

# Habitat Characteristics and Abundance of Goonch (*Bagarius yarelli*) in Perjaya Dam, Komerling River, South Sumatra, Indonesia

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## ABSTRACT

This study is aimed to observe the habitat characteristics and abundance of goonch in Perjaya Dam, Komerling River, South Sumatra, Indonesia. Sampling was conducted from March to September 2020 using the purposive sampling method at three stations which were Komerling River watersheds located in three different villages, namely Trengguli Village (Station I), Perjaya Village (Station II), and Way Handak Village (Station III). Goonch caught were measured for total length and weight to determine length and weight classes. The measurement of environmental conditions was done through in situ and ex situ water quality parameters measurements. Food habits of goonch were analyzed by observing diet composition and determining the main food of goonch based on analysis of gut content. A higher abundance of goonch was found during the dry season in August 2020 at a value of 40 individuals that was higher than that of during the rainy season (8 individuals) in March 2020. The highest number of captured fish was on the size of 19-101 g (27 individuals), while the highest number of captured fish based on the fish length classes was found on the size of 19-22 cm (15 individuals). Most of physical and chemical factors in all stations were in normal ranges, except dissolved oxygen that was below the normal range and ammonia level that was above the normal range for freshwater culture practices. Gut content of goonch consisted of insects, small crustaceans, small fish, and plankton. The main food of goonch was small crustaceans that had a value of 42.41% in index of preponderance. Thus, it demonstrated that goonch is categorized as carnivorous fish.

**Key words :** Abundance, Environmental conditions, Goonch, Perjaya Dam

## Introduction

Komerling River is one of the largest rivers in South Sumatra, Indonesia, with a length about 145.45 km (Aida *et al.*, 2010). This river stretches along 4 districts in South Sumatra including South Ogan Komerling Ulu, East Ogan Komerling Ulu, Ogan Komerling Ilir, and Banyuasin. Komerling River has high biodiversity and several economic value species. However, several studies reported that there

has been a decrease in fish species living in Komerling River. During 1987-1988, it was recorded that no less than 55 fish species could be found in Komerling River, but the number was reduced to 48 and 25 species in 2007 and 2014 (Gaffar and Utomo, 1991; Husnah *et al.*, 2007; Nizar *et al.*, 2014).

The decline in fish species found in Komerling River occurs due to natural changes and human activities, such as household and industrial waste disposal. Another cause is the change in the river hy-

drology since the construction of Perjaya Dam in 1991. The Perjaya Dam is located in Komerling River upstream, precisely in Perjaya Village, Martapura Sub-District, East Ogan Komerling Ulu. The construction of this dam causes drought in Komerling River during the dry season. River damming also results in several changes in the ecological balance, such as changes in ecosystems from lotic to lentic, the benthic food web turning into the pelagic food web, eutrophication, and changes in nutrient content in the waters (Costa-Pierce, 1997; Miranda, 2001). These issues can cause changes in fish habitat that adversely affect the fish commodities, such as changes in abundance, size, and growth patterns.

Goonch is one of the essential economic value freshwater fish. This fish belongs to the Sisoridae, often found in the river upstream with fast-flowing water and sandy-rocky riverbed (Utomo and Krismono, 2006). Goonch is one of the fish species affected by dynamic changes due to activities along the Komerling River. The production of goonch has still been obtained from traditional fishing activities, but with the declined environmental conditions, it is feared that it will impact on the abundance of goonch and ultimately affect the number of catches from nature, leading to commodity scarcity. Therefore, it is necessary to carry out management activities on the habitat of goonch to preserve its existence. Preservation of fish stocks can also be carried out through aquaculture activities that begin with the domestication of certain fish commodities.

There are not many studies reported about goonch, so the information obtained is minimal. Therefore, it is necessary to study habitat characteristics, food habits, growth, and reproduction, before the domestication is conducted. This study aimed to observe the habitat characteristics and abundance of goonch in Perjaya Dam, Komerling River, South Sumatra, Indonesia.

## Materials and Methods

### Study Area

This study was conducted in Komerling River, East Ogan Komerling Ulu, South Sumatra (Figure 1). The determination of stations was carried out based on the river characteristics and the habitat of goonch. Sampling was conducted at three stations which were Komerling River watersheds located in three different villages, namely Trengguli Village (Station



Fig. 1. Observation and sampling locations of goonch (*Bagarius yarrelli*)

I), Perjaya Village (Station II), and Way Handak Village (Station III).

### Sampling Procedure

This study was conducted from March to September 2020 using the purposive sampling method. Sampling was done for 3 weeks per month through fishing activities conducted by local fishermen using fishing rods and gillnets. Goonch caught were measured for total length and weight to determine length and weight classes.

### Environmental Conditions Measurement

Environmental conditions express habitat characteristics of goonch living in Komerling River. The measurement of environmental conditions was done through in situ and ex situ water quality parameters measurements. In situ measurement was conducted to measure pH, total dissolved solids (TDS), temperature, and brightness, while ex situ measurement was done to measure dissolved oxygen (DO), ammonia, sulphide, sulphate, nitrate, and nitrite. The standard method from APHA (2005) was used as a manual for sample collection, storage, transportation, and analysis.

### Food Habits of Goonch

Food habits of goonch were analyzed by observing diet composition and determining the main food of goonch based on analysis of gut content. The gut content was calculated by calculating index of preponderance (IP) to analyze the levels of diet compo-

sitions in the gut of goonch. The formula to calculate IP is explained by Natarjan and Jhingran (1961) as follows:

$$IP = \frac{V_i \times O_i}{\sum (V_i \times O_i)} \times 100$$

Note:

- IP = index of preponderance
- V<sub>i</sub> = percentage of diet volume
- O<sub>i</sub> = percentage of diet occurrence

**Data Analysis**

Data collected from this study were analyzed through descriptive statistics using Microsoft Excel version 2019. The data were presented in tables and figures.

**Results**

**The Abundance of Goonch**

The number of goonch observed during this study was 48 individuals. A higher abundance of goonch was found during the dry season (40 individuals) in August 2020 (Figure 2). It was higher than that of during the rainy season (8 individuals) in March

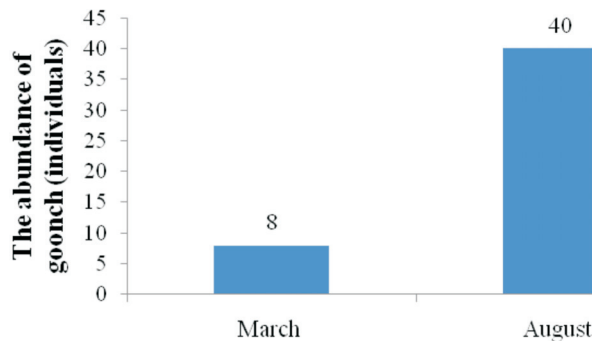


Fig. 2. The abundance of goonch (*Bagarius yarrelli*) in Perjaya Dam during this study

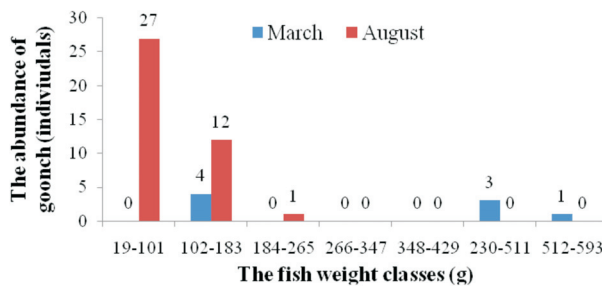


Fig. 3. The abundance of goonch (*Bagarius yarrelli*) in Perjaya Dam based on the fish weight classes during this study

2020. Based on the fish weight classes in Figure 3, it was observed that the highest number of captured fish was on the size of 19-101 g (27 individuals), while the highest number of captured fish based on the fish length classes was found on the size of 19-22 cm as many as 15 individuals (Figure 4).

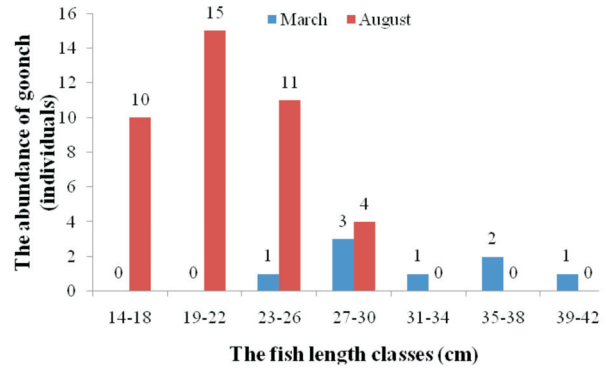


Fig. 4. The abundance of goonch (*Bagarius yarrelli*) in Perjaya Dam based on the fish length classes during this study

**Habitat Characteristics**

A high water debit expressed environmental conditions in Perjaya Dam during the rainy season. It was followed by brown water colour and a rise of water depth. Several changes in environmental conditions occurred during the dry season characterized by a low water volume and a high brightness. Station 1 is Komereng River stream which has a short distance with residential areas. This location is utilized for sand mining and has a transparent water colour in dry season. Station 2 was also Komereng River stream around Perjaya Dam that has a function as irrigation installation supplying water to Komereng, Macak, Belitang, Bahuga, Mucak Kabau, and Tulang Bawang. This area also has another function as a tourism spot in South Sumatra. Perjaya Dam has 9 irrigation canals and 1 fish ladder unit. This location has a high water current and many big rocks at the bottom of the dam. Station 3 is Komereng River stream located in the bridge which connects Way Handak Village with Karang Moncol Village. This location has a transparent water colour, even though it is located 8 m from residential areas.

The results of the observation of environmental conditions, including physical and chemical factors, are presented in Table 1. Physical factors varied among stations observed in this study. The temperature range in all stations was 27-29°C, while brightness and TDS were 25-55 cm and 31-48 mg/l<sup>-1</sup>. Station

**Table 1.** Environmental conditions of Perjaya Dam

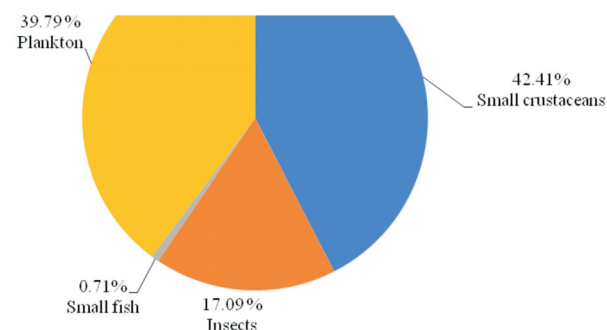
Parameters	Unit	Observation stations			References
		Station 1	Station 2	Station 3	
Physical factors					
Temperature	°C	27-28	29	29	25-30 <sup>1</sup>
Brightness	cm	25-55	38-55	41-55	-
Total dissolved solids	mg l <sup>-1</sup>	38-45	31-46	31-48	≤ 1000 <sup>2</sup>
Chemical factors					
pH		6.8-7.2	6.5-7.0	7.0	6-9 <sup>2</sup>
Dissolved oxygen	mg l <sup>-1</sup>	2.9-4.1	2.9-3.4	2.4-3.9	≥ 3 <sup>2</sup>
Ammonia	mg l <sup>-1</sup>	0.0	0.0-0.3	0.0-0.6	≤ 0.02 <sup>2</sup>
Sulphite	mg l <sup>-1</sup>	<0.51-5.05	2.52-6.64	5.38-9.15	
Sulphate	mg l <sup>-1</sup>	0.00	0.00	0.00-0.02	-
Nitrate	mg l <sup>-1</sup>	4.7-6.9	7.4-8.1	3.9-8.2	≤ 20 <sup>2</sup>
Nitrite	mg l <sup>-1</sup>	<0.0033-0.0200	0.0300-0.0800	<0.0033-0.0900	≤ 0.06 <sup>2</sup>

References: 1. Boyd (1982); 2. Water Quality Criteria Class III of Indonesian Government Regulation 82 (2001).

1 has lower temperature and brightness ranges than those of Stations 2 and 3. Temperature and TDS in all stations were in the normal ranges for freshwater culture practices. Most of chemical factors in all stations were in normal ranges, except dissolved oxygen that was below the normal range. Stations 2 and 3 had higher ammonia levels than Station 1. The ammonia levels in Stations 2 and 3 were above the normal range for freshwater culture practices.

### Food Habits of Goonch

Based on analysis of gut content of fish samples in all stations (n = 40 individuals) as presented in the index of preponderance (IP) in Figure 5, it showed that gut content of goonch consisted of insects, small crustaceans, small fish, and plankton. The main food of goonch was small crustaceans that had a value of 42.41% in IP, while the complementary foods of goonch were plankton and insects that had values of 39.79 and 17.09% in IP, followed by small fish as supplementary food that had a value of 0.71% in IP.



**Fig. 5.** The diet composition of goonch (*Bagarius yarrelli*) in Perjaya Dam

Thus, it demonstrated that goonch is categorized as carnivorous fish.

### Discussion

Several factors that have been notable affecting fish distribution in tropical rivers are 1) environmental factors including biogeography (Jenkins *et al.*, 2010), geography, and topography (Russel *et al.*, 2003), and 2) ecological factors such as predation, competition, and trophic interactions (Power, 1983; Bariliet *al.*, 2011). A high difference in rainfall also can change fish community structures due to the changes in water level, which are positively associated with changes in condition and niche (Eikaas and McIntosh, 2006; Jenkins *et al.*, 2010). Anthropogenic factors caused by a change in land use and the construction of a dam will decrease water quality and affect species distribution to migrate upstream as life cycle part (Jones III *et al.*, 1999; March *et al.*, 2003; Han *et al.*, 2009). The abundance of fish in the dry season was higher than that in the rainy season. This result is in line with the results of Simanjuntak (2012). The main factor causing the difference in fish diversity in both seasons is high turbidity in the rainy season, leading to the availability of habitat or niche for fish communities. The same pattern is also found in Vanua Levu. An increase in turbidity during the rainy season is caused by a high runoff input from surrounding rivers that will affect the fish diversity and the species abundance (Jenkins and Jupiter, 2011). A low abundance of goonch in the dry season can be associated with spawning season and migration. Goonch commonly enters its annual

spawning season during the rainy season, so the fish is suspected of migrating to its natural habitat in a rocky river with a strong current. In South Sumatra, this species is distributed along the river upstream such as Lahat, Pagar Alam, and Ogan Komering Ulu (Utomo and Krismono, 2006).

Goonch is not dominated in the composition of the captured fish by local fishermen in South Sumatra. The frequently captured size is around 30-50 cm, with the largest captured size being 1 m. According to Roberts (1983), goonch is one of the giant Asian catfish and is the most prominent member of the Sisoridae. The maximum size found was 2 m that was found in the Bo River of Mahakam basin and the Mekong river basin (Popta, 1906; Allan *et al.*, 2005), while another study reported that the maximum size captured was 148 cm and weighing 65.0 kg (Hossain, 2010). The captured length in this study was smaller than those in previous studies, while the weight was similar to the results reported by Yustiati *et al.* (2019), who found goonch in upstream of Cimanuk at a weight of 100 g. It expresses the regional differences in maximum length and weight that probably depend on the ecological conditions, especially water temperature, that directly affects fish growth by influencing the fish physiology (Mommssen, 1998). Moreover, ecological conditions directly affect food availability and, subsequently fish growth (Weatherley and Gill, 1987; Santic *et al.*, 2006).

The ranges of physical and chemical factors in Perjaya Dam were in normal ranges for freshwater culture based on Indonesian Government Regulation 82 (2001), except DO and ammonia concentrations. Boyd (1982) stated that DO is probably the most critical water quality parameter in the fish culture. Moreover, fish also requires adequate DO concentration for survival and growth. A fish may tolerate a poor DO concentration for a few hours without ill effect, but it will die if exposed to this low concentration for several days. A fish still can survive at a DO concentration less than 3 mg $l^{-1}$  for prolonged periods, but it cannot grow well. The value of DO in this study decreased than that of in previous study by Nizar (2014).

Utomo and Krismono (2006) stated that goonch is a carnivorous fish that eats insects, small fish, frog, and crustaceans as its main foods. Another study by Roberts (1983) demonstrated that food items in the stomach of goonch included prawns (56%), fish (16%), aquatic insects (12.5%), and unidentified de-

bris or detritus (12.5%). Those results were similar to the results of this study. Carnivorous fish has an intestine that is shorter than its body length. In addition, its intestine has thick and elastic structures (Nikolsky, 1963). These characteristics are associated with the food habits and feeding habits of goonch.

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