

Current status of *Schismatogobius marmoratus* (Peters, 1868) from West Sulawesi, Indonesia

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Abstract. *Schismatogobius marmoratus* (Peters, 1868) was first described from Samar Island, Philippines. Known distributions from Taiwan, Japan, and Indonesia. We collected several specimens from June 2021 to August 2022 during field trips to the Pamboang River, Mosso River, and Leppangan River Majene Regency, West Sulawesi. This study aimed to report the distribution of *S. marmoratus* from West Sulawesi. Specimens were collected using an electro shocker 120 Volt and 10 amperes, hand nets mesh size 2 mm, and trap nets mesh size 1 mm. Morphometric measurements were taken from point to point using digital calipers with a precision of 0.01 mm. These records extend its occurrence and confirm its widespread distribution in Sulawesi. The discovery of several specimens in Sulawesi increased the urgency of research to determine the distribution and the conservation status of this species, currently listed as least concern (LC) in the International Union for Conservation of Nature (IUCN) red list.

1 Introduction

Schismatogobius de Beaufort, 1912, a distinctively scaleless genus of small gobies, is found in the tropical Indo-West Pacific. [1]. Mostly discovered on gravel, pebbles, and sand substrates, fast-flowing freshwater streams [1]. They are amphidromous. However, there is no information on their life histories. [3-5]. *Schismatogobius* species exhibit sexual dimorphism in terms of jaw length. Although the lengths of the fins are the same for both

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sexes, males have noticeably broader jaws than females. [1,6]. 18 species in all have recently been recognized as belonging to this genus. They are found throughout the Indo-Pacific, from Samoa to southern India. [1,7-10].

In the Indonesian region, eight species are known: *Schismatogobius bruynisi* de Beaufort, 1912, *S. insignis* (Herre, 1927), *S. arscuttoli* Keith, Lord & Hubert, 2017, *S. saurii* Keith, Lord, Hadiaty & Hubert, 2017, *S. Risdawatae* Keith, Dahrudin, Sukmono & Hubert, 2017, *S. Bussoni* Keith, Hubert, Limmon & Dahrudin, 2017 and *S. Sapoliensis* Keith, Dahrudin, Limmon & Hubert, 2018, and *S. limmoni* Keith & Hubert, 2021 [1,10].

Schismatogobius marmoratus (Peters, 1868) was described from Samar Island, Philippines. Distributed from Japan, Taiwan, Philippines to Indonesia [1]. In Indonesia, currently known from East Java, West Java, and Central Sulawesi [11-12]. The paper aims to report on the distribution of *S. marmoratus* from West Sulawesi and discuss the urgency of research for management and conservation.

2 Materials and Methods

This study was conducted from June 2021 to August 2022. Sampling was carried out six times during the study: four times in 2021 (June, August, September, and October) and two times in 2022 (April and August). Sampling was conducted along the Pamboang River (-3°29'34"S 118°54'30"E), Mosso River (3°24'38"S 118°51'57"E), and Leppangan River (-3°22'56"S 118°51'52"E) in Majene Regency, West Sulawesi, Indonesia (Fig.1). using a hand net mesh size of 2 mm, trap net mesh size of 1 mm, and electro shocker 120 Volt and 10 amperes. The specimens were stored in 70% ethanol after being treated with 10% formalin. Specimens were photographed and identified following *P. Keith et al.* [1], *K. Maeda et al.* [5]. The percentage of standard length (SL) was used to express measurements that were made with a dial caliper to the closest tenth of a millimeter. Each fish had its left side measured and counted. Measurements and counts follow *P. Keith et al.* [1].

3 Results and Discussions

Fifteen specimens totaling *S. marmoratus* were obtained from the Pamboang River, Mosso River, and Leppangan River in Majene Regency, West Sulawesi. This species has a body that is nearly round in cross-section, naked, and slender. Rather pointed snout and head rounded. Eyes that are dorsolaterally situated and near together. Mouth terminal, oblique, and usually with the lower jaw typically jutting outward from the upper jaw. Fin size and shape are the same in males and females. (Fig. 2). The first dorsal fin typically has six spines, and the second dorsal fin typically has a single spine and nine soft rays. The base of the second dorsal fin's spine was attached to the membrane of the first dorsal fin's posterior to the spine.

Typically, 16 pectoral rays, with rows of dark dots banding the pectoral fins. Males have a ventral surface of the head that is whitish with a border, mentum, and isthmus that are all black, and frenum that is somewhat pigmented. Females have a whitish ventral surface of the head with a blackish border, occasionally with a white mentum; the frenum and pelvic disk are typically whitish. Typically, a single spine and nine soft rays are present on an anal fin. Between the first and second soft ray bases of the second dorsal fin is where the anal fin originates. The second dorsal fin is longer than the anal fin. The caudal fin is rounded or shortened. Males and females exhibit sexual dimorphism, with males having longer jaws. The urogenital papilla is slightly triangular in males and broadly rounded in females. Morphometric data is given in Table 1.

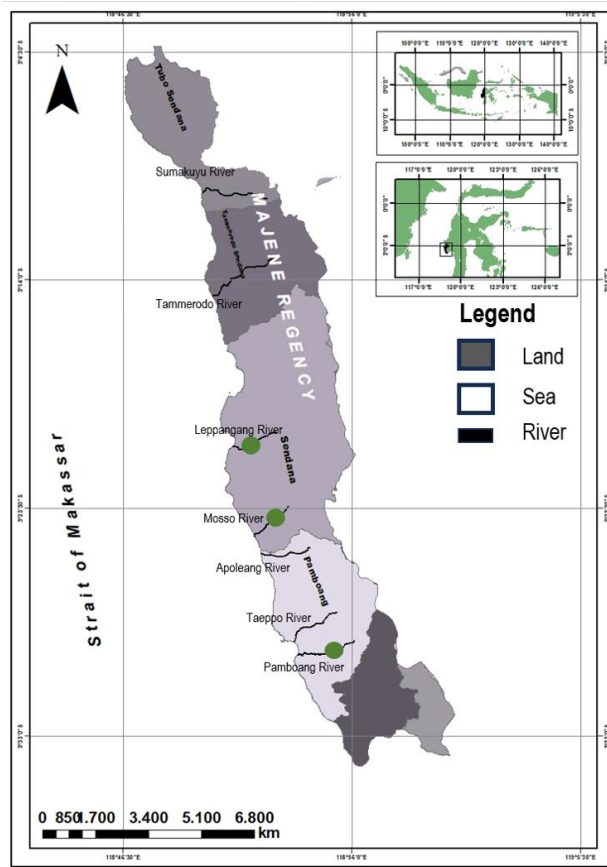


Fig. 1. Map of sampling sites of *Schismatogobius marmoratus* in West Sulawesi, Indonesia.



Fig. 2. Specimens of *Schismatogobius marmoratus* (a. Male, b. Female) from West Sulawesi after fixation.

Table 1. Morphometrics fifteen characters of *Schismatogobius marmoratus* from West Sulawesi, Indonesia.

Characters	Range	
	Males (N=3)	Females (N=12)
Morphometrics (mm)		
Total length (TL)	31.36-32.26	32.06-34.45
Standard length (SL)	23.8-27.97	26.2-28
Morphometrics (% of SL)		
Predorsal length	37-39	37-39
Preanal length	62-71	66-69
Head length	30-33	24-26
Jaw length	17-18	9-11
Caudal peduncle length	11-13	12-14
Pectoral fin length	21-23	18-19
Body depth at the anus	14-15	19-20
Second dorsal fin length	30-31	30-31
Anal fin length	30-34	30-31
Caudal fin length	18-20	25-26
Meristics counts		
Dorsal rays	VI,1.9	VI,1.9
Pectoral rays	16	16
Anal rays	1.9	1.9

Freshwater gobies have a benthic life as an adult. Research location in West Sulawesi waters has the characteristics habitats of sand with pebbles and gravel substrates, fast-flowing, which are one of the habitat preferences for *S. marmoratus* (Fig.3). This species is tough to observe in the field because of its cryptic coloration, which blends in with their background. Having a body color similar to the color of the rocks on the substrate is one form of camouflage in *Schismatogobius* fish, which is quite difficult to distinguish from the substrate. Sometimes, burrow into the pebbles immediately with only the head visible. Thus far, this species has only been found in shallow runs with a substratum of small pebbles.



Fig. 3. Typical habitats of *Schismatogobius marmoratus* from West Sulawesi: a. Leppangan River, b. Mosso River, c. Pamboang River.

Schismatogobius is known as a type of amphidromous fish whose life cycle is in two different waters and migrates to rivers during the post-larval stage. However, no reports have been related to the post-larvae of *Schismatogobius* species caught in Indonesian waters. The post-larva fishing activities of amphidromous goby fish are still being carried out because it is one of the consumption fish that is quite popular for people living in coastal areas. In some areas, such as in West Sulawesi, Central Sulawesi, Gorontalo, and West Java, it has become a routine activity carried out by the community to catch amphidromous goby during the migration season during the new moon [13-20].

The genus *Schismatogobius* is a type of goby that belongs to cryptic species, so it has a variation of shape and color pattern on the body. Identification carried out through morphological and molecular approaches solved the problem of cryptic species so that they can be distinguished from one another [1,21-22]. There is still a lack of research on schismatogobius fish, also a concern. Over the past five years, at least six new species have been described in Indonesia, two of which are endemic (*S. risdawatieae* from Sumatra and *S. limmoni* from Sulawesi) [1,9-10].

Thus far, the species of *Schismatogobius* reported from Sulawesi Island consist of seven species, namely *S. insignis*, *S. bruynisi*, *S. arscuttoli*, *S. saurii*, *S. Bussoni*, *S. Sapoliensis*, and *S. limmoni* [1,9-10]. For West Sulawesi, only *S. saurii* has been reported [16]. The species mentioned above until now there has been no evaluation regarding their conservation status. For *S. marmoratus* status in the International Union for Conservation of Nature (IUCN) red list currently listed as least concern (LC). Freshwater fish inventory also adds information on fish diversity and distribution [23-24]. Further research is needed on ecology, reproductive biology, behavior, food and feeding habits, genetics, population status, and other aspects that can complete information for *Schismatogobius*, especially for endemic species.

4 Conclusion

This study reports fifteen *S. marmoratus* specimens collected from three rivers of West Sulawesi as distributional notes. *S. marmoratus* was found to share the same habitat as *S. saurii*, this is a note that there is the potential for the existence of other species of *Schismatogobius* in West Sulawesi. The current IUCN Red List conservation status of *S. marmoratus* is least concern, indicating a need for further research.

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