

Fish fauna of the Batetangnga River, West Sulawesi, Indonesia

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Abstract. Batetangnga River is one of the rivers in West Sulawesi and is well known as an ecotourism area. This preliminary study was performed to reveal fish fauna in the Batetangnga River, West Sulawesi. Ichthyofauna research was conducted in April and May 2021 at two stations in Batetangnga River, namely Rawa Bangun and Butute'neng. During the study period, a total of 14 species belonging to 9 families were identified. No endemic species were found in the study area. Native fish species such as *Stiphodon semoni*, *Butis butis*, *Glossogobius* sp., *Glossogobius aereus*, *Stiphodon* sp., *Giuris* sp, *Atule* sp. *Ambassis miops*, *Ambassis interrupta*, *Microphis* sp. were recorded. Four alien fishes species were documented i.e. *Aplocheilichthys panchax*, *Poecilia reticulata*, *Anabas testudineus*, and *Oreochromis niloticus*. Freshwater fish exploration and efforts to control alien fishes species in west Sulawesi are essential things to be done shortly.

1 Introduction

Sulawesi is the largest island of the Wallacea, a biodiversity hotspot located between the Sunda and Sahul shelves [1, 2]. In terms of its geological history in the past, Sulawesi was an island that was never united with any mainland in the world. This is why this area has many unique features, such as the presence of endemic fishes. The latest data on endemic fishes reported as many as 68 species [3]. Recently, this number has increased with the discovery of four endemic fish species, namely *Oryzias dopingdopingensis* in the Doping-doping River [4], *Nomorhamphus versicolor* in Palu River [5], *N. aenigma* in Cerekang River [6], dan latest *Schismatogobius limmoni* in the Wera Falls Nature Tourism Park, Palu, Central Sulawesi [7], bringing the total endemic fish Sulawesi to 72 species consisting of four orders and seven families.

There is still a chance to discover a new endemic fish species in the Sulawesi river if the ichthyofauna research is conducted frequently. On the other hand, the biodiversity of endemic freshwater fish from Sulawesi also faces the threat of population decline and extinction. This is mainly due to the anthropogenic effects, especially the devastation of

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fish habitat, the introduction of alien species, wild-caught for ornamental fish, overharvesting, and water pollution [8]. For conservation purposes, research to explore the fish fauna of the freshwater ecosystem of Sulawesi Island is an important thing to do.

Ichthyofauna research in several areas in Sulawesi has not been carried out. Currently, Sulawesi endemic fish research activities are still focused on lake waters, such as Lake Mahalona, Lantoa, and Masapi [9], Lake Matano [10,11], Lake Poso [12], and lakes in Central Sulawesi. Some studies on the endemic fishes that inhabit flowing waters have been carried out in the Maros River Basin, South Sulawesi [13], Majene Regency's rivers, West Sulawesi [14].

Batetangnga River is one of the rivers in West Sulawesi and is well known as an ecotourism area. As a part of the Wallacea region, the freshwater ecosystem of west Sulawesi is thought to have many endemic fish species. However, the ichthyofauna of rivers in west Sulawesi is little known. Therefore, this study was performed to reveal fish fauna in the Batetangnga River, West Sulawesi.

2 Methods

Fish sampling was conducted from April to May 2021 at two stations in Batetangnga River, namely Rawa Bangun, which is located in the ecotourism area, and Butute'neng, which is situated in the outside of ecotourism area (Fig. 1). The Batute'neng research station is located downstream and only 1 km from the estuary, while the Rawa Bangun station is 3 km upstream of Batute'neng station.

A seine net with 2 m long, 1 m deep, and with a stretched mesh size of 1 mm was used to collect the ichthyofauna of the river. All collected fishes were photographed in a new state. Initially, fish specimens were preserved in a 10% formalin solution. The samples were labeled with station and collection dates, the name of the collector, and other necessary information. In the Integrated Laboratory of Sulawesi Barat University, the fish specimens were rinsed with running water and transferred into 70% alcohol containers and then were identified. Identification was made by referring to several pieces of literature [15-20] and several other related kinds of literature. All fish samples were identified to the lowest taxon.



Fig. 1. Map of sampling sites in Batetangnga River.

3 Results

During the study period, a total of 14 species belonging to 9 families were identified (Table 1). No endemic fish species were found in the study area. Of these, ten species are native fishes, and four species are alien fishes.

Gobiidae was the most abundant family represented by four species, followed by Ambassidae and Carangidae that constituted by two species. Other families such as Anabantidae, Aplocheilidae, Cichlidae, Eleotridae, Poeciliidae, and Syngnathidae were pointed out by one species. Native fish species like *Stiphodon semoni*, *Butis butis*, *Glossogobius* sp., *Glossogobius aureus*, *Stiphodon* sp., *Giuris* sp, *Atule* sp. *Ambassis miops*, *Ambassis interrupta*, *Microphis* sp. were documented. Four alien fish species were captured: *Aplocheilus panchax*, *Poecilia reticulata*, *Anabas testudineus*, and *Oreochromis niloticus*. During the study period, 12 fish species were collected in the Batute'neng station, while eight fish species were captured in the Rawa Bangun station (Table 1).

Table 1. List of fish found in Batetangnga River.

Number	Family/Species	Area	
		Batute'neng	Rawa Bangun
	Ambassidae		
1	<i>Ambassis miops</i>	+	-
2	<i>Ambassis interrupta</i>	+	-
	Anabantidae		
3	<i>Anabas testudineus</i>	+	+
	Aplocheilidae		
4	<i>Aplocheilus panchax</i>	+	+
	Carangidae		
5	<i>Giuris</i> sp	+	-
6	<i>Atule</i> sp.	+	-
	Cichlidae		
7	<i>Oreochromis niloticus</i>	+	+
	Eleotridae		
8	<i>Butis butis</i>	+	-
	Gobiidae		
9	<i>Stiphodon semoni</i>	-	+
10	<i>Glossogobius</i> sp.	+	+
11	<i>Glossogobius aureus</i>	+	+
12	<i>Stiphodon</i> sp.	+	+
	Poeciliidae		
13	<i>Poecilia reticulata</i>	-	+
	Syngnathidae		
14	<i>Microphis</i> sp.	+	-

Noted: (+) found, (-) not found

4 Discussion

Although the freshwater of Sulawesi Island is a habitat for many endemic fishes in Indonesia [3], no endemic fish was recorded in Batetangnga River during the study period. Batangannga River has similar characteristics with rivers in the Maros Watershed, namely clear water, rocky, and fast-flowing water. Moreover, the Maros Watershed is a harbor for

many endemic fishes [13]. Therefore, there is still an opportunity to find a new endemic fish species in Batangannga River through regular survey and monitoring.

The fish communities that inhabit river waters can vary from one habitat to another. Fluctuations in environmental conditions related to species characteristics and their life cycles provide an overview of the variety and structure of fish assemblages in the waters [21]. The composition of fish species in the river changes from upstream to downstream. In this study, Batute'neng, located downstream, was higher (12 species) than the Rawa Bangun station located upstream (8 species). This is due to differences in upstream and downstream chemical, physical, and habitat characteristics, resulting in habitat heterogeneity. Heterogeneity increases along with the upstream to downstream gradient, affecting the fish communities that inhabit the area [22]. The further downstream, the river flows slower and the increasing number of nutrients or food for fish, resulting in more diverse fish being found. The further upstream, the current faster so that particular adaptations are needed for fish to survive. At the upstream station (Rawa Bangun), many fishes from the Gobiidae were found, as many as four species. Gobiid fish use pectoral fins to grip the rocks and other substrates, thus not being carried away by river currents [23,24]. The current is a limiting and controlling factor for organisms in the river. The current velocity affects fish distribution in rivers more than any other abiotic factor [25].

This study recorded 14 species representing nine families. This number is less than that found in the rivers of Majene Regency, West Sulawesi [14]. A total of 31 species from 10 families was recorded from rivers of the Majene Regency. The difference in the number is caused by various factors such as differences in geographical conditions, habitat area, and the number of sampling stations. The geographical conditions in the rivers of Majene Regency are higher, consisting of broader and longer rivers. The number of sampling stations also causes more species to be found than in this study. Another study in the Sopokomil tributaries found that four main environmental parameter factors also significantly influenced differences in the structure of river fish assemblages, such as altitude, total suspended solids, dissolved oxygen, and temperature [26].

Gobiidae was the highest family number of species in the present study. [27] reported that fishes from Gobiidae are the dominant species in the Wallacea Region, with the discovery of 52 species. Moreover, 23 species of these Gobiidae are endemic. Cyprinidae is the first group of fish with the highest number of species and is followed by Gobiidae is the second largest fish group in Indonesian waters [27]. In addition, the most significant number of fish within the world, around 212 genera, and 1,875 species are Gobiidae which is seen from the taxonomic side [28]. This fish can be found in various types of waters. This proves that gobiid fish can adapt to several waters in the world to have an extensive habitat. The existence of the Gobiidae in the west Sulawesi is essential because it becomes the primary source of food for the local community when the fish is still in the larval and early juvenile stages and well known by local people as *penja* fish.

In this study, ten native fish species were found: *Stiphodon semoni*, *Butis butis*, *Glossogobius* sp., *Glossogobius aureus*, *Stiphodon* sp., *Giuris* sp, *Atule* sp. *Ambassis myops*, *Ambassis interrupta*, *Microphis* sp. Some of these fishes can adequate to a broad range of salinities. According to [29,30], most of Sulawesi's freshwater fish species belong to the peripheral division, namely tribes whose members have a high tolerance for salinity, including Anguillidae, Kuhliidae, Gobiidae, and Eleotrididae. The native fish species existence in the Batetannga River is the first record, so it needs to be maintained with the proper management.

Four alien fish species were documented in the Batetannga River i.e. *Aplocheilichthys panchax*, *Poecilia reticulata*, *Anabas testudineus*, and *Oreochromis niloticus*. The origin of these alien species is not yet known. It is likely introduced by humans on purpose, mainly to increase fishery production. The cichlid, *Oreochromis niloticus*, is a freshwater

culture fish with good adaptability in various habitats, fast growth, and reproduction cycle. This species has also been introduced to several lakes in Sulawesi, such as Lake Lindu, Lake Poso [31], Lake Matano [32], and some rivers in the Maros Watershed [13].

The introduction of alien fish species in the various body of water is considered as one of the main threats to aquatic biodiversity because it harms native fish in the form of population decline [33], species extinction [31], decreased diversity, and community structure of native fish [34]. [31] explains that although the introduction of alien fish is not always harmful, based on experience in various parts of the world, the impact is more often detrimental. Interspecific competition, predation, habitat change, parasite/ disease transfer, and hybridization impact alien fish species [35-37].

The present research suggests that exploration of freshwater fish and efforts to control alien fish species in west Sulawesi are essential things to propose in the near future. In addition, several conservation efforts to maintain the existence of native fish should be carried out, such as in situ conservation through the establishment of fish reserves or protected areas, ex situ conservation or fish captivity, fish domestication, fish status determination, prohibition of destructive fishing activities, habitat restoration and habitat protection from the introduction of alien fish species.

5 Conclusion

Ichthyofauna in Batetangnga River comprises 14 fishes species from nine families. Gobiidae is the most deceptive family and consists of four genera (24%). Ten species are categorized as native species, and four species are alien fish species. Freshwater fish exploration and some actions to control alien fish species are relevant activities in the rivers of West Sulawesi.

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