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First Report of *Stiphodon atropurpureus* (Herre, 1927) in Marente Village, Sumbawa, West Nusa Tenggara

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Abstract

Marente is a village at the foot of the ancient Sumbawa volcano, located on the Tiu Kele River and the Agal waterfall, which empties directly into the sea. The ecological condition of the Tiu Kele River is an ideal environment for *Stiphodon* fish to live and breed. Therefore, this study focused on identifying the species of *Stiphodon* sp. (Gobiidae), whose presence has not been recorded in West Nusa Tenggara. There is still no literature study related to the Gobiidae family, especially the genus *Stiphodon* in the waters of the Tiu Kele river, which makes this research very important to do. This research was conducted from September 13 to October 13, 2021, in Tiu Kele river, Marente village, Sumbawa. The tools used are nets, dipper, aquarium, sampling tubes, thermometer, pH meter, and camera, while the material used is 96% alcohol for specimen preparation. The identification results stated that *Stiphodon atropurpureus* had visible characteristics. It had a bright blue body from the snout and cheeks to the tail, the dorsal fin is separated and fibrous. These results were also later strengthened by various related references about the physical properties and characteristics of *Stiphodon atropurpureus*. The results of this research can later be used as a reference and new data related to the distribution of *Stiphodon* in Indonesia, especially in Lesser Sunda.

INTRODUCTION

Sumbawa Regency is located on the island of Sumbawa, West Nusa Tenggara. This area has abundant natural wealth that has excellent potential as a tourism area, both nature tourism, sports recreation, and research (Roniansyah, 2019; Keith *et al*., 2019; Nurjirana *et al*., 2021). One of the villages that have great potential is Marente village. This village is located at the ancient volcanic foothills, with the Tiu Kele River stretching and dividing the village. Marente village has an expansive view of the rice fields and a waterfall, an icon and a tourist attraction. The ecological conditions of the Tiu Kele River in Marente village are constantly

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changing, causing a threat to organisms that live in these waters. One of them can be in the form of a loss of habitat for aquatic organisms, which can cause a loss of biodiversity in the Tiu Kele River. Therefore, it is necessary to immediately make efforts to conserve fishery resources in the Tiu Kele River.

Stiphodon sp. is a member of the Gobiidae family found in the waters of the Tiu Kele River. The Gobiidae family contains more than 1700 species distributed in brackish water, seawater, and freshwater (Keith *et al*., 2021; Hasan *et al*., 2021). Fish belonging to this family are relatively small; some are large but rarely found. The hallmark of this fish's morphology is fused abdominal fins shaped like a disc. These fins function to attach themselves to the substrate and live in the sea and rivers (Andriyani, 2018). One of the species of the genus *Stiphodon*, namely *Stiphodon atropurpureus* (Herre, 1927), is widespread in various Asian regions, such as the Philippines, Taiwan, Japan, Hong Kong, China, Indonesia, and Malaysia (Fellowes *et al*., 2002). There is still no literature study on the Gobiidae family, especially the *Stiphodon* genus in the Tiu Kele River waters. *Stiphodon* fish are amphidromous, which means they grow and spawn in fresh waters, but their young will go to the sea to breed. When they are juveniles, these species will return to freshwater (upstream) streams (Nip, 2010) to undergo metamorphosis into adults and produce (Keith *et al*., 2015; Iqbal *et al*., 2018).

S. atropurpureus generally lives in clean, fresh water, hiding under large and small rocks in rivers with relatively swift currents. Their life cycle depends on the quality of fresh water. This species has an osmoregulatory adaptation to the marine environment and inhabits inland river waters with low salinity. The reproduction process of this species occurs in fresh water. Embryos that drift downstream undergo a planktonic phase and return upstream of the river to grow and reproduce (McDowall, 2007).

Research related to *S. atropurpureus* (Herre, 1927) in the Tiu Kele River at the village of Marente has not yet been carried out. Therefore, this study focused on identifying the species *S. atropurpureus* (Herre, 1927) from Marente village, Sumbawa Regency.

METHODOLOGY

Place and Time

The research was conducted on December 2021 at the Marente Village and Applied Biology Laboratory, Faculty of Life Science and Technology, Sumbawa University of Technology.

Research Materials

This study used primary fishing gears such as scoop, seine, and tray net with a density of 8 mesh to catch the sample fish. An aquarium size of 40x30x40 cm was used to store live fish samples. For collection and further research, some fish samples were preserved using 96% alcohol and stored in 50 ml falcon tubes (Onemed). Water quality with pH and temperature parameters was measured using a digital pH meter (ATC) and a hand thermometer (Digital Asphalt, TP 101), respectively. The camera used for documenting was Fujifilm X-A2 with an XC macro 16-50 MM lens equipped with a waterproof Seafrog Hardcase.

Research Design

This study was done using the observation method.

Work Procedure

Sample Collection and Preservation

The study was conducted from March to June 2022 at the Tiu Kele River, Marente Village, Sumbawa (Figure 1). Seine and tray nets were used to trap and catch the sample fish.

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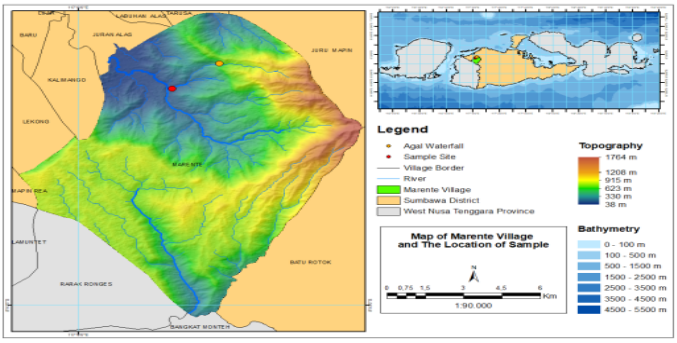

Figure 1. Location of sampling site in the Marente village, Sumbawa.

Samples with the best appearance and color pattern are selected to be identified. Other fish samples are put into an aquarium filled with river water, sand, and small stones. The fish in the aquarium were brought to the Biotechnology laboratory to be used as specimens. According to Metcalfe and Craig (2011), the sample was then preserved before being identified for ethical treatment with scientific purposes. Furthermore, the collected specimens were labeled and fixed in 96% alcohol solution. The specimens are then stored in a specimen cabinet and to be used as material for further research.

Identification and Water Quality Testing

Morphological observations included body shape, mouth shape, mouth position, fin shape, pelvic fin shape, and unique characteristics of fish (Hasan *et al*., 2021). Illustration of the morphology of *Stiphodon atropurpureus*; (a) mouth; (b) eyes; (c) first dorsal fin; (d) second dorsal fin; (e) caudal fin; (f) anal fin; (g) pectoral fins; (h) pelvic fins following Andriyani (2018) as presented in Figure 2.

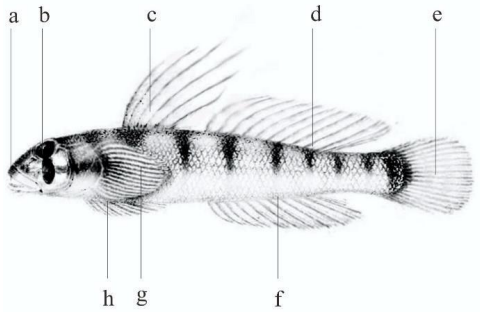

Figure 2. Illustration of the morphology of *Stiphodon atropurpureus*; (a) mouth; (b) eyes; (c) first dorsal fin; (d) second dorsal fin; (e) caudal fin; (f) anal fin; (g) pectoral fins; (h) pelvic fins following Andriyani (2018).

Furthermore, water quality, such as pH and temperature, was measured using a thermometer and pH meter. Parameters of pH and temperature are essential parameters to determine the environmental conditions in which this species lives, ideally.

RESULTS AND DISCUSSION

Identification of *Stiphodon atropurpureus*

The genus *Stiphodon* is a member of the Gobiidae family, widely distributed from tropical to subtropical waters. There are 32 valid species in the genus (Maeda

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and Tan, 2013). Herre (1927) stated that *Stiphodon atropurpureus* had seven dorsal spines, nine soft dorsal spines, one anal spine, and ten soft anal fin spines. Male *S. atropurpureus* has a green/blue/purple body, snout and cheeks (depending on the angle of view and age of the fish). The first dorsal fin is not stringy, and the dorsal fin has a narrow red edge, while the female body has fur and is white/pale with two distinct transverse stripes. The observation of the morphological characteristics of *S. atropurpureus* was carried out on the identified samples. The results of the observation of morphological characteristics can be seen in Table 1.

Table 1. Morphological characteristics of *Stiphodon atropurpureus* in Tiu Kele River.

No	Parameter	Explanation
1	Body shape	*Fusiform* (torpedo)
2	Mouth position	Terminal
3	Scale shape	Stenoid
4	Tail fin shape	Rounded
5	Pectoral fin	Have
6	Dorsal fin	Have
7	Tail fin	Have
8	Belly fin	Have (suction disc)
9	Anal fin	Have

The identification results showed that the *S. atropurpureus* found in the Tiu Kele River, Marente has the appearance and morphological characteristics as *S. atropurpureus* (Herre, 1927) in Watson and Chen (1998). It has seven spines in its entirety, nine softback spines, one anal spine, and ten spines. The anal fin is soft and has a sucking disc fin, and in adult males, the body, snout, and cheeks are green/blue/purple, the first dorsal fin is not elongated/fibrous, and the dorsal fin with a narrow red border while the female body has white/pale fur with two clear transverse lines (Watson and Chen, 1998).

S. atropurpureus (Herre, 1927), which exists in the Tiu Kele River, inhabited clear water with a substrate mixture of boulders and gravel (Figure 3). These species cling to rocks while eating algae. When disturbed, the fish swim to nearby rocks or hide under and between rocks.

Figure 3. *Stiphodon atropurpureus* (Herre, 1927) from the Tiu Kele River in Marente.

Adult *S. atropurpureus* (Herre, 1927) feeds on epiphytes and biofilm on rocks. As it is well known, the distinctive feature of *S. atropurpureus* (Herre, 1927) is the amphidromous nature, this species will return to freshwater for reproduction in the upper part of freshwater streams, while the larvae that will hatch flow from upstream to downstream and develop in the marine environment and as juveniles of this species (Nip, 2010). Therefore, it is not recommended to block migration

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paths such as the construction of dams or culverts in the habitat of *S. atropurpureus* (Herre, 1927), which can cause significant impacts on this species. This action aims to maintain the flow of the river and keep the river flowing to the sea.

Water Quality

Tiu Kele River water conditions can be categorized as clean water, with a depth of about 50-80 cm, and the bottom of the river can be seen clearly from above the water's surface. The river has a pH of 8.4 and a temperature of 25.3 °C with a substrate mixture of boulders, gravel, and sand. The physicochemical characteristics of the Tiu Kele river show that pH, temperature, and brightness fall within the standard by PP RI No. 82 - 2001, about Water Quality Management and Water Pollution Control (Class II) (SETKAB-RI, 2001). The optimal temperature for several species of tropical fish ranges from 24-27 °C. Water temperatures of more than 32 °C allow fish to die (Dapar *et al*., 2021). Moreover, water pH, temperature, and brightness are essential parameters influencing other water quality components (Dapar *et al*., 2021).

The condition of the Tiu Kele River is similar to other rivers, which are the natural habitat of this fish species. In recent years, the existence of this fish has been reported to be threatened because it is very vulnerable to modification of aquatic habitats (Sarkar *et al*., 2008; Kang *et al*., 2009) such as land exploitation, climate change, pollution, and the introduction of invasive species (Bagarinao, 2001; Cagauan, 2007). Therefore, more attention is needed from the local government and stakeholders to initiate sustainable environmental management to protect this fish species from human activities that damage natural vegetation. Moreover, the Tiu Kele River is a vital water source for the people of Sumbawa.

CONCLUSION

The result of this research is a new record of *Stiphodon atropurpureus* (Herre, 1927) in Lesser Sunda, especially on the island of Sumbawa.

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