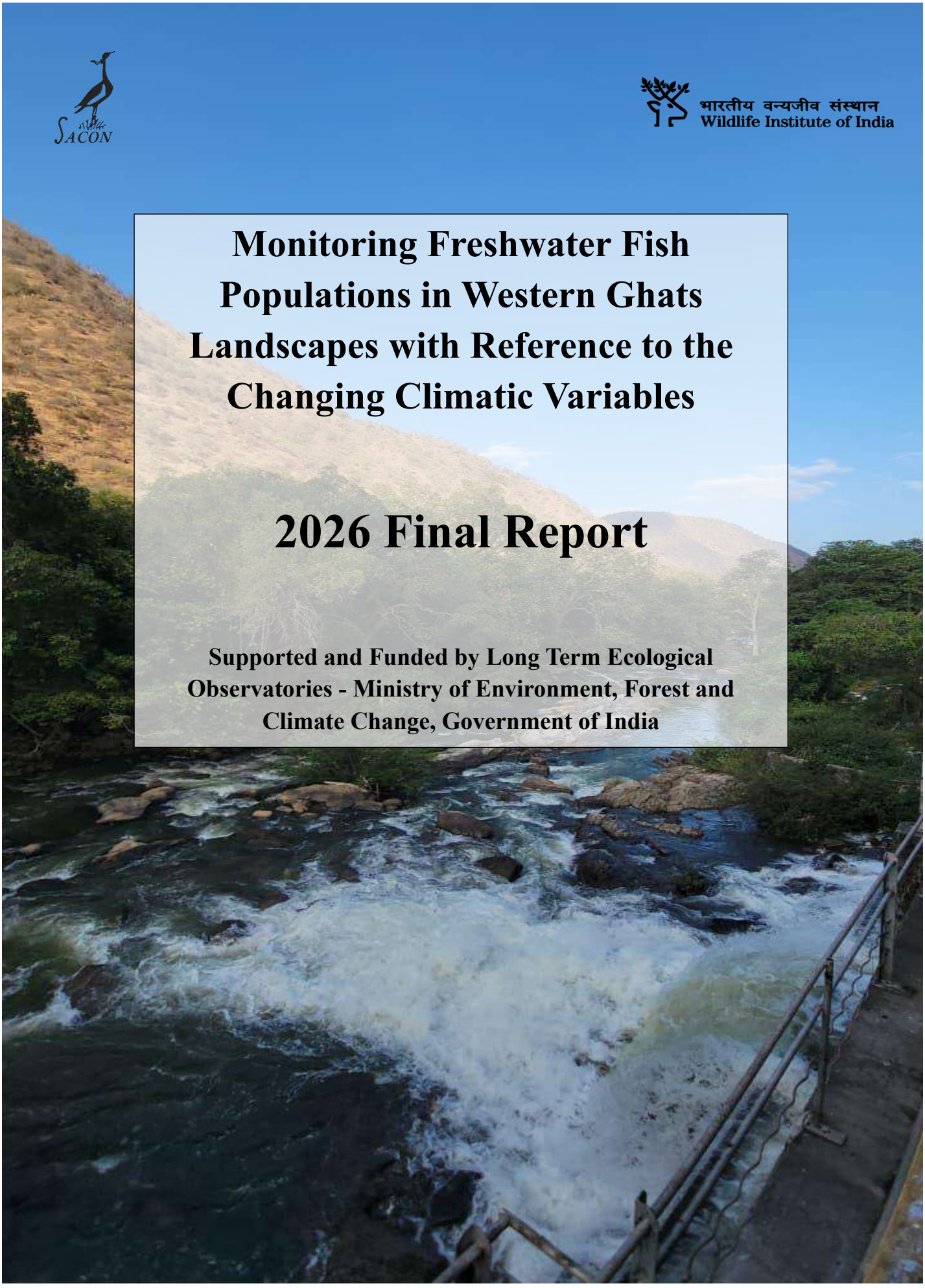

SACON

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Monitoring Freshwater Fish Populations in Western Ghats Landscapes with Reference to the Changing Climatic Variables

2026 Final Report

Supported and Funded by Long Term Ecological Observatories - Ministry of Environment, Forest and Climate Change, Government of India

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF IMAGES

Executive Summary:

Background

- Freshwater fish diversity, assemblage structure, and habitat integrity were assessed across river systems of the Moyar landscape and Mukurthi National Park, Western Ghats, under India's Long-Term Ecological Observatories (LTEO) programme
- Sampling was conducted across 13 river reaches spanning an elevational gradient of 341 to 2241 m asl within Mudumalai Tiger Reserve, Sathyamangalam Tiger Reserve, and Mukurthi National Park
- Standardised multi-gear fish sampling was combined with comprehensive river habitat and water quality assessments
- This is a continuation of the study conducted in 2022 for LTEO

Objectives of the Study

(i) Document the patterns of fish diversity (richness and relative abundance) in Moyar River sub-basin.

(ii) Investigate factors influencing fish diversity at local (reach) and regional (sub-basin) scale.

(iii) Understand the ecology of indicator species in terms of their population structure and responses to the changing environmental variables.

(iv) Develop an Index of Biological Integrity (IBI) for long-term monitoring aquatic habitats.

(v) Examine the occurrence of invasive species in the Moyar and Mukurthi NP river sub-basin.

Methods

- We used a nested hierarchical study design to assess the stream habitat structre and composition.
- Different fishing gears namely, castnet, dragnet and gillnets of varying mesh sizes were used for fish sampling.
- Fishes were recorded for their total length (cm) and weight (g) with photographic records and released immediately.
- Water quality was measured using a multiparameter kit (HI98194) and flow was assessed using a flow meter (GEOPACKS flow meter).

- Stream profiling was done wherever feasible and discharge was measured.

Sampling Adequacy

- The species accumulation curve did not reach an asymptote across the 13 sites, indicating that the true fish diversity of the study area remains incompletely documented.
- Rarefaction and extrapolation analyses identified Mangalpatti as harbouring the greatest diversity, with a substantial pool of undetected rare species.

Fish Compostition from the 2026 Survey

- In total, 437 individuals across 34 species of fish were recorded; Primarily, *Garra mullya* and *Devario malabaricus* accounted for approximately 39% of the total catch
- Fish richness ranged from 1 at Bangithapal to 14 at Mangalpatti, while CPUE ranged from 0.5 to 30.0 fish deployment^{-1}.
- The assemblage comprised 12% Western Ghats endemics and 2% exotic invasive species.
- Two Critically Endangered species, namely *Hemibagrus punctatus* and *Tor remadevii*, were recorded, underscoring the high conservation value of these river systems.

Temporal Diversity Comparison (2022 vs. 2026)

- Fish abundance declined at most of the six resurveyed sites, while species richness increased at five of the six sites.
- Substantial seasonal shifts were observed in dissolved oxygen, electrical conductivity, total dissolved solids, and wetted width, which were identified as the principal environmental predictors of fish richness, abundance, and community composition.
- The species composition using NMDS ordination confirmed a significant seasonal shift in fish community composition (PERMANOVA: $F = 1.44$, $R^2 = 0.13$, $p = 0.031$), with wetted width and pH identified as the primary environmental drivers.

Index of Biotic Integrity (IBI)

- Mangalpatti was the only site classified as Excellent (IBI: 56 score), recording the highest native, intolerant, and rheophilic species richness across the study area.
- Six sites were classified as Good (IBI: 44 to 52 score), namely Kargudi-I, Sigur Bridge, Thengumarahada, Anaikatty Bridge, Puthurvayal, and Jagalikadavu.

- Three sites were classified as Fair (IBI: 34 to 42 score), namely Theppakadu, Mayar Gorge, and Kargudi-II.
- Three sites were classified as Poor (IBI: 28 to 32 score), namely Bangithapal, Sandroad, and Thorappaly.

Disturbance Relationship

- A strong negative relationship was observed between disturbance intensity and fish community across all 13 sites.
- Low disturbance sites supported the highest median fish abundance and fish richness, with Mangalpatti recording 14 species as the richest site overall.
- High disturbance sites consistently recorded the lowest fish abundance and fish richness, with Bangithapal recording only 2 individuals belonging to a single exotic species.

Indicator Species Analysis (ISA)

- 6 species significantly associated with elevation, sand content, wetted width, or cross-sectional area (9,999 permutations).
- Elevation was the strongest driver: *garsp1*, *Labeo dero*, *Hypselobarbus dubius* → low elevation; *H. carnaticus* → mid-elevation.

  H. carnaticus's mid-elevation and mid-channel-size associations converge as independent evidence of a preference for intermediate stream conditions.

Invasive Species

- Two exotic invasive species were recorded, namely, Mozambique Tilapia *Oreochromis mossambicus* () at the lowland sites Jagalikadavu and Sandroad, and Rainbow Trout *Oncorhynchus mykiss* () at the high-elevation site Bangithapal (2241 m asl).

  The presence of invasive species represents a significant conservation concern, particularly at Bangithapal where native fish were entirely absent.

Priority Conservation Actions

- Protection of ecologically sensitive reaches, particularly Mangalpatti and Thengumarahada.

- Regulation of destructive fishing practices including dynamite fishing, poisoning, and indiscriminate netting.
- Enforcement of environmental flow provisions in dam-regulated stretches.
- Targeted monitoring and management of invasive species across all affected sites.
- Continuation of standardised long-term monitoring across the LTEO network.
- Community engagement and awareness programmes for local stakeholders.