

# Exploring the Hidden Richness of Fishes in Padel Estuarine Mangrove Ecosystem in Sindhudurg (M.S)

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**Abstract:** Fisheries contribute significantly to the economy, food security, foreign exchange revenues, and employment in coastal areas. Maharashtra has a 720 km coastline stretched across 7 districts, including Thane, Palghar, Mumbai city, Mumbai suburban, Raigad, Ratnagiri, and Sindhudurg, along the Arabian Sea with abundant marine resources. Mangroves are among the most prolific ecosystems in the Konkan region. The estuarine habitat supports the ecology and protects its young stock and valuable biomass. Mangroves are renowned as a salt-tolerant forest environment. Coastal communities rely on it for a variety of ecological and economic benefits, making it a valuable resource. Padel is a small village in the Devgad Taluka of Sindhudurg district, known for its rich natural beauty and dense mangrove forests. These mangroves play a crucial role in maintaining the ecological balance of the region. They serve as a vital habitat for a diverse range of wildlife, including fish, molluscs, birds, insects, and reptiles. The intricate root systems of the mangroves provide shelter and breeding grounds for various aquatic species, ensuring the sustainability of marine life. The presence of these forests also supports a wide variety of birds, making Padel a potential spot for birdwatchers and nature enthusiasts. This research focuses on studying fish diversity in Padel's mangrove ecosystem, highlighting its ecological significance and role in sustaining fisheries. Understanding species diversity helps assess environmental health, support conservation efforts, and promote sustainable fishing practices. Protecting this ecosystem is crucial for biodiversity, local livelihoods, and long-term ecological stability.

**Key words:** biodiversity, mangrove, fisheries, sustainable aquaculture.

## INTRODUCTION

One of the planet's most prolific ecosystems is the mangrove. They serve as custodians of their juvenile stock and form most valuable biomass (Odum, 1971). Mangroves are an ecological category of halophytic plant species that sustain a variety of other coastal and marine habitats and are referred to as the salt-tolerant forest ecosystem. They offer a wide range of ecological and economic products and services.

'Mangrove' has been variously defined in literature. The Oxford dictionary mentioned the words 'mangrove' and 'mangrove' since 1613, indicating tropical trees or shrubs found in coastal swamps with tangled roots that grow above the ground, whereas the Americans, the Spanish, and the Portuguese used the term 'Mangle' and 'Mangue' indicating trees and shrubs of the genus *Rhizophora* (Mepham & Mepham, 1984). Later, the term 'mangrove' was referred to the individual plant or tidal forest or both, as 'Mangrove plants' and 'Mangrove ecosystem' (MacNae 1968).

Mangrove ecosystems are one of the most productive and biologically diverse coastal environments, playing a critical role in maintaining ecological balance and supporting fisheries. These unique coastal forests thrive in saline and brackish waters, forming dense root systems that stabilize shorelines, prevent erosion, and serve as a natural buffer against storm surges and tidal waves. Mangroves also act as a carbon sink, absorbing large amounts of carbon dioxide, which helps mitigate climate change. Additionally, they support a vast array of biodiversity, providing a habitat for numerous terrestrial and aquatic species, including fish, molluscs, birds, insects, and reptiles. Mangrove forests are one of the most important ecosystems in Sindhudurg district's estuaries, contributing significantly to ecological balance, biodiversity, and economic advantages. These forests are found in coastal and estuarine areas where freshwater meets seawater, creating a highly productive environment. Sindhudurg is rich estuarine ecosystems, including regions like Devgad, Malvan, and Vengurla, support dense mangrove forests that serve multiple ecological and socio-economic functions.

Mangrove forests in Sindhudurg act as a protective shield against coastal erosion by stabilizing sediments with their complex root systems. These roots help reduce the impact of tidal waves, storms, and cyclones, safeguarding coastal communities and

infrastructure. The ability of mangroves to trap sediments also improves water quality by filtering pollutants, reducing turbidity, and maintaining the health of estuarine ecosystems. Mangroves are known as biodiversity hotspots, providing habitat and breeding grounds for various aquatic and terrestrial species. They serve as nurseries for fish, crabs, molluscs, and shrimp, which are essential for maintaining fishery stocks. Many commercially important fish species spend their early life stages in mangrove waters, gaining protection from predators before migrating to open seas. Additionally, these forests support various bird species, reptiles, and insects, making them crucial for maintaining regional biodiversity.

The mangrove forests of Sindhudurg significantly contribute to the local fisheries industry by supporting a diverse range of fish and crustaceans. Fishing communities rely on these ecosystems for their livelihood, as mangroves enhance fish populations and provide sustainable fishing opportunities. Estuarine fishing, crab farming, and shrimp cultivation thrive in mangrove-rich areas, boosting the local economy. Additionally, mangroves support traditional livelihoods such as honey collection, shellfish harvesting, and medicinal plant extraction. Many local communities depend on these resources for their economic well-being. Sustainable management of these forests is crucial to ensure the long-term viability of these industries while preventing overexploitation of resources. Studying fish diversity in Padel's mangrove ecosystem is crucial for assessing the health of the environment and ensuring the sustainability of fishery resources. Fish diversity serves as an indicator of ecological balance, with any decline in species richness signalling potential environmental stressors such as pollution, habitat destruction, or climate change. Research in this field can help

identify key species that are essential for the ecosystem, monitor changes in fish populations, and guide conservation strategies to protect vulnerable species. Additionally, understanding fish diversity can aid in sustainable fisheries management by ensuring that fishing practices do not deplete critical populations. It can also help local communities adapt to environmental changes and make informed decisions regarding resource use. Given the increasing threats posed by habitat destruction and human activities, comprehensive studies on fish diversity in Padel's mangrove ecosystem are necessary for conservation efforts and long-term ecological stability.

The mangrove forests of Padel are vital for supporting fisheries, maintaining biodiversity, and ensuring environmental stability. Conducting research on fish diversity in this region will not only contribute to conservation efforts but also help in managing fisheries resources sustainably. Protecting and preserving these ecosystems is essential for the well-being of both the local community and the broader ecological network.

This study aims to catalogue and assess the diversity of fish species in the estuarine region of Padel, Sindhudurg district. It focuses on identifying species, understanding their distribution, and evaluating ecological factors influencing fish populations for conservation and sustainable fisheries management.

## MATERIALS AND METHODS

### Study Area:

Padel village (16.4757° N, 73.3873° E), located 12 km from Devgad was chosen as the primary study area to investigate ichthyofaunal diversity and relative species abundance in the estuarine fisheries of Sindhudurg district of Maharashtra state. (Fig: 1)

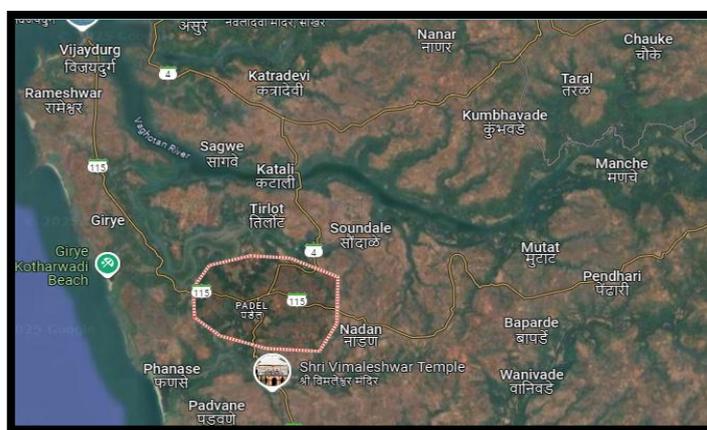


Fig:1 Map of Padel showing the fish collection site

In Padel mostly traditional fishing methods, utilizing nets such as the “karpi,” “Bandhi,” “Dol,” and “Rampan net,” were employed to capture fish samples. The caught fish were thoroughly identified and documented, with a focus on lesser-known species.

**Sampling Period:**

The study lasted six months, from September 2023 to February 2024, and aimed to document seasonal changes in fish biodiversity. During this time, visits were undertaken once a month to ensure a full assessment of the ichthyofaunal diversity in the research area.

**Fish Identification:**

Ichthyologic fauna were identified by an assortment of visual observations and, when necessary, the expertise of local fishermen who are familiar with species recognition. Fish samples were identified up to the species level, using recognized taxonomic keys and references.

**RESULTS**

During the research, we identified 13 distinct fish species, spanning 3 orders and 11 families.

Table1. Distribution species in Scientific Name and Common Name, Order, Family of fishes

Scientific name	Common name	Order-	Family	Marathi name
Carcharhinus sorrah	Spot tailed shark	Carcharhiniformes	Carcharhinidae	Vatu
Haploblepharus fuscus	Brown shy shark	Carcharhiniformes	Scyliorhinidae	Mushi
Lates calcarifer	Sea bass	Perciformes	Latidae	kalay
Lutjanus argentimaculatus	Mangrove red snapper	Perciformes	Lutjanidae	Tamboshi
Lutjanus bengalensis	Bengal snapper	Perciformes	Lutjanidae	Tamboshi
Epinephelus coioides	Orange spotted grouper	Perciformes	Serranidae	Gobra
Epinephelus malabaricus	-	Perciformes	Serranidae	Gobra
Epinephelus kupangensis	-	Perciformes	Serranidae	Gobra
Eleutheronema tetradactylum	Forefinger threadfin	Perciformes	Polynemidae	Rawas
Siganus vermiculatus	Vermiculated spinefoot	Perciformes	Siganidae	Tauj
Mugil cephalus	Flathead grey mullet	Mugiliformes	Mugilidae	Boyar
	Shingala		Ariidae	All cat fishes
	gobies		Gobiidae	vaan

**DISCUSSION**

This study provides a comprehensive overview of Padel’s ichthyofaunal, including both well-known and lesser-known species. Our study’s findings are consistent with past research on similar coastal regions. In Indian coastal fisheries, species diversity is high, with mullets and groupers dominating similar to our study. For instance, Bhathal & Pauly (2008) stated that high species diversity in coastal fisheries of India was reported, with a notable dominance of species such as mullets and groupers, which were also prevalent in our study. Similarly, Shamsi, *et al.*,(2011) observed that the ecological significance of a wide range of species, from economically important fish to lesser-known species was highlighted, documenting remarkable fish diversity

in the tropical estuaries of India. The finding of lesser-known species highlights the need for more investigation into their possible benefits to local economic growth and food security.

Studies in similar mangrove and estuarine regions, such as the Mandovi-Zuari estuaries in Goa and the Sundarbans in West Bengal, have reported high fish diversity due to the nutrient-rich environment. Research in these areas has documented species from orders such as Perciformes, Clupeiformes, and Siluriformes, which are commonly found in estuaries. Comparing the species found in Padel with these studies can help understand the regional differences in fish composition and habitat preferences.

Estuarine regions typically host species that can tolerate variations in salinity, such as mullets (Mugilidae), catfish (Ariidae), and gobies (Gobiidae). The presence of 11 families in Padel suggests a well-balanced ecosystem supporting a range of feeding behaviors, from detritivores to carnivores. Studies from similar ecosystems in Kerala's Vembanad estuary and Maharashtra's Vashishti estuary indicate that mangrove-rooted zones support greater fish diversity compared to open estuarine waters.

The fish diversity in Padel's estuary may be influenced by factors such as water temperature, salinity fluctuations, and the extent of mangrove cover. Studies from other coastal regions of India have shown that estuarine biodiversity is threatened by habitat degradation, pollution, and climate change. A comparison with studies from the Bhitarkanika mangroves in Odisha and the Godavari estuary in Andhra Pradesh can provide insights into how conservation efforts in Padel can help maintain fish diversity.

The identification of 11 species across 3 orders and 11 families in Padel's estuarine region is a significant contribution to regional fish biodiversity data. Comparing these findings with studies from other mangrove and estuarine ecosystems can help assess ecological similarities and conservation needs. Future research should focus on seasonal variations in fish diversity, breeding patterns, and the impact of human activities on estuarine habitats.

Despite their importance, mangrove forests in Sindhudurg face significant threats from deforestation, pollution, coastal development, and climate change. Land reclamation for agriculture, aquaculture, and urban expansion has led to habitat destruction, affecting the balance of estuarine ecosystems. Additionally, pollution from industrial and domestic sources threatens water quality, impacting marine biodiversity.

To ensure the sustainability of mangrove forests, conservation efforts such as afforestation, community-based management, and strict legal protection are essential. Public awareness and government initiatives should focus on restoring degraded mangrove areas and promoting eco-friendly tourism to generate income while preserving biodiversity.

#### CONCLUSION

Mangrove forests in the estuarine regions of Sindhudurg district are vital for ecological stability, fisheries, coastal protection, and climate change mitigation. Their conservation is essential for sustaining local livelihoods, maintaining biodiversity, and ensuring long-term environmental health. Protecting these forests will not only benefit the region's economy but also safeguard its rich natural heritage for future generations.

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