

Ichthyofaunal diversity of the Godavari River in Maharashtra: Biodiversity, ecological significance, threats and conservation perspectives

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Abstract

The Godavari River is one of the most important freshwater ecosystems of peninsular India and supports a diverse assemblage of fishes of ecological, economic and conservation significance. The river originates in the Western Ghats of Maharashtra and traverses a heterogeneous landscape comprising headwater streams, free-flowing river stretches, tributaries, reservoirs, wetlands, floodplain habitats and human-modified aquatic environments. This environmental heterogeneity creates a wide range of ecological niches and contributes to the richness of the riverine fish community. The present review synthesizes available published information on the ichthyofaunal diversity of the Godavari River, with particular emphasis on the Maharashtra portion of the river. Published local investigations have reported 26 fish species from Nanded, 18 species from Dhargar Takli in the Purna region and 12 species from Kopergaon, whereas the Nandur-Madhmeshwar wetland has yielded different species totals in different investigations, demonstrating the influence of sampling period, habitat coverage and methodology on observed richness. At the basin scale, Jadhav *et al.* (2024) documented 152 freshwater fish species belonging to 37 families, 84 genera and 16 orders in the Godavari River, including 44 Indian endemic species, 12 invasive alien species and 20 species categorized as threatened or Near Threatened. These basin-wide data should not, however, be interpreted as the species richness of the Maharashtra stretch alone. The review indicates that cypriniform fishes constitute a major component of the assemblage, accompanied by catfishes, snakeheads, featherbacks, cichlids and other indigenous freshwater fishes. The fish community provides important ecosystem services through trophic regulation, nutrient cycling and maintenance of aquatic food webs, while also supporting inland fisheries and local livelihoods. At the same time, habitat alteration, flow regulation, pollution, sand extraction, overfishing, siltation, invasive alien species and increasing climatic variability threaten the ecological integrity of the river. Future research should emphasize standardized multi-season sampling, long-term population monitoring, taxonomic verification, molecular approaches, environmental DNA, GIS-based habitat assessment and community participation. Effective conservation of the Godavari ichthyofauna requires an ecosystem-based strategy that protects critical habitats while recognizing the socioeconomic dependence of local communities on riverine fisheries.

Keywords: Godavari River, Maharashtra, ichthyofaunal diversity, freshwater fishes, fish biodiversity, endemic fishes, invasive species, river ecology, fisheries, conservation

Introduction

Freshwater ecosystems occupy a relatively small proportion of the Earth's surface but support a disproportionately high share of global biodiversity. Freshwater fishes are particularly important because they contribute simultaneously to ecological processes, human nutrition, fisheries, cultural practices and local economies. Their distribution and abundance are strongly influenced by water quality, flow regime, habitat structure, food availability, connectivity and seasonal hydrological changes. Consequently, changes in fish assemblages can provide valuable information about the ecological condition of river systems.

The Godavari is one of India's major river systems and the largest river of peninsular India. Its upper reaches originate in the Nashik region of Maharashtra, after which the river flows eastward through the Deccan Plateau before continuing toward the Bay of Bengal. Within Maharashtra, the river and its associated aquatic habitats form an extensive network of ecological environments. These include relatively fast-flowing upper reaches, deeper river channels, pools, tributary junctions, reservoirs, backwaters, floodplain habitats and wetlands. Such habitat heterogeneity provides opportunities for fishes with very different ecological requirements.

The importance of the Godavari as a fishery resource has long been recognized in Maharashtra. Shillewar and Nanware (2008) ^[11], for example, described the Godavari as an important source of capture fisheries in the Marathwada region and recorded 26 fish species from the Nanded stretch during a two-year investigation. Later, Balkhande and Kulkarni (2015) ^[2] recorded 18 species from Dhargar Takli in Purna taluka of Parbhani district, while Dandawate and Lonkar (2014) ^[5] recorded 12 species from the Kopergaon stretch.

These local studies are valuable, but they also reveal an important methodological problem. Fish diversity is rarely distributed uniformly along a large river. A survey restricted to one locality, one season or one type of fishing gear can capture only a fraction of the total assemblage. Consequently, species richness values obtained from individual studies should not simply be added together to estimate the total fish diversity of the Maharashtra Godavari.

A broader perspective is provided by Jadhav *et al.* (2024) ^[8], who compiled freshwater fishes of the Godavari River at the basin scale. Their inventory included 152 species belonging to 37 families, 84 genera and 16 orders. Among these were 44 Indian endemic fishes, 12 invasive alien species and 20 species classified within threatened or Near Threatened categories. This work substantially expands the

understanding of the ichthyological importance of the Godavari, while simultaneously emphasizing the need to distinguish basin-level diversity from site-specific observations.

The present review therefore focuses on the available knowledge of the Godavari fish fauna in Maharashtra, evaluates patterns of diversity reported by different investigators, discusses ecological and socioeconomic importance, examines major threats and identifies priorities for future research and conservation.

Objectives of the Review

The present review was undertaken with the following objectives:

1. To synthesize available information on the fish diversity of the Godavari River in Maharashtra;
2. To compare the ichthyofaunal composition reported from different investigated localities;
3. To examine the major taxonomic groups represented in the river;
4. To discuss the ecological and economic significance of the fish fauna;
5. To evaluate major threats affecting fish biodiversity;
6. To identify limitations and knowledge gaps in existing studies; and
7. To suggest priorities for future ichthyological research and conservation.

Review Methodology

This review follows a narrative synthesis approach. Published research articles, regional ichthyofaunal inventories, institutional biodiversity assessments and recent literature relating to freshwater fish diversity in the Godavari River and Maharashtra were examined.

Particular attention was given to studies that provided information on species composition, taxonomic structure, sampling locality, sampling period and conservation concerns. Important site-specific studies from Nanded, Kopergaon, Dhangar Takli and Nandur-Madhmeshwar were considered alongside the basin-wide inventory of Jadhav *et al.* (2024)^[8].

Because the available studies differ in sampling design, duration, fishing gear, habitat coverage and taxonomic treatment, their reported species numbers were interpreted comparatively rather than statistically pooled. A species count from a single locality was not considered equivalent to a basin-wide inventory.

The review also considers broader information on Maharashtra's endemic freshwater fish fauna. Ghatge *et al.* (2013)^[7] documented 73 freshwater fishes endemic to Maharashtra based on published literature and specimens available at the Zoological Survey of India, emphasizing the considerable conservation value of the state's freshwater ecosystems.

Recent studies were also considered to identify emerging research directions. For example, Chilke (2025)^[4] highlighted habitat loss, pollution, overfishing and invasive species as important pressures on freshwater fish diversity in Maharashtra, while Bhitre (2026)^[3] discussed artificial intelligence as an emerging tool for monitoring fish diversity in the Jayakwadi reservoir system.

Ecological Setting of the Godavari River in Maharashtra

1. Geographical and environmental characteristics

The Godavari originates near Trimbakeshwar in the Nashik district of Maharashtra. Its upper basin is influenced by the

Western Ghats and Deccan Plateau, creating substantial variation in elevation, rainfall, temperature and drainage characteristics.

The physical structure of the river changes along its course. Upper reaches may contain shallow channels and relatively rapid flow, whereas downstream stretches contain deeper pools, wider channels, depositional zones and extensive modified habitats. Tributaries further increase environmental heterogeneity.

Fish communities respond strongly to these environmental differences. Species adapted to flowing water may be associated with riffles and well-oxygenated channels, while other fishes prefer pools, marginal vegetation, backwaters or floodplain habitats. Thus, the ecological identity of the Godavari is best understood as a network of interconnected habitats rather than as a single uniform aquatic environment.

2. Tributaries, wetlands and reservoirs

The ecological character of the Godavari in Maharashtra is further modified by tributaries, reservoirs and wetlands. These habitats provide alternative feeding, breeding and nursery environments.

Nandur-Madhmeshwar is especially important because it represents a wetland environment associated with the Godavari and Kadwa rivers. Wagh *et al.* (2018)^[13] recorded 39 freshwater fish species belonging to 14 families and 30 genera from the wetland during 2010^[10]–2012. Twenty-one of those species were reported for the first time from the wetland during that investigation. The authors also identified invasive alien fishes, overfishing, sand mining, siltation and pollution as important threats.

A more recent survey by Achegawe *et al.* (2026)^[1], using primary and secondary information, reported 16 fish species from Nandur-Madhmeshwar Bird Sanctuary. The difference between this result and the earlier 39-species inventory illustrates how fish species counts can vary with sampling design, temporal coverage and habitat representation.

Jayakwadi Dam represents another major transformation of the Godavari aquatic environment. The impoundment has created extensive reservoir and backwater habitats that support fisheries but differ ecologically from the original free-flowing river. Recent literature has suggested that approximately 50–65 freshwater fish species may occur in the Jayakwadi/Nathsagar system, although these figures should be treated as a literature-based estimate rather than as a standardized contemporary inventory (Bhitre, 2026)^[3].

Development of Ichthyofaunal Research in the Godavari

Research on the Godavari fish fauna in Maharashtra has historically been fragmented. Many studies have focused on particular localities rather than examining the entire Maharashtra stretch systematically.

Shillewar and Nanware (2008)^[11] surveyed the Godavari at Nanded during 2005–2007 and recorded 26 species belonging to 18 genera, six orders and nine families.

Dandawate and Lonkar (2014)^[5] conducted fish diversity studies at Kopergaon during May 2013–April 2014^[5]. Twelve fish species belonging to four orders, eight families and nine genera were recorded from the Godavari at Kopergaon.

Balkhande and Kulkarni (2015)^[2] studied the Dhangar Takli stretch of the Godavari in Purna taluka, Parbhani district, from January 2014 to January 2015^[2, 5]. They recorded 18 fish species belonging to five orders, eight

families and 14 genera. Cypriniformes represented the largest component, with eight species and approximately 44% of the fish species recorded. These investigations collectively demonstrate that the Godavari supports diverse fish communities, but they also

demonstrate that observed richness depends strongly on location and sampling approach.

Comparative Assessment of Published Fish-Diversity Studies

Table 1: Selected studies on fish diversity associated with the Godavari River in Maharashtra

Study locality	Study period	Reported fish diversity	Major observation
Nanded	2005–2007	26 species	Rich local fish assemblage
Kopergaon	May 2013–April 2014	12 species	Four orders and eight families
Dhangar Takli, Purna, Parbhani	January 2014–January 2015	18 species	Cypriniformes dominant
Nandur-Madhmeshwar wetland	2010–2012	39 species	High wetland diversity; 21 species reported for first time from the wetland
Nandur-Madhmeshwar Bird Sanctuary	Recent survey	16 species	Cypriniformes dominant
Godavari River, basin-wide	Published 2024	152 species	37 families, 84 genera; 44 Indian endemics and 12 invasive alien species

Note: The values represent different geographical and methodological scopes and should not be summed to produce a Maharashtra-wide total. Sources: Shillewar and Nanware (2008); Dandawate and Lonkar (2014); Balkhande and Kulkarni (2015); Wagh *et al.* (2018); Jadhav *et al.* (2024); Achegawe *et al.* (2026) ^[1, 2, 5, 8, 11, 13].

The variation shown in Table 1 is ecologically informative. It indicates that different habitats within the Godavari system support different fish assemblages. It also demonstrates why long-term standardized sampling is necessary before attempting to determine temporal trends in fish biodiversity.

Taxonomic Composition of the Ichthyofauna

1. Cypriniformes

Cypriniform fishes represent one of the most important components of freshwater fish communities in the Godavari system. Several studies from Maharashtra have reported their numerical dominance.

Balkhande and Kulkarni (2015) ^[2] recorded eight cypriniform species at Dhangar Takli, representing approximately 44% of the fish species observed. Similarly, cypriniform fishes were the dominant group in the recent Nandur-Madhmeshwar survey reported by Achegawe *et al.* (2026) ^[1].

The group includes commercially and nutritionally important fishes such as *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*, along with numerous smaller indigenous fishes. Their ecological diversity allows them to occupy different feeding and habitat niches.

2. Siluriformes

Catfishes form another important component of the Godavari ichthyofauna. Representatives of families such as Bagridae, Siluridae and Clariidae occur in different habitats. Catfishes occupy a variety of trophic positions. Some are active predators, while others are opportunistic feeders. Their morphological and physiological adaptations allow several species to survive under environmental conditions that may be unsuitable for more sensitive fishes.

3. Osteoglossiformes

Featherbacks such as *Notopterus notopterus* are characteristic freshwater fishes associated with the Indian subcontinent. They occur in suitable slow-flowing, deep or vegetated habitats.

Balkhande and Kulkarni (2015) ^[2] recorded two osteoglossiform species from Dhangar Takli, demonstrating the contribution of this group to the local assemblage.

4. Channiform and other air-breathing fishes

Snakeheads and other air-breathing fishes are important components of tropical freshwater ecosystems. Their ability to tolerate periods of reduced dissolved oxygen allows them to exploit shallow, stagnant or heavily vegetated habitats.

These species may become particularly important in wetlands, backwaters and seasonal aquatic habitats where oxygen conditions fluctuate.

5. Cichlids and introduced fishes

Cichlids such as tilapia have been reported from parts of the Godavari system. Some introduced species can become abundant in modified habitats and may compete with indigenous fishes.

Jadhav *et al.* (2024) ^[8] identified 12 invasive alien fish species in their basin-wide assessment, highlighting the importance of biological invasions in the conservation of Godavari fish diversity.

Representative Fish Fauna

The Godavari fish community includes a combination of major carps, minor carps, catfishes, snakeheads, featherbacks and small indigenous fishes.

Representative taxa documented in studies of the Maharashtra Godavari include:

Family/group	Representative species	General ecological significance
Cyprinidae	<i>Catla catla</i>	Major food fish and pelagic feeder
Cyprinidae	<i>Labeo rohita</i>	Important commercial fish
Cyprinidae	<i>Cirrhinus mrigala</i>	Major carp and bottom-associated feeder
Cyprinidae	<i>Labeo calbasu</i>	Indigenous food fish
Cyprinidae	<i>Puntius</i> spp.	Small indigenous fishes
Bagridae	<i>Mystus</i> spp.	Predatory/opportunistic catfishes
Siluridae	<i>Wallago attu</i>	Large predatory fish
Notopteridae	<i>Notopterus notopterus</i>	Important freshwater food fish
Channidae	<i>Channa</i> spp.	Air-breathing predators
Cichlidae	<i>Oreochromis mossambicus</i>	Introduced fish with invasive potential

The table is intended to illustrate major components rather than provide an exhaustive checklist. Species-level taxonomy should be updated against current authoritative databases before publication of a final species inventory.

Ecological Importance of the Fish Community

Fish are not merely organisms harvested for human consumption. They are active components of river ecosystem processes.

1. Food-web regulation

Predatory fishes regulate populations of smaller fishes and aquatic organisms. Herbivorous and omnivorous fishes influence algal and detrital pathways. Consequently, changes in the abundance of particular trophic groups can influence the structure of the aquatic food web.

2. Nutrient cycling

Fish participate in nutrient transfer through feeding, excretion, movement and decomposition. Their movement among habitats can transport nutrients from one part of the river system to another.

3. Energy transfer

Fish transfer energy from lower trophic levels to larger predators, including piscivorous birds and other aquatic and semi-aquatic animals. Thus, fish diversity contributes directly to broader ecosystem functioning.

4. Biological indication

Changes in fish communities can reflect changes in habitat quality. Sensitive species may disappear from degraded habitats, whereas tolerant species may become relatively dominant.

For this reason, fish diversity can complement physicochemical measurements in assessments of river health.

Economic and Livelihood Significance

The Godavari supports capture fisheries that are important to communities living along its banks. Shillewar and Nanware (2008) ^[11] specifically recognized the Nanded stretch as an important source of capture fisheries in the Marathwada region. Fish provide animal protein, micronutrients and income. Commercially important carps and catfishes contribute to local markets, while small indigenous fishes may be particularly important for household consumption.

The socioeconomic value of fish biodiversity should therefore not be measured solely by market price. A species with limited commercial value may still perform important ecological functions or contribute substantially to local food security. A sustainable management strategy must consequently balance fish harvest with the reproductive and ecological requirements of fish populations.

Endemic Fish Diversity and Conservation Significance

Endemism greatly increases the conservation value of a freshwater ecosystem. Ghatge et al. (2013) ^[17] identified 73 endemic freshwater fish species from Maharashtra, with Cyprinidae accounting for the largest proportion. Their assessment also showed that several endemic species fall within threatened categories. The basin-wide Godavari inventory of Jadhav et al. (2024) ^[8] further documented 44 Indian endemic fishes. Twenty species in their inventory

were reported within threatened or Near Threatened categories.

These findings demonstrate that conservation planning for the Godavari should not focus only on commercially important fishes. Small-bodied and less commercially valued endemic fishes may be equally or more important from a biodiversity perspective. Protection of endemic fish populations requires maintenance of habitat quality, river connectivity, breeding grounds and appropriate flow regimes.

Invasive Alien Fishes

Biological invasion is increasingly recognized as a major threat to freshwater biodiversity.

Jadhav et al. (2024) ^[8] documented 12 invasive alien fish species from the Godavari River. Their occurrence raises concerns because invasive fishes may compete with native species, alter predator-prey interactions, occupy breeding habitats and modify community structure. However, the ecological effects of introduced species are context-dependent. Not every non-native species produces the same level of ecological impact, and some may become particularly successful in habitats already modified by human activities. Management should therefore combine early detection, population monitoring and ecological impact assessment rather than relying only on species presence.

Major Threats to Fish Diversity

1. Pollution

Pollution is one of the most direct pressures on riverine biodiversity. Domestic sewage, industrial effluents, agricultural runoff, solid waste and organic enrichment can alter water chemistry and habitat quality.

Pollution may affect fish through acute mortality as well as through chronic effects on growth, reproduction, immunity and physiology.

Recent events in Nashik demonstrate that fish mortality remains an active environmental concern. In 2026^[1], authorities investigated the occurrence of large numbers of dead fish in the Godavari after collecting water and fish samples to identify the cause.

This type of event highlights the need for continuous monitoring rather than relying exclusively on investigations after visible fish mortality.

2. Dam construction and altered hydrology

Reservoir construction changes river flow, sediment transport, depth, temperature and habitat connectivity. The Jayakwadi system is an important example. The reservoir provides substantial benefits for irrigation and water supply and also supports fisheries, but the ecological conditions differ considerably from those of a free-flowing river. Altered discharge patterns can influence fish migration, spawning and recruitment. Therefore, water-resource management should incorporate ecological requirements alongside human water demands.

3. Overfishing

Excessive fishing pressure can reduce fish abundance and alter population structure. Selective removal of large breeding individuals may be particularly damaging because it can reduce reproductive potential. Fishing restrictions should therefore be based on biological information

concerning breeding seasons, size at maturity and recruitment.

4. Sand mining

Sand extraction can alter riverbed morphology and substrate characteristics. It can disturb benthic habitats and potentially destroy spawning or feeding grounds.

Wagh *et al.* (2018) ^[13] identified sand mining as one of the anthropogenic threats affecting the fish fauna of Nandur-Madhmeshwar wetland.

5. Siltation

Increased sedimentation can reduce habitat complexity and affect spawning substrates. Excessive siltation may also reduce the availability of clean gravel and other substrates required by particular fishes.

6. Habitat fragmentation

Dams, barrages, channel modification and other structures can interrupt longitudinal connectivity. Fish that depend on movement between feeding, spawning and nursery habitats may be particularly affected.

7. Invasive species

Invasive alien fishes can compete with native fishes and may become dominant in disturbed environments. The documented presence of 12 invasive alien species in the basin-wide Godavari inventory emphasizes the need for systematic surveillance (Jadhav *et al.*, 2024) ^[18].

8. Climate variability

Changing rainfall patterns, increasing temperature, droughts and extreme flood events can modify fish habitats and reproductive cycles. Climate change is likely to interact with existing human pressures. A river already affected by pollution and habitat fragmentation may have less capacity to absorb additional climatic stress.

Fish Diversity and River Health

Fish communities can be used as biological indicators because they integrate environmental changes occurring over relatively long periods.

A river with good habitat heterogeneity can support fishes with different feeding strategies, reproductive behaviours and environmental tolerances. When environmental quality deteriorates, sensitive species may decline and tolerant species may become dominant.

A comprehensive river-health assessment should therefore combine fish data with:

- Temperature;
- pH;
- Dissolved oxygen;
- Electrical conductivity;
- Turbidity;
- Total dissolved solids;
- Nutrients;
- Organic pollution;
- Heavy metals and other contaminants where appropriate;
- Habitat structure; and
- Flow characteristics.

Such an integrated approach would provide more meaningful information than either biological or physicochemical monitoring alone.

Limitations of Existing Studies

The current literature provides valuable information but has several limitations.

1. Geographic limitation

Most published investigations have focused on individual localities. There is still a need for systematic sampling across the entire Maharashtra stretch.

2. Temporal limitation

Many studies have relatively short sampling periods. Fish communities can change seasonally, and a single annual survey may miss species that occur temporarily or migrate between habitats.

3. Gear selectivity

Different fishing gears have different capture efficiencies. Small fishes, benthic fishes and cryptic species may be underrepresented in surveys based on conventional fishing gear.

4. Taxonomic changes

Fish taxonomy has undergone substantial revision. Older publications may use scientific names that are no longer accepted or may contain identification uncertainties.

5. Limited population information

Species checklists provide presence information but do not necessarily indicate population health. Abundance, biomass, size structure, recruitment and reproductive condition require separate investigation.

6. Inconsistent reporting

Differences in sampling intensity and methodology make direct comparisons between studies difficult. These limitations explain why the development of a standardized Maharashtra-wide Godavari fish-monitoring programme is necessary.

Future Research Priorities

1. Long-term monitoring

Permanent sampling stations should be established along the major ecological zones of the river. Monitoring should be conducted across seasons and repeated annually.

2. Molecular taxonomy

DNA barcoding and other molecular methods can help resolve taxonomic uncertainties and distinguish closely related species.

3. Environmental DNA

eDNA offers an important opportunity to detect rare, cryptic and invasive species without relying entirely on physical capture.

4. GIS and remote sensing

GIS-based mapping can identify habitat loss, changes in water spread, river fragmentation and alteration of floodplain habitats.

5. Digital fish identification

Artificial intelligence and machine-learning approaches could assist species recognition and automated biodiversity monitoring. Bhitre (2026) ^[3] specifically proposed AI-based approaches for fish monitoring in the Jayakwadi/Nathsagar reservoir system.

6. Population genetics

Genetic studies should be undertaken for endemic and threatened fishes to determine population connectivity and genetic differentiation.

7. Fisheries assessment

Future studies should integrate biological diversity with catch-per-unit-effort, fishing intensity, market value and socioeconomic dependence.

Conservation and Management Recommendations

Effective conservation of the Godavari ichthyofauna should be based on an ecosystem approach.

Protection of critical habitats

Spawning areas, nursery grounds, deep pools, vegetated margins and wetland connections should be identified and protected.

Maintenance of river connectivity

Where feasible, fish movement should be considered in the planning and operation of dams and barrages. Environmental-flow requirements should be incorporated into river management.

Pollution reduction

Municipal and industrial wastewater should be adequately treated before discharge. Agricultural runoff should also be managed through improved nutrient and pesticide practices.

Sustainable fishing

Minimum mesh sizes, seasonal fishing restrictions, protection of juvenile fishes and restrictions on destructive fishing methods should be considered.

Invasive-species management

Regular surveillance should be conducted to detect new introductions and monitor established invasive populations.

Wetland conservation

Associated wetlands such as Nandur-Madhmeshwar should be treated as integral components of the river ecosystem rather than isolated water bodies.

Community participation

Local fishing communities should be involved in monitoring and management. Their knowledge concerning fish movement, breeding seasons, fishing grounds and long-term changes in catches can complement scientific observations.

Biodiversity database

A centralized digital database should be developed containing species records, photographs, collection localities, habitat information, conservation status and molecular data.

Conceptual Framework for Conservation of Godavari Ichthyofauna

The conservation of fish diversity can be understood as an interaction among five major components:

River flow → Habitat quality → Fish population → Fisheries → Human livelihood

Changes in river flow influence habitat structure. Habitat structure affects fish reproduction, feeding and survival.

Fish populations determine the productivity of fisheries, while fisheries provide food and income to local communities. Human activities, in turn, influence water quality, flow, habitat and fishing pressure.

Consequently, conservation cannot be successful if it focuses exclusively on individual fish species. The river processes that sustain those species must also be protected.

Conclusions

The Godavari River in Maharashtra represents an ecologically important freshwater ecosystem with considerable ichthyofaunal diversity. Available local studies from Nanded, Kopergaon, Dhangar Takli and Nandur-Madhmeshwar demonstrate that fish assemblages vary considerably among locations. This variation is expected because the river contains a complex mixture of flowing channels, pools, tributaries, reservoirs, wetlands and floodplain habitats. Cypriniform fishes constitute a major component of the fish assemblage in several Maharashtra studies, while catfishes, featherbacks, snakeheads, cichlids and numerous smaller indigenous fishes contribute to overall ecological diversity. The river also supports fishes of substantial fisheries value and therefore has direct importance for human nutrition and livelihoods.

The basin-wide inventory of Jadhav *et al.* (2024) ^[8], which documented 152 freshwater fish species, 44 Indian endemic species and 12 invasive alien species, confirms the exceptional biological importance of the Godavari. However, this figure should not be interpreted as the fish diversity of Maharashtra alone. Rather, it provides a regional context within which Maharashtra's local fish assemblages should be understood. The conservation outlook is complicated by multiple interacting pressures. Pollution, habitat modification, altered river flow, dams, sand mining, siltation, overfishing, invasive alien species and climatic variability can collectively reduce the resilience of fish populations.

The most important requirement at present is therefore a coordinated, long-term ichthyological monitoring programme covering the major ecological zones of the Maharashtra Godavari. Such a programme should combine conventional fish sampling with water-quality monitoring, GIS, molecular taxonomy, eDNA, population genetics and digital technologies. Conservation should also recognize the dependence of local communities on river fisheries. A scientifically sound management strategy must therefore seek a balance between biodiversity protection and sustainable resource use.

The future of Godavari fish diversity will ultimately depend on the condition of the river itself. Protecting fish species without protecting their habitats, flow regimes, breeding grounds and ecological connectivity is unlikely to produce lasting results. An ecosystem-based approach that integrates biodiversity conservation, water management and community participation offers the most promising pathway for maintaining the ichthyological heritage of the Godavari River in Maharashtra.

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