

Ichthyofaunal Assemblages and Conservation Significance of Multiple Wetland Complexes in Srikakulam, Andhra Pradesh, India

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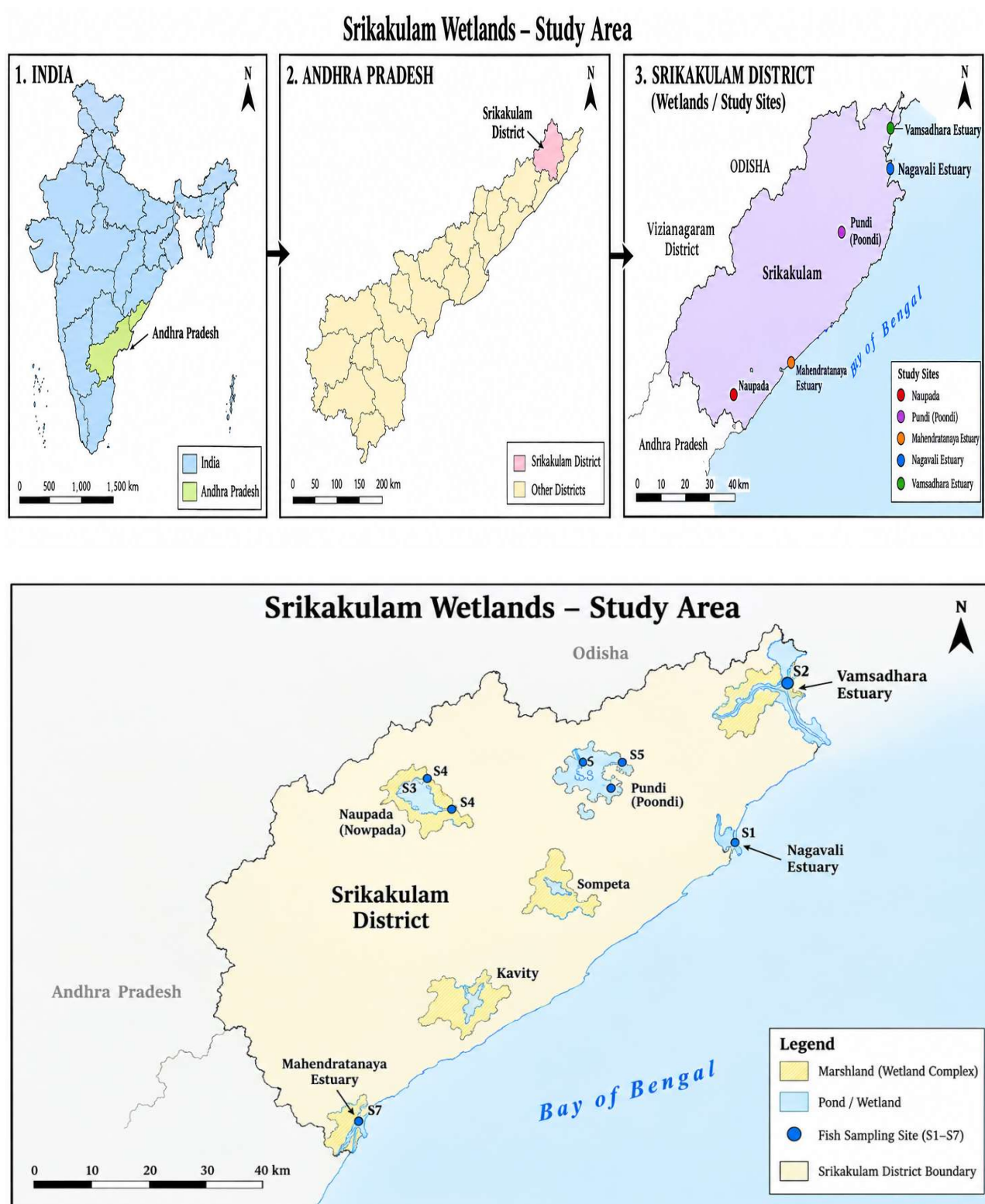
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Abstract

Wetland fishes are important components of aquatic ecosystems and play significant roles in maintaining food-web structure, nutrient cycling, and ecosystem functioning. Assessment of ichthyofaunal diversity and composition in wetland habitats is therefore essential for understanding aquatic biodiversity and developing appropriate conservation and management strategies. The present study was undertaken to assess the diversity, taxonomic composition, conservation status, and ecological characteristics of the Ichthyofauna occurring in the wetlands of Srikakulam District, Andhra Pradesh, India. A total of **90 fish species belonging to 24 families and 12 orders** were recorded from the selected wetland habitats. Among the recorded orders, **Cypriniformes** was the most species-rich order with **27 species**, followed by **Siluriformes (18)**, **Anabantiformes (13)**, **Mugiliformes (9)**, **Beloniformes (5)**, **Anguilliformes (4)**, **Cichliformes (4)**, **Osteoglossiformes (3)**, **Gobiiformes (2)**, **Perciformes (2)**, **Synbranchiformes (2)**, and **Gonorynchiformes (1)**. Cypriniformes also represented four families, while Siluriformes comprised six families, indicating considerable taxonomic diversity among freshwater and associated wetland fishes. The ichthyofaunal assemblage included freshwater, brackish-water, and marine-associated species, reflecting the ecological connectivity and habitat heterogeneity of the Srikakulam wetland system. Based on the IUCN Red List conservation assessment, **four species were classified as Near Threatened (NT) and three species as Vulnerable (VU)**, highlighting the conservation significance of these wetlands for fish biodiversity. The occurrence of species with different habitat associations and feeding strategies further indicates the availability of diverse aquatic resources and ecological niches within the study area. The present inventory provides baseline information on the ichthyofaunal diversity of Srikakulam wetlands and can serve as a reference for future monitoring, biodiversity assessment, conservation planning, and sustainable management of wetland fish resources in Andhra Pradesh.

Keywords: Biodiversity, conservation status, ichthyofauna, fish diversity, freshwater fishes, brackish water, wetland ecosystem, species richness.

Figure 1. Map of study area showing Seven different sites (S1 to S7) of Srikakulam Wetland in district Srikakulam, Andhra Pradesh, India.



1. Introduction

Wetlands are among the most productive and ecologically important ecosystems, supporting diverse assemblages of aquatic and terrestrial organisms and providing a wide range of ecosystem services (. **Sarkar et al.**). They function as feeding, breeding, nursery and refuge habitats for numerous aquatic organisms, including fishes, which constitute an important component of wetland food webs and contribute substantially to nutrient cycling and ecosystem functioning [**Dinesh et al. (2026)**]. In addition to their ecological importance, wetland fisheries provide food, livelihood opportunities and economic benefits to local communities. However, wetland ecosystems are increasingly affected by habitat modification, pollution, hydrological alteration, overexploitation of biological resources, invasive species and climate-related changes [**Dwivedi, A. K., & Joshi, K. D. (2013).**]. These pressures can alter fish assemblage structure and reduce aquatic biodiversity, making systematic assessment and long-term monitoring essential for sustainable wetland management.(1,14)

Ichthyofaunal diversity is an important component of aquatic biodiversity assessment because fish communities respond to variations in water quality, habitat structure, hydrological connectivity, food availability and anthropogenic disturbance [**Satpathy, B. B., & Bhaumik, U. (2013)**]. Wetland fish assemblages may contain freshwater, estuarine and marine-associated species, particularly in systems connected with rivers, tidal creeks and coastal environments. Consequently, the composition of fish communities can provide useful information on habitat heterogeneity and ecological connectivity. The conservation of wetland fish diversity is therefore important not only for maintaining aquatic ecosystem functioning but also for sustaining fisheries resources and associated ecosystem services [**Ghosh et al. (2024)**]

India possesses a wide variety of wetlands, including natural lakes, floodplain wetlands, reservoirs, rivers, estuaries, lagoons and coastal wetlands. These systems support substantial fish diversity but are subject to increasing anthropogenic pressure [**Roshnath, R., Nisha, P. V., & Anvar Ali. (2023)**]. A national review of Indian wetlands has highlighted the ecological and economic importance of these ecosystems while identifying urbanization, land-use change, pollution, encroachment and overexploitation as major pressures affecting wetland condition. Similarly, reviews of Indian floodplain wetlands have emphasized their importance for fish production, small indigenous fishes and livelihood security, while also highlighting biodiversity loss and habitat degradation as major concerns [**Sarkar & Das (2016)**].

Andhra Pradesh contains several important freshwater, coastal and estuarine ecosystems that support diverse fish communities. **Kolleru Lake**, one of the major freshwater wetlands of Andhra Pradesh, has been the subject of several ichthyofaunal investigations. A study of Kolleru Lake documented **92 fish species belonging to 34 families and 13 orders**, demonstrating considerable fish diversity within the wetland ecosystem. Studies of other Andhra Pradesh wetland and estuarine systems, including Pulicat Lake and associated estuarine environments,

have likewise demonstrated substantial ichthyofaunal diversity. These studies indicate that variation in hydrology, salinity, habitat type and connectivity with rivers and coastal waters can contribute to differences in fish assemblage composition.

Srikakulam District, situated along the northern coast of Andhra Pradesh, possesses a particularly heterogeneous aquatic environment comprising rivers, reservoirs, freshwater wetlands, estuaries and coastal wetland habitats. The **Vamsadhara, Nagavali and Mahendratanaya river systems**, together with their associated wetlands and estuarine zones, provide a range of aquatic habitats supporting freshwater and brackish-water fish communities. Earlier investigations have demonstrated the ichthyofaunal importance of individual aquatic systems in the district. For example, the Narayanapuram Anicut of the Nagavali River supported **56 fish species belonging to nine orders, 19 families and 34 genera** during a two-year investigation.

The estuarine environments of Srikakulam are particularly important because they provide transition zones between freshwater and marine ecosystems. The Kalingapatnam estuary, for example, was reported to support **97 fish species belonging to 26 orders, 53 families and 85 genera**, comprising freshwater, estuarine and marine fishes. The study also identified differences in habitat association and feeding strategies, demonstrating the ecological complexity of the estuarine fish community. Earlier investigations of the Vamsadhara and Nagavali estuaries recorded **98 fish species belonging to 70 genera, 40 families and 13 orders**, further indicating the importance of these estuarine systems for regional ichthyofaunal diversity.

A multi-complex assessment is therefore particularly valuable for understanding the overall ichthyofaunal diversity of Srikakulam wetlands. It also provides a framework for understanding the contribution of individual wetland complexes to the overall regional fish diversity.

Present study

The present study was undertaken to assess the **ichthyofaunal diversity and taxonomic composition across multiple wetland complexes of Srikakulam District, Andhra Pradesh, India**. The study documented **90 fish species representing 24 families and 12 orders**. Among the recorded orders, **Cypriniformes was the most species-rich, with 27 species**, followed by **Siluriformes (18 species)** and **Anabantiformes (13 species)**. Mugiliformes contributed nine species, Beloniformes five species, Anguilliformes and Cichliformes four species each, Osteoglossiformes three species, and Gobiiformes, Perciformes and Synbranchiformes two species each, while Gonorynchiformes was represented by one species.

The study further evaluates the conservation significance of the recorded ichthyofauna, including species categorized under threatened IUCN conservation categories. By integrating species richness, taxonomic composition, habitat associations and conservation status, the study aims to provide a comprehensive baseline for understanding the ecological importance of the Srikakulam

wetland complexes and to support future monitoring, conservation and sustainable management of their fish resources.

2. MATERIAL AND METHODS

a) Study area

The present study was conducted in the **Srikakulam wetland complexes of Srikakulam District, Andhra Pradesh, India**, covering estuarine and inland wetland habitats distributed across the coastal region. The study area comprises ecologically diverse aquatic environments influenced by major river systems, including the **Nagavali, Vamsadhara and Mahendratana**, together with associated wetlands, agricultural areas and shallow water habitats. These ecosystems provide suitable conditions for a diverse assemblage of freshwater, brackish-water and estuarine fishes. (**Figure 1**)

For the assessment of ichthyofaunal diversity, **seven sampling sites** were selected from different wetland complexes. The selected sites included **Nagavali Estuary (S1; 8°18'–18°20' N, 83°24'–83°27' E)**, **Vamsadhara Estuary (S2; 18.328°N, 84.848°E)**, **Nowpada Wetlands (S3 and S4; 18.0°N, 84.7°E)**, **Pundi Wetlands (S5 and S6; 18.2°N, 84.6°E)**, and **Mahendratana Estuary (S7; 18.1°N, 84.5°E)** [**Table 1**]. The selected sites represent different aquatic conditions, ranging from freshwater wetlands to estuarine and brackish-water environments. Fish sampling was carried out at these sites to document **species composition, taxonomic diversity, feeding habits, habitat associations, local status, population trends and conservation status**. Seasonal variations in rainfall, water level, salinity and habitat conditions were considered important factors influencing the distribution and abundance of ichthyofauna within the Srikakulam wetland complexes.

b) Data Collection

Ichthyofaunal surveys were conducted at **seven selected sampling sites within the Srikakulam wetland complexes**, representing estuarine and inland wetland habitats. Fish sampling was carried out at regular intervals during the study period to document seasonal variation in species composition, abundance and distribution. Sampling was conducted in representative habitats, including **shallow water, deeper water, marginal areas, estuarine zones and associated wetland channels**. Fishes were collected using appropriate fishing gears such as **cast nets, drag nets, gill nets and locally available traditional fishing methods**, depending on the habitat characteristics and accessibility of each site. Additional observations and records were obtained from local fishermen and fish landing areas to supplement field collections and prepare a comprehensive checklist of ichthyofauna.

Collected specimens were photographed and identified using standard taxonomic keys and relevant literature. The nomenclature and taxonomic classification were cross-checked with current authoritative fish databases. For each species, information on **order, family, scientific name, common name, feeding habit, habitat preference, local status, global population trend and IUCN Red List category** was compiled. Habitat associations were recorded under **freshwater, brackish-water, marine and freshwater–brackish-water** categories. Feeding habits were classified as **carnivorous, omnivorous or insectivorous** based on published ecological information. Conservation status was assessed according to the **IUCN Red List**, while relevant national conservation provisions were also considered.

while the Red List of the IUCN (2024) guided assessment for conservation status and global population trend.

Relative diversity (RDi) of bird families was computed as

$$RDi = \frac{\text{Number of Bird Species in a Family}}{\text{Total Number of Bird Species}} \times 100$$

following the Torre-Cuadros et al. (2007) formula.

Table 1. General features of the selected Srikakulam wetland sites in Srikakulam District of Andhra Pradesh, India.

Wetland site	Coordinates	General features
Nagavali Estuary–S1	8°18′–18°20′ N, 83°24′–83°27′ E	Estuarine habitat with freshwater–brackish water, tidal channels and mudflats. Supports diverse estuarine fishes.
Vamsadhara Estuary–S2	18.328°N, 84.848°E	Shallow tidal estuary with mudflats and sandy substrates. Supports brackish-water and estuarine fishes.
Nowpada Wetlands–S3	18.0°N, 84.7°E	Shallow seasonal wetlands with marshes and aquatic vegetation. Provides suitable freshwater fish habitat.
Nowpada Wetlands–S4	18.0°N, 84.7°E	Shallow water bodies with marshy and vegetated margins. Supports diverse freshwater fish species.
Pundi Wetlands–S5	18.2°N, 84.6°E	Seasonal shallow wetlands surrounded by agricultural land and aquatic vegetation. Supports freshwater fishes.
Pundi Wetlands–S6	18.2°N, 84.6°E	Shallow seasonal water bodies with vegetated margins and agricultural surroundings. Provides suitable fish habitat.
Mahendratanaya Estuary–S7	18.1°N, 84.5°E	Tidal estuarine habitat with shallow water, mudflats and sandbanks. Supports freshwater and brackish-water fishes.

3. Results

A total of **90 fish species belonging to 24 families and 12 orders** [Figure 2] were recorded from the selected wetland and estuarine sites of Srikakulam district, Andhra Pradesh (Table 2). **Cypriniformes** was the most dominant order with **27 species**, followed by **Siluriformes (18)**, **Anabantiformes (13)**, **Mugiliformes (9)**, **Beloniformes (5)**, **Anguilliformes and Cichliformes (4 species each)**, **Osteoglossiformes (3)**, and **Gobiiformes, Perciformes and Synbranchiformes with two species each**. **Gonorynchiformes** was represented by only **one species** (Table 2).

Analysis of the **Relative Diversity Index (RDi)** revealed that **Cyprinidae** was the most diverse family, comprising **17 species (RDi = 18.89)**, followed by **Bagridae, Channidae and Mugilidae**, together representing 9 species (**RDi = 10.00**), and **Danionidae** with 7 species (**RDi = 7.77**). **Anguillidae and Cichlidae** each contributed four species (**RDi = 4.44**). **Belonidae and Notopteridae** together represented three species (**RDi = 3.33**), whereas several families, including **Hemiramphidae, Siluridae, Schilbeidae, Clariidae, Ariidae, Osphronemidae, Gobiidae, Ambassidae and Mastacembelidae**, were represented by two species each (**RDi = 2.22**). **Heteropneustidae, Anabantidae, Nandidae, Nemacheilidae and Chanidae** were represented by a single species each (**RDi = 1.11**) (Table 3).

Based on the IUCN Red List status, the majority of the recorded fish species were categorized as **Least Concern (LC)**, comprising **76 species (84.44%)**. **Four species (4.44%)** were listed as **Near Threatened (NT)**, while **three species (3.33%)** were categorized as **Vulnerable (VU)**. A total of **two species (2.22%)** were classified as **Data Deficient (DD)**, indicating insufficient information for their complete assessment. **Five species (5.56%)** were categorized as **Not Evaluated (NE)**. Thus, the ichthyofauna of the study area was predominantly represented by species under the Least Concern category, with a smaller proportion of species requiring greater conservation attention [(Table 2)].

Figure 2. Composition of Fish community in Srikakulam wetlands of Srikakulam District of Andhra Pradesh, India.

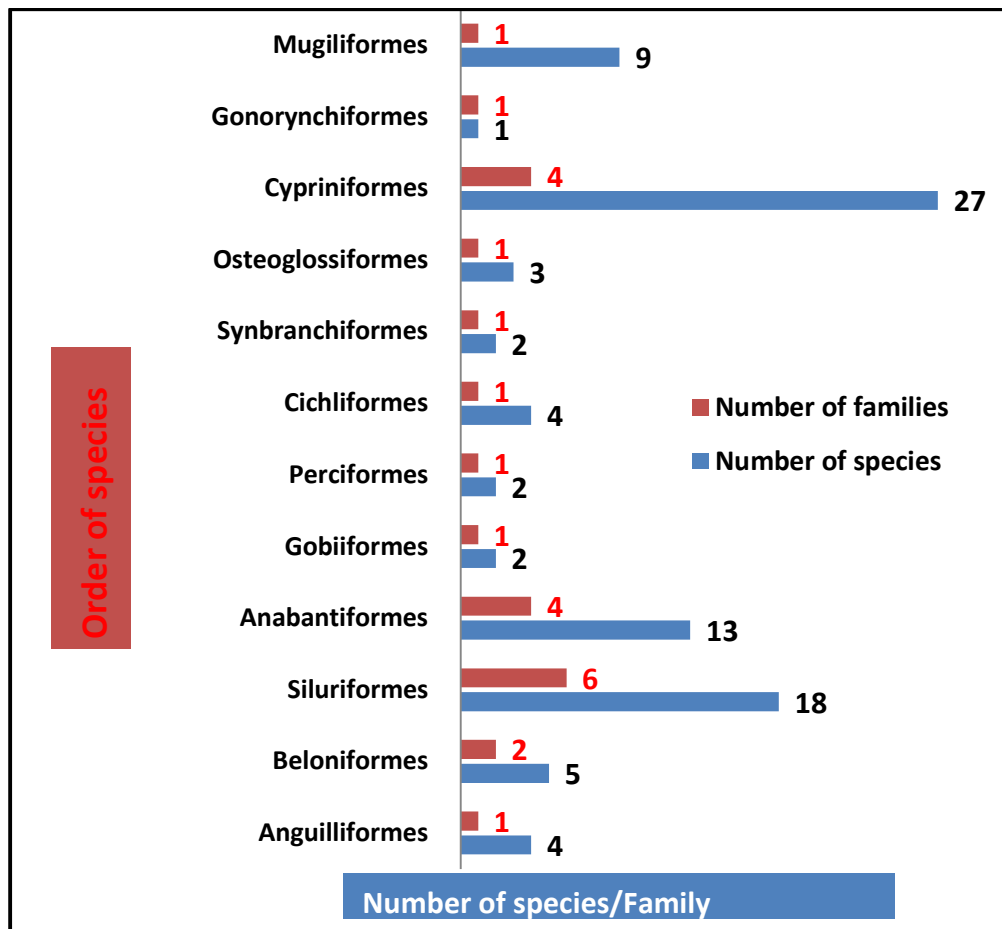


Table 2. List of Ichthyofauna species recorded from Srikakulam wetlands of Srikakulam District, Andhra Pradesh, India together with their respective taxonomic position, Feeding habitat, Habitat code, local abundance status, Global status, and IUCN status.

Order/Family	S.no	Scientific name (Authority)	Common name	Feeding habitat	Habitat Code	Local status	Global status	IUCN status
I. Anguilliformes								
1.Anguillidae	1	<i>Anguilla bengalensis bengalensis</i> (Gray, 1831)	Indian Longfin Eel	CR	FW/BW	C	↓	NT
	2	<i>Anguilla bicolor bicolor</i> McClelland, 1844	Indonesian Shortfin Eel	CR	FW/BW	FC	↓	NT
	3	<i>Anguilla marmorata</i> Quoy & Gaimard, 1824	Giant Mottled Eel	CR	FW/BW	R	↓	LC
	4	<i>Anguilla nebulosa nebulosa</i> McClelland, 1844	Mottled Eel	CR	FW/BW	R	→	LC
II. Beloniformes								
2.Belonidae	5	<i>Xenentodon cancila</i> (Hamilton, 1822)	Freshwater Garfish	CR	FW	C	?	NE
	6	<i>Strongylura strongylura</i> (van Hasselt, 1823)	Spottail Needlefish	CR	BW/M	C	→	LC
	7	<i>Strongylura leiura</i> (Bleeker, 1850)	Banded Needlefish	CR	BW/M	C	→	LC
3.Hemiramphidae	8	<i>Hyporhamphus gaimardi</i> (Valenciennes, 1847)	Congaturi Halfbeak	OM	BW/M	C	→	DD
	9	<i>Hyporhamphus limbatus</i> (Valenciennes, 1847)	Pacific Halfbeak	OM	BW/M	FC	→	LC
III. Siluriformes								

4.Bagridae	10	<i>Mystus bleekeri</i> (Day, 1877)	Bleeker's Catfish	OM	FW	C	→	LC
	11	<i>Mystus cavasius</i> (Hamilton, 1822)	Gangetic Mystus	CR	FW	FC	→	LC
	12	<i>Mystus vittatus</i> (Bloch, 1794)	Striped Dwarf Catfish	OM	FW	C	→	LC
	13	<i>Mystus tengara</i> (Hamilton, 1822)	Tengara Catfish	CR	FW	FC	→	LC
	14	<i>Mystus armatus</i> (Day, 1865)	Armed Mystus	CR	FW	R	?	LC
	15	<i>Mystus montanus</i> (Jerdon, 1849)	Nilgiri Mystus	CR	FW	R	→	LC
	16	<i>Mystus gulio</i> (Hamilton, 1822)	Long-whiskered Estuarine Catfish	OM	BW/FW	UC	?	LC
	17	<i>Sperata seenghala</i> (Sykes, 1839)	Giant River Catfish	OM	FW	UC	?	LC
	18	<i>Sperata aor</i> (Hamilton, 1822)	Long-whiskered Catfish	CR	FW	R	→	LC
5.Siluridae	19	<i>Ompok bimaculatus</i> (Bloch, 1794)	Butter Catfish	CR	FW	FC	↓	NT
	20	<i>Wallago attu</i> (Bloch & Schneider, 1801)	Freshwater Shark	CR	FW	UC	↓	LC
6.Schilbeidae	21	<i>Eutropiichthys vacha</i> (Hamilton, 1822)	Batchwa Vacha	CR	FW	R	↓	LC
	22	<i>Pseudeutropius atherinoides</i> (Bloch, 1794)	Indian Glass Catfish	IN	FW	FC	→	LC
7.Heteropneustidae (1)	23	<i>Heteropneustes fossilis</i> (Bloch, 1794)	Stinging Catfish	OM	FW	C	?	LC
8.Clariidae	24	<i>Clarias batrachus</i> (Linnaeus, 1758)	Walking Catfish	OM	FW	FC	↓	LC

	25	<i>Clarias gariepinus</i> (Burchell, 1822)	African Catfish (Introduced)	OM	EX*/FW	R	→	LC
9.Ariidae	26	<i>Netuma thalassina</i> (Rüppell, 1837)	Giant Catfish	OM	BW	R	→	LC
	27	<i>Plicofollis dussumieri</i> (Valenciennes, 1840)	Dussumier's Catfish	OM	BW	R	→	LC
IV. Anabantiformes								
10.Channidae	28	<i>Channa marulius</i> (Hamilton, 1822)	Bullseye Snakehead	CR	FW	UC	→	DD
	29	<i>Channa orientalis</i> Bloch & Schneider, 1801	Ceylon Snakehead*	CR	FW	R	↓	VU
	30	<i>Channa striata</i> (Bloch, 1793)	Striped Snakehead	CR	FW	C	→	LC
	31	<i>Channa punctata</i> (Bloch, 1793)	Spotted Snakehead	OM	FW	C	?	LC
	32	<i>Channa micropeltes</i> (Cuvier, 1831)	Giant Snakehead	CR	FW	R	→	LC
	33	<i>Channa gachua</i> (Hamilton, 1822)	Dwarf Snakehead	CR	FW	FC	→	LC
	34	<i>Channa stewartii</i> (Playfair, 1867)	Stewart's Snakehead	CR	FW	R	→	LC
	35	<i>Channa melanostigma</i> Geetakumari & Vishwanath, 2011	Black-spotted Snakehead	CR	FW	R	→	NE
	36	<i>Channa andrao</i> Britz, 2013	Blue Snakehead	CR	FW	R	?	NE
11.Anabantidae	37	<i>Anabas testudineus</i> (Bloch, 1792)	Climbing Perch	OM	FW	C	→	LC
12.Osphronemidae	38	<i>Trichogaster fasciata</i> Bloch & Schneider, 1801	Banded Gourami	OM	FW	C	→	LC
	39	<i>Trichogaster lalius</i> (Hamilton,	Dwarf	OM	FW	FC	→	LC

		1822)	Gourami					
13.Nandidae	40	<i>Nandus nandus</i> (Hamilton, 1822)	Gangetic Leaffish	CR	FW	UC	→	LC
V. Gobiiformes								
14.Gobiidae	41	<i>Glossogobius giuris</i> (Hamilton, 1822)	Tank Goby	CR	FW/BW	C	?	LC
	42	<i>Awaous grammepomus</i> (Bleeker, 1849)	Banded Goby	OM	FW	R	→	LC
VI. Perciformes								
15.Ambassidae	43	<i>Parambassis nama</i> (Hamilton, 1822)	Elongate Glass Perchlet	CR	FW	C	→	LC
	44	<i>Parambassis ranga</i> (Hamilton, 1822)	Indian Glassy Fish	OM	FW	C	→	LC
VII. Cichliformes								
16.Cichlidae	45	<i>Etroplus maculatus</i> (Bloch, 1795)	Orange Chromide	OM	FW/BW	FC	→	LC
	46	<i>Etroplus suratensis</i> (Bloch, 1790)	Green Chromide	OM	FW/BW	UC	→	LC
	47	<i>Oreochromis mossambicus</i> (Peters, 1852)	Mozambique Tilapia	OM	EX*/FW	C	↓	VU
	48	<i>Oreochromis niloticus</i> (Linnaeus, 1758)†	Nile Tilapia	OM	EX*/FW	C	?	LC
VIII. Synbranchiformes								
17.Mastacembelidae	49	<i>Mastacembelus pancalus</i> Hamilton, 1822	Barred Spiny Eel	CR	FW	C	?	LC
	50	<i>Mastacembelus armatus</i> (Lacepède, 1800)	Zig-zag Spiny Eel	CR	FW	C	→	LC
IX. Osteoglossiformes								
18.Notopteridae	51	<i>Notopterus notopterus</i> (Pallas, 1769)	Bronze Featherback	CR	FW	C	→	LC

	52	<i>Chitala chitala</i> (Hamilton, 1822)	Clown Knifefish (Indian Featherback)	CR	FW	UC	↓	NT
	53	<i>Chitala ornata</i> (Gray, 1831)	Giant Featherback*	OM	EX*/FW	R	→	LC
X. Cypriniformes								
19.Danionidae	54	<i>Danio devario</i> (Hamilton, 1822)	Devario	OM	FW	C	→	LC
	55	<i>Amblypharyngodon mola</i> (Hamilton, 1822)	Mola Carplet	OM	FW	C	→	LC
	56	<i>Amblypharyngodon microlepis</i> (Bleeker, 1853)	Small-scaled Carplet	OM	FW	FC	→	LC
	57	<i>Rasbora daniconius</i> (Hamilton, 1822)	Slender Rasbora	OM	FW	C	?	LC
	58	<i>Rasbora elanga</i> (Hamilton, 1822)	Elanga Rasbora	OM	FW	FC	→	LC
	59	<i>Salmostoma bacaila</i> (Hamilton, 1822)	Large Razorbelly Minnow	IN	FW	C	→	LC
	60	<i>Salmostoma phulo</i> (Hamilton, 1822)	Finescale Razorbelly Minnow	IN	FW	FC	?	LC
20.Cyprinidae	61	<i>Catla catla</i> (Hamilton, 1822)	Catla	OM	FW	C	→	LC
	62	<i>Cirrhinus reba</i> (Hamilton, 1822)	Reba Carp	OM	FW	C	?	LC
	63	<i>Cirrhinus mrigala</i> (Hamilton, 1822)	Mrigal	OM	FW	C	→	LC
	64	<i>Labeo rohita</i> (Hamilton, 1822)	Rohu	OM	FW	C	→	LC
	65	<i>Labeo porcellus</i> (Heckel, 1838)	Lowfin Labeo	OM	FW	FC	→	LC
	66	<i>Labeo fimbriatus</i> (Bloch, 1795)	Fringe-lipped Carp	OM	FW	C	?	LC
	67	<i>Labeo calbasu</i> (Hamilton, 1822)	Orangefin	OM	FW	C	→	LC

			Labeo					
	68	<i>Labeo bata</i> (Hamilton, 1822)	Bata	OM	FW	C	→	LC
	69	<i>Labeo ariza</i> (Hamilton, 1807)	Ariza Labeo	OM	FW	FC	→	LC
	70	<i>Cyprinus carpio</i> Linnaeus, 1758	Common Carp*	OM	EX*/FW	C	→	VU
	71	<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	Grass Carp	HR	EX*/FW	C	→	LC
	72	<i>Garra gotyla</i> (Gray, 1830)	Sucker Head	HR	FW	UC	?	LC
	73	<i>Osteobrama cotio</i> (Hamilton, 1822)	Cotio	OM	FW	C	→	LC
	74	<i>Pethia chola</i> (Hamilton, 1822)	Swamp Barb	OM	FW	C	→	LC
	75	<i>Pethia ticto</i> (Hamilton, 1822)	Ticto Barb	OM	FW	C	→	LC
	76	<i>Systomus sarana</i> (Hamilton, 1822)	Olive Barb	OM	FW	FC	↓	LC
	77	<i>Pethia sophore</i> (Hamilton, 1822)	Pool Barb	OM	FW	C	→	LC
21.Nemacheilidae	78	<i>Schistura corica</i> (Hamilton, 1822)	Corica Stone Loach	IN	FW	R	→	LC
22.Cobitidae	79	<i>Lepidocephalichthys berdmorei</i> (Blyth, 1860)	Berdmore's Loach	OM	FW	R	→	LC
	80	<i>Lepidocephalichthys guntea</i> (Hamilton, 1822)	Guntea Loach	OM	FW	C	→	LC
XI. Gonorynchiformes								
23.Chanidae	81	<i>Chanos chanos</i> (Forsskål, 1775)	Milkfish	OM	M/BW	C	→	LC
XII. Mugiliformes								
24.Mugilidae	82	<i>Planiliza parsia</i> (Hamilton, 1822)	Goldspot Mullet	OM	BW/FW	C	→	NE
	83	<i>Planiliza macrolepis</i> (Smith, 1846)	Largescale Mullet	OM	M/BW	FC	?	LC
	84	<i>Planiliza parsia</i> (Hamilton, 1822)	Goldspot Mullet	OM	BW/FW	C	→	NE

	85	<i>Planiliza dussumieri</i> (Valenciennes, 1836)	Dussumier's Mullet	OM	M/BW	FC	→	LC
	86	<i>Planiliza subviridis</i> (Valenciennes, 1836)	Greenback Mullet	OM	M/BW	FC	→	LC
	87	<i>Ellochelon vaigiensis</i> (Quoy & Gaimard, 1825)	Squartail Mullet	OM	M/BW	UC	?	LC
	88	<i>Osteomugil cunnesius</i> (Valenciennes, 1836)	Longarm Mullet	OM	M/BW	C	?	LC
	89	<i>Corsula corsula</i> (Hamilton, 1822)	Corsula Mullet	OM	FW/BW	FC	→	LC
	90	<i>Mugil cephalus</i> Linnaeus, 1758	Flathead Grey Mullet	OM	M/BW	C	→	LC

Feeding habitat: CR-carnivore | OM- omnivore | IN- Insectivore | HR-herbivore.

Habitat Code: FW-fresh water | FW/BW-fresh and brackish water | BW/M-Brackish and Marine water | Brackish water.

Local status : C-Common | FC-Fairly common | R-Rare | UC- Un common.

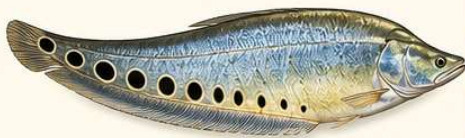
Global status : ↓-Decrease | →- Stable | ↑- Increase | ?-Un known.

IUCN Red List: Not evaluated; Data deficit LC—Least Concern | NT—Near Threatened | VU—Vulnerable | EN—Endangered.

EX*—Species that are Exotic species in the Srikakulam wetlands

Nearly Threatened Species

Chitala chitala



Natural habitat: Rivers, estuaries and freshwater lakes

Ompok bimaculatus



Natural habitat: Rivers, streams and floodplains

Anguilla bengalensis bengalensis



Natural habitat: Freshwater rivers, estuaries and coastal waters

Anguilla bicolor bicolor



Natural habitat: Estuaries, mangroves, brackish waters and coastal areas

Vulnerable Species

Cyprinus carpio



Natural habitat: Ponds, lakes, rivers and slow-moving waters

Oreochromis mossambicus



Natural habitat: Freshwater lakes, ponds, reservoirs and brackish waters

Channa orientalis



Natural habitat: Rivers, lakes, swamps and paddy fields

Table 3. Relative diversity index (RDi) of various Fish families in Srikakulam wetlands of Srikakulam District, Andhra Pradesh, India

Fish famylies	Number of Species	Rdi value
Cyprinidae (17)	17	18.89
Bagridae , Channidae , Mugilidae	9	10.00
Danionidae (7)	7	7.77
Anguillidae , Cichlidae	4	4.44
Belonidae , Notopteridae ,	3	3.33
Hemiramphidae , Siluridae , Schilbeidae , Clariidae , Ariidae , Osphronemidae , Gobiidae, Ambassidae , Mastacembelidae , Cobitidae	2	2.22
Heteropneustidae , Anabantidae, Nandidae , Nemacheilidae , Chanidae	1	1.11

Based on **feeding habits**, omnivorous fishes were the most dominant group, comprising **53 species**, followed by carnivorous fishes with **31 species**, insectivorous fishes with **4 species**, and herbivorous fishes with **2 species**. Regarding habitat preference, **66 species** were recorded from freshwater habitats, **2 species** from brackish-water habitats, **11 species** from freshwater/brackish-water habitats, and **11 species** from brackish/marine (Figer-3)

With respect to **global population trends**, **61 species** were categorized as globally stable, while **11 species showed decreasing population trends** and **18 species had unknown population trends**. No species in the present dataset was categorized under an increasing global population trend. These results indicate that the studied wetlands support a substantial number of fish species with varying conservation and population-status categories.(Table-2)

The conservation assessment revealed that several recorded fishes were of particular conservation importance. Species such as **Chitala chitala**, **Anguilla bengalensis bengalensis**, **Anguilla bicolor bicolor**, **Channa orientalis**, **Ompok bimaculatus**, and **Oreochromis mossambicus** were represented among the threatened categories, while a number of exotic species were also recorded from the study area. **Six exotic fish species** were identified, including *Cyprinus carpio*, *Ctenopharyngodon idella*, *Oreochromis mossambicus*, *Oreochromis niloticus*, *Clarias gariepinus*, and *Chitala ornata* (Table 5).

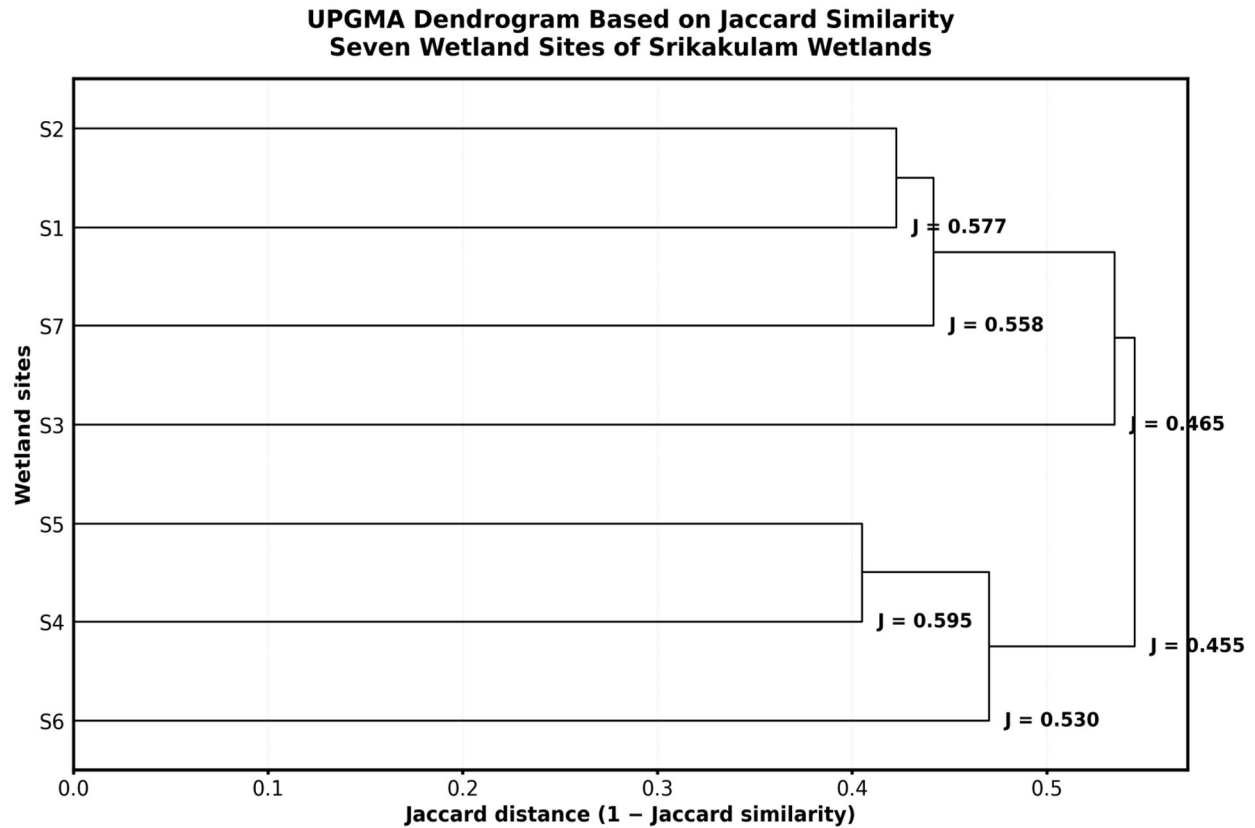


Figure. 2. Cluster analysis based on Jaccard's similarity index using unweighted paired group method with arithmetic mean- UPGMA showing similarity of wetland Fish species composition in different habitat(sites) in Srikakulam wetlands of Srikakulam district of Andhra Pradesh (Nagavali Estuary-S1, Vamsadhara Estuary-S2, Nowpada Wetlands-S3, Nowpada Wetlands-S4, Pundi Wetlands-S5, Pundi Wetlands-S6, Mahendratana Estuary-S7)

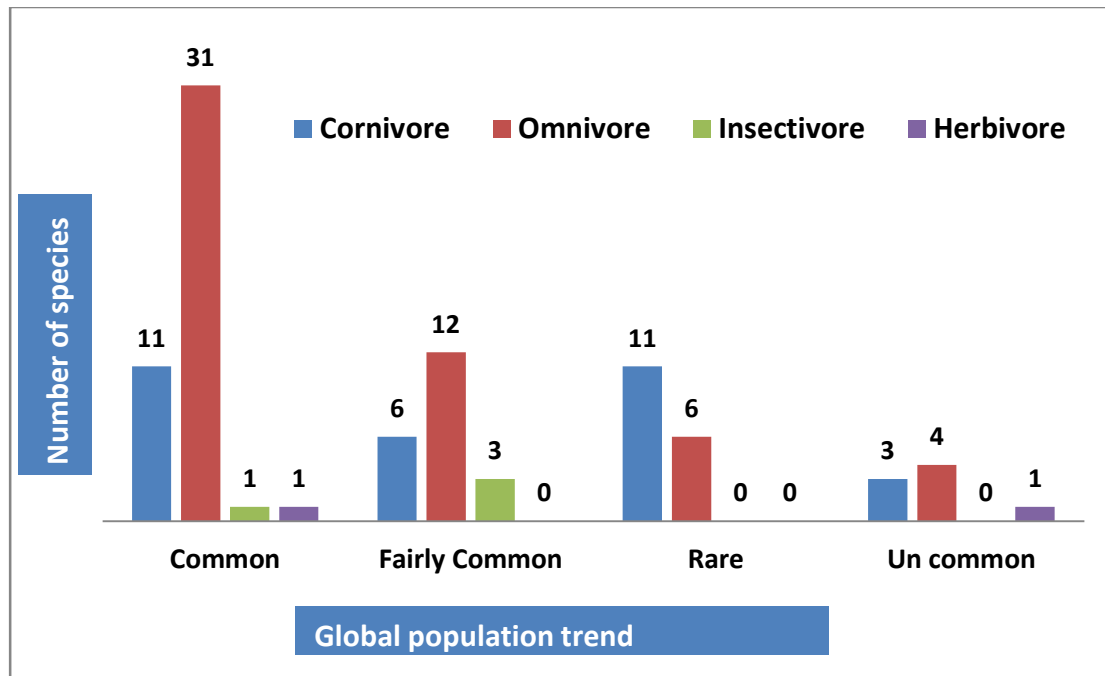


Figure 4. Comparison of Global population trend and Feeding habitat type of fish species recorded from Srikakulam wetlands of Srikakulam District, Andhra Pradesh, India.

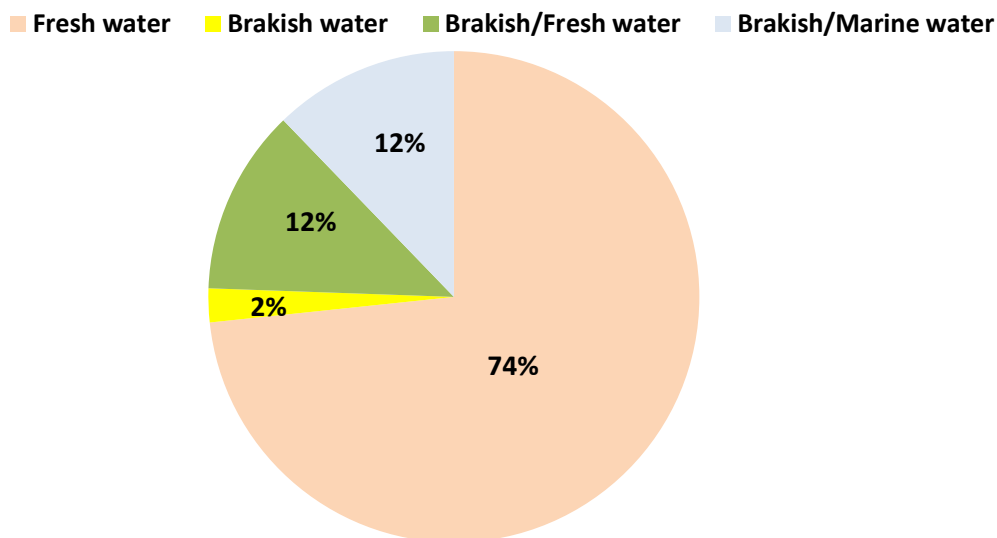


Figure 3. Residential Habitat status of fish species recorded from Srikakulam wetlands of Andhra Pradesh, India.

Overall, the ichthyofaunal composition demonstrates that the **Srikakulam wetlands and associated estuarine habitats support considerable fish diversity**, comprising freshwater, brackish-water and marine-associated species. The dominance of Cyprinidae and Cypriniformes, together with the occurrence of carnivorous, omnivorous, insectivorous and herbivorous fishes, reflects the ecological heterogeneity and diverse trophic resources available within the study area.

4. DISCUSSION

The present study documented a rich ichthyofaunal assemblage from the selected wetland complexes of Srikakulam district, Andhra Pradesh, comprising **90 fish species belonging to 24 families and 12 orders**. The ichthyofaunal richness recorded in the present study demonstrates the ecological importance of the wetlands and associated rivers, estuaries and floodplain habitats of the district. When compared with earlier studies from Andhra Pradesh and adjoining coastal regions, the diversity observed in the present study is comparable with several freshwater, estuarine and wetland systems. Kolleru Lake supported 92 species belonging to 34 families and 13 orders (Raju et al. 2014), while Bharatha Lakshmi et al. (2015) recorded 78 species, 37 families and 14 orders from Kolleru Lake and Upputeru Creek. Similarly, 95 species were reported from Pulicat Lake by Jesintha et al. (2022), whereas Yosuva et al. (2025) documented a considerably higher richness of 202 species from the same lake. The Godavari River also supported 88 species, 33 families and 16 orders (Rao et al. 2025). These comparisons indicate that the ichthyofaunal richness of the Srikakulam wetlands is substantial and reflects the diversity of aquatic habitats available within the region.

Table 4. A comparison of Ichthyofauna recorded from different study areas of Andhra Pradesh and surroundings , India.

s. n o	Study area	Recorded Ichthyofauna			Reference
		Species	Family	Order	
1	Kolleru Lake, Andhra Pradesh	92	34	13	Raju et al. (2014)
2	Kolleru Lake and Upputeru Creek, Andhra Pradesh	78	37	14	Bharatha Lakshmi et al. (2015)
3	Kolleru Lake, Andhra Pradesh	58	26	10	Jammu et al. (2013)
4	Pulicat Lake, Andhra Pradesh–Tamil Nadu	95	46	15	Jesintha et al. (2022)

5	Pulicat Lake, Andhra Pradesh–Tamil Nadu	202	65	23	Yosuva et al. (2025)
6	Vamsadhara River, Srikakulam	49	19	12	Rama Rao (2023)
7	Kalingapatnam Estuary, Srikakulam	97	53	26	Karri & Harathi (2023)
8	Mahendratana River, Srikakulam	58	19	10	Hemasundararao et al. (2025)
9	Madduvalasa Reservoir, Srikakulam	31	13	5	Sanapala et al. (2022)
10	Hiramandalam Reservoir, Srikakulam	59	23	11	Laxminarayana et al. (2024)
11	Vamsadhara and Nagavali Estuaries, Srikakulam	98	40	13	Mishra (2010) Zoological Survey of India
12	Godavari River, Andhra Pradesh	88	33	16	DOI: 10.17582/journal.pjz/20230820044600.

The 90 species recorded in the present study are higher than those reported from the Vamsadhara River (49 species), Madduvalasa Reservoir (31 species), Mahendratana River (58 species) and Hiramandalam Reservoir (59 species), while remaining comparable with Kolleru Lake (92 species), Godavari River (88 species), Pulicat Lake (95 species) and Kalingapatnam Estuary (97 species). This comparison suggests that the multi-wetland approach adopted in the present study effectively captures the broader ichthyofaunal diversity of Srikakulam district.

Among the different taxonomic groups recorded during the present investigation, **Cypriniformes was the most species-rich order**, comprising 27 species and four families, followed by Siluriformes with 18 species and six families and Anabantiformes with 13 species and four families. Mugiliformes contributed nine species, while Beloniformes and other orders represented smaller proportions of the assemblage. The predominance of Cypriniformes and Siluriformes is consistent with their widespread distribution and adaptability to diverse freshwater habitats, including rivers, reservoirs, wetlands and associated agricultural water bodies. Similar dominance of these groups has been reported from several Indian freshwater ecosystems, indicating their important contribution to regional fish assemblages.

The ichthyofaunal composition also varied considerably among the study locations, reflecting differences in habitat characteristics, hydrological connectivity and salinity regimes. The Srikakulam region contains a mosaic of **freshwater, brackish, estuarine and marine-influenced habitats**, particularly around the Nagavali and Vamsadhara river systems and their estuaries. Such connectivity facilitates the movement of fishes between freshwater and estuarine environments and consequently contributes to increased species turnover and overall diversity.

Earlier work on the Vamsadhara and Nagavali estuaries documented 98 species belonging to 40 families and 13 orders (**Mishra 2010**), providing an important historical baseline for the ichthyofaunal resources of the district. Karri and Harathi (**2023**) subsequently recorded 97 species, 53 families and 26 orders from the Kalingapatnam Estuary, further demonstrating the high fish diversity associated with the coastal and estuarine environments of Srikakulam.

The present findings are also comparable with recent studies conducted in individual aquatic ecosystems of Srikakulam district. **Rama Rao (2023)** recorded 49 species from the Vamsadhara River, while **Sanapala et al. (2022)** documented 31 species from Madduvalasa Reservoir. **Laxminarayana et al. (2024)** reported 59 species from Hiramandalam Reservoir, and **Hemasundararao et al. (2025)** recorded 58 species from the Mahendratanaya River. The higher overall richness recorded in the present study compared with several individual-site investigations may be attributed to the inclusion of multiple wetland complexes and associated aquatic habitats. Sampling across different habitat types can capture species with contrasting ecological requirements and thereby provide a more comprehensive representation of regional ichthyofaunal diversity.

The occurrence of fishes with different feeding habits and habitat preferences further indicates the ecological heterogeneity of the study area. Freshwater, brackish-water and marine-associated species were represented, reflecting the influence of riverine connectivity and estuarine exchange. The presence of species adapted to different trophic niches also suggests the availability of diverse food resources within the wetlands. The combination of shallow-water habitats, deeper channels, marshy areas, agricultural-water interfaces and estuarine zones provides suitable conditions for fishes occupying different ecological niches.

From a conservation perspective, the ichthyofaunal assemblage recorded in the present study is important because wetlands and connected river-estuary systems provide feeding, breeding, nursery and refuge habitats for a wide range of fish species. Although most of the recorded species were categorized as **Least Concern (LC)**, the occurrence of species under **Near Threatened (NT)**, **Data Deficient (DD)** and other conservation categories highlights the need for continued monitoring. The presence of species for which adequate population information is unavailable also emphasizes the importance of systematic surveys and population assessments. Conservation of fish diversity therefore requires protection not only of individual wetlands but also of the hydrological connectivity linking rivers, wetlands and estuaries.

The high ichthyofaunal diversity of Srikakulam wetlands is nevertheless subject to several anthropogenic pressures. Indian wetland and riverine ecosystems are increasingly affected by habitat modification, water pollution, alteration of natural flow regimes, excessive fishing pressure, conversion of wetland areas, agricultural runoff, sand mining and other developmental activities. Reduction in water availability and disruption of connectivity between river channels, wetlands and estuaries can adversely affect fish migration, breeding and recruitment. Such

pressures may be particularly important in Srikakulam because several of its wetlands are directly or indirectly connected with major river systems and coastal estuaries.

The present study therefore provides an important **baseline inventory of ichthyofaunal diversity in the selected wetlands of Srikakulam district**. Comparison with earlier investigations from Kolleru, Pulicat, Godavari, Vamsadhara, Nagavali and other aquatic ecosystems demonstrates that Srikakulam supports a considerable proportion of the regional fish diversity. The results emphasize the importance of maintaining wetland–river–estuary connectivity, controlling pollution and destructive fishing practices, protecting breeding and nursery habitats, and implementing regular fish population monitoring. The study can serve as a reference for future investigations on fish diversity, community structure, conservation status and sustainable management of the wetland ecosystems of Srikakulam district.

CONCLUSION

The present study documented **90 fish species belonging to 24 families and 12 orders**, highlighting the rich ichthyofaunal diversity of the selected wetlands of Srikakulam district, Andhra Pradesh. The occurrence of fishes with diverse habitat preferences and feeding habits reflects the ecological heterogeneity and importance of these wetland ecosystems. The presence of species under different conservation categories further emphasizes the need for regular monitoring and protection. Therefore, maintaining wetland–river–estuary connectivity, controlling pollution, regulating fishing activities and protecting critical fish habitats are essential for long-term conservation. The present study provides a valuable baseline for **future ichthyofaunal research, biodiversity monitoring and sustainable management of Srikakulam wetlands**.

Reference:

1. Roshith, C. M., Sharma, A. P., Manna, R. K., Satpathy, B. B., & Bhaumik, U. (2013). *Ichthyofaunal diversity, assemblage structure and seasonal dynamics in the freshwater tidal stretch of Hooghly estuary along the Gangetic delta*. *Aquatic Ecosystem Health & Management*, 16(4), 445–453. <https://doi.org/10.1080/14634988.2013.857561>.
2. Raju, Ch. Sebastian. (2014). *Biodiversity and Conservation status of Ichthyofauna of Lake Kolleru, Andhra Pradesh, India*. *International Journal of Scientific Research*, 3(5), 555–562. The study reports 92 species, 34 families and 13 orders.
3. Bharatha Lakshmi, B., Poli Naidu, Y., & Rama Rao, K. (2015). *Ichthyo Faunal Diversity and Conservation of Kolleru Lake – A Ramsar Site in Andhra Pradesh*. *IOSR Journal of Pharmacy and Biological Sciences*, 10(2), 13–21. DOI: 10.9790/3008-10221321.

- 4. Jammu, Chandra Sekhara Rao, Simhachalam, G., & Raju, Ch. Sebastian. (2013).** *Ornamental Fish Diversity of Lake Kolleru, the only Ramsar site in Andhra Pradesh, India.* The study recorded 58 ornamental fish species.
- 5. Jesintha, N., Jayakumar, N., Karuppasamy, K., Ahilan, B., Manikandavelu, D., Uma, A., & Madhavi, K. (2022).** *An Annotated Checklist of Finfish and Shellfish Diversity of Pulicat Lake, Southeast Coast of India.* **Indian Journal of Animal Research**, **56(4)**, 468–475. DOI: 10.18805/IJAR.B-4740.
- 6. Yosuva, M., Jeyapragash, D., Tiburtius, A., & Saravanakumar, A. (2025).** *An annotated checklist on marine bony fishes of the Pulicat Lake, India.* **Journal of the Marine Biological Association of India**, **67(1)**, 100–109. DOI: 10.6024/jmbai.2025.67.1.2521-13.
- 7. Sanapala, Chinnababu, Pedda, Lakshmi Chaya, Kandrakunta Babu, Paidi, Sandeep, & Kanti Priya, K. (2022).** *The study on fish diversity of Madduvalasa reservoir.* DOI: 10.22271/fish.2022.v10.i2b.2653. The paper reports 31 species, 13 families and 5 orders.
- 8. Laxminarayana, Gunta, Rama Rao, K., & Ratnakala, M. (2024).** *Taxonomic Check List of Ichthyofaunal Diversity at Hiramandalam Reservoir, Srikakulam Dt. Andhra Pradesh, India.* **Uttar Pradesh Journal of Zoology**, **45(9)**, 177–187. DOI: 10.56557/UPJOZ/2024/v45i94036.
- 9. Hemasundararao, K., Shanti Prabha, Y., & Harikrishana Prasad, M. (2025).** *Ecological Status and Fish Diversity in the Mahendranayan River Srikakulam-Andhra Pradesh-India.* **Uttar Pradesh Journal of Zoology**, **46(2)**, 125–137. DOI: 10.56557/upjoz/2025/v46i24769.
- 10. Rao, N. Veerabhadra, Jawahar, P., Jayakumar, N., Sujathkumar, N.V., Rani, V., Rathod, R., & Mohale, Hari Prasad. (2025).** *An Annotated Checklist of Ichthyofaunal Diversity of the Godavari River, Andhra Pradesh, India.* **Pakistan Journal of Zoology**, **57(4)**, 1811–1822. DOI: 10.17582/journal.pjz/20230820044600.
- 11. Mishra, S.S. (2010).** *Fishes.* In C.A. Nageswara Rao (Ed.), *Fauna of Vamsadhara and Nagavali Estuaries, Andhra Pradesh, Estuarine Ecosystem Series No. 6*, pp. 73–113. Zoological Survey of India, Kolkata.
- 12. Sharker, M. R., Kabir, M. A., Choi, S. D., Hasan, K. R., Rahman, M. M., & Shamuel, T. A. (2024).** *Diversity pattern of ichthyofaunal assemblage in South-central coastal region of Bangladesh.* **The European Zoological Journal**, **91(2)**, 830–841. DOI: 10.1080/24750263.2024.2376597.
- 13. Dwivedi, A. K., & Joshi, K. D. (2013).** *Fish diversity, community structure and ecological integrity of the tropical River Ganges, India.* **Aquatic Ecosystem Health & Management**, **16(4)**, 395–407. DOI: 10.1080/14634988.2013.851592.
- 14. Effect of river connectivity on hydrochemistry, sediment enzyme activity and biotic communities of wetlands. (2017).** **Aquatic Ecosystem Health & Management**, **20(1)**, 140–150. DOI: 10.1080/14634988.2017.1301095.

15. **Sarkar et al. / Indian floodplain wetland fisheries review** — useful for wetland fisheries, biodiversity decline, threats and sustainable management.
16. **Ghosh et al. (2024), Fisheries and Aquaculture in Wetland Ecosystems: A Review of Benefits, Risks, and Future Prospects in India** — useful for ecosystem services, fisheries, food security and management.
17. **Roshnath, R., Nisha, P. V., & Anvar Ali. (2023).**
Ichthyofaunal diversity of the Kattampally wetlands, Kannur and conservation challenges. Journal of the Marine Biological Association of India, 65(1). DOI: 10.6024/jmbai.2023.65.1.2331-19.
18. **Sarkar & Das (2016), Wetland Ecosystem Services and its Valuation with Special Reference to India** — useful for ecosystem-service justification.
19. **Karri & Harathi (2023), Kalingapatnam Estuary** — one of the most directly relevant recent Srikakulam ichthyofaunal studies.
20. **Vamsadhara and Nagavali Estuaries, Zoological Survey of India** — highly relevant historical baseline for your district.
21. **Rama Rao & Ramachandra Rao (2021), Narayanapuram Anicut, Nagavali River** — useful for comparison within Srikakulam.
23. **Sarkar et al. (2024), State fishes of India: current status, knowledge gaps and conservation** — useful for the conservation and sustainable-utilization section.
24. **Dinesh et al. (2026), Fish for Future: A Strategic Outlook from Indian Ramsar Wetlands** — a very recent reference that can strengthen the modern national context of wetland ichthyofaunal resea
25. **Torre-Cuadros, L., M. De Los Ángeles, S. Herrando-Pérez & K.R. Young (2007).**
Diversity and structural patterns for tropical montane and premontane forests of central Peru, with an assessment of the use of higher-taxon surrogacy. *Biodiversity and Conservation* 16: 2965– 2988. <https://doi.org/10.1007/s10531-007-9155-9>
26. **Kumar, S. S., Ambili, T. R., Baby, P., & Mani, R. R. (2024).**
Ichthyofaunal Diversity and Physico-chemical Analysis of Water in the Middle Stretch of Vembanad Lake, Kerala, India. Uttar Pradesh Journal of Zoology, 45(10), 1–15. DOI: 10.56557/UPJOZ/2024/v45i104040.
27. **Raju, C., Sridharan, G., Mariappan, P., & Chelladurai, G. (2017).**
Physico-chemical parameters and Ichthyofauna diversity of Arasalar estuary in southeast coast of India. Applied Water Science, 7, 445–450. DOI: 10.1007/s13201-014-0260-0.