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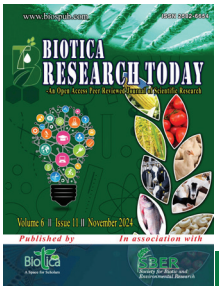

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Reservoir Fisheries Assessment Tools: A Requisite for Reservoir Management

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Abstract

Reservoir fisheries assessment requires various scientific tools that qualify the management status and health status of the reservoir. These scientific tools comprehend vast information about the various aspects of the reservoir fisheries. This paper attempts to introduce some of the scientific tools popular for reservoir fisheries assessment.

Keywords: FBI, IBI, RFAI, RFMI

Introduction

Reservoirs were referred to as sleeping giants which required a comprehensive approach for enhancing fisheries. This approach required analyzes of the reservoir's morphometric characteristics, water quality parameters, ecology, fisheries, stakeholders' perception about the reservoir and socio-economic factors which is very elaborate. Reservoir fisheries assessment thus encompasses various scientific tools that qualify the management status and health status of the reservoir. These scientific tools comprehend vast information about the various aspects of the reservoir fisheries. This paper attempts to introduce some of the scientific tools popular for reservoir fisheries assessment.

Fisheries Assessment Tools

There are various fisheries assessment tools that address the health and management status of the reservoir with the help of indices. These indices help in:

- *Summarizing Data*: We summarize the data and rank the data points.
- *Representing Data*: Represent data for social sciences and sustainability research.
- *Measuring Impact*: Using an equation-based model to create an index.
- *Organizing Content*: Identifying key themes, grouping similar concepts and cross-referencing information.

Some of the indices are Index of Biotic Integrity (IBI) , Reservoir Fish Assemblage Index (RFAI), Fish-based Index (FBI), European Fish Index (EFI), Fish Assemblage Integrity Index (FAII), Ecosystem Health Index (EHI), Reservoir Fisheries Management Index (RFMI), *etc*. (Table 1).

Table 1: Indices used in reservoir fisheries assessment

Indices	Remarks
IBI	Based on the abundance of fish species in reservoir
RFAI	An annex to the IBI indicator for reservoirs
FBI	Based on the fish groups in reservoirs
EFI	A fish-based index for estimating the ecological status of rivers and streams in Europe
FAII	Based on the species assumed to be present in various stretches in rivers
EHI	Assess the health of ecosystem
RFMI	Assess the management status of reservoir

Steps for Indexing

Identification of Candidate Metrics

Candidate metrics should be the most applicable and strong

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fish-based metrics. They are decided by incorporating expert opinion, Delphi opinions, expert workshops and case studies and benchmarking. These indices responded in the study area to the threats such as loss of habitat, invasion of exotics, eutrophication). Such candidate metrics may include diversity of indigenous and exotic species, population status of the key species, and recruitment and health status of the native species. Good sampling effort and bias were also important criteria of metric selection.

Continuous Scoring of Metrics

Such selected metric is scored based on ambient scoring method. These metrics are set individually and metric at the reference status is given the maximum or minimum score. Metrics that were believed to decrease with environmental degradation received the highest scores (10) and lowest scores (0).

Index of Biological Integrity (IBI)

The Index of Biological Integrity (IBI) is a scientific tool that assesses the health of aquatic ecosystems. Scores metrics for IBI were processed based on the values of the region's least impaired aquatic system and then rates the sample site from 'very poor to excellent' scores. The metrics used includes the number of indigenous species, the relative abundance of tolerant and intolerant species, and percent of infected fishes. These were typically used to identify and classify water pollution problems.

Reservoir Fisheries Assessment Index (RFAI)

This is an annexure to the IBI (Table 2) for assessing reservoirs (Jennings *et al.*, 1995).

Table 1: Indices used in reservoir fisheries assessment

Metrics	Sub-metrics
Species composition and richness	Number of species that form 90% of the sample, total number of species and indigenous species, Shannon diversity and evenness index for indigenous species.
Trophic structure	Number of species such as carnivorous, omnivorous and invertivorous species.
Tolerance	Number of intolerant and tolerant species.
EFI	A fish-based index for estimating the ecological status of rivers and streams in Europe
FAII	Based on the species assumed to be present in various stretches in rivers
EHI	Assess the health of ecosystem
RFMI	Assess the management status of reservoir

European Fish based Index (EFI)

This is a fish-based method for assessing the ecological health of European rivers. EFI uses environmental descriptors to predict biological reference conditions and then compares the fish community structure to those conditions. The ecology of a river is expressed on a scale of 1-5, with 1 being the best and 5 being the worst. The index was limited in its use to Western and Northern Europe. It doesn't accurately represent the conditions of large rivers or rivers in southern and Mediterranean countries and does not address alien fishes.

Ecosystem Health Index (EHI)

EHI help us to understand and restore ecosystem health of the aquatic ecosystem. It measures ecosystem degradation and some changes in the biological and physical parts of ecosystems (Xu *et al.*, 2005).

The ecosystem health index of a reservoir in India were extracted from five major drivers, fish assemblage, plankton assemblage, invasiveness, fish production potential and water quality parameter. An ecosystem health card developed by ICAR-CIFRI is presented below (Figure 1).

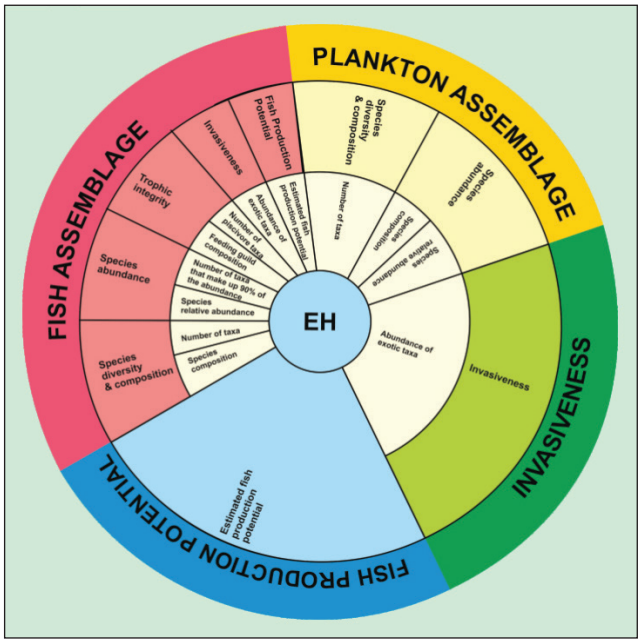

Figure 1: Ecosystem Health card

Reservoir Fishery Management Index (RFMI)

Fishers in the reservoir are to be considered as the primary stakeholders in planning and policy development which is required for enhancing the productivity of the fisheries without affecting the biodiversity, governmental priorities and regulations. Thus it was felt that the fisher's perception on various aspects of fisheries management plays an important role for better reservoir fishery management with help of policies, plans and schemes. The RFMI was attempted based on the fishers' perception on various drivers that hold the key for the improvement of the livelihood status of the fishers prioritising sustainability of the resource and various other means and measures to augment the fisheries resource of the reservoirs.

The RFMI (Figure 2) - a composite index with parameters such as social, technical, economical and institutional and policy was devised. Each of these drivers has 4-5 attributes

which were scored on a five point continuum. The continuum addressed the fishers perception with 5 (being strongly agree) to 1 (strongly disagree). The scores that were provided for each attribute were computed for the drivers. The computed indices provided the fishers perception on the priorities for the reservoir fisheries management with fisher participation (Paul *et al.*, 2020).

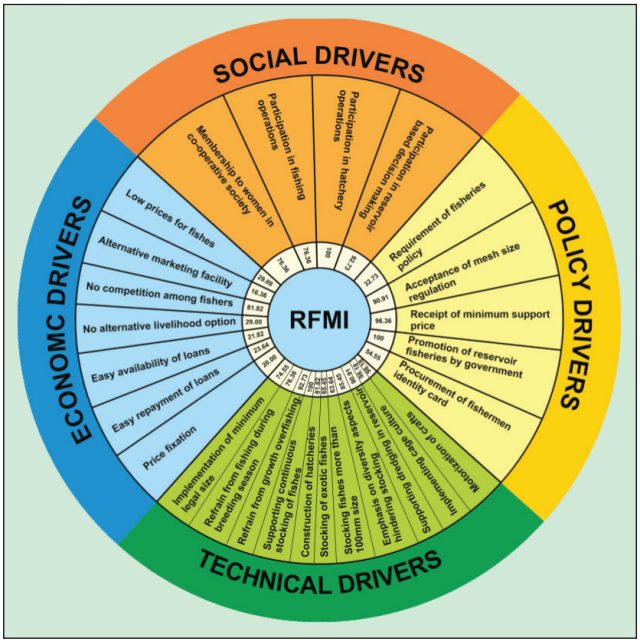

Figure 2: Reservoir Fisheries Management index

Conclusion

These indices which are composite measures help in easy assessment of aquatic ecosystems such as reservoir and helps in bringing up sound management measures. Effective use of such tools helps in drafting policy level suggestion and recommendations for fishery enhancement and management of the reservoir with special emphasis on ecosystem health.

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