



Taxonomic Check List of Ichthyofaunal Diversity in Gosthani River at Tagarapuvalasa, Visakhapatnam, Andhra Pradesh, India

K. Rama Rao ^{a*}, P. Jaya ^a, J. Prameela ^a, K. Shyamala ^a,
S. Anu Radha ^a and B. Sharmila ^a

^a Department of Zoology/ Fisheries, Dr. V. S. Krishna Govt. Degree & PG College (A),
Visakhapatnam, Affi. Andhra University, Andhra Pradesh, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The study was designed to examine the taxonomy and assortment of fish species in the Gosthani River in Andhra Pradesh from April 2023 to March 2024. A total of 47 fish species were documented at the two landing sites of Gosthani River. The fish samples were carefully cleansed, and photos were taken on location. These fish were fixed in glass jars and kept in a 10% formalin solution. Following that, the samples were identified up to the species level using classical taxonomic techniques. Order Cypriniformes was observed to have the highest contribution to the species diversity: 15.78% families, 38.23% genera, and 40.42% species, followed by Siluriformes (26.31% families, 17.64% genera, and 21.73% species); Belontiiformes (10.52% family, 5.88% genera, and 4.25% species); Cichliformes (1 family, 3 genera and 3 species); Perciformes and Synbranchiformes (1 family, 2 genera and 2 species); Anguilliformes (1 family, 1 genera and 2

*Corresponding author: Email: drkarriramarao@gmail.com;

species); Channiformes (5.26% family, 8.82% genera, and 6.38% species); Cyprinodontiformes, Gobiiformes, Osteoglossiformes, and Anabantiformes (5.26% family, 2.94% genera, and 2.12% species). The taxonomic trophic levels were found to have the largest percentage of omnivores have 46.81%, followed by carnivorous 34.04% and herbivorous 19.14%. The composition of taxa, population status, trophic levels, and IUCN status were reported in this research paper.

Keywords: Ichthyofauna; population status; trophic level; herbivorous; omnivorous; carnivorous; IUCN.

1. INTRODUCTION

India is endowed with enormous inland open water resources, which are known for their high fish diversity and production potential. The nation has 29,000 km of riverine resources, including 14 large rivers (catchment area >20,000 km²), 44 medium rivers (catchment area 2,000–20,000 km²), and numerous small rivers (catchment area <2,000 km²) [1]. Indian subcontinent has around 2500 fish species, 930 of which are freshwater and 1570 of which are marine (Kar et al., 2003). There are 801 freshwater fishes present (Fish base 2004). Ichthyofaunal diversity refers to the diversity of fish species that exist depending on context and magnitude; it can relate to alleles or genotypes within life forms within a fish community as well as species or life forms that exist throughout aquaculture environments [2]. There are approximately 21,723 extant fish species in the world, including 8,411 freshwater species and 11,650 marine forms. India is one of the world's mega-biodiversity countries, ranking ninth in terms of freshwater mega-biodiversity [3]. Biodiversity is the degree of variation of living forms within a particular ecosystem; biodiversity is necessary for ecological stabilization, conservation of overall environmental quality, and comprehending the inherent worth of all species on the planet, as expressed by Ehrlich et al., [4]. India is regarded as one of the mega-diversity countries, owing to its enormous

geographical size and extensive tropical zone [5]. Traditional fishers in Gosthani river and surrounding regions, fisher families from Scheduled and Backward Castes, have fishing rights in these bodies of water, which have been recognized by the Panchayats or Fisheries Department as Fishermen Cooperative Societies. The current study provides the most recent database of fish species and is the first documentation of fish fauna in Gosthani River.

2. MATERIALS AND METHODS

The Gosthani River is a medium-sized, east-flowing river in Andhra Pradesh, India. It originates in the Ananthagiri Hills of the Eastern Ghats and flows for 120 kilometers across Thatipudi reservoir before entering the Bay of Bengal at Bheemunipatnam to form an estuary. The Gosthani River is a minor river basin with a total drainage area of less than 2000 km². The depth of the river's deepest point varies by location and 1.5-2 meters in the river's middle part. The Vizianagram and Vishakhapatnam districts rely heavily on the Gosthani River for drinking water. The water from this River has been diverted for commercial and agricultural use. Riverine fisheries are a sort of inland fishing where fish are caught straight from river systems using scientifically designed gear. India has vast riverine fisheries resources due to the presence of several fertile riverine systems.

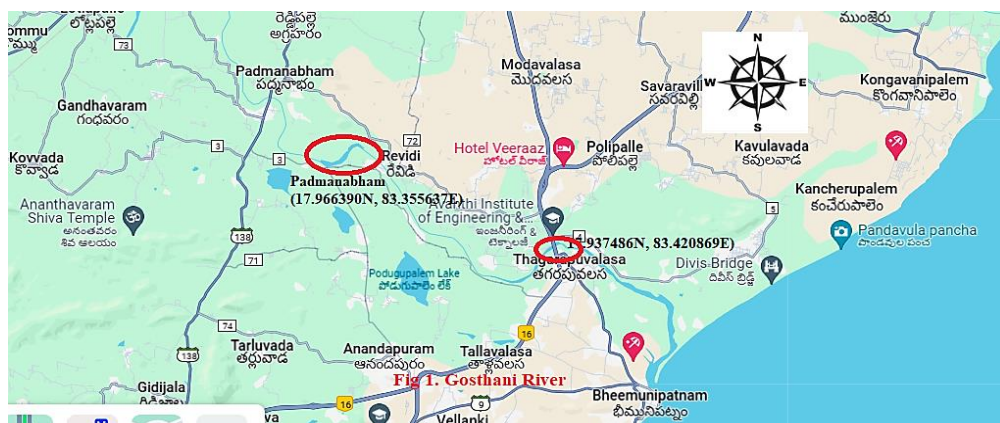


Fig. 1. Gosthani River



Fig. 2. Gosthani River at Thagarapuvalasa and Padmanabham

The fish samples were collected out fortnightly from April, 2023 to March 2024 from three landing stations (Thagarapuvalasa (17.937486N, 83.420869E). Padmanabham (17.966390N, 83.355637E) Figs. 1 & 2. Representative species collected carefully with the help of local fishermen by using different types of gears and baskets traps [6]. In the laboratory, the samples were washed thoroughly and images were captured. These fish were fixed in glass jars before being preserved in a 10% formalin solution. Following that, the samples were recognized up to the species level using classical taxonomic methods such as morphometric features, meristic counts, and descriptive characters. Fish species identification was validated using guidelines standardized by Day [7], Talwar and Jhingran [8], Jayaram [9,10], Menon [11], and Munro [12]. The population and IUCN status were determined by calculating the proportion of individual abounded species and the total number of reported species based on the ichthyofauna assessment.

3. RESULTS AND DISCUSSION

The current study assessed the taxa and diversity of fish species in the Gosthani River in Andhra Pradesh from April, 2023 to March 2024. A total of 47 fish species were documented in the two selected landing stations. An updated, comprehensive checklist of finfish with their current scientific names, trophic level, fishery status, and IUCN status was prepared after verification with published literature and web-based information such as Froese and Pauly, [13], (FishBase), Eschmeyer 2023 (Catalog of Fishes) (Table 1). According to CIFE [14], there are 64 fish species in the Godavari River in Maharashtra, belonging to 15 distinct families and 38 genera, from Gangapur Dam to Raheer. Chinnababu et al., [15] reported a total of 50 fish species from the selected locations of the Godavari river at Rajamahendravaram, which

was significantly fewer than the current documented species.

In the present study, a total of 47 finfish species belonging to 11 orders, 19 families and 34 genera were recorded from Gosthani River. Among the 11 orders, the order Cypriniformes was observed to have the highest contribution to the species diversity (15.78% families, 38.23% genera and 40.42% species), followed by Siluriformes (26.31% families, 17.64% genera and 21.73% species); Belontiiformes (10.52% family, 5.88% genera and 4.25% species); Cichliformes (1 family, 3 genera and 3 species), Perciformes and Synbranchiiformes (1 family, 2 genera and 2 species); Anguilliformes (1 family, 1 genera and 2 species); Channiformes (5.26% family, 8.82% genera and 6.38% species); Cyprinodontiformes, Gobiiformes, Osteoglossiformes, and Anabantiformes (5.26% family, 2.94% genera and 2.12% species) Table 2; Fig. 3. Chandra Sekhara Rao et al., [16] identified 66 fish species from 9 orders, 22 families, and 38 genera. Order Cypriniformes had the most dominant group with 26 species, followed by Siluriformes and Mugiliformes each with 11 species, Perciformes with 7 species, Anguilliformes, Cyprinodontiformes, and Mastacembeliformes each with 3 species, and Osteoglossiformes and Elopiformes each with 1 species. Rama Rao [17] reported at Lower Manair Dam at Karimnagar Dt.

The taxonomic trophic levels in the present study was classified into herbivorous (2.0-2.5), omnivore (2.5-3.5), and carnivorous (3.5-4.5) based on their trophic level. The omnivores have a highest percentage of 22 (46.81%), followed by the carnivorous 16 (34.04%), and the herbivorous 09 (19.14%) (Tab. 3, Fig. 4). A similar study was observed by Rama Rao [18] reported the highest number of omnivores (51.02%, followed by carnivores (26.53% and herbivores (18.36%) in Gotta Barrage at

Hiramandalam. The trophic level community structure of recorded fish species demonstrated the dominance of top-level carnivores (39%), followed by mid-level carnivores (28%), predators (17%), omnivores (14%), and herbivores or planktivores (2%), according to Haojie Su (2021). The majority of the finfish species identified as omnivorous throughout this study. In the present investigation the number and percentage composition of Population Status was 25 species were common which contributed to 53.19%, followed by 11 species were abundant which contributed to 23.40%, 7 species were abundant which contributed to 14.89% and 04 species are moderate which contributed to 08.51% in the total taxa (Table 4, Fig. 5). Rama Rao [17] the similar results were reported to 25 species were common which contributed to 51.02%, 12 species were abundant which contributed to 24.48%, 7 species are moderate which contributed to 14.28% and 5 species were moderate which contributed to 10.20% in the total catch at Gotta Barrage. Rama Rao [16] represented the number and percentage composition of Population Status is 19 species were abundant contributed to 29.69%, 21 species common (32.81%), 14 species moderate (21.86%) and 10 species rare (15.63%) in the total catch at Lower Manair Dam.

According to IUCN status 39 species contributed to 82.97% are least concern (LC), six species contributed to 12.76% are near threaten (NT), one species were not evaluated (NE) and data deficient (DD) with 2.12%, Table 4, Fig. 6. The similar study was reported by Priyanka et al., (2021) represents the IUCN red list categories, 52.5% of the species are least concern, 20% are not evaluated, 10% are near threatened, 5 % are data deficient, 5% are lower risk near threatened and vulnerable, and 2.5% are lower risk least concern [19]. Rama Rao and Ramachandra Rao [20] observed the Ichthyofaunal diversity at Narayanapuram Anicut at Nagavali River. Further species diversity was found to be the highest during Monsoon season compared to other seasons. Rama Rao [21] reported more Least concerned fish species at Kalinga Dal reservoir. Rama Rao [16] identified 51 species (79.69%) are least concern (LC), 3 species (4.69%) are not evaluated (NT), 4 species (6.25%) are data (EN), vulnerable (VU) and not evaluated (NE) in Lower Manair Dam at Karimnagar Dt. In the present study the ichthyofauna species percentage contribution was nearly similar and *Labeo rohita* and *Catla catla* are found to be dominant species in total catch in the sampling stations [22-24].

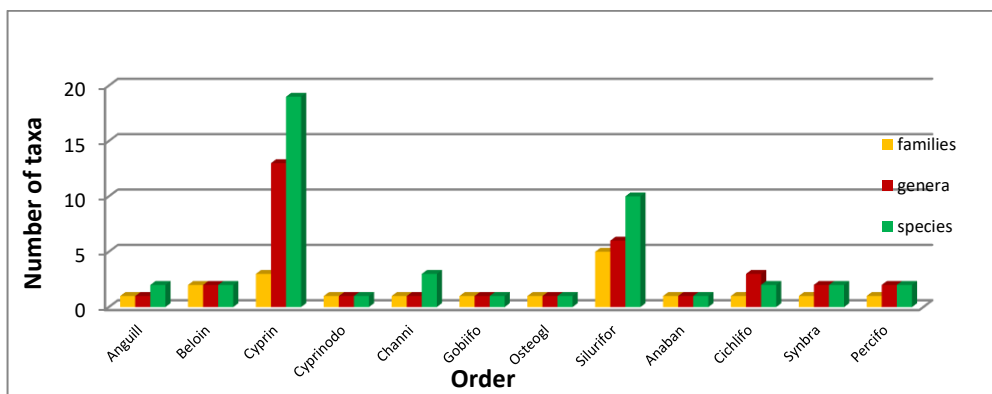


Fig. 3. Percent composition of taxa

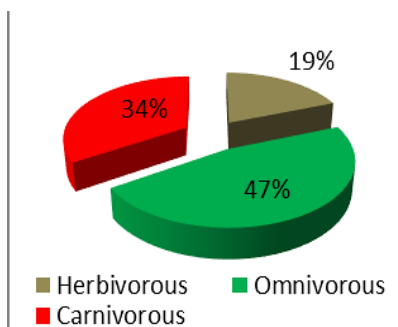


Fig. 4. trophic level

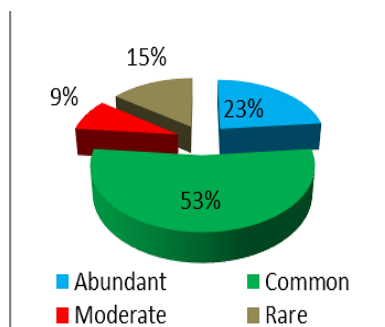


Fig. 5. Population Stat

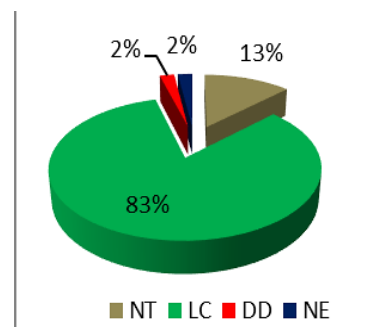


Fig. 6. IUCN status

Table 1. Taxa of fishes and their order, family, genus, species, population status and IUCN status at Gosthani river

No.	Order / Family	Scientific Name	Trophic level	Population Status	IUCN Status
1	Anguilliformes/ Anguillidae	<i>Anguilla bengalensis</i>	3.8	R	NT
2	Anguilliformes/ Anguillidae	<i>Anguilla bicolor</i>	3.6	R	NT
3	Beloniformes/ Belonidae	<i>Xenentodon cancila</i>	3.9	R	DD
4	Beloniformes/ Hemiramphidae	<i>Hyporhamphus limbatus</i>	3.1	R	LC
5	Cypriniformes/ Cyprinidae	<i>Cirrhinus mrigala</i>	2.4	A	LC
6*	Cypriniformes/ Cyprinidae	<i>Ctenopharyngodon idella</i>	2.0	M	LC
7*	Cypriniformes/ Cyprinidae	<i>Hypophthalmichthys molitrix</i>	2.0	R	NT
8	Cypriniformes/ Cyprinidae	<i>Labeo catla</i>	2.8	A	LC
9	Cypriniformes/ Cyprinidae	<i>Labeo calbasu</i>	2.0	C	LC
10	Cypriniformes/ Cyprinidae	<i>Labeo rohita</i>	2.2	A	LC
11	Cypriniformes/ Cyprinidae	<i>Osteobrama cotio</i>	2.9	C	LC
12	Cypriniformes/ Cyprinidae	<i>Puntius chola</i>	2.5	A	LC
13	Cypriniformes/ Cyprinidae	<i>Puntius ticto</i>	2.2	A	LC
14	Cypriniformes/ Cyprinidae	<i>Puntius sophore</i>	2.6	A	LC
15	Cypriniformes/ Cyprinidae	<i>Systemus sarana</i>	2.9	C	LC
16	Cypriniformes/ Cyprinidae	<i>Garra gotyla</i>	2.0	R	LC
17	Cypriniformes/ Danionidae	<i>Amblypharyngodon microlepis</i>	3.3	A	LC
18	Cypriniformes/ Danionidae	<i>Amblypharyngodon mola</i>	3.3	A	LC
19	Cypriniformes/ Danionida	<i>Salmostoma bacaila</i>	3.2	C	LC
20	Cypriniformes/ Danionida	<i>Salmostoma phulo</i>	3.2	C	LC
21	Cypriniformes/ Danionida	<i>Rasbora daniconius</i>	3.1	C	LC
22	Cypriniformes/ Danionidae	<i>Danio devario</i>	3.0	C	LC
23	Cypriniformes / Cobitidae	<i>Lepidocephalichthys guntea</i>	2.7	M	LC
24	Cyprinodontiformes/ Aplocheiidae	<i>Aplocheilus panchax</i>	3.8	C	LC
25	Channiformes/ Channidae	<i>Channa orientalis</i>	3.8	C	NE
26	Channiformes/ Channidae	<i>Channa panctata</i>	3.8	A	LC
27	Channiformes/ Channidae	<i>Channa striatus</i>	3.6	C	LC
28	Gobiiformes/ Gobiidae	<i>Glossogobius giuris</i>	3.7	C	LC
29	Osteoglossiformes/ Notopteridae	<i>Notopterus notopterus</i>	3.5	C	LC
30	Siluriformes/ Bagridae	<i>Mystus bleekeri</i>	3.3	C	LC
31	Siluriformes/ Bagridae	<i>Mystus cavasius</i>	3.4	C	LC
32	Siluriformes/ Bagridae	<i>Mystus gulio</i>	4.0	R	LC
33	Siluriformes/ Bagridae	<i>Mystus tengara</i>	3.2	A	LC
34	Siluriformes/ Bagridae	<i>Mystus vittatus</i>	3.1	A	LC
35	Siluriformes/ Claridae	<i>Clarias batrachus</i>	3.4	C	LC
36	Siluriformes/ Heteropneustidae	<i>Heteropneustes fossilis</i>	3.6	C	LC
37	Siluriformes/ Siluridae	<i>Ompok bimaculatus</i>	3.9	C	NT
38	Siluriformes/ Siluridae	<i>Wallago attu</i>	3.7	C	NT
39	Siluriformes/Schibeidae	<i>Eutropiichthys vacha</i>	3.9	C	LC
40	Anabantiformes /Anabantidae	<i>Anabas testudineus</i>	3.0	M	LC
41*	Cichliformes / Cichlidae	<i>Oreochromis mossambicus</i>	2.2	M	NT
42	Cichliformes/ Cichlidae	<i>Pseudotropheus maculatus</i>	2.7	C	LC

No.	Order / Family	Scientific Name	Trophic level	Population Status	IUCN Status
43	Cichliformes/ Cichlidae	<i>Etilapia suratensis</i>	2.9	C	LC
44	Synbranchiformes / Mastacembelidae	<i>Mastacembelus armatus</i>	2.8	C	LC
45	Synbranchiformes / Mastacembelidae	<i>Macrognathus pancalus</i>	3.5	C	LC
46	Perciformes / Ambassidae	<i>Chanda nama</i>	3.9	C	LC
47	Perciformes / Ambassidae	<i>Parambassis ranga</i>	3.6	C	LC

A= Abundant (76-100%); C = Common (51-75%); M = Moderate (26-50%); R = Rare (1-25%) of the total catch. EN- Endangered; VU- Vulnerable; LC- Least concern; DD- Data deficient; NE- Not evaluated, NT: Near threaten. *Exotic fishes No.s: 6, 7 and 41

Table 2. Number and percent composition of families, genera and species of fishes under various orders

S.No	Orders	% of families in an order	% of genera in an order	% of species in an order
1	Anguilliformes	5.26	2.94	4.25
	Beloniformes	10.52	5.88	4.25
2	Cypriniformes	15.78	38.23	40.42
3	Cyprinodontiformes	5.26	2.94	2.12
4	Channiformes	5.26	2.94	6.38
5	Gobiiformes	5.26	2.94	2.12
6	Osteoglossiformes	5.26	2.94	2.12
7	Siluriformes	26.31	17.64	21.73
8	Anabantiformes	5.26	2.94	2.12
9	Cichliformes	5.26	8.82	6.38
10	Synbranchiformes	5.26	5.88	4.25
11	Perciformes	5.26	5.88	4.25

Table 3. Taxonomic trophic level of fish species at Gosthani river

Trophic level	Herbivorous (2.0–2.5)	Omnivorous (2.6–3.5)	Carnivorous (3.6–4.50)
Number of species	09	22	16
% Composition	19.14	46.81	34.04

Table 4. Taxonomic composition of population status and IUCN [25]

Population Status	Abundant (76-100%)	Common (51-75%)	Moderate (26-50%)	Rare (1-25%)
Number of species	11	25	4	7
% Composition	23.40	53.19	8.51	14.89
IUCN (2024)	NT	LC	DD	NE
No. of species	06	39	01	01
% contribution	12.76	82.97	2.12	2.12



Ctenopharyngodon idella



Hypophthalmichthys molitrix



Anguilla bengalensis



Anguilla bicolor



Xenentodon cancila



Hyporhamphus limbatus



Garra gotyla



Mystus gulio

Plate 1. Exotic and rare fish species in Gosthani River

4. CONCLUSION

Traditional fishers in Gosthani river and surrounding regions, fisher families from Scheduled and Backward Castes, have fishing rights in these water bodies, which have been recognized by the Panchayats or Fisheries Department as Fishermen Cooperative Societies. The current study provides the most recent database of fish species and is the first documentation of fish fauna in Gosthani River.

ETHICAL APPROVAL

This study was conducted according to international ethical standards set by the Institutional Plant care and Use Committee

DATA AVAILABILITY STATEMENT

The authors confirm that the data used to support the findings of this study are available within the manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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