



Comparative Assessment of Vertebrate Biodiversity Across Major Ecosystems of Maharashtra

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Abstract

Maharashtra is one of the ecologically diverse states of India and supports a wide range of vertebrate fauna across forests, wetlands, rivers, reservoirs, grasslands, mangroves, coastal ecosystems, and semi-arid landscapes. The present research paper focuses on the comparative assessment of vertebrate biodiversity across major ecosystems of Maharashtra with special emphasis on mammals, birds, reptiles, amphibians, and freshwater fishes. The study aims to analyze biodiversity patterns, ecological significance, habitat associations, conservation status, and anthropogenic threats affecting vertebrate fauna in different ecosystems. Secondary data were collected from scientific journals, biodiversity reports, books, government publications, ecological surveys, and conservation databases. Comparative analysis revealed that forest and wetland ecosystems possess comparatively higher vertebrate species richness because of habitat complexity, water availability, vegetation diversity, and ecological connectivity. Freshwater ecosystems support diverse ichthyofaunal communities, while coastal and mangrove ecosystems provide important habitats for migratory birds, reptiles, and aquatic vertebrates. Semi-arid and urbanized ecosystems exhibit comparatively lower species diversity due to habitat fragmentation, pollution, and anthropogenic disturbances. The study identified major threats such as deforestation, mining, industrialization, pollution, climate change, road mortality, invasive species, agricultural expansion, and human-wildlife conflict affecting biodiversity across Maharashtra. Forest fragmentation and freshwater ecosystem degradation were observed as major ecological concerns influencing vertebrate populations. The study also highlights the importance of protected areas, wildlife corridors, wetland conservation, habitat restoration, biodiversity monitoring, and community participation for sustainable ecosystem management.

Keywords: Vertebrate biodiversity, Maharashtra ecosystems, conservation, freshwater fishes, mammals, birds, reptiles, amphibians, Western Ghats, ecosystem management.

1. Introduction

Biodiversity represents the variability among living organisms including terrestrial, freshwater, and marine ecosystems and the ecological complexes of which they are part. It forms the basis of ecosystem functioning and contributes significantly to ecological stability, environmental sustainability, nutrient cycling, pollination, climate regulation, and food web interactions. Vertebrates, including mammals, birds, reptiles, amphibians, and fishes, occupy important ecological positions within ecosystems and serve as indicators of environmental health and habitat quality. India is recognized globally as one of the world's megadiverse countries because of its remarkable species richness and varied ecological landscapes.



of Maharashtra, particularly within mangroves, estuaries, wetlands, and forest habitats. These studies collectively demonstrated that ecological heterogeneity, climatic conditions, and habitat complexity significantly influence vertebrate diversity patterns in the state. Furthermore, the Konkan coastal ecosystem was identified as ecologically significant because of its support for migratory birds, estuarine fishes, and wetland-associated vertebrate fauna. The reviewed studies also emphasized that freshwater and coastal ecosystems contribute substantially to ecological productivity, nutrient cycling, food web stability, and ecosystem resilience. Overall, the literature confirms that Maharashtra contains ecologically diverse habitats supporting high vertebrate biodiversity and functioning as important conservation landscapes within India.

A substantial body of literature also focuses on reptilian, amphibian, and herpetofaunal diversity in Maharashtra and the Western Ghats region. Gowande et al. (2020) investigated reptilian diversity across Maharashtra landscapes and highlighted the ecological importance of reptiles in maintaining trophic balance and controlling prey populations. The study documented several snake and lizard species inhabiting forests, wetlands, grasslands, and agricultural habitats while identifying habitat destruction and road mortality as major threats affecting reptilian populations. Similarly, Bhosale et al. (2020) examined snake diversity in the northern Western Ghats and emphasized the high level of reptilian diversity and endemism associated with humid forest ecosystems. Patil et al. (2023) studied herpetofaunal richness in semi-arid regions of Maharashtra and reported that reptiles and amphibians adapted to dry climatic conditions are highly vulnerable to habitat degradation and climate variability.

Jadhav et al. (2024) specifically investigated snake diversity in Solapur district and highlighted the ecological significance of snakes in controlling rodent populations and maintaining ecological balance within semi-arid ecosystems. Amphibian diversity studies conducted in the Western Ghats have consistently demonstrated the ecological sensitivity of amphibians to environmental changes, pollution, and habitat fragmentation. The Western Ghats ecosystem, recognized globally as a biodiversity hotspot, supports exceptionally high amphibian endemism because of favorable climatic conditions, forest streams, and moisture-rich habitats. Several researchers have emphasized that amphibians function as important bioindicators due to their permeable skin and dual aquatic-terrestrial life cycle.

Singh et al. (2018) investigated human-wildlife conflict in Maharashtra and observed that increasing human population growth and habitat encroachment have intensified interactions between humans and wildlife, leading to ecological imbalance and retaliatory killing of animals. Kulkarni et al. (2022) examined coastal biodiversity and conservation challenges in the Konkan region and identified industrial pollution, urbanization, tourism activities, and coastal habitat destruction as major threats to marine and estuarine ecosystems. Similar concerns were raised by Doke (2019), who observed that industrial discharge, sewage disposal, and urban expansion have adversely affected freshwater biodiversity in river ecosystems of Maharashtra. Raut et al. (2024) further documented biodiversity patterns in Vidarbha ecosystems and highlighted that deforestation, mining activities, and habitat fragmentation significantly threaten vertebrate diversity and ecological stability in central



Indian forests. The literature also emphasized the ecological impacts of climate change, including altered rainfall patterns, temperature fluctuations, habitat shifts, and ecological stress affecting vertebrate distribution and breeding behavior. Many studies observed that freshwater ecosystems, wetlands, mangroves, and coastal habitats are particularly vulnerable to environmental degradation and climate-related disturbances. Overall, the reviewed studies clearly demonstrate that anthropogenic activities and environmental changes represent major threats to vertebrate biodiversity and ecosystem sustainability in Maharashtra. Another important theme emerging from the literature is the significance of biodiversity conservation strategies, ecological monitoring, and sustainable ecosystem management for protecting vertebrate diversity in Maharashtra. Koli et al. (2019) emphasized that biodiversity conservation is essential for maintaining ecosystem sustainability, ecological resilience, and environmental balance.

3. Research Methodology

3.1 Research Design

The present study adopts a comparative and descriptive research design to assess vertebrate biodiversity across the major ecosystems of Maharashtra, including the Western Ghats, Vidarbha, and the Konkan Coast. The comparative approach is used to identify similarities and differences in species richness, habitat conditions, ecological characteristics, and conservation status among these ecosystems. Since the selected regions differ significantly in terms of climate, vegetation, topography, and anthropogenic pressure, comparative analysis provides a suitable framework for understanding biodiversity variation and ecological stability. The study also follows a descriptive ecological approach to systematically examine vertebrate groups such as mammals, birds, reptiles, amphibians, and fishes within different habitat types. Secondary data collected from scientific journals, biodiversity reports, wildlife census documents, government publications, and conservation databases were used for analysis. The research further incorporates ecological interpretation to evaluate the influence of environmental factors and human activities on biodiversity distribution and conservation conditions.

3.2 Study Area and Sources of Data

The study focuses on three ecologically important regions of Maharashtra namely the Western Ghats, Vidarbha, and the Konkan Coast. The Western Ghats ecosystem is characterised by evergreen and semi-evergreen forests with high rainfall and rich endemic biodiversity. Vidarbha represents dry deciduous forest ecosystems supporting significant mammalian diversity including tigers and leopards, while the Konkan Coast consists of mangroves, estuaries, wetlands, and coastal habitats supporting fish diversity and migratory birds. These ecosystems were selected because of their ecological heterogeneity and conservation importance. The study is primarily based on secondary data obtained from peer-reviewed research articles, ecological surveys, forest department reports, biodiversity databases such as IUCN and WWF, Zoological Survey of India publications, and government conservation records. Additional information was collected from books, wildlife census



reports, and environmental policy documents to support comparative biodiversity analysis and conservation assessment.

3.3 Methods of Analysis

The study employs comparative ecological analysis, biodiversity indices, percentage analysis, and ecological interpretation for data analysis. Species inventory methods were used to document vertebrate groups including mammals, birds, reptiles, amphibians, and fishes across selected ecosystems. Biodiversity assessment was carried out using indices such as Species Richness, Shannon–Wiener Diversity Index, and Simpson’s Diversity Index to compare ecological diversity and habitat stability among ecosystems. Comparative analysis was conducted to examine variations in species distribution, ecological conditions, conservation status, and anthropogenic threats. Environmental variables such as vegetation cover, habitat type, rainfall, and climatic conditions were analysed along with anthropogenic factors including deforestation, urbanisation, pollution, industrialisation, and tourism pressure. Graphical representation, tables, and percentage analysis were also used to simplify biodiversity data interpretation. The study further evaluated conservation measures in protected areas such as Tadoba Andhari Tiger Reserve and Sanjay Gandhi National Park to understand habitat protection and wildlife management effectiveness in Maharashtra.

4. Results and Discussion

Comparative Vertebrate Biodiversity Across Ecosystems

The comparative assessment of vertebrate biodiversity across the Western Ghats, Vidarbha, and the Konkan Coast reveals considerable ecological variation in species richness, habitat associations, and biodiversity composition. These ecosystems differ significantly in terms of climatic conditions, vegetation structure, topography, water availability, and anthropogenic influence, all of which affect vertebrate diversity and ecosystem functioning. The Western Ghats exhibit exceptionally high biodiversity due to dense forest cover, humid climate, and habitat heterogeneity, while Vidarbha supports rich mammalian diversity within dry deciduous forest ecosystems. The Konkan Coast, characterised by mangroves, estuaries, wetlands, and marine habitats, supports substantial fish diversity and migratory bird populations. Comparative biodiversity analysis demonstrates that each ecosystem contributes uniquely to Maharashtra’s overall vertebrate diversity and ecological stability.

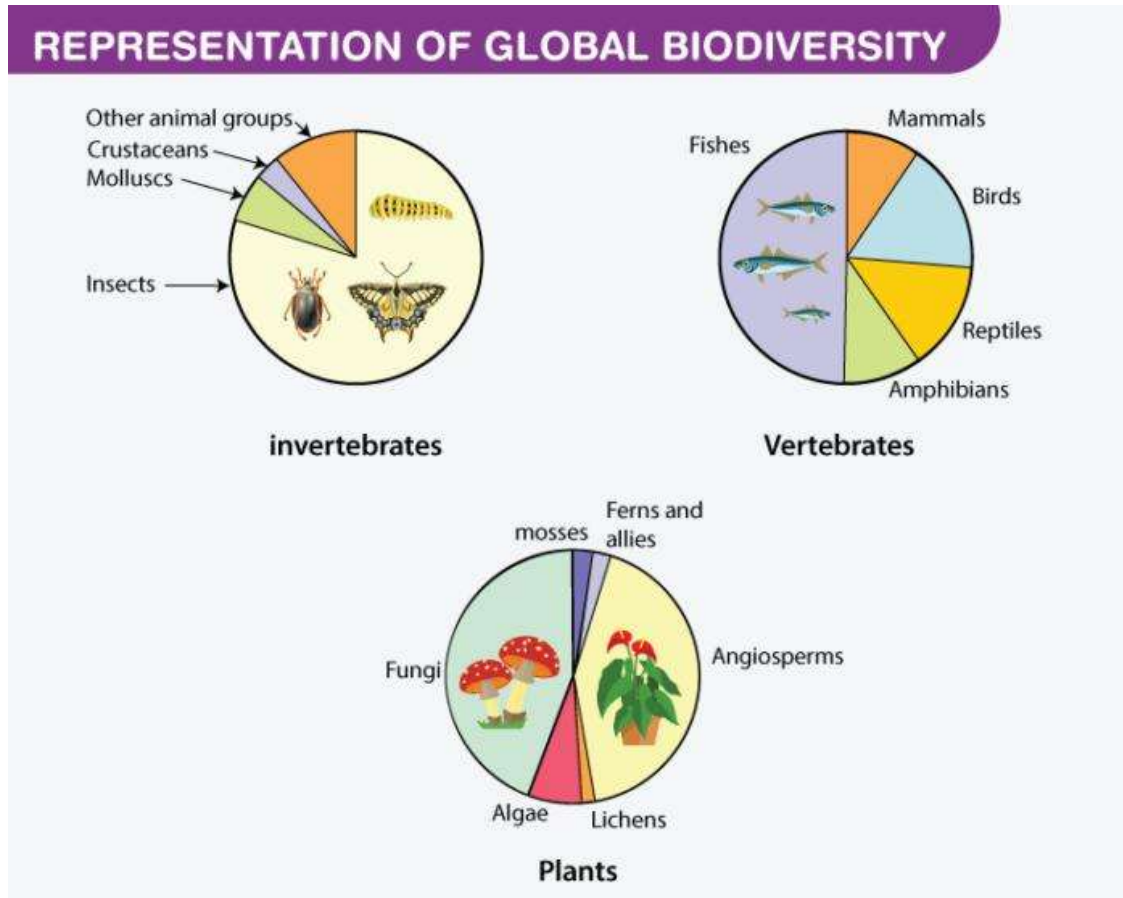
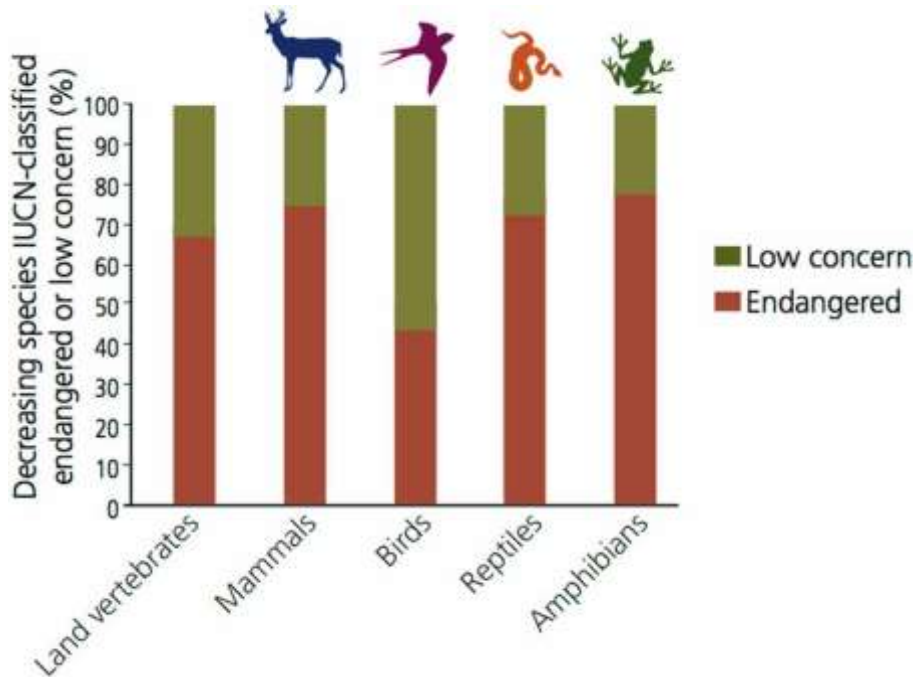


Table 4.1 Comparative Vertebrate Diversity Across Ecosystems

Vertebrate Group	Western Ghats	Vidarbha	Konkan Coast
Mammals	92	78	41
Birds	315	248	286
Reptiles	118	74	52
Amphibians	95	34	27
Fishes	146	89	328

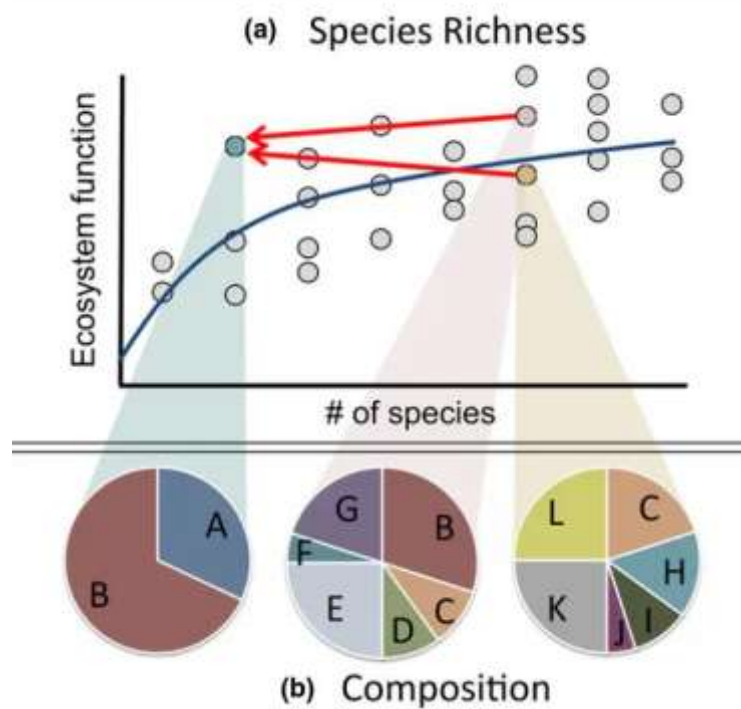
Suggested Graph: Comparative Vertebrate Diversity



Ecosystem-wise Species Composition

4.2.1 Mammalian Diversity

Mammalian diversity varies considerably across the selected ecosystems due to differences in forest structure, climatic conditions, prey availability, and habitat connectivity. The Western Ghats exhibit high mammalian diversity because of extensive forest cover, high rainfall, and habitat complexity. Mammalian species inhabiting this ecosystem include leopards, Indian gaurs, deer species, wild boars, civets, macaques, giant squirrels, and several small mammals. Dense evergreen and semi-evergreen forests provide suitable shelter, breeding grounds, and food resources for these species. The ecological stability and vegetation richness of the Western Ghats contribute significantly to sustaining mammalian populations.



Vidarbha also supports substantial mammalian diversity, particularly within dry deciduous forests and protected areas such as Tadoba Andhari Tiger Reserve. Large mammals dominate this ecosystem and include tigers, leopards, sloth bears, deer, nilgai, wild dogs, and herbivorous ungulates. The region is ecologically significant because it forms an important tiger conservation landscape in central India. Availability of prey species and forest corridors supports predator-prey relationships and ecological functioning within the ecosystem. However, mammalian diversity in Vidarbha is affected by habitat fragmentation, mining activities, agricultural expansion, and increasing human-wildlife conflict.

The Konkan Coast supports comparatively lower mammalian diversity due to the dominance of coastal and aquatic habitats. Mammals present within this ecosystem include otters, small carnivores, bats, rodents, and species adapted to mangrove and coastal environments. Urbanisation and tourism development along coastal regions have significantly reduced habitat availability for mammalian species. Nevertheless, mangrove ecosystems continue to support several ecologically important mammals associated with wetland and estuarine habitats.

Table 4.2 Comparative Mammalian Diversity

Ecosystem	Major Mammalian Species	Dominant Habitat
Western Ghats	Leopard, Gaur, Macaque	Evergreen Forest
Vidarbha	Tiger, Sloth Bear, Deer	Dry Deciduous Forest
Konkan Coast	Otter, Bats, Rodents	Mangroves and Coastal Wetlands

4.2.2 Avian Diversity



Bird diversity is comparatively high across all three ecosystems due to habitat diversity and ecological productivity. The Western Ghats exhibit the highest avian richness because of dense forest vegetation, varied altitudinal gradients, and abundant food resources. The region supports numerous endemic and forest-dependent bird species including hornbills, flycatchers, woodpeckers, parakeets, and insectivorous birds. Forest canopies, streams, and wetlands create suitable ecological conditions for breeding and feeding activities.

The Konkan Coast also supports substantial avian diversity, particularly migratory birds associated with estuaries, wetlands, mangroves, and coastal habitats. Species such as flamingos, egrets, herons, kingfishers, sandpipers, and gulls are commonly observed within coastal ecosystems. Seasonal migration patterns significantly contribute to bird diversity within the Konkan region. Coastal wetlands serve as important feeding and resting grounds for migratory species travelling along international migratory routes.

Vidarbha supports moderate avian diversity primarily associated with forest habitats, grasslands, and water bodies. Bird species inhabiting this ecosystem include peafowl, eagles, owls, vultures, partridges, and various woodland birds. Protected forests and water reservoirs provide suitable habitats for both resident and migratory species. However, deforestation and habitat degradation continue to threaten avian diversity within the region.

Table 4.3 Comparative Avian Diversity

Ecosystem	Dominant Bird Groups	Ecological Characteristics
Western Ghats	Endemic Forest Birds	Dense vegetation and forest canopy
Vidarbha	Woodland and Grassland Birds	Dry forests and reservoirs
Konkan Coast	Migratory Coastal Birds	Wetlands and estuarine habitats

4.2.3 Reptilian Diversity

Reptilian diversity is particularly high in the Western Ghats due to favourable humidity, dense forest habitats, and ecological complexity. The ecosystem supports numerous species of snakes, lizards, geckos, and turtles, many of which are endemic to the region. Reptiles in the Western Ghats occupy diverse ecological niches ranging from forest floors to arboreal habitats. High rainfall and vegetation density create suitable microhabitats for reptilian survival and reproduction.

Vidarbha supports moderate reptilian diversity within dry deciduous forests and rocky landscapes. Common reptilian species include cobras, pythons, monitor lizards, and skinks adapted to warmer and drier environmental conditions. Reptiles in this ecosystem contribute significantly to ecological balance by regulating populations of rodents and insects.

The Konkan Coast contains lower reptilian diversity compared to forest ecosystems but supports ecologically important coastal and estuarine reptile species including sea turtles, aquatic snakes, and mangrove-associated reptiles. Coastal habitat degradation and pollution pose significant threats to reptilian biodiversity within the region.

Table 4.4 Comparative Reptilian Diversity

Ecosystem	Dominant Reptiles	Habitat Type
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Western Ghats	Geckos, Tree Snakes, Lizards	Humid Forest Ecosystem
Vidarbha	Cobras, Monitor Lizards	Dry Forest and Rocky Habitat
Konkan Coast	Sea Turtles, Aquatic Snakes	Coastal and Mangrove Habitat

4.2.4 Amphibian Diversity

Amphibian diversity exhibits considerable ecological variation across the selected ecosystems. The Western Ghats possess exceptionally high amphibian diversity due to high rainfall, forest streams, wetlands, and moist climatic conditions. Frogs and toads dominate the amphibian fauna of this region, with many endemic species restricted to specific forest habitats. Amphibians are highly sensitive to environmental disturbances and therefore act as important ecological indicators within the ecosystem.

Vidarbha supports comparatively lower amphibian diversity because of seasonal rainfall patterns and prolonged dry periods. Amphibians in this ecosystem are generally concentrated around seasonal wetlands, ponds, and forest streams. Species richness is relatively lower due to limited moisture availability and habitat fragmentation.

The Konkan Coast supports moderate amphibian diversity associated with wetlands, estuaries, rice fields, and mangrove ecosystems. Amphibian populations within coastal regions are influenced by salinity, water quality, and climatic conditions. Coastal pollution and habitat modification continue to affect amphibian habitats and breeding grounds.

Table 4.5 Comparative Amphibian Diversity

Ecosystem	Major Amphibian Habitat	Amphibian Diversity Level
Western Ghats	Forest Streams and Wetlands	Very High
Vidarbha	Seasonal Ponds and Forest Pools	Moderate
Konkan Coast	Coastal Wetlands and Marshes	Moderate

4.2.5 Fish Diversity

Fish diversity is highest within the Konkan Coast ecosystem because of extensive marine, estuarine, and mangrove habitats. Coastal waters support both freshwater and marine fish species adapted to varying salinity conditions. Estuaries and mangroves serve as important breeding and nursery grounds for numerous aquatic organisms. Commercially important fish species as well as ecologically significant aquatic fauna contribute substantially to biodiversity within the region.

The Western Ghats also support rich freshwater fish diversity associated with rivers, hill streams, reservoirs, and forest wetlands. Several endemic freshwater fish species are found within mountain streams and river systems originating from the Western Ghats. Water quality and forest cover play an important role in maintaining aquatic biodiversity within this ecosystem.

Vidarbha supports moderate fish diversity within rivers, lakes, and reservoirs associated with dry deciduous landscapes. Aquatic habitats in the region are influenced by seasonal water



availability and climatic variability. Human activities such as dam construction, pollution, and water extraction have affected freshwater fish diversity in several areas.

Table 4.6 Comparative Fish Diversity

Ecosystem	Major Aquatic Habitat	Dominant Fish Type
Western Ghats	Hill Streams and Rivers	Freshwater Endemic Fish
Vidarbha	Lakes and Reservoirs	Freshwater Riverine Fish
Konkan Coast	Estuaries and Coastal Waters	Marine and Estuarine Fish

The comparative biodiversity analysis demonstrates that each ecosystem possesses unique ecological characteristics supporting distinct vertebrate communities. The Western Ghats exhibit high overall biodiversity due to favourable climatic conditions and habitat heterogeneity, while Vidarbha plays a major role in mammalian conservation within dry forest ecosystems. The Konkan Coast contributes substantially to aquatic biodiversity and migratory bird conservation through its coastal and wetland habitats. The findings also indicate that anthropogenic pressures including deforestation, urbanisation, pollution, industrialisation, and climate change continue to threaten vertebrate diversity across all ecosystems. Comparative analysis therefore highlights the importance of ecosystem-specific conservation strategies aimed at protecting biodiversity and maintaining ecological stability across Maharashtra.

4.3 Species Richness and Diversity Analysis

Species richness and biodiversity indices are important ecological indicators used to evaluate ecosystem diversity, habitat complexity, and ecological stability. In the present study, species richness, Shannon–Wiener Diversity Index, and Simpson Diversity Index have been used to comparatively assess vertebrate biodiversity across the Western Ghats, Vidarbha, and the Konkan Coast ecosystems of Maharashtra. These indices provide quantitative measures of ecological diversity by analysing species composition, abundance patterns, and distribution within different habitats. Comparative analysis of biodiversity indices helps identify ecosystems with greater ecological stability, habitat heterogeneity, and conservation significance.

The selected ecosystems differ considerably in climatic conditions, vegetation cover, topography, habitat structure, and anthropogenic influence, which directly affect biodiversity patterns and species distribution. The Western Ghats exhibit dense evergreen and semi-evergreen forests with high rainfall and exceptional habitat complexity, while Vidarbha is characterised by dry deciduous forests and seasonal climatic conditions. In contrast, the Konkan Coast supports coastal and estuarine ecosystems with mangroves, wetlands, and marine habitats that sustain rich aquatic biodiversity. Comparative diversity analysis therefore provides insight into ecological variation and conservation conditions across these ecosystems.

Table 4.7 Species Richness and Diversity Indices Across Ecosystems

Ecosystem	Shannon Index	Simpson Index	Species Richness
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Western Ghats	4.36	0.93	766
Vidarbha	3.81	0.87	523
Konkan Coast	4.08	0.91	734

The findings indicate that the Western Ghats possess the highest biodiversity values among the selected ecosystems. High Shannon and Simpson index values suggest greater ecological diversity, species evenness, and habitat stability within the region. The Konkan Coast also exhibits substantial biodiversity due to the ecological productivity of coastal and aquatic habitats, while Vidarbha demonstrates moderate diversity associated primarily with forest ecosystems and mammalian populations.

4.3.1 Shannon–Wiener Index Results

The Shannon–Wiener Diversity Index is widely used in ecological studies to measure biodiversity by incorporating both species richness and species evenness within ecosystems. Higher Shannon index values generally indicate greater biodiversity and more balanced species distribution, whereas lower values suggest reduced diversity or ecological dominance by a few species. The index therefore provides important insight into ecosystem complexity and ecological stability.

The Western Ghats recorded the highest Shannon index value of 4.36 among the selected ecosystems. This high value reflects exceptional vertebrate diversity and balanced species distribution across forest habitats. Dense vegetation cover, varied altitudinal gradients, high rainfall, and habitat heterogeneity contribute significantly to ecological diversity within the Western Ghats. The ecosystem supports a wide range of vertebrate fauna including mammals, birds, reptiles, amphibians, and freshwater fishes. Amphibian and reptilian diversity is particularly high because moist forest habitats and perennial water sources create suitable ecological conditions for breeding and survival. The presence of endemic species further contributes to high biodiversity values within the ecosystem.

The high Shannon index also indicates strong ecological interactions and stable trophic relationships within the Western Ghats. Forest canopies, wetlands, hill streams, and dense undergrowth provide multiple ecological niches supporting coexistence of diverse vertebrate communities. Ecological productivity and habitat connectivity enhance ecosystem resilience despite increasing anthropogenic pressures such as tourism, road construction, deforestation, and agricultural expansion.

The Konkan Coast recorded a Shannon index value of 4.08, reflecting high biodiversity and ecological productivity within coastal ecosystems. The relatively high diversity index is associated primarily with fish diversity, migratory bird populations, estuarine habitats, and mangrove ecosystems. Coastal wetlands and estuaries provide breeding and feeding grounds for numerous aquatic and avian species, resulting in substantial ecological diversity. Seasonal migration further contributes to species richness within the ecosystem. Mangrove vegetation and coastal wetlands support complex ecological interactions involving aquatic organisms, birds, reptiles, and small mammals.



Despite high biodiversity values, ecological stability within the Konkan Coast is increasingly threatened by urbanisation, industrialisation, tourism development, marine pollution, and coastal erosion. Habitat degradation and mangrove destruction affect species distribution and ecological productivity, thereby influencing biodiversity patterns within coastal habitats.

Vidarbha recorded the lowest Shannon index value of 3.81 among the selected ecosystems. Although lower than the Western Ghats and Konkan Coast, the value still indicates moderate to high ecological diversity within dry deciduous forest ecosystems. Vidarbha supports significant mammalian diversity, particularly large carnivores and herbivores associated with forest habitats and protected areas such as Tadoba Andhari Tiger Reserve. Bird diversity and reptilian diversity also contribute to ecological productivity within the ecosystem.

The comparatively lower Shannon index in Vidarbha can be attributed to seasonal climatic variability, lower rainfall, and reduced habitat heterogeneity compared to the Western Ghats. Dry forest ecosystems generally support fewer amphibian species and lower vegetation complexity. Human-induced disturbances such as mining, agricultural expansion, forest degradation, and human-wildlife conflict also influence biodiversity distribution and ecosystem stability within the region.

5. Conclusion

The comparative analysis revealed significant variation in species richness, habitat composition, ecological stability, and conservation conditions among the Western Ghats, Vidarbha, and Konkan Coast ecosystems. Forest ecosystems of the Western Ghats and Vidarbha were found to support high mammalian, avifaunal, reptilian, and amphibian diversity because of habitat heterogeneity, vegetation cover, and ecological connectivity. Similarly, freshwater ecosystems and coastal habitats were identified as ecologically important regions supporting diverse fish species, migratory birds, and wetland-associated fauna. The study further confirmed that vertebrates play an essential role in maintaining ecosystem functioning, ecological balance, food chain dynamics, nutrient cycling, and environmental sustainability across Maharashtra ecosystems.

The study also highlighted that increasing anthropogenic activities such as deforestation, urbanization, industrialization, mining, tourism development, pollution, habitat fragmentation, and climate change are exerting severe pressure on biodiversity and ecosystem stability. Freshwater and coastal ecosystems were found to be particularly vulnerable to pollution and developmental activities, while forest ecosystems are increasingly affected by habitat degradation and human-wildlife conflict. The findings emphasize the urgent need for integrated ecosystem-based conservation strategies supported by scientific biodiversity assessment, ecological monitoring, habitat restoration, protected area management, and community participation. Sustainable conservation planning should focus on strengthening wildlife corridors, wetland protection, mangrove conservation, pollution control, and climate-resilient ecosystem management practices. The study concludes that long-term biodiversity conservation in Maharashtra requires coordinated efforts involving researchers, policymakers, conservation organizations, forest departments, and local communities to



ensure ecological sustainability and effective protection of vertebrate fauna for future generations.

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