SPECIES

To Cite:
Farkade AA, Bhandarkar SV, Sangve KB. Diversity and abundance of ichthyofauna in Shekhdari dam, district Amravati, Maharashtra. *Species* 2023; 24: e39s1531
doi: https://doi.org/10.54905/disssi/v24i73/e39s1531

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Peer-Review History
Received: 18 March 2023
Reviewed & Revised: 22/March/2023 to 01/May/2023
Accepted: 03 May 2023
Published: 6 May 2023

Peer-Review Model
External peer-review was done through double-blind method.

Species
pISSN 2319–5746; eISSN 2319–5754

DISCOVERY
SCIENTIFIC SOCIETY

Diversity and abundance of ichthyofauna in Shekhdari dam, district Amravati, Maharashtra

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ABSTRACT

Fish species in Shekhdari Dam Reservoir of Warud Tahsil are the subject of the current investigation, District Amravati of Maharashtra India. Amravati district harbors wide range of peninsular areas near forest region around Warud city, the water bodies consist of marshy wetlands, Rivers, Ponds, Reservoirs and Dams. Theses water bodies are utilized primarily for irrigation and drinking purposes, also helpful for the socio-economic development of fisherman community. However, the status of these water bodies is unrevealed. These water bodies enriched with variety of flora and fauna, unnoticed to the policy makers due to lack of hydro biological studies in this region. In the present paper, Ichthyofaunal diversity was recorded for the first time throughout the year 2020-2021. A total of 24 fishes were recorded for the first time. The diversity and abundance of the fishes is discussed.

Keywords: Ichtyofaunal diversity, Abundance, Shekhdari Dam, Warud, Amravati.

1. INTRODUCTION

For the life on our planet, fresh water supplies are incredibly valuable. During the past several years, there have been a lot more dams, reservoirs, tanks and other structures built. The aquatic environment is significant and contains many economically significant organisms, particularly fish and a significant source of food. India's lakes are home to a wide range of fish species, which in turn encourages the economic exploitation of the country's fisheries' potential (Krishna and Piska, 2006). For the best possible use of a water body's fisheries resources, a full understanding of those resources' availability and distribution is required (Pawar et al., 2006). The natural environment of all living things has been severely harmed by our actions. Fresh water resources are used for a variety of purposes, including those related to agriculture, industry, home use, leisure and the environment. Due to constant anthropogenic stress, fish diversity is progressively reducing every day. Not only is this variety the source of our world's wealth, but it also has a significant impact on fisheries. So, in order to create an information system on fresh water fish variety, adequate research and recording of this fish diversity are urgently required.

From the standpoint of changes in fish fauna over time and space, it is important to include biodiversity and its distribution across time and space and permits to define the strategies for its protection since natural waterways provide more stable circumstances under which the fish evolve. With the exception of water utility management, the fresh water reservoirs built for this purpose are underused. The primary resources used for inland fisheries may be reservoirs and lakes. For the use of fresh water reservoirs and the sustainable as well as economical management, recognizing the diversity of fish species is essential (Battul et al., 2007). Maharashtra has benefited from the introduction of fresh water fish by Misra, (1962), Day, (1878) and Hamilton-Buchanan, (1822). The majority of vertebrates on earth are fish, which makes up over half of all vertebrates. They exist in practically every type of aquatic environment. They have a huge range in terms of size, form, biology and the ecosystems they live in.

Nelson, (2006) estimated that there are 21,723 extant fish species worldwide. Day, (1889) described 1418 fish species from 342 genera in British India. Maharashtra has a wide variety of freshwater fish and freshwater reservoirs, including rivers, lakes, dams and irrigation canals. Because of its natural water resources and importance for fish production, Maharashtra has enormous potential for the development of its fisheries. Numerous researchers have extensively studied the fish diversity, including Ahmad et al., (2008), Goswami and Mankodi (2010), Sarwade and Khillare, (2010), Deviprasad et al., (2009), Jadhav et al., (2011), Bhakta and Bandyopadhyay, (2008), Muruga and Prabaharal, (2012), Thirumala et al., (2011), Bandopadhyay, (1999) and Gohil and Mankodi, (2013). The fisheries industry has a great deal of potential for expansion, but there is little information available about the Ichthyofauna that lives in the lotic and lentic habitats of the Amravati district.

As a result, an effort has been made to document the fish fauna currently known. The presence of 24 species of fish from 6 orders (Cypriniformes, Siluriformes, Osteoglossiformes, Perciformes and Anguilliformes). With 13 species, the dominant order was Cypriniformes, which contains the big carps. The order Siluriformes with 04 species belongs to family of Bagridae, Heteroneustidae, Siluridae, Clarriidae. 02 species belong to Osteoglossiformes. 04 species from Order Perciformes, while only 01 species from Order Anuilliformes.

2. MATERIAL AND METHODS

The availability of certain species in fishermen's catches and surveys from neighborhood fish markets are used to determine the diversity of fresh water fish species in the study region. Fish species that have been collected are examined for their morphological characters. The identification of the fishes was done using the work of Day, (1994), Talwar and Jhingran, (1991), Hiware, (2015), Jayaram, (1994) and Qureshi and Qureshi, (1983). For taxonomy analysis and identity verification, pictures were captured and morphometrical characteristics were recorded.

Study area

The study site is located near the Gavankund village in Warud Tahsil in Amravati district. The dam is surrounded by open hills of Satpuda ranges. Official designation of Shekdhari dam irrigation Project is “Shekdhari Dam, D – 01383” (21°31'51"N 78°11'47"E) (Figure 1). However, it is also known as "Shekhdari Lake" locally. In 1982, the Maharashtra government built it as a component of irrigation projects. Shakti River is impounded and built upon there. Warud Taluka, Warud, in Maharashtra's Amravati district, is the closest city near the dam. The dam is a fill dam made of earth. The dam is 730m (2395.01 feet) in length and 30.36m (99.6062 feet) in height above the lowest foundation. Various spillways are part of the project. The spillway is 501.969 meters long. The spillway of the dam is un-gated. 3.51 thousand hectares are inside the dam's catchment area. 5.204MCM is the maximum/gross storage capacity. 4.54 MCM is the live storage capacity.

Figure 1 Satellite view of Shekhdari Dam, Shekhadari Tah Warud, Dist. Amaravati

3. RESULT

An occurrence of 24 fish species from 6 orders (Cypriniformes, Siluriformes, Osteoglossiformes, Perciformes and Anguilliformes). The order Cypriniformes, which contains large carps, prevailed with 13 species. The family of Bagridae, Heteroneustidae, Siluridae, and Clarriidae belongs to the order Siluriformes, which has 01 species from each family. The Osteoglossiformes order has 02 species belongs to the family Notopteridae. Only 01 species from the Order Anuilliformes, while 04 species from the Order Perciformes, 01 species from family Anabantidae and 02 species from Channidae. The fish dynamics were counted based on the frequency cited at the time of collection and occurrence in the local market. On the basis of that their abundance was estimated as Rare, Moderate, Dominant and Predominant (Table 1). Among the major carps, *Catla catla, Cirrhinus mrigala* and *Labeo rohita* were estimated as predominant.

Key to species

Anguilla bengalensis bengalensis

It is commonly referred to as the Indian long fin eel, has an extended body, a conical head that is dorsally flattened and a tail that is moderately compressed. It has small eyes, thick, protruding lips and jaws with narrow bands of teeth. Smooth, eel-like body with tiny or primitive scales embedded in the skin (Near Threatened).

Catla catla

A short, deep body. Stomach was rounded. Wide and large head, bluntly rounded snout, possibly with pores, thin skin covering. Wide anterior rounded mouth. Large, forward-facing eyes those are visible from beneath the ventral surface. Lacking an upper lip, the lower lip is continuous, moderately thick and has a free posterior margin.

Cirrhinus mrigala

Body is streamlined, with a depth roughly equal to the length of the head. Mouth wide; lower lip is most indistinct, upper lip complete. There is only one short pair of rostral barbells. Dorsal fin as high as body.

Cyprinus carpio

Strong, slightly condensed body. Triangular head and obtusely rounded snout. Small oblique protruding mouth. Thick and fleshy lips. Two barbels in pairs. Dorsal fin positioned halfway between caudal fin base and snout tip. Quite large and rounded pectoral fins. Scales are large.

Labeo rohita

Body slightly longer than average; dorsal profile more arched than ventral. Snout projects past the mouth and is generally depressed. The back of the head obscures the eyes. Thick fringed lips with a small inferior mouth, Dorsal fin inserted midway between snout-tip and caudal fin base.

Labeo calbasu

Body stout and more or less deep. The conical head is shorter than the depth of the body. Depressed, somewhat pointed and pore-filled snout. From the bottom of the head, eyes are not visible. Mouth is inferior, lips thick and conspicuously fringed. Two pairs of barbels. Dorsal fin with long base, inserted midway between tip of snout and base of caudal fin.

Labeo fimbriatus

Body elongates, dorsal profile more convex than ventral. Snout blunt, fairly swollen. Eyes not visible from under side of head. lower mouth; thick, fringed lips. Dorsal fin inserted nearer to snout-tip than to caudal fin base. Pectoral fins as long as head.

Labeo pangusia

Body elongates, its ventral profile is more concave than the dorsal tiny eyes, not visible from the back of the head, the diameter 4.5 to 5.5 times in head. Barbels a short maxillary pair. Pectoral fins do not extend up to pelvic fin.

Wallago attu

Median longitudinal groove on head reaching base of occipital process. Two pairs of barbels, maxillary pair reaching anal fin origin, mandibular as long as snout. Gape of mouth reaching below eyes. Adipose dorsal fin absent. Pectoral fin reaching beyond pelvic fin. Pelvic fin reaching anal fin origin.

Clarias batrachus

Snout not pointed but broad. Nasal barbels not more than two times head length. Dorsal fin with 70-77 rays. The dorsal fin is positioned just anterior to the pectoral fin tip. Anal fin with 45-58 rays.

Channa punctatus

Eyes moderate, its diameter 7 to 8.5 times in head length. Mouth large, lower jaw with 3 to 6 canines, 4 or 5 scales between orbit and angle of preopercle, 12 or 13 predorsal scales. Pelvic fins more than half length of pectoral fins. Pectoral fins plain.

Ctenopharyngodon idellus

Body sub-cylindrical anteriorly and compressed posteriorly. Head depressed and flattened. A horizontal rostral fold covering base of upper lip Upper jaw slightly longer than lower and protractile. Barbels absent. Lateral line with 40 to 42 scales. Caudal fin forked.

Rasbora daniconius

A medium-sized Rasbora that lacks any lateral coloration stripes has a thin body, a dorsal fin with 7 branching rays and an anal fin with 5 branched rays, a shorter snout and a deeper head.

Puntius sarana sarana

A moderately deep bodied fish with 4 barbels. Dorsal ray osseous, serrated. Lateral line complete with 30-33 scales and prominent finger like dark spot-on caudal peduncle. Each scale gives an appearance of black longitudinal lines over body, dark border posteriorly.

Puntius sophore

Body fairly deep, more convex on its dorsal than ventral aspect. Head short, its length 3.8 to 4.1 in standard length. Mouth terminal; barbels absent. The base of the caudal fin and the tip of the dorsal fin are equally spaced apart. Last unbranched dorsal ray osseous and smooth. Lateral line complete.

Puntius ticto

Body more or less elongate, its depth 2.4 to 2.9 in standard length. Head length 3.5 to 4.0 in standard length. Mouth terminal and small; barbels absent. Dorsal fin somewhat placed behind pelvic fin origin; it's last un-branched ray osseous fairly strong and serrated at its posterior edge. Lateral line incomplete often ceases after six to eight scales; 23 to 25 scales in longitudinal series.

Notopterus notopterus

Head contains large and oblique mouth, whitish eyes and nostrils. A small ventral fin or no ventral fin exists and a short dorsal fin. Anal fin that is extremely long and caudal fin that is shorter paired, closely spaced ventral and pectoral fins.

Notopterus chitala

Body is around 1.5 meters long and heavily compacted, with a small pre-caudal area. White eyes, nostrils and a big, oblique mouth are present on the head. The ventral fin is severely diminished or nonexistent, while the dorsal fin is short. The caudal fin is smaller and has a greatly enlarged anal fin.

Tilapia mossambica

Moderately deep body, compressed shape. Body more or less elongate. Abdomen rounded. Mouth terminal large. Dorsal fin with 15 spines and 10 or 12 rays located at the base of the pectoral fins. Anal fin with 3 spines. Caudal fin rounded. Lateral line incomplete.

Mystus seenghala

Measures 15 to 30 cm length and 4 to 5 cm in width. Head contains mouth, snout, eyes and barbells. Teeth on palate in the form of continuous crescent. Fins are dorsal, pectoral, ventral, pelvic and caudal.

Channa striatus

Scale rows 9 or 10 between orbit and angle of preopercle. Predorsal seales 18 to 20. Lateral line with peninsula of the darker colour extending into the yellow; several dark vertical bands below lateral line.

Anabus testudineus

Body elongates and moderately deep. Body depth 3.0 to 3.5, snout 5.7 to 7.7 times in standard length. 8–10 rays on the dorsal fin. Scales large, 21 to 29 in lateral series.

Heteropneustes fossilis

Occipital process not reaching basal bone of dorsal fin. Four pairs barbels; maxillary extending to middle of pectoral fin or to pelvic fin base, nasals to middle of pectoral fins; outer and inner mandibular pairs reaching beyond pectoral fin end. Round and short pectoral fins. Round caudal fin. Body deep to slim. More than 6.0 inches in head length; tiny eyes.

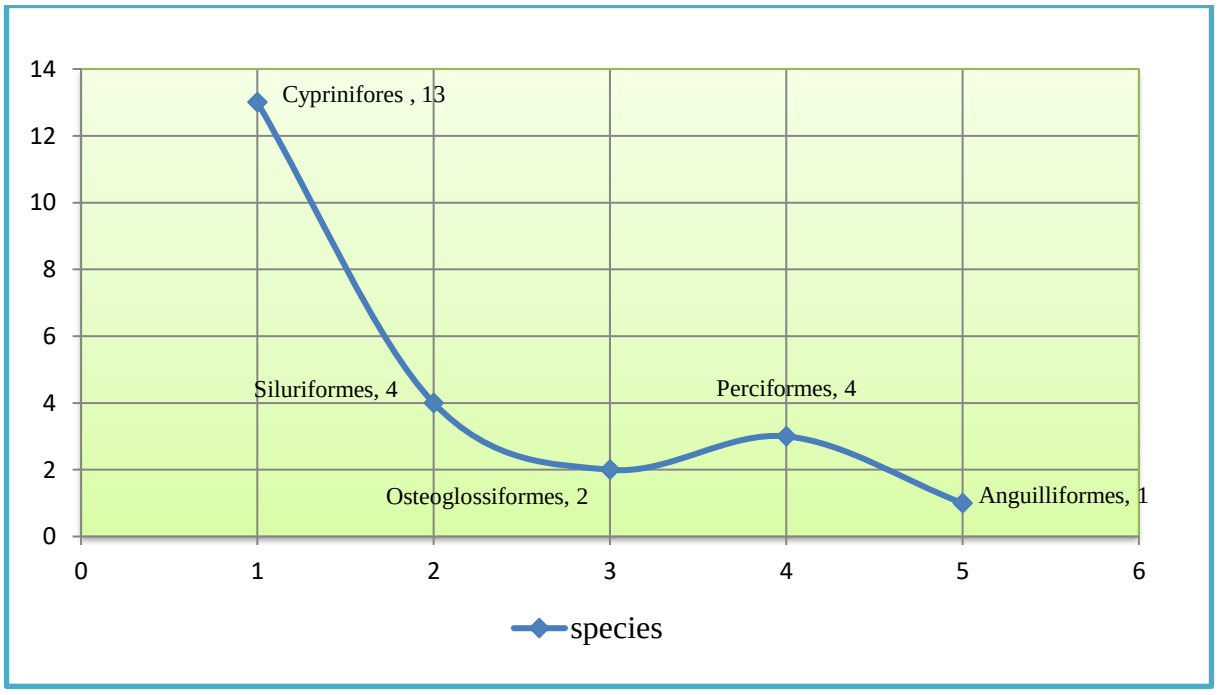

Figure 2 Showing numbers of fish species per family during the year 2020-2021

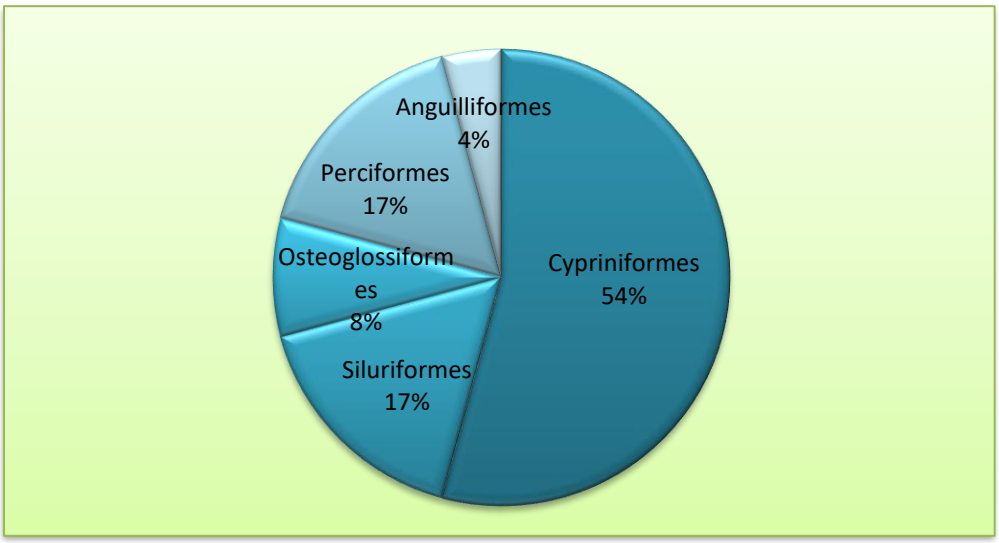

Figure 3 Showing Species % of fish species per family during the year 2020-2021

4. DISCUSSION

The reservoirs are one of the most significant sources of a variety of fish that are commercially significant for both the environment and for human consumption. Fish's nutritional and therapeutic benefits have been understood since ancient times (Pawara et al., 2014). There are 165 fish species in Maharashtra that have been identified and confirmed by various authors, including 82 genera, 26 families from 09 orders (Pawara et al., 2014). A total of 24 fish species were included in the current investigation (Table 1) (Figure 2) from 6 orders were present (Cypriniformes, Siluriformes, Osteoglossiformes, Perciformes and Anguilliformes). With 13 species, the order Cypriniformes, which includes large carps, predominated. The families Bagridae, Heteroneustidae, Siluridae and Clarriidae, which each have one species, make up the order Siluriformes. There are two species in the Notopteridae family that make up the Osteoglossiformes order. There is just one species in the Order Anuilliformes, 04 in the Order Perciformes, one species each in the Family Anabantidae and Cichlidae and two in the Family Channidae.

The findings of this study indicate that Cypriniformes are the most common, dominant, moderate and rare fishes in the assemblage composition contributing 54% to total fish diversity (Figure 3) in which Predominant- *Catla catla* (Hamilton, 1822); *Cirrhinus mrigala*, (Hamilton, 1822); *Labeo rohita* (Hamilton, 1822), Rare- *Labeo calbasu*, (Hamilton, 1822); *Labeo fimbriatus* (Bloch, 1795), Moderate- *Labeo pangusia* (Hamilton, 1822); *Cyprinus carpio*, (Linnaeus, 1738); *Ctenopharyngodon idellus* (Valenciennes, 1844). Rare- *Hypophthalmichthys molitrix* (Valenciennes, 1844); *Rasbora daniconius* (Hamilton, 1822); *Puntius sarana sarana* (Hamilton, 1822), Moderate- *Puntius sophore* (Hamilton, 1822), Rare- *Puntius ticto* (Hamilton, 1822) found in the Shekhdari Dam in the year 2020-2021. The Order Siluriformes comprises of 17% of the total fish diversity consist of 01 species from the family Bagridae, i.e., Rare- *Mystus seenghala* (Sykes, 1839) 01 species Rare- *Heteropneustes fossilis* (Bloch, 1794) from Heteroneustidae, 01 species Rare- *Wallago attu* (Bloch and Schneider, 1801) from Siluridae and 01 from Clariidae i.e., Rare- *Clarias batrachus* (Linnaeus, 1758). The Order Osteoglossiformes comprises of 08% of the total fish diversity consist of only one family Notopteridae with 02 species i.e., Moderae- *Notopterus notopterus* (Pallas, 1769) and *Notopterus chitala* (Fowler, 1934).

The Perciformes contributed 17% of the total fish diversity consist of 03 families, Channidae with 02 species i.e., Moderae- *Channa striatus* (Bloch, 1793) and *Channa punctatus* (Bloch, 1793), family Cichlidae with only 01 species i.e., *Tilapia mossambica* (Peter, 1852) while Anabantidae with only 01 species i.e., Moderae-*Anabus testudineus*, (Bloch, 1792). The order Anguilliformes comprises of only 4% of the total fish diversity with only one family Anuillidae with only 01 fish species i.e., Dominant-*Anguilla bengalensis* (Gray, 1831). Hamilton, (1822), Hora, (1943, 1951, 1953), Misra, (1959), Menon, (1999), Dey, (1973), Jayaram, (1999), Talwar and Jhingran and others have conducted earlier studies on the fresh water fish diversity in India (1991). Fish and fisheries at Derala Tank, district of Nanded, Maharashtra, were studied by Kulkarni et al., (2008).

Fish diversity was investigated at Asthi Lake district Solapur by Nikam et al., (2014). Katphal Lake, Dist. Solapur, was home to 210 different species of fish (Mirgane and Kumbhar, 2016). 29 fish species were identified from Rawanwadi Lake in the Bhandara district by Kalbande et al., (2007). During the current investigation, some exotic fish species, including *Cyprinus carpio*, *Hypopthalmicthys molitrix* and *Ctenopharyngodon idella*, were also reported. The species *Anabas testudineus* (Climbing perch), which is not a native species in this lake, appears to have been introduced from West Bengal with the fish seed. Out of 24 species of fish, 17

fish species was categorized as Least Concern (LC), *Labeo pangusia, Hypophthalmichthys molitrix, Notopterous chitala* and *Anguilla bengalensis* (Dominant) were categorized as Near Threatened (NT) while *Cyprinus carpio, Wallago attu* and *Tilapia mossambica* was come under Vulnerable (VU) category as per the recent access by red data book of IUCN Red list.

Aquatic diversity management areas must be established for the water bodies that are home to endangered fish species. To stop the loss of fresh water endangered fish resources, it should be prohibited to utilize illegal fishing tactics in this area. The fish producers should have access to scientific training and facilities. It is best to avoid fishing for spawning, larval fish and young fish. It was also established that research might be done to create methods for cultivating fish, safeguarding them and conserving their biodiversity. If suitable conservation measures are not taken, there will likely be a greater loss of aquatic fish diversity due to the human population's fast growth, heavy dependence on aquatic fisheries resources and the continuous introduction of exotic species into natural water bodies. Since the majority of weed fish are prolific breeders, they actively compete with large carps for the food in the reservoir even if they don't feed on domesticated species. They often eat a lot of zooplankters, which are what carp spawn mostly eat (Chaudhari, 1960). Carp eggs and hatchlings are the sole food source for the juvenile weed fish (Alikunhi, 1957).

According to the findings of this study, the Reservoir is a highly productive aquatic system that helps the local populations. But these days, the Reservoir is constantly under threat from a variety of man-made issues, including anthropogenic impact, idols immersion, siltation, the appearance of exotic (non-native) fish species and weed fishes, which are collectively too held responsible for the decline in the Reservoir's biodiversity, ecology and fishery. Future fish management development plans will be provided through this study.

Table 1 The Shekhdari Dam's fresh water fish list, Amaravati district of Maharashtra, India

S.N	Order	Family	*Scientific name*	Common/Local name	*Abundance	**Status
1	Cypriniformes	Cyprinidae	*Catla catla (Hamilton, 1822)*	Catla, Tambra	+++++	LC
2	Cypriniformes	Cyprinidae	*Cirrhinus mrigala, (Hamilton, 1822)*	White Carp, Mrigal	+++++	LC
3	Cypriniformes	Cyprinidae	*Labeo rohita (Hamilton, 1822)*	Rohu, Tambda masa	+++++	LC
4	Cypriniformes	Cyprinidae	*Labeo calbasu, (Hamilton, 1822)*	Black Rohu, Kanas	++	LC
5	Cypriniformes	Cyprinidae	*Labeo fimbriatus (Bloch, 1795)*	Fringed lipped carp	++	LC
6	Cypriniformes	Cyprinidae	*Labeo pangusia (Hamilton, 1822)*	Pangasia	+++	NT
7	Cypriniformes	Cyprinidae	*Cyprinus carpio, (Linnaeus, 1738)*	Common carp, Soneri	+++	VU
8	Cypriniformes	Cyprinidae	*Ctenopharyngodon idellus (Valenciennes, 1844)*	Grass carp, Jittada	+++	LC
9	Cypriniformes	Cyprinidae	*Hypophthalmichthys molitrix (Valenciennes, 1844)*	Silver carp	++	NT
10	Cypriniformes	Cyprinidae	*Rasbora daniconius (Hamilton,1822)*	Blackline Rasbora, Dandai	++	LC
11	Cypriniformes	Cyprinidae	*Puntius sarana sarana (Hamilton, 1822)*	Olive barb, Daral	++	LC
12	Cypriniformes	Cyprinidae	*Puntius sophore (Hamilton, 1822)*	Swamp barb, Koshti	+++	LC
13	Cypriniformes	Cyprinidae	*Puntius ticto (Hamilton, 1822)*	Tikto barb, Kaoli	++	LC
14	Siluriformes	Bagridae	*Mystus seenghala (Sykes, 1839)*	Shingta	++	LC
15	Siluriformes	Heteropneust	*Heteropneustes fossilis*	Stinging catfish	++	LC

		idae	*(Bloch, 1794)*			
16	Siluriformes	Siluridae	*Wallago attu (Bloch and Schneider,1801)*	Helicopter catfish	++	VU
17	Siluriformes	Clariidae	*Clarias batrachus (Linnaeus, 1758)*	Magur	+++	LC
18	Osteoglossiformes	Notopteridae	*Notopterus notopterus (Pallas, 1769)*	Feather back, Chalat	+++	LC
19	Osteoglossiformes	Notopteridae	*Notopterus chitala (Fowler, 1934)*	Knifefishes, Chital	++	NT
20	Perciformes	Channidae	*Channa striatus (Bloch, 1793)*	Striped snake head,	+++	LC
21	Perciformes	Channidae	*Channa punctatus (Bloch, 1793)*	Maral	+++	LC
22	Perciformes	Anabantidae	*Anabus testudineus, (Bloch, 1792)*	Climbing perch, Koi	+++	LC
23	Perciformes	Cichlidae	*Tilapia mossambica (Peter, 1852)*	Tilapia	++	VU
24	Anguilliformes	Anguillidae	*Anguilla bengalensis (Gray,1831)*	Eel, Bam	++++	NT

*Abundance: ++ (Rare), +++ (Moderate), ++++ (Dominant), +++++ (Predominant) **Status: LC (Least Concern), NT (Near Treatened), VU (Vulnerable)

Abbreviations

LC: Least Concern
NT: Near Threatened
VU: Vulnerable

Contribution of Each person

Miss Ashwini Farkade: Collection of Data, literature survey
Dr Sudhir Bhandarkar: Preparation of Manuscript, Literature survey
Dr Kiran B Sangve: Identification of fishes and moderation of literature

Informed consent

Not applicable.

Ethical approval

The Animal ethical guidelines are followed in the study for species observation & identification.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Funding

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

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