

# A Review Study of the diversity of fishes in the Western Ghats of India

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## ABSTRACT

The states of Gujarat, Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu are all traversed by the Western Ghats. The Narmada-Tapi, the Northern Deccan Plateau, the Southern Deccan Plateau, the Southern Eastern Ghats, and the Western Ghats are the five main ecoregions or categories that the freshwater rivers and streams in the Western Ghats fall under. With about 140,000 species of macroscopic fungi, plants, and animals, this freshwater contains ecosystems with some of the highest levels of biological diversity on Earth, accounting for around 12% of all documented species in rivers, lakes, and wetlands. Currently, there are about 18,000 species of fish found in fresh water, and each year, hundreds of new species are discovered. There have been 290 species of freshwater fish studied from the Western Ghats, which are divided into 11 orders, 33 families, and 106 genera. Few of these can also survive in habitats with brackish or salt water. Cyprinidae (72 species), Balitoridae (34 species), Bagridae (19 species), are the families in this area with the highest number of species. The present review study elaborates on the diversity of fishes in the western ghats.

*Key words: Western Ghats, Diversity, Fishes.*

## Introduction

The Western Ghat biogeographic region in southern part of India extends along the west coast starting from 08°19'08"-21°16'24"N to 72°56'24"-78°19'40"E with a north to south distance of 1,490 km. It has a minimum width of 48 km and maximum width of 210 km. It covers a total area of 136,800 km<sup>2</sup> (Dahanukar *et al.*, 2011). The Western Ghats cross the states of Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu interrupted only once by a 30-km break called the Palghat Gap in northern Kerala. Freshwater fish consists of almost 13,000 species belonging to 2,513 genera (Levêque *et al.*, 2008). These fresh waters consist of ecosystems with incredibly high biological diversity on earth, with above 140,000 species of macroscopic fungi, plants

and animals representing about 12% of all described species in rivers, lakes, and wetlands. Presently around 18,000 fish species have been found in fresh water along with hundreds of new species described each year (Vander Sleen, 2021). According to a study by Dahanukar, *et al.* (2013), 290 species of freshwater fishes belonging to 11 orders, 33 families and 106 genera have been studied from the Western Ghats. Out of these, at least 35 species can also live in marine and/or brackish water habitats (secondary freshwater fishes). The most species-rich families of this region are Cyprinidae (72 species), Balitoridae (34 species), Bagridae (19 species), and Sisoridae (12 species). The Western Ghats also have a rich endemic fish fauna of 189 species, belonging to 7 orders, 23 families and 69 genera (Dahanukar *et al.*, 2013).

### The riverine system of the Western Ghats

Broadly, the freshwater rivers and streams in the Western Ghats fall under five main categories or ecoregions, viz., Narmada-Tapi, the Northern Deccan Plateau (Godavari River system), the Southern Deccan Plateau (Krishna River system), the Southern Eastern Ghats (Cauvery River system) and the Western Ghats (west flowing rivers) (Molur, 2011). Western Ghats is divided into eight riverine regions, namely, the Dhule-Tapi region having five major streams and two protected areas; Nashik-Mumbai-Pune region having five major streams and six protected areas; Koyna Valley-Sawanthawadi having five rivers and three protected areas; Aghanashini Valley-Terekhol Valley having six streams and seven protected areas; Sharavathy Valley-Pushpagiri having seven major rivers and protected areas; Kodagu-Wyanad-Nilgiri having four major rivers and ten protected areas; Periyar-Anamalai having seven major rivers and twelve protected areas; and Agasthyamalai having five major rivers and four protected areas (Molur, 2011). The major river systems, in Tamil Nadu includes the Cauvery-Bhavani River complex, the Thambraparani, the Vaigai, the Periyar and the Pennaiyar with their irrigation canals, associated tanks and paddy fields (Rema and Indra, 2000).

Main west flowing rivers are Sharavati, Kalinadi, Netravati, Bedti/ Gangavalli, Aganashini and Chakra. Godavari, together with its tributaries Manjira and Karanja, is the river that flows towards the east major division. Principal tributaries of River Krishna include the Tungabhadra, Bhima, Ghataprabha and Malaprabha. The Cauvery River passes over Kodagu, eastern slopes of the ghats, the Mysore plateau; through Tamil Nadu upland before entering the Bay of Bengal (Chandrashekhariah, 2000).

Godavari, Krishna, Bhima, and Tapi are the four principal rivers of Maharashtra. The Krishna River's basin is located at the extreme south of the state. This basin is also traversed by the two tributaries of Krishna river- Koyna and Varna. Between the Mahadeo and Balaghat ranges in the south, the Bhima River Basin is located above the Krishna River Basin. Along with the Mira of Bhima, a few other tributaries pass through this basin, and the river merges with Krishna beyond the border of Maharashtra. With numerous tiny tributaries, the Godavari basin is higher up between the Sahyadri in

the west and the eastern border of the state. The Tapti River rises from the Sahyadri in the far north and empties into the Arabian Sea by flowing in a north-westerly direction (Archarya and Iftekhhar, 2000).

### Fishes recorded in the western ghats

Laxmappa *et al.* (2015) conducted a study on the Krishna River at 15 locations in the Mahabubnagar district. The orders of fishes listed are Siluriformes, Perciformes, Synbranchiformes, Beloniformes, Osteoglossiformes, and Anguilliformes, with Cypriniformes dominating the list. The families Notopteridae, Anguillidae, Belonidae, Anabantidae, Gobiidae, Mugilidae, Pangasidae, Heteropneustidae, Sisoridae, have 1 species each. Families Hemiramphidae, Ambassidae, Clariidae have 2 species each, Family Siluridae has 3 species. Families Mastacembelidae, Channidae, Cichlidae Sisoridae have 4 species each. Family Schilbedae has 6 species while Bagridae has 12 species and Cyprinidae has 61 species. The river Hiranyakeshi near Amboli merges with Ghataprabha, which ultimately drains in the Krishna River system. According to the study by Kumkar *et al.* (2017), the orders of fishes recorded on various locations of Hiranyakeshi river are Cypriniformes, Siluriformes, Osteoglossiformes, Perciformes, Anguilliformes, Cyprinodontiformes and Symbranchiformes. The families Anguillidae, Hemiramphidae, Balitoridae, Cobidae, Aplocheilidae, Cichlidae, Mastacembelidae have been found to have 1 species each. Family Cyprinidae has 27 species, Nemachelidae has 3 species Bagridae has 4 species. Families Ambassidae, Channidae, Clariidae, Siluridae, have 2 species each.

In the Periyar Tiger Sanctuary, the Periyar River can be found traversing a number of places, including Pamba (Azhutha Pachakkanam), Vallakkadavu, Periyar Lake, Mullayar, Thannikkudy, Ummikuppanthodu, Mlappara, and Moolavaigae, as per a study by Radhakrishnan and Kurup (2010). Cypriniformes, Siluriformes, Perciformes, Anguilliformes, Cyprinodontiformes, and Beloniformes are the orders listed. The families Anguillidae, Cobidae, Siluridae, Sisoridae Heteropneustidae, Belonidae, Aplochelidae, Poecilidae, Mastecembalidae, Gobiidae, Anabantidae, have 1 species each. The families Bagridae, Clariidae, Ambassidae, Cichlidae, Channidae, have 2 species each. The family Balitoridae has 8 species, while Cyprinidae has 27 species.

According to a study by Sreenivasan *et al.* (2021) on the stretch of the Cauvery River between Shivanasamudram falls and Mekedattu within Cauvery Wildlife Sanctuary, the fish orders recorded are Beloniformes, Cypriniformes, Mugiliformes, Osteoglossiformes, Incertae, Anabantiformes, Cichliformes, Gobiiformes, Siluriformes and Synbranchiformes. Families Mugilidae, Notopteridae, Badidae, Clariidae, Loricariidae, Pangasiidae, Schilbeidae, Mastacembelidae, Adrianichthyidae have 1 species each. Families Ambassidae, Gobiidae, Siluridae, Belonidae have 2 species each. Family Cichlidae, has 3 species each. Families Channidae, Bagridae, have 4 species each. Danionidae has 8 species while Cyprinidae has 21 species.

According to a study by Thampy (2021), Kabini, also known as river Kapila, is an important tributary of Cauvery which waters almost the entire part of the Wayanad Plateau on various sites of Kambini river. The orders recorded are Cypriniformes, Siluriformes, Cyprinodontiformes, Synbranchiformes, Ovalentaria, Cichliformes, Anabantiformes, Gobiiformes, Osteoglossiformes, Anguilliformes, Beloniformes, Characiformes, Polypteriformes. Families Heteropneustidae, Pangasiidae, Loricariidae, Mastacembelidae, Anabantidae, Badidae, Gobiidae, Anguillidae, Hemiramphidae, Belonidae, Serrasalminidae Polypteridae, have 1 species each. Families Balitoridae, Clariidae, Pristolepididae have 2 species each and families Poeciliidae, Cichlidae, Osphroneminae, 3 species each. Families Siluridae, Sisoridae, Ambassidae, Channidae, have 4 species each. Family Bagridae has 8 species, family Nemacheilidae has 11 species, family Danionidae has 13 species and family Cyprinidae has 50 species. According to a study by Mogalekar (2019) sample collection was done at different sites along Thamirabarani at Manimuthar dam and its upstream waters, Vannarapettai midstream, Srivaikundam dam and Punnakayal estuary. The orders recorded are Anguilliformes, Beloniformes, Clupeiformes, Cypriniformes, Cyprinodontiformes, Elopiformes, Gonorhynchiform, Mugiliformes, Perciformes, Pleuronectiform, Siluriforms, Synbranchiformes and Tetraodontiformes. Fish families Congridae, Adrianichthyidae, Nemacheilidae, Balitoridae, Nemacheilidae, Poeciliidae, Elopidae, Anabantidae, Mullidae,

Osphronemidae, Scatophagidae, Cynoglossidae, Soleidae, Schilbeidae, Triacanthidae, Tetrodontidae have 1 species each. Families Anguillidae, Hemiramphidae, Engraulidae, Cobitidae, Aplocheilidae, Mugilidae, Acanthuridae, Ambassidae, Gerreidae, Gobiidae, Leiognathidae, Lutjanidae, Serranidae, Sillaginidae, Teraponidae, Clariidae, Heteropneusidae, Mastacembelidae, have 2 species each. Families Belonidae, Clupeidae, Channidae, Signanidae, have 3 species each. Families Cichlidae, Ariidae, Siluridae, have 4 species each. Carangidae has 5 species, Bagridae has 6 species, Cyprinidae has 9 species.

According to a study by Patole (2013) the fish orders recorded on Tapi river and its tributaries at Nandurabar are Beloniformes, Clupeiformes, Cypriniformes, Osteoglossiformes, Perciformes and Siluriformes. Families Belonidae, Clupeidae, Clariidae, Schilbidae, Siluridae, Channidae, Bagridae, Notopteridae have 1 species each. Families Balitoridae, Channidae have 2 species each. Families Ambassidae has 3 species while Cyprinidae has 17 species. In total, 21 fresh water fish species and 22 taxa have been identified from Wan River and its tributaries (M.S.), which belong to 8 families and 5 orders, according to an Ichthyofaunal study by Khade *et al.*, (2017). The family Cyprinidae has been found to be dominant with 12 fish species followed by Siluridae, Channidae, Mastacembelidae having 2 species each, Notopteridae, Clariidae, Gobiidae, Bagridae having 1 species each.

In the study by Vibhute (2016), The fish samples from Rajewadi lake were collected from four different collection stations of study area. The orders recorded are Cypriniformes, Siluriformes, Synbranchiformes and Perciformes. The Families of Heteropneustidae, Schilbeidae, Mastacembelidae, Gobiidae, Lactariidae, Ambassidae, have 1 species each. The family Bagridae has 4 species while Family Cyprinidae has 14 species. In a study by Kamble and Ganesh (2016) on four spots at Kelageri lake Dharwad, the orders recorded are Cypriniformes, Siluriformes, Perciformes, Synbranchiformes, Clupeiformes, Osteoglossiformes. Families Pangasidae, Claridae, Bagridae, Channidae, Cichlidae, Gobidae, Ambassidae, Mastacembelidae, Clupeidae, Notopteridae, have 1 species each. Families Cobitidae, Siluridae have 2 species each while Cyprinidae has 8 species each.

## Discussion and Conclusion

Due to human dependence on freshwater supplies, localised and remote perturbations from upstream drainage networks, and further worsened by anthropogenic climate change, freshwater ecosystems are among the most endangered ecosystem in the world. Human activities have increased the threats to biodiversity (Deb and Chitnis, 2017), including habitat modification, water pollution, overfishing, the introduction of exotic species, river diversions, fragmentation and flow control, the expansion of agricultural and urban landscapes, rising sea levels, and altered precipitation regimes.

The highly vulnerable groups of vertebrates on our planet are freshwater vertebrates, especially fishes and amphibians. The rate of decline of freshwater fishes is closely associated with the extent of riverine diversions and wetland loss. Increase in human population along with rapid pace of industrialization and pollution in water bodies have increased tremendously (Acharya and Deb, 2017). Fish and marine mammals occupy the topmost position of the aquatic food chain and are subjected to higher levels of toxins directly from the polluted water and also by preying on other fishes who are already subjected to high levels of toxins in water (Ganguly, 2013).

Hence, it is of utmost importance to evaluate the biology, genetics of the candidate species of exotic fishes, its possible consequences on the native species in the natural environment, and lower the destructive ecological and economic effects resulting from introduction of alien species. Gene bank plays an important part in saving species from extinction by preserving live animals or cry preserved gametes, captive breeding and restocking in species-specific recovery programmes. Cryopreservation of germ plasm development of species-specific protocols is a very good ex-situ strategy to conserve existing allelic diversity for future by provide gametes for artificial propagation programmes in off seasons (Arunkumar and Manimejlan, 2018). Wildlife tourism, bird watching, and trekking are examples of eco-tourism activities that assist the government in better managing natural resources. There is an ardent need for long term research on issues and investigation of other sites experiencing tourist pressure, and the level and rate at which the tourist traffic triggers negative impact on wildlife; hence set a level that will minimize the impact on the

biodiversity. Instead of granting licences for sand mining through auction, a system should be established to directly mine the sands in the required quantities from the permitted areas and sell them directly to the consumers. This should be regulated based on the rate of deposition of sand in each area and that should ensure a minimum deposition and development of sand deposition the following year (Amitha Bachan, 2003).

The department of forests and the local bodies should initiate a forestation programme for the development and conservation of riparian forests in the degraded area as the riparian vegetation acts as a gene pool for the wildlife relevant in each area. Excessive killing of fishes should be abided by the law. Every major fish market in the Western Ghats belt should have a licence and there should be a check over the sale of threatened fish species. Fishermen should be instructed with guidelines to save particular fish with the use of nets of suitable mesh size and their practical knowledge can be utilized in conservation work. Attempts should be made to prepare an updated document on the Ichthyofaunal of the Western Ghats including suggestions of Species Survival Commission and Convention on Trade in Endangered Species (CITES). Construction of large dams should be done according to data based on first identification of species at risk, undertaking a full and comprehensive environmental impact assessment following the framework set out in the World Commission on Dams report. In addition, attempts should be made to construct appropriate fish passages and ladders in the existing dams.

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