

Rapid Communication**First record of the non-native vermiculated sailfin catfish
Pterygoplichthys disjunctivus (Weber, 1991) from Lohandra River, Eastern Nepal**Jash H. Limbu¹, Dipak Rajbanshi¹, Asmit Subba², Laxman Khanal², Jin-Quan Yang³ and Chenhong Li^{1,3}¹College of Fisheries and Life Science, Shanghai Ocean University, Shanghai, China²Central Department of Zoology, Institute of Science and Technology, Tribhuvan University, Kathmandu 44618, Nepal³Shanghai Universities Key Laboratory of Marine Animal Taxonomy and Evolution, Shanghai Ocean University, Shanghai, ChinaCorresponding author: Jash H. Limbu (limbujash@gmail.com)

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Received: 23 November 2023**Accepted:** 17 February 2024**Published:** 20 May 2024**Handling editor:** Ting Hui Ng**Thematic editor:** Karolina Bączela-Psychalska**Copyright:** © Limbu et al.This is an open access article distributed under terms of the Creative Commons Attribution License ([Attribution 4.0 International - CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).**OPEN ACCESS****Abstract**

The non-native vermiculated sailfin catfish *Pterygoplichthys disjunctivus* (Weber, 1991) is recorded for the first time in eastern Nepal's aquatic systems. Native to South America, the first reports of *P. disjunctivus* in Asia were recorded in India, with subsequent reports from Bangladesh, Hongkong, Indonesia, Malaysia, Singapore, Thailand and Vietnam. Our findings mark the first known occurrence of a non-native species of sailfin catfish in Nepal. The public, policy makers, researchers, and merchants of ornamental fish all need to be informed critically about the release of non-native fish into natural water systems in light of the concerns. Non-native fish may negatively affect native fish populations if released into natural waters. Therefore, it is imperative that strict measures must be taken to prevent the intentional or unintentional escape of non-native fish into Nepal's natural water systems.

Key words: new record, lowland, fish diversity, stream, ornamental fish, Loricariidae**Introduction**

The Loricariidae family of suckermouth armored catfishes, which numbers 846 recognized species and 90 genera, are native to South and Central America (Berra 2001; Novák et al. 2022; Fricke et al. 2023). In South America, from the Parana River basin to the Orinoco River basin, the loricariid genus *Pterygoplichthys* contains a possible 15 valid species (Nico et al. 2012; Weber 1992). Several *Pterygoplichthys* species and possible hybrids have been widely introduced outside of their native ranges over the past few decades (Armbruster and Page 2006). Currently, established non-native populations have been identified in the inland waters of North and Central America, southern and eastern Asia, and a number of islands in the Indo-Pacific and Caribbean (Nico et al. 2009).

Biological invasions are a key contributor to global reductions in native biodiversity and ecological functioning (Ng and Tan 2010; Lim et al. 2018). Outside of its native area, the success of an invasive species mainly depends on its capacity to reproduce rapidly and to survive a wide range of both biotic and abiotic conditions (Jayachandran et al. 2018). Loricariids, also

known as “plecos”, “janitor fish”, and “armored sailfin catfish”, are very popular freshwater fish sold in the aquarium trade. This has facilitated their introduction and establishment in tropical, sub-tropical and warm-water habitats worldwide (Hoover et al. 2004; Ruesink 2005). In Mexico, non-native Loricariids have been associated with the collapse of local fisheries (Mendoza et al. 2009) and with the creation of biogeochemical hotspots that can alter the functioning of natural freshwater systems (Capps and Flecker 2013). Loricariids have apparently been inappropriately introduced for biological control purposes in Lombok Island, Indonesia (see Patoka et al. 2020).

In Nepal, alien fishes such as magur (*Clarius* sp.), mosquitofish (*Gambusia* sp.), and tilapia (*Oreochromis* sp.) have apparently been introduced both intentionally and accidentally for various purposes. During the survey, certain alien fish species were found in local water bodies of eastern rivers, ponds, and reservoirs. However, the processes through which alien species affect native species in the natural aquatic environment are limited. The introduction of further non-native species is possible given the lack of scientific data on the potential effects of alien fish in Nepal, which could result in significant environmental and financial implications.

During our ichthyological survey, 43 individuals of *P. disjunctivus* were collected from two different stations. After the inspection of morphometric and meristic data, we identified *Pterygoplichthys disjunctivus*, the first known occurrence of a non-native species of armored catfish for Nepal.

Materials and methods

Ichthyological surveys were conducted in the Tamor, Lohandra, Singhiya, Keshaliya, Bakraha, Mawa, Ratuwa, and Kankai (Figure 1 and Supplementary material Table S1) rivers between May 2019 and July 2023. For fish sampling, we used cast net (4 to 6 m diameter, 2 cm mesh size), gill net (4 to 6 cm mesh size), and local fishing tools (Dhadiya, Ghorlang, and Mosquito net, see Figure 2). The captured fish specimens were photographed in the field for the best living colour representation. After photography, collected specimens were preserved in 10% formaldehyde solution in the plastic jar by making their head upright in order to protect their caudal fin. The catfish were identified based on meristic and morphometric analysis following Nelson et al. (2016) and Nico et al. (2009). In total, 20 adult voucher specimens were used for morphometric and meristic analysis. Measurements and counts were done using digital Vernier caliper for point to point measurements, and data was recorded to the nearest tenth of a millimeter from the specimen’s left side. Voucher specimens (JL101–JL120), were deposited in the house of the Nature Conservation and Health Care Council (NCHCC), Biratnagar, Tintoliya, Morang district, Nepal.

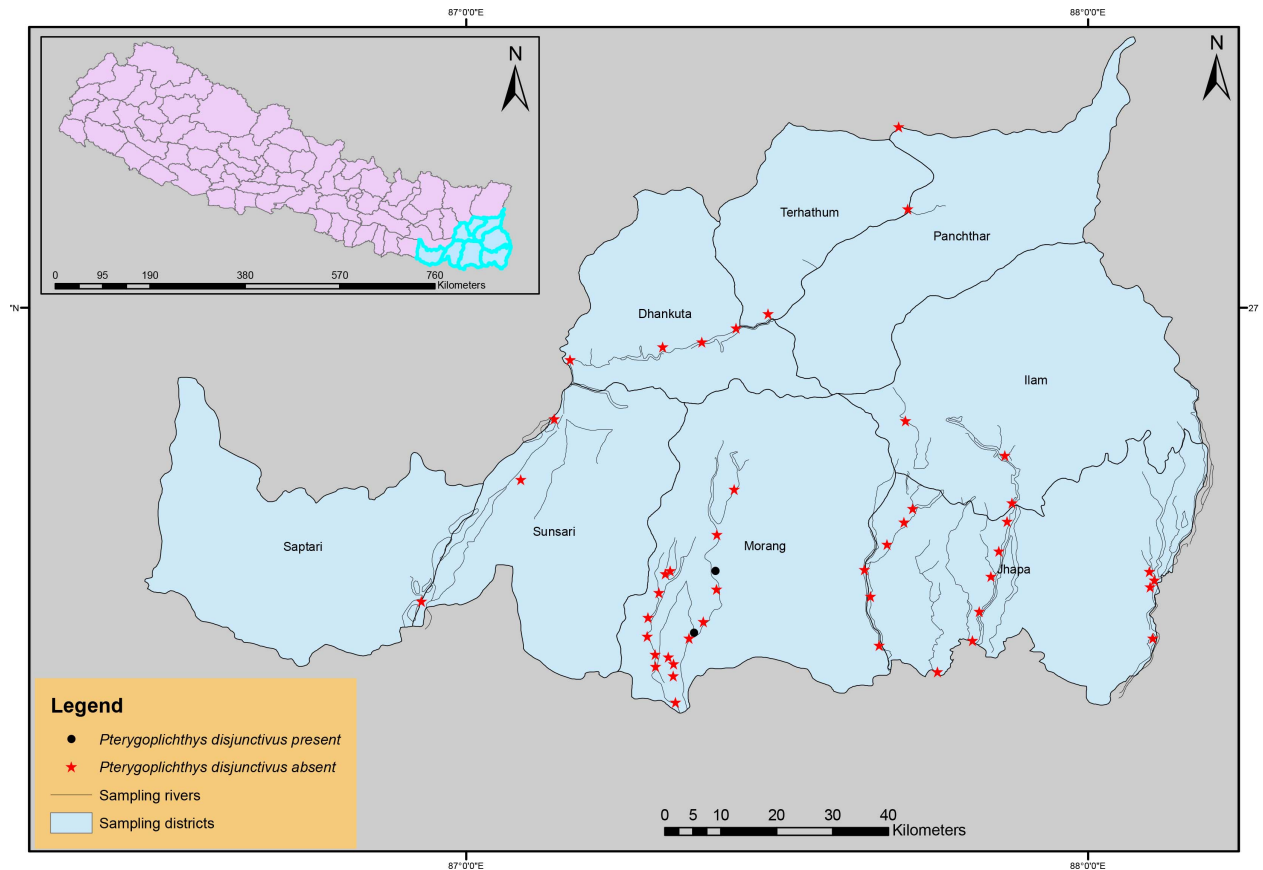


Figure 1. Map of sampling stations showing *Pterygoplichthys disjunctivus* recorded localities (see details in Table S1).

Results and discussion

We collected 43 individuals of *Pterygoplichthys* from the Lohandra River. Based on the analysis conducted on the adult specimens, the fishes are identified as *Pterygoplichthys disjunctivus* (Figure 3). We did not find evidence that the population is established in Lohandra River. The standard body length of the *P. disjunctivus* specimens ranged from 139 to 205 mm. The body is elongated, with a depressed head. The head is surrounded by a thick bone covering, and the supraoccipital process is missing. The dots extending from the belly have a characteristic combination of dark and light areas. The ventral suckorial mouth is easily identifiable by its robust lateral line bony plates. The dorsal fin is made up of 11–12 rays, with the second being the largest and the first being the smallest. The anal fin has four rays, while the pectoral and pelvic fins have five rays each; the first ray is the biggest. The dorsal fin and the beginning of the caudal fin are separated by the small adipose fin. The lower lobe of the caudal fin is expanded and oriented toward the terminal, making it marginal in character. The caudal fin contains 14–16 rays. Tough and massive bone plates with short spines extending over the lateral line cover the body. The entire body is covered in black and yellow patches, and the dorsal surface of the head has dark vermiculation. There are light grey specks on the brown-gray fins. The abdomen region is covered in continuous brown and white reticulations. It has 29 lateral line bony plates. Inferior mouth with a sucking disk with a single



Figure 2. Local fishing tools used to collect *Pterygoplichthys disjunctivus* in the Lohondra River, (A) Mosquito net, (B) installed bamboo fish trap (Dhadiya) and (C) Local fisherman with Ghorlang. Photographed by Jash H. Limbu.

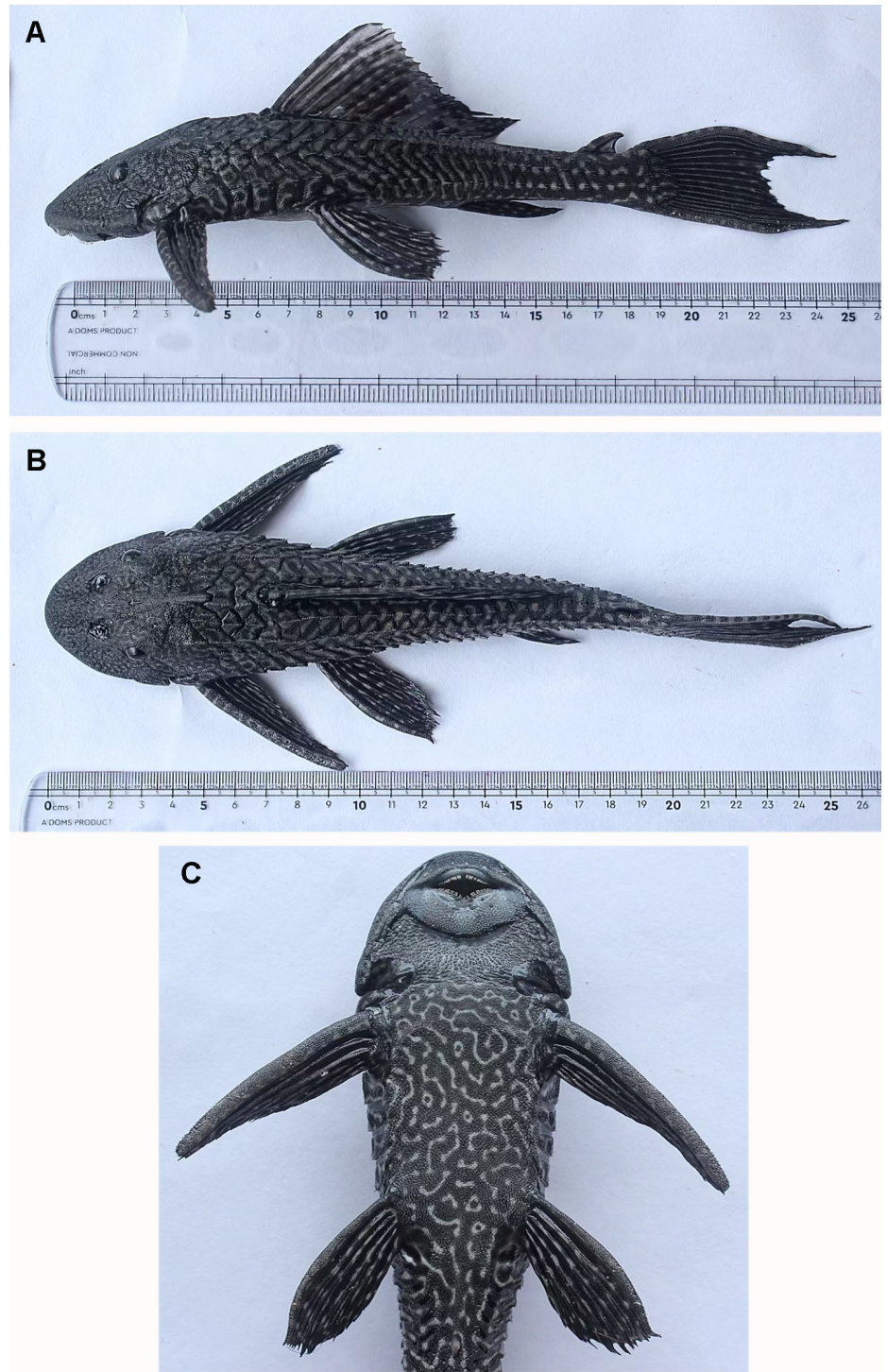


Figure 3. *Pterygoplichthys disjunctivus*, (A) lateral view, (B) dorsal view and (C) ventral view. Photographed by Jash H. Limbu.

round and slightly wide buccal papilla and a single small barbell on each side. Body covered with 24–26 rows of armored plates. Furthermore, *P. disjunctivus* has large dorsal fin; an abdominal color pattern consisting of light and dark vermiculations (dark vermiculations arising from spot coalescence); and dark ventral vermiculations on the venter that are wider or the same width as the light vermiculations.



Figure 4. Collected habitat of *Pterygoplichthys disjunctivus* in the Lohandra River.

Pterygoplichthys disjunctivus is native to South America's Amazon River region (Nico et al. 2012). Our discovery of *P. disjunctivus* in Nepal's aquatic river systems is the country's first confirmed report of this invasive group of catfishes. But the way in which this species entered Nepal's aquatic ecosystem is uncertain. *Pterygoplichthys* are common in the aquarium trade elsewhere (e.g., Meena et al. 2016) and occasionally sold in Nepal (JHL *pers. obs.*), so it might have also been introduced into Nepal via the introduction of ornamental pet trade. Another possible introduction pathway for non-native *Pterygoplichthys* species into Nepal's rivers may be via waterways that connect to rivers in India, where the species has been introduced and is established (Das et al. 2020). However, except for the Lohandra River (for collected habitat see Figure 4), we were unable to locate individuals of *P. disjunctivus* in the other rivers surveyed. Over the past ten years, numerous studies have reported the presence of *Pterygoplichthys* outside of their natural range, some identifying the locations of introductions while others describing the growth of existing populations (Wakida-Kusunoki et al. 2016). Some recent reports are from west Bengal of India, Southern India, Bangladesh, Indonesia, Hongkong, Singapore and Malaysia (Hossain et al. 2008; Das et al. 2020; Patoka et al. 2020; Tan et al. 2020; Chan et al. 2023; Parvez et al. 2023).

Several *Pterygoplichthys* species have been found in India in both aquaculture and other river systems. The spread of *Pterygoplichthys* in these areas has the potential to soon lead to significant environmental problems and pose a high risk to the native species (Parvez et al. 2023). Therefore, to limit the spread of invasive fish species and the harmful consequences, the introduction and dispersal paths must be tightly regulated (Meena et al. 2016). Furthermore, local fisherman should be made aware of the ecological ramifications of this species, as well as education efforts intended at hobbyists to avoid releasing this fish alive into bodies of water. Paradoxically some laws and regulations without the education of the public and stakeholders may not be effective (Patoka et al. 2018). If we do not restrict this species expansion in inland water bodies, it will most likely pose a major threat to native biodiversity and the livelihoods of traditional inland fishermen (Britton et al. 2011). In addition, the public, policy makers, researchers, and merchants of ornamental fish all need to be informed critically about the release of exotic fish into natural water systems in light of the concerns. Non-native fish species may negatively affect natural fish populations if let into natural waters. Therefore, it is imperative that strict measures must be taken to prevent the intentional or unintentional release of non-native invasive fish into Nepal's natural water systems. Furthermore, monitoring of *P. disjunctivus* in Nepal is recommended.

Authors' contribution

The study design and conception were done by Jash H. Limbu and Dipak Rajbanshi. Material preparation, data collection and analysis were performed by Jash H. Limbu, Dipak Rajbanshi, Asmit Subba and Laxman Khanal. The first draft was written by Jash H. Limbu, with the contribution of Dipak Rajbanshi, Asmit Subba and Laxman Khanal, Jin-Quan Yang and Chenhong Li. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Supplementary material

The following supplementary material is available for this article:

Table S1. Sampling stations and records of *Pterygoplichthys disjunctivus* in 2019–2023

This material is available as part of online article from:

http://www.reabic.net/journals/bir/2024/Supplements/BIR_2024_Limbu_et_al_SupplementaryMaterial.xlsx