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## Additional records of *Sicyopus discordipinnis* (Watson, 1995) (Oxudercidae: Sicydiinae) in Central Sulawesi, Indonesia

by

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**Résumé.** – Nouvelles occurrences de *Sicyopus discordipinnis* (Watson, 1995) (Oxudercidae : Sicydiinae) dans le Sulawesi central, Indonésie.

*Sicyopus discordipinnis*, de la sous-famille des Sicydiinae (Oxudercidae), a été décrit de Papouasie-Nouvelle-Guinée et a été plus récemment découvert en Papouasie, Indonésie, aux Salomon, en Australie et sur le plateau du Sahul. Au cours de recherches sur l'ichtyofaune d'eau douce de l'île de Sulawesi, *S. discordipinnis* a été trouvé dans quatre rivières de Banggai Regency, dans la Province Centrale de Sulawesi. Ces données confirment sa présence plus à l'ouest et dans Wallacea. Cette espèce, classée en Données Insuffisantes (DD), peut être assez répandue mais localement rare et potentiellement menacée de disparition.

**Key words.** – *Sicyopus discordipinnis* – Sicydiinae – Amphidromous goby – Sulawesi.

Sulawesi is the largest island of Wallacea region<sup>1</sup>, and is renowned for its endemic ichthyofauna, including at least 23 species of Gobiidae, 18 in the Adrianichthyidae and 17 in the Telmatherinidae (Hubert *et al.*, 2016), but the riverine ichthyofauna is less well known. Gobies most frequently found in both upstream and downstream riverine habitat include the genera *Stiphodon* and *Sicyopterus* of the subfamily Sicydiinae; many of which have Indo-Pacific distributions and amphidromous life-cycles (Keith *et al.*, 2015). Habitat characteristics can be an indicator of the likely presence of certain species in a specific area, especially for gobies, which tend to have marked habitat preferences. Nonetheless, it is impor-

tant to accumulate data on the current distribution of species, especially on rare gobies. This study reports new records of *Sicyopus discordipinnis* Watson, 1995 (Oxudercidae: Sicydiinae) from rivers in Central Sulawesi, contributing to the exploration of Indonesian freshwater fishes.

### MATERIALS AND METHODS

This research was conducted from January 2019 to January 2020. Sampling was conducted along the Soho River, Koyoan River, Nambo River, and Simpong River in the Luwuk Banggai region, Banggai Regency, Central Sulawesi Province, Indonesia (Fig. 1), using an electro shocker, hand nets, and trap nets. Specimens were photographed and identified following Keith *et al.* (2015) then preserved in 70% ethanol. Morphometric measurements and meristic counts were made under an Olympus Stereo SZ61 microscope and using calipers.

DNA barcoding analysis was made with a mitochondrial marker (cytochrome c oxidase subunit 1: *COI*) to complete the morphometric analyses. Finclip of the specimen caught were taken using surgical scissors and were preserved in a labelled 2 ml tube filled with 95% ethanol. Amplification of the target DNA sequence (DNA barcode) was done using Gold (Bioline) Polymerase Chain Reaction (PCR) and the parameters of the PCR cycling process were as follows: denaturation at 94°C for 30 seconds, annealing at 50°C for 30 seconds, and extension at 72°C for 30 seconds, with 38 cycles (Barber *et al.*, 2006). The DNA barcode fragment of the COI mitochondrial gene was amplified using primers jgLCO1490 forward primer (TITCIACIAAYCAYAARGAYATTGG) and jgHCO2198 reverse primer (TAIACYTCIGGRTGICCRARAAYCA) (Geller *et al.*, 2013). Amplified PCR products with the target gene segment was verified using electrophoresis and then sent to a sequencing company at PT. Genetic Science Indonesia (<https://ptgenetika>).

1 The islands of Wallacea lie between the Sunda Shelf (the Malay Peninsula, Sumatra, Borneo, Java, and Bali) to the west, and the Sahul Shelf including Australia and New Guinea to the south and east.

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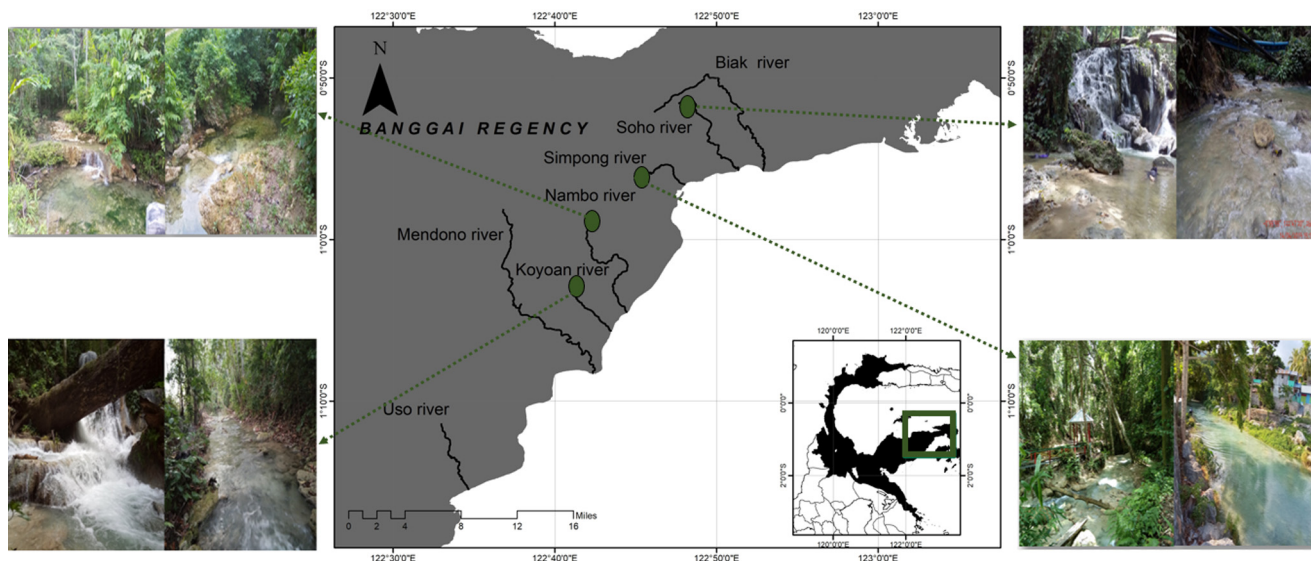


Figure 1. – Map of sampling sites with typical habitats of *Sicyopus discordipinnis* in Central Sulawesi, Indonesia.

com) in order to obtain DNA sequence data. The sequences were trimmed and aligned using the Clustal W routine in MEGA 5.2. The phylogenetic topology reconstruction was implemented in MEGA 5.2 with the neighbour-joining method.

**RESULTS**

The first expedition which reports *Sicyopus discordipinnis* in Sulawesi found one specimen in the Koyoan River. Further exploration found *S. discordipinnis* in the Soho River, Nambo River, and Simpong River, all in Banggai Regency, Central Sulawesi. In each river, only one individual was found (Tab. I), in habitat briefly described below.

**Koyoan River** (–1°2’19”S, 122°43’52”E): at 248 m above sea level (ASL), this site has rocky substrate and clear water habitat host several amphidromous sicydiine gobies (mainly genera *Sicy-*

*opterus* and *Stiphodon*) similar with Nambo and Simpong rivers, while the riverbanks tend to have muddy sand substrate.

**Soho River** (–1°2’21”S, E 122°43’52”E): at 233 m ASL, the Batu Tikar waterfall has a rocky substrate, clear waters and fast currents and is also quite popular with locals and visitors. Gobies found here include the genera *Sicyopterus*, *Sicyopus*, *Stiphodon*, *Smilosicyopus*, *Redigobius* and *Lentipes*.

**Nambo River** (–1°2’46”S, 122°42’3”E): to the west of the Koyoan River at 336 m ASL with no nearby settlements, the collection site has clear waters which are generally calm and run through plantations. Rocks embedded in the sandy substrate are often covered with turf-like water plants. Gobies found here include members of the genera *Sicyopterus*, *Sicyopus*, *Stiphodon*, *Smilosicyopus*, and *Lentipes*; mostly found on the rocks, *Lentipes* is the most abundant genus.

**Simpong River** (–0°57’28”S, 122°46’42”E): at 152 m ASL, Mini Tountoan waterfall has clean and clear waters with rocky banks, fairly swift currents, offering both rocky and muddy habitat. Gobies found here include the genera *Sicyopterus*, *Sicyopus*, *Stiphodon*, *Smilosicyopus*, *Redigobius* and *Lentipes*.

The specimen measurements are in table I and are registered in Museum Zoologicum Bogoriense (MZB) Bogor, West Java (Indonesia) with catalogue number MZB. 26269.

*Sicyopus discordipinnis*, first described by Watson (1995) from a river in southeastern Wewak, Papua New Guinea, exhibits a sexual dimorphism. The male of *S. discordipinnis* displays a characteristic colour pattern (Fig. 2); the rear half of the body, from the second dorsal fin to the caudal peduncle, is orange to bright red, with two grey to black horizontal stripes bordering a white horizontal stripe from the head (passing through the eye) to halfway along the body; the tail is bright red (Keith *et al.*, 2015). There are two rows of scales mostly black below and between the first and second dorsal fins; the lower two-thirds of the body below the second dorsal fin and the lower caudal part are with some scattered blackish pigment. Females are pale and almost translucent with small

Table I. – Selected morphometric characters and meristic counts of the sampled *Sicyopus discordipinnis*.

N	4 specimens			
	Sex	Ind.	Male	
Lab. catalogue number	MSFUH 1745	MSFUH 1747	MSFUH 1721	MSFUH 1831
Site	Soho River	Simpong River	Koyoan River	Nambo River
Morphometric characters (mm)				
Total length	27	26	35.89	37.2
Standard length	21.8	21	29.89	31.8
Head length	5	5	6.9	9.4
Body depth	3.9	3.8	4.4	4.8
Eye diameter	1.2	1.1	1.59	2.4
Snout length	2	1.8	2.6	2.8
Meristic counts (Roman numerals = spines; Arabic numbers = rays)				
First dorsal fin	VI	VI	VI	VI
Second dorsal fin	I+9	I+9	I+9	I+9
Pectoral fin	14	14	15	14
Anal fin	11	11	10	10
Caudal fin	13	13	13	13



Figure 2. – Male of *Sicyopus discordipinnis* specimen collected from Central Sulawesi. MZB.26269 (SL 37.2 mm; MSFUH 1831) (Photo A. Bakri).

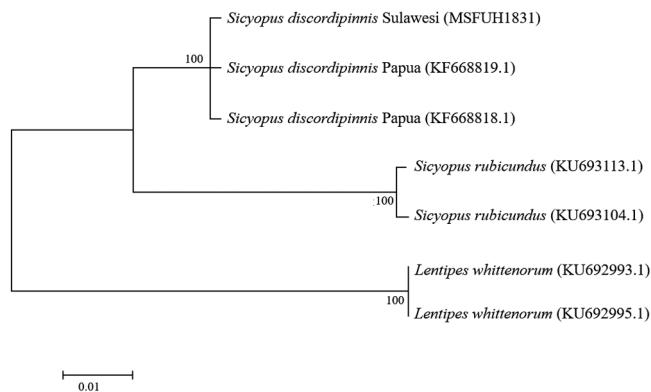


Figure 3. – Phylogenetic reconstruction using the neighbour-joining method with the Kimura 2-parameter model.

black spots in the hypural region. Urogenital papillae are long and thin with slightly rounded tips in males, and rounded in females.

A phylogenetic reconstruction of *S. discordipinnis* is done with two other species from Papua (Indonesia) to complete the morphometric measurements with *Sicyopus rubicundus* Keith, Hadiaty, Busson & Hubert, 2014 and *Lentipes whittendorum* Watson & Kotelat, 1994 as outer group (Fig. 3).

## DISCUSSION

*Sicyopus discordipinnis* has been reported from several locations including Papua New Guinea, New Hanover and Bougainville (Watson, 1995), the Solomon Islands (Boseto *et al.*, 2007; Polhemus *et al.*, 2008; Keith *et al.*, 2021), Northern Queensland, and Australia (Ebner *et al.*, 2011). Most recently it was reported in Indonesia in Kumafa and Kaimana (Papua) (Keith *et al.*, 2015), and Luluk Banggai (Sulawesi) (Gani *et al.*, 2020); and see BIF program on <http://www.boldsystems.org> (N. Hubert coord.). The discovery of several specimens in Sulawesi confirms its presence in this island, extends to the west its occurrence and confirms its widespread distribution in Wallacea. However, information regarding *S. discordipinnis* populations is still fragmentary, and the species may be present elsewhere. While some *Sicyopus* species can be quite abundant, *S. discordipinnis* appears to be naturally rare, with only 1-2 individuals found at each site. The intensive and unregulated fishing of amphidromous goby postlarvae (which could include *S. discordipinnis*) by local coastal communities (Nurjirana *et al.*, 2019) could be a threat to this species in Sulawesi, increasing the urgency of research to determine its real distribution and its conservation status, as it is currently listed as Data Deficient (DD) in the International Union for Conservation of Nature (IUCN) Red List.

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