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A new inclusion to the ichthyofauna of Nepal

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Abstract

This study documents new inclusions to the ichthyofauna of Nepal, focusing on four fish species: *Cirrhinus cirrhosus*, *Labeo boggut*, *Piaractus brachypomus*, and *Oreochromis aureus*. Ichthyological surveys were conducted in the Kankai River from August 2023 to July 2024, utilizing a combination of cast nets, gill nets, and local fishing tools. Specimens were subjected to detailed morphometric and meristic analyses, and their conservation statuses were reviewed. The findings underscore the importance of ongoing field investigations and conservation efforts to protect Nepal's aquatic biodiversity, particularly in the face of increasing non-native fish species introductions.

Keywords: Biodiversity, fish species, new record, updated inventory

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Introduction

Fish diversity in Nepal has been somewhat studied, but there are likely gaps in comprehensive research, with varying levels of study across different regions and river systems. The country's diverse aquatic habitats and the fact that certain areas are less explored suggest significant potential for the discovery of new fish species. As scientific exploration and research efforts continue, it is highly possible that additional fish species will be identified, enhancing our understanding of the region's biodiversity. Ongoing conservation and research efforts are essential in uncovering and documenting Nepal's rich aquatic life. While some fish data are available in Nepal, their quality and geographical coverage have gaps that require extensive field investigation (Kottelat and Whitten, 1996).

Over the past four decades, there has been a rise in ichthyological activity in Nepal, which has increased the number of fish species for the country. For the first time, Shrestha (1981) published her ground-breaking monograph, which featured 120 fish species. Rajbanshi (1982) increased his investigation to 171 fish species, including seven non-native species. Shrestha (1994) compiled a total of 188 fish species, including nine exotic species. Shrestha (1995) reported 193 fish species including 10 non-native fish species. Likewise, Rajbanshi (2005) listed 198 fish species, including 11 non-native fish species. Later, Shrestha (2008) reported 232 fish species, including 14 endemic fish species. A total of 118 fish species were reported from Morang district (Subba *et al*., 2017, 2024). The most recently compiled checklist of fish species of Nepal was conducted by Shrestha (2019), listing 252 fish species, including 16 endemic fish species.

The continued introduction of non-native species for aquaculture and the improvement of native fisheries, the listing of synonyms and misidentifications, and an increase in ichthyological activity over the past 25 years (Edds and Ng, 2007), including published descriptions of new species are some of the reasons for the varying accounts of the number of fish species recorded for Nepal (Terashima, 1984; Ng and Edds, 2004, 2005a,b; Ng, 2006; Conway *et al*., 2011) plus new records for

species discovered to exist in the country (Edds, 1985; Shrestha and Edds, 2012; Rai, 2022; Limbu *et al*., 2023; 2024).

Materials and methods

Ichthyological surveys were conducted in the Kankai River from August 2023 to July 2024 (Fig. 1). For fish sampling, we used cast nets (4 to 6 m in diameter, 2 cm mesh size), gill nets (4 to 6 cm mesh size), and local fishing tools (Dhadiya, Ghorlang, and mosquito nets). The captured fish specimens were photographed in the field and preserved in 10% formaldehyde solution in plastic jars, with their heads positioned upright to protect their caudal fins. They were then transported to the laboratory at Damak Multiple Campus, TU, Jhapa, Nepal for further study. Measurements and counts were taken using a digital Vernier caliper for precise point-to-point measurements, and data were recorded to the nearest tenth of a millimeter from the left side of each specimen. The voucher specimens were deposited in the laboratory at Damak Multiple Campus, TU, Jhapa, Nepal. The recent valid names of species, genera, and families were determined using (www.fishbase.org) and Fricke *et al.* (2024). Additionally, the conservation status of all studied species was checked against the IUCN Red List (https://www.iucnredlist.org/).

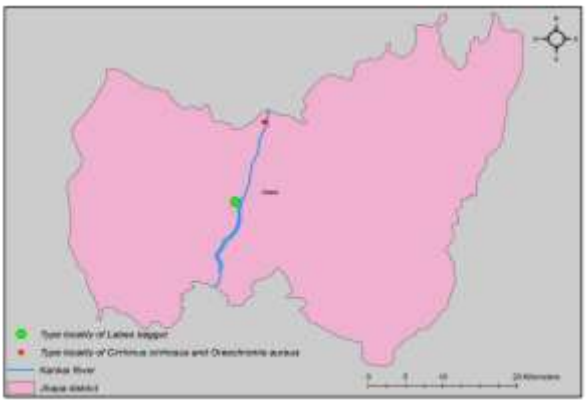

Figure 1. Collection localities of newly recorded fish species

Results

In this study, we present new records for four fish species discovered during recent ichthyological surveys in Nepal, which were not included in previous compilations of the country's known fish species.

Order Cypriniformes
Family Cyprinidae
Cirrhinus cirrhosus (Bloch, 1795) (Fig. 2)
Material examined. BRCC20241, BRCC20242, 200-220 mm SL, Kankai River, Jhapa district.

Morphological description

The body is elongated and streamlined, or laterally compressed. The dorsal profile is more convex than the abdomen, while the ventral profile is slightly convex. The back is grayish or greenish, with silvery sides and underside. In larger specimens, the fins are slightly orange in color. The lateral line is present and complete, with around 40-45 scales. The snout is obtusely rounded, covering the upper lip and equipped with proes. The upper lip is whole and not continuous with the lower lip. The eyes are positioned closer to the tip of the snout than to the rear edge of the operculum. There are two pairs of nostrils located at the anterior superior angle of the orbits, and a pair of rostral barbels is present. The gill openings are wide, with gill rakers spaced at short intervals. The caudal peduncle is short, the lateral line is complete, and the scales are hexagonal. The distance between the pelvic and anal fins is large, and the caudal fin is deeply forked. The dorsal fin has 3 spines followed by 13 soft rays. The pectoral fin has 17-18 soft rays, the pelvic fin has one spine followed by 8 soft rays, and the anal fin has 3 spines followed by 5 soft rays.

Figure 2. *Cirrhinus cirrhosis*

Coloration. Body colouris usually dark grey on the back and silvery on the sides and belly. Fins are grayish; tips of the pelvic, anal, and lower lobe of the caudal are tinged orange.

Fin formula. D. 16 (3/13); P 1. 17; P 2. 9 (1/8); A. 8(3/5)

Habitat. This species was collected from a lowland river (Kankai River) with slow-moving water.

Distribution. Jhapa district.

Economic importance. This fish is locally famous for food.

IUCN. Vulnerable (VU)

Order Cypriniformes
Family Cyprinidae
Labeo boggut (Sykes, 1839) (Fig. 3
Material examined. BRCC34571, BRCC34572, 107-121 mm SL, Kankai River, Jhapa district.

Figure 3. *Labeo boggut*

Morphological description

A slender, elongated body with a more convex dorsal profile compared to the ventral profile. The snout and lips are thick, and the mouth is of moderate size. There is only one pair of short maxillary barbels. The pectoral fins are as long as the head but do not reach the pelvic fins, and the caudal fin is deeply forked.D. 11-12 (3/8-9); P_1. 17; P_2. 9 (1-8); A. 7(2/5).

Coloration. Body silvery, darkest on back, fins are orange color. A dark spot usually presents near base of caudal.

Fin formula. D. 11-12 (3/8-9); P 1. 17; P 2. 9 (1-8); A. 7(2/5).

Habitat. This species was collected from a lowland river (Kankai River) with swift moving water.

Distribution. Jhapa district.

Economic importance. This fish is locally famous for food fish.

IUCN. Vulnerable (VU)

Order Characiformes
Family Serrasalmidae
Piaractus brachypomus (Cuvier, 1818) (Fig. 4)
Material examined. BRCC 20902, Jhapa.

Figure 4. *Piaractus brachypomus*

Morphological description

The body of *P. brachypomus* was compressiform with a terminal mouth, and the snout was blunter in larger individuals. The body profile of the examined specimens was nearly straight from the insertion of the dorsal fin to the origin of the adipose fin. The body was deepest at the vertical line through the origin of the pelvic fin. The dorsal fin was located in the middle of the back, while the adipose fin was closer to the caudal fin than to the dorsal fin. The pelvic fin originated slightly anterior to the vertical line through the dorsal fin's origin. The base of the anal fin was slightly longer than that of the dorsal fin. The dorsal fin had 3 to 4 unbranched rays and 14–17 branched rays, while the anal fin had 2 unbranched rays and 22–26 branched rays. The pelvic fin contained 1 unbranched ray and 5 to 7 branched rays, and the pectoral fin had 1 unbranched ray and 13–18 branched rays. The ventral keel was composed of 48 to 66 ventral-keel spines. The lateral line was complete, running straight along its length and ending posteriorly between the middle caudal fin rays.

Coloration. Grey in base color with a red belly. The pectoral, anal and pelvic fins also have red coloration. It has a very small adipose fin and the body may have irregular dark grey-black spots.

Fin formula. D1, 11-13; A, 3; P, 16-18; V, 6

Habitat.Plain region of Kankai River

Distribution.This fish can be found in lowland Nepal's fish farms.

Economic Importance.This fish is locally famous for its food.

IUCN.Least Concern (LC).

Order Perciformes
Family Cichlidae
Oreochromis aureus (Steindachner, 1864) (Fig. 5)
Material examined. BRCC20241, BRCC20242, 250-270 mm SL, Kankai River.

Figure 5. *Oreochromis aureus*

Morphological description

The first gill arch has 27-30 gill rakers, and the number of vertical stripes is not prominent, which are key identifying features of *O. aureus*. The body is compressed, with the caudal region being more depressed. The caudal fin lacks regular dark vertical stripes but has a broad pink to bright red distal margin. The dorsal and anal fins are striped, with the stripes running obliquely on the soft dorsal fin and longitudinally on the caudal fin. The dorsal fin has 14-17 spines and 11-15 soft rays, while the anal fin has three spines and 9-11 soft rays.

Coloration. The color of its body is metallic blue-green, with greater intensity on the head. Its belly is light colored. Its dorsal fins and the end of the caudal

fin are red.
Fin formula. D 14-16, 11-15; A 3, 9-11
Habitat. This fish was collected from the Kankai River with slow moving water.
Distribution. Kankai River, Jhapa district.
Economic Importance. This fish is famous as food.
IUCN. Not Evaluated.

Discussion

There are various reports in the field of ichthyology regarding the number of fish species identified in Nepal (Edds and Ng, 2007). Early works by Shrestha (1981), Rajbanshi (1982), and subsequent studies by Shrestha (1995) and Shrestha (2019) listed 171, 179, 183, and 252 species, respectively. The discrepancies in the reported number of fish species in Nepal can be attributed to several factors, including the introduction of non-native species for aquaculture, improvements in native fisheries, updates to synonym lists and corrections of misidentifications, and increased ichthyological research over the past 25 years (Edds and Ng, 2007). Additionally, published descriptions of new species (Terashima, 1984; Ng and Edds, 2004, 2005a,b; Ng, 2006; Conway *et al*., 2011) and new records of species discovered in the country (Edds, 1985; Shrestha and Edds, 2012; Rai, 2022; Limbu *et al*., 2023; 2024) contribute to these varying accounts. *Cirrhinus cirrhosus* was collected from the Kankai River and is likely an introduced species in Nepal, though it is not listed among the known species. This fish can be found in fish shops in Eastern Nepal (pers. obs. JHL). While *C. mrigala* and *C. reba* have been introduced and are commonly found in Nepalese river systems, the new report of *C. cirrhosis* adds another population of the genus *Cirrhinus* to Nepal. *Piaractus brachypomus* and *Oreochromis aureus* have been cultivated (pers. obs. JHL and DR) but are not included in the list of Nepalese fish. It is possible that *O. aureus*, which may have escaped from a fish farm, was recorded in the Kankai River. Oreochromis species are considered invasive and could potentially disrupt native aquatic ecosystems by competing for food and space, leading to negative impacts on native species. Therefore, it is crucial to implement strict measures to prevent the intentional or accidental escape of non-native invasive fish into Nepal's natural water systems.

Conclusion

This study focuses on documenting four fish species newly recorded in Nepal: *Cirrhinus cirrhosus*, *Labeo boggut*, *Piaractus brachypomus*, and *Oreochromis aureus*. The study highlights the importance of ongoing research and conservation efforts to protect the country's aquatic biodiversity, especially considering the potential ecological impacts of non-native species. The conclusion should emphasize the necessity for strict measures to prevent the spread of invasive species, the value of continued ichthyological exploration, and the need for accurate species inventory updates to safeguard Nepal's diverse aquatic ecosystems.

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