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Freshwater ichthyofaunal diversity of Vidarbha, Maharashtra, India: A review

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Abstract
Vidarbha, a region in eastern Maharashtra, India, is endowed with rich freshwater ecosystems, including rivers, reservoirs, and traditional lakes, supporting a diverse ichthyofaunal community. This review synthesizes recent studies (2009-2024) on the freshwater fish diversity of Vidarbha, focusing on species richness, dominant families, conservation status, and threats to these aquatic ecosystems. The region harbors approximately 160 fish species across 9 orders, 25 families, and 80 genera, with Cypriniformes and Cyprinidae being the most dominant. Notable water bodies include the Wardha, Wainganga, and Godavari rivers, as well as reservoirs like Itiadoh and Asolamendha. Key threats include habitat loss, pollution, overfishing, and invasive species, necessitating urgent conservation measures. This review highlights the ecological and economic significance of Vidarbha's fish fauna and proposes science-based recommendations for sustainable management.

Keywords: Freshwater fish diversity, Vidarbha ichthyofauna, Cypriniformes and Cyprinidae, Aquatic ecosystem threats, River and reservoir biodiversity, Species richness in Maharashtra, Fish conservation strategies, Habitat degradation and pollution, Invasive species impact, Sustainable fisheries management

1. Introduction
Vidarbha, encompassing districts such as Nagpur, Chandrapur, Gondia, Yavatmal, and Buldhana, is a biodiversity-rich region in Maharashtra, India. Its freshwater ecosystems, including major rivers like the Godavari, Wainganga, and Wardha, and numerous reservoirs and ex-malgujari tanks, support a vibrant ichthyofaunal diversity. Freshwater fish are critical to the region's ecology, providing food security, livelihoods, and cultural value to local communities. Despite their importance, these ecosystems face multiple anthropogenic stressors, including pollution, overexploitation, and habitat degradation. This review compiles data from recent studies to assess the ichthyofaunal diversity of Vidarbha, their conservation status, and the challenges to their sustainability, aiming to inform conservation strategies.

2. Methodology
This review is based on a comprehensive analysis of secondary data from peer-reviewed articles, technical reports, and books published between 2009 and 2024, focusing on Vidarbha's freshwater fish diversity. Key sources include studies on rivers (e.g., Wardha, Wainganga), reservoirs (e.g., Itiadoh, Asolamendha), and other water bodies. Data were collected on species richness, taxonomic composition, conservation status (IUCN Red List), and threats. The review also incorporates ecological and physicochemical parameters influencing fish diversity, where available.

3. Ichthyofaunal Diversity in Vidarbha
A. Species Richness and Taxonomic Composition
Vidarbha's freshwater ecosystems are home to a rich ichthyofaunal diversity, with approximately 160 species recorded across 9 orders, 25 families, and 80 genera. The order Cypriniformes dominates, followed by Siluriformes, with the family Cyprinidae being the most species-rich, contributing around 44-47% of the total species in various water bodies. Notable studies include:

- **Wardha and Nirguda Rivers (Yavatmal District):** A study conducted from November 2008 to October 2009 recorded 37 species across 24 genera, 14 families, and 7 orders. Cyprinidae was the dominant family, with small indigenous species valued for their taste and food value.
- **Itiadoh Reservoir (Gondia District):** This large reservoir hosts 35 species across 6 orders and 16 families, including major carps, catfishes and EEL fishes, highlighting its potential for fisheries.
- **Asolamendha Lake (Chandrapur District):** From June 2010 to May 2012, 32 species from 24 genera, 12 families, and 7 orders were recorded, with carps, minnows, barbs, catfishes, and perches being prominent.
- **Khadakpurna Dam (Buldhana District):** Between July 2013 and June 2015, 23 species from 21 genera, 12 families, and 7 orders were documented, with Cyprinidae contributing 47% of the species.
- **Wainganga River (Gadchiroli District):** A study near AA Energy plant recorded significant fish diversity, though specific species counts were not detailed in the provided data.

The dominance of Cypriniformes and Cyprinidae is consistent across Vidarbha, reflecting the region's favorable ecological conditions, such as warm-water habitats and diverse riverine systems.

4. Key Species and Economic Importance

The fish fauna of Vidarbha includes species with significant economic and ecological roles:-

- **Indian Major Carps (IMC):** Species like *Labeo rohita*, *Catla catla*, and *Cirrhinus mrigala* are widely cultivated and form the backbone of inland fisheries.
- **Catfishes and Minor Carps:** Species such as *Wallago Attu* and *Puntius sophore* are abundant and contribute to local food security.
- **Exotic Species:** Introduced species like *Cyprinus carpio* and *Oreochromis mossambicus* are present but contribute less to overall catches compared to native species.
- **Endemic and Ornamental Species:** Approximately 30 species are endemic to the Western Ghats, with some having ornamental value, supporting local aquarium trade.

These species support livelihoods through capture fisheries, aquaculture, and ornamental fish trade, making them vital to Vidarbha's economy.

5. Conservation Status

The conservation status of Vidarbha's fish fauna, based on IUCN Red List categories, indicates varying levels of threat:-

- **Itiadoh Reservoir:** Of the 35 species, 2 are Critically Endangered, 10 are endangered, 4 are Vulnerable, and 14 are Near Threatened.
- **Asolamendha Lake:** Most species are Least Concern, but specific threatened species were not detailed.
- **Khadakpurna Dam:** The majority of the 23 species are Least Concern, with 1 Vulnerable and 6 Near Threatened.
- **Regional overview:** Across vidarbha, 2 species are critically endangered 10 are endangered, 4 are Vulnerable, and 14 are Near Threatened, with 30 species endemic to the Western Ghats.
- The presence of threatened species underscores the need for targeted conservation efforts.

6. Ecological and Physicochemical Influences

The diversity and distribution of fish in Vidarbha are influenced by physicochemical parameters and habitat characteristics:

- **Water Quality:** Studies on the Pauna River in Pune District, adjacent to Vidarbha, showed that high levels of CO_2, BOD, COD, and low dissolved oxygen (DO) downstream due to sewage and industrial effluents reduce fish diversity with only pollution-tolerant species surviving. Similar trends are likely in Vidarbha's urbanized river stretches.
- **Habitat Diversity:** The Wainganga and Wardha rivers, with their varied substrates and flow regimes, support diverse fish assemblages, including hill stream and warm-water species.
- **Reservoirs and Lakes:** Man-made reservoirs like Itiadoh and Asolamendha provide stable habitats but are threatened by overfishing and siltation.

7. Threats to Ichthyofaunal Diversity

Vidarbha's freshwater fish face multiple threats:-

1. **Habitat Loss:** Damming, sand mining, and urbanization fragment riverine habitats, particularly affecting migratory species.
2. **Pollution:** Industrial effluents, agricultural runoff, and untreated sewage degrade water quality, reducing fish populations in rivers like the Pauna.
3. **Overfishing:** Unselective fishing practices deplete stocks, especially in reservoirs like Itiadoh.
4. **Invasive Species:** Exotic species like *Cyprinus carpio* compete with native fish, disrupting ecosystems.
5. **Climate Change:** Altered rainfall patterns and temperature shifts affect breeding and migration, threatening endemic species.

8. Conservation and Management Recommendations

To ensure the sustainability of Vidarbha's ichthyofaunal diversity, the following measures are proposed, adapted from broader Indian freshwater conservation strategies:

1. **Establish Protected Areas:** Designate critical habitats, such as spawning grounds in the Wainganga and Wardha rivers, as freshwater protected areas.
2. **Regulate Exotic Species:** Implement stricter controls on the introduction of exotic fish to minimize ecological impacts.
3. **Environmental flow management:** Maintain hydrological connectivity through regulated water releases from dams to support fish migration and breeding.
4. **Pollution Control:** Enforce stricter regulations on industrial and agricultural discharges to improve water quality.
5. **Community-Based Fisheries Management:** Engage local communities in sustainable fishing practices and habitat restoration.
6. **Research and Monitoring:** Conduct regular taxonomic and genetic studies to update species inventories and assess population trends.

9. Conclusion

Vidarbha's freshwater ecosystems host a remarkable ichthyofaunal diversity, with approximately 160 species supporting ecological balance and local livelihoods. The dominance of Cypriniformes and Cyprinidae, coupled with the presence of endemic and threatened species, highlights the region's ecological significance. However, ongoing threats like habitat loss, pollution, and overfishing necessitate urgent conservation action. By integrating science-based management, policy interventions, and community participation, Vidarbha can preserve its rich fish biodiversity for future generations.

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