

Biodiversity of freshwater fish in Pangalengan District, Bandung, West Java

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Abstract. Java Island has about 132 freshwater fish species compared to the other major islands in the Sundaland region, such as Sumatra, which has about 589 species. This study aims to reveal and identify the diversity of freshwater fish around Pulosari Village, Pangalengan District. Exploration activities were conducted in river and lake habitats of Pangalengan District, Bandung Regency, West Java. Specimens were collected by authors and local fishermen using three fishing gears: gill nets, fishing rods, and fish scrappers. Immediately after collecting, fish were documented using a digital camera to obtain their original color. In this study, a total of 11 freshwater fish species belonging to 10 families were found. Some species are recognized as introduced fish.

1 Introduction

Indonesia is known as a hotspot of high biodiversity of animals, including fish. They are further classified as seawater fish and freshwater fish [1], [2]. About 1.248 species are recorded as Indonesian freshwater fishes [3]. The West Java Province is one of many areas that use freshwater fish as a source of protein for the local community. A previous study stated that there are about 147 species of freshwater fish spread across the western Java region that are utilized for food and ornamental fish commodities [5]. Pangalengan is one of the areas in West Java, it is located about 45 km from South Bandung. In this area, there is an artificial lake called Situ Cileunca, which was built during the Dutch government period from 1919 to 1926. A previous study declared that most of the species in this lake are known as indigenous species except for one species, *Aequidens rivulatus* [6]. Furthermore, the number of species was estimated to increase, with the discovery of several new species [4] while for Situ Cileunca it is still unclear how many species exist until now. Based on the previous study, exploration activities are needed for updating the data [6].

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The Situ Cileunca is a waste disposal site for chemical and organic agriculture around the waters and cattle farms. Various activities in the Situ have changed the water quality, thereby encouraging damage or degradation of habitat and aquatic biodiversity [10]. This study aims to reveal and understand the biodiversity of the freshwater fish in the Subdistrict of Pangalengan, Pulosari Village, West Java Province based on the field collection in early 2022.

2 Methods

This study was carried out in the river and situ of the Subdistrict of Pangalengan, Village of Pulosari, West Java Province, with an altitude of 1550 m. above the sea water level (Figure 1) on March 21 to 22, 2022, during the daytime from morning to afternoon. During field collection, three types of fishing gear were used, including gill nets, fishing rods, and fish scoops. After collection, fish were documented using a digital camera (Nikon COOLPIX AW 100).



Fig. 1. Situ Cileunca, (Google map modification). Red pins indicate the locality of samples (see Table 1 for details).

Information on the coordinates of field collection can be found in Table 1. Identification of species was based on [1, 6, 7, 11, 12, 17].

Table 1. Coordinates of the specimen of freshwater fish in Situ Cileunca

Station	Latitude	Longitude	Species
1	07°11'42.2"	107°32'59.3"	<i>Brachgobius xanthomelas</i> , <i>Barbodes binotatus</i> , <i>Xiphophorus helleri</i> , <i>Oxyeleotris marmoratus</i> , <i>Poecillia reticulata</i>
2	07°11'46.2"	107°32'59.5"	<i>Brachgobius xanthomelas</i> , <i>Poecillia reticulata</i> , <i>Channa striata</i>
3	07°12'18.8"	107°32'51.8"	<i>Brachgobius xanthomelas</i> , <i>Xiphophorus helleri</i> , <i>Barbodes binotatus</i> , <i>Poecillia reticulata</i>

Station	Latitude	Longitude	Species
4	07°12'25.6"	107°32'44.5"	<i>Oxyeleotri marmoratus</i> , <i>Clarias garipenus</i> , <i>Brachgobius xanthomelas</i> , <i>Pterygoplichthys</i> sp.
5	07°12'26.6"	107°32'45.4"	<i>Betta picta</i> , <i>Brachgobius xanthomelas</i> , <i>Oxyeleotris marmoratus</i>
6	07°12'05.0"	107°32'44.6"	<i>Oxyeleotris marmoratus</i> , <i>Barbodes binotatus</i> , <i>Oreochromis niloticus</i> , <i>Andinoacara rivulatus</i> , <i>Oreochromis niloticus</i>

3 Results and discussion

The water coloration of Situ Cileunca, Pangalengan, was brown to green due to the phytoplankton accumulation caused by high nutrient enrichment in the water (eutrophication) [10]. The high nutrient is probably caused by fertilizer which is used in plantations such as coffee, vegetables, orange trees, other agricultural commodities, and nearby cattle farming activities.

In this study, 11 species of freshwater fishes were collected from nine families including Poeciliidae (2 species), Cichlidae (2 species), Clariidae (1 species), Chaniidae (1 species), Loricariidae (1 species), Butidae (1 species), Osphronemidae (1 species), Cyprinidae (1 species), and Oxudercidae (1 species). In the lake (situ), we have found the following species of fish:

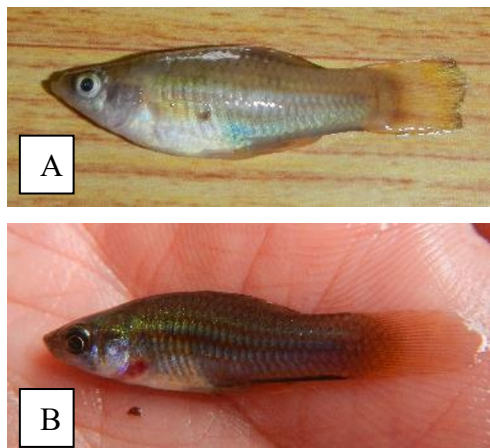


Fig. 2. A Female, 24.59 mm SL (A). and a male, 39.72 mm SL. (B) *Xiphophorus helleri* collected from Situ Cileunca, Bandung Selatan, Western Java.

Xiphophorus hellerii (swordtail fish), locally known as ikan seribu (Figure 2). This species is originally from Mexico [1]. Morphologically, the females of this species have rounded shape of bellies, compared to the males which are slimmer. The caudal fin of a male with a long and sharp-tipped process at the lower corner. This species also has various color forms [1]. This species is distributed widely in Indonesia's freshwater (rivers and ponds). According to the previous study, this species was included in the group family Poeciliidae [1].



Fig. 3. A male of *Poecilia reticulata*, 18.98 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

Poecilia reticulata (guppy fish) (Figure 3) is the same as *Xiphophorus hellerii*, known as ikan seribu and ornamental fish. Originally from Venezuela, Amerika Latin [1]. The male of this species has brightly colored with black spots above the anal and below the dorsal; various color forms [1]. This species has higher pectoral fins position compared to the other normal fish. The females of this species have rounded shape of bellies compared with the males, which are slimmer [7]. This species can be found in many areas in Indonesia. This species has an orange on the body. Males of this species can be distinguished from females by their more colorful body.



Fig. 4. A male of *Andinoacara rivulatus*, 152.27 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

Andinoacara rivulatus (golson fish or lohan) (Figure 4) originally from North America. This species has green lines on the face near the mouth and is known as carnivora [10]. This species has a compressed body; mouth terminal; the rounded shape of the caudal fin. This fish has two lines from the orbital eye to the mouth. The fins (dorsal, pelvic, and anal) are brownish [15]. This species is known as ornamental fish. According to the local people, most of the ornamental fish of the *Andinoacara rivulatus* were released into the wild when they did not want to keep them in the aquarium anymore.



Fig. 5. A male of *Oxyeleotris marmorata*, 139.83 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

Oxyeleotris marmorata (betutu fish) (Figure 5) has a yellowish body coloration; marbled with brown in a large pattern; and brown stripes along rows of scale [17]. Known as freshwater fish distributed very widely distribution including Mekong, Basin Chap Phraya,

Malaysia Peninsula, Indochina, Thailand, Kamboja, Vietnam, Singapore, Filipina, and Indonesia (Sumatra, Borneo, Sulawesi) [1]. This species is a carnivorous fish, prey on insects, shrimp, and small fish. This species was originally from the Mekong River, in China and introduced to Indonesia in 1927 [16].



Fig. 6. A male of *Betta picta*, 39.77 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

Betta picta (cupang fish) (Figure 6), the original habitat is in Southeastern Asia including Indonesia. This species has a small size of the body. The shape of the caudal fin is rounded, consisting of a stripe in the head, from the snout tip backward and one from throat to eye and backward over the operculum [1]. The unique shape and known as an aggressive fish when protecting its territory. (http://www.bkipm.kkp.go.id/bkipmnew/ias/ias_dtl/2)



Fig. 7. A *Barbodes binotatus*, 76.03 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

Barbodes binotatus, the common name of this species is spotted barb (local name as ikan wader bintik dua) (Figure 7). This species is in the family Cyprinidae which has many species in the world. This fish has a spot in the middle of the caudal peduncle. Moreover, the fish has one large blotch at the anterior base of the dorsal. This fish has a flat, longer body shape and a mouth that can be popped out of the mouth. In addition, the species has four barbels [1].



Fig. 8. A *Brachygobius xanthomelas*, 18.20 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

Brachygobius xanthomelas, the common name of this species is a bumblebee goby (Figure 8), and they are from the family Oxudercidae. This species can be distinguished by the black bars which are shaped and arranged irregularly. This species has one complete black bar reaching the ventral midline behind the anal base [1]. The body size of this species is about 2 cm. Not many people who keep this species as a pet in the aquarium, even though

this fish can be used as an ornamental fish. The distribution of this species is Borneo, Malaya [1].



Fig. 9. *Oreochromis niloticus*, 134.08 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

The species *Oreochromis niloticus* (Figure 9) is common in Indonesia. The local name of this species is tilapia or nila. Morphologically, this fish has a flat body width, with a small head. The fish has black coloration, mouth points upwards; when the fish is in the breeding mood, the tips of the fins (pectorals, pelvics, and caudal) are red. This fish has several bars on the body (when mature) [1]. This species is not a native fish but is originally from Africa. Local people use this species for consumption.



Fig 10. *Channa striata* (larvae) from Situ Cileunca, Bandung Selatan, Western Java

The common name of *Channa striata* is snakehead fish (Figure 10). This species is a predator. Morphologically, the side of the fish has chevron-shaped bars pointing forwards [1]. This species is known as a species of the family of Channidae. The genus *Channa* has 50 valid species. Currently, the *Channa* has become very popular, especially for ornamental fish lovers. Some species from this genus have attractive color patterns. This species is distributed in Sundaland, Sulawesi, Lesser Sundas, Moluccas, India, Indochina, China [1]



Fig. 11. *Clarias garipenus*, 203.40 mm SL, from Situ Cileunca, Bandung Selatan, Western Java (Preserve specimen)

On the other hand, *Clarias garipenus*, or catfish with the local name lele (Figure 11). Morphologically, the body of this species was decorated with white spots. Anal fin, caudal fin, and dorsal fin do not connect. Presence of white spots on the body; the color of the fish was greyish-green and marmorated forms [1, 7]. It is also collected in this area, originally from Africa but very common in Indonesia. This fish is used as consumption fish for local people.



Fig. 12. A *Pterygoplichthys* sp., 27.80 mm SL, from Situ Cileunca, Bandung Selatan, Western Java

Pterygoplichthys sp. (suckermouth catfish) or ikan sapu-sapu (Figure 12) are introduced fish. Originally from the Amazon River. This genus can be distinguished by its wide dorsal fin and granular margin on the south [14]. This species is distributed very widely in Indonesia, including Sulawesi. The blooming of this species may affect the biodiversity of the endemic species in many places. The mechanism of introduction in Indonesia was from aquarium or aquaculture [13].

The existence of alien fishes in Indonesia especially in the western Java area was abundant with varying numbers. However, the species reported in the west Java area including *X. hellerii* and *P. reticulata*, are species of freshwater ornamental fishes [5, 7, 8, 9]. Based on the results obtained, there were no endemic fish in this Situ, and so many introduced fish were recorded. Competition for food and habitat has occurred in nature

between introduced and native fishes with similar habits and habitats in rivers in West Java, such as introduced fish species, *P. reticulata* and *X. helleri*, against local fish *Rasbora aprotaenia*, which is one of Java Island's endemic species [7, 10]. A previous study mentioned that *P. reticulata* was introduced in Indonesia as an ornamental aquarium fish in 1920, and this fish was initially expected to eradicate various types of mosquito larvae in nature to control malaria but was unsuccessful [1].

Local community knowledge of these freshwater fishes is still lacking. People around the lakes and rivers still do not understand about the non-native fishes, which have already been invasive. Invasive species are alien fish that have been introduced, live, and develop in certain areas and can threaten biodiversity. Moreover, according to local people, gourami fish still exist in the lake with a low number of individuals, because this fish was rare or difficult in Situ Cileunca.

4 Conclusion

The number of species in Situ Cileunca in this study was more numerous than in a previous study, including *X. helleri*, *B. picta*, *O. marmorata*, *P. reticulata*, *C. garipenus*, *A. rivulatus*, *B. binotatus*, *B. xanthomelas*, *O. niloticus*, *C. striata*, *Pterygoplichthys* and gourami fish. In this study, we found no endemic species in the lake, and more than half of the species are identified as alien species. Further exploration is needed at Situ Cileunca and its surroundings to determine the extent of the distribution, the impact of introduction fishes, and to re-evaluate the presence of native fishes.

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