservoirs should be carried out post environmental assessment study to improve the species structure and fisheries efficiency.

Three Pronged Strategy for Fishery Enhancement

Three pronged strategy supported and adopted by ICAR-CIFRI for the development of the reservoir fishery consists of information dissemination, input and infrastructure development. This strategy helped to address the inability of poor fishermen in purchasing the inputs for CBF such as seed, feed, crafts, gears and medicines for efficient exploitation of resources. The optimum fishing effort required in a particular reservoir has to be estimated for the effective utilization of the resource, further which the fishing effort can be raised to the optimum effort for utilizing the maximum potential of the reservoirs. With the advent of ICT, the information dissemination has not been a cumbersome process. This strategy ensures spread of information to the fishers in all possible means. Development of infrastructure includes provisions for cage and pen culture and market structures. This holistic approach of reservoir fisheries development can pave the way for sustainable management of the resources.

Conclusion

The highly prestigious Pradhan Mantri Matsya Sampad Yojana supports reservoir fisheries development through the three pronged strategy recommended by ICAR-CIFRI. Culture based fisheries is the best strategy for fishery enhancement in small reservoirs in Kerala. Pen and cage culture techniques can also be used as a fishery enhancement strategy in Kerala. The paper indicates a need for better policies for fishery management in small reservoirs for Kerala which can be used for small scale fisheries.

References

DOF, 2018. *Annual Report* 2018-2019, p. 198.

NFDB, 2016. *Guidelines for Cage Culture in Inland Open Water Bodies of India*, p. 20.

Sugunan, V. V., 1995. *Reservoir Fisheries of India*. Daya Books, p. 423.