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Gonadosomatic index and hepatosomatic index of Bonylip Barb (*Ostechilus vittatus*) from Lebak Kalong Floodplain, Ogan Komering Ilir, South Sumatra, Indonesia

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Abstract

Bonylip barb (*Osteochilus vittatus*) is one of the freshwater fish species found in the Kalong Floodplain, Ogan Komering Ilir Regency. This species has high economic value locally. The purpose of this study was to determine the distribution frequency distribution, gonadosomatic index, and hepatosomatic index of O. vittatus from the Kalong Floodplain. This research was conducted in Kalong Floodplain, Ogan Komering Ilir Regency, from June to August 2023. The research method used is direct observation with a purposive sampling technique. A total of 24 O. vittatus were used in this study (15 females and 9 males). The results showed that the highest frequency distribution of O. vittatus body weight was 21–30 g (29.2%); the lowest was 71–80 g and 81–90 g (4.2%). The gonadosomatic index of female O. vittatus was 10.05%, and the gonadosomatic index of male O. vittatus was 8.16%. The hepatosomatic index of female O. vittatus was 1.23%, and the hepatosomatic index of male O. vittatus was 1.13. The gonadosomatic index and hepatosomatic index of female O. vittatus were greater than those of males.

Keywords: Bonylip barb; Floodplain; Gonadosomatic index; Hepatosomatic index; Swamp

1. Introduction

Ogan Komering Ilir (OKI) Regency has an area of 19,023.47 km2 (BPS, 2020). 75% of the OKI Regency area is in the form of inland waters, including rivers, lakes, swamps, and floodplains. The area of floodplain swamp in OKI Regency is estimated to be around 146,279 hectares, or 58.96% of the total lebak area in South Sumatra (Rosana, 2021). The Kalong Floodplain in Ogan Komering Ilir Regency has a diversity of freshwater fish species. The floodplain area not only plays an important role for fish life but also for local residents for aquaculture, fishing, agriculture, and livestock activities (Afriansyah *et al*, 2023).

Bonylip barb (*Osteochilus vittatus*) is a species of freshwater fish that belongs to the Cyprinidae family (Lumbantobing & Vidthayanon, 2020). This species has various local Indonesian names, including nilem fish, carp fish, pawas fish, melem fish, and paweh (Saanin, 1984). In South Sumatra, this species is known as the palau fish (Muslim et al., 2020). The genus Osteochilus has more than 17 species distributed in Indonesia, Malaysia, Muangthai, Cambodia, and Vietnam (Weber & Beufort, 1916). *O. vittatus* belongs to a group of fish that have high economic value. In addition to its meat, the eggs of this fish are also favored by the public because of their delicious taste. This species has opportunities as an export commodity (Subagja et al., 2006). This fish is known to have a very savory taste of meat and eggs (Syandri & Azrita, 2015). Apart from being a side dish, this fish can also be served as a snack or in the form of fried baby fish and various types of processed products, such as dendeng, pindang, ikan asap, and ikan kaleng (Mulyasari, 2010).

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The gonadosomatic index is the ratio of gonad weight to fish body weight expressed in percent (%) (Picket and Pawson, 1994). The average weight gain of female fish gonads will increase by 10–25% of their body weight, while in male fish it will increase by 5–10% of their body weigh. The hepatosomatic index is the ratio between liver weight and fish body weight (Effendie, 2002). The hepatosomatic index is one of the important aspects of the development of gonadal maturity because it can describe the energy reserves in the fish body when the fish is experiencing the development of gonadal maturity. The liver condition will change due to the accumulation of energy in the form of fat in the liver, where this energy will be used for the growth and development of gonads (Lodeiros et al., 2001).

Studies on the gonadsomatic index and hepatosomatic index of *O. vittatus* from the Kalong Floodplain have never been conducted. The purpose of this study was to determine the gonadosomatic index and hepatosomatic index of *O. vittatus* from the Kalong Floodplain, Ogan Komering Ilir Regency, South Sumatra, Indonesia.

2. Material and methods

2.1. Time and Location

This research was conducted in Kalong Floodplain, Ogan Komering Ilir Regency, from June to August 2023. Determination of sampling points using the purposive sampling technique based on information from local fishermen. The sampling stations in this study consisted of 3 stations, namely station 1 (-3°16′33″,104°49′10″), station 2 (-3°16′1″,104°48′55″), and station 3 (3°15′39″,104°48′47″) (Figure 1).

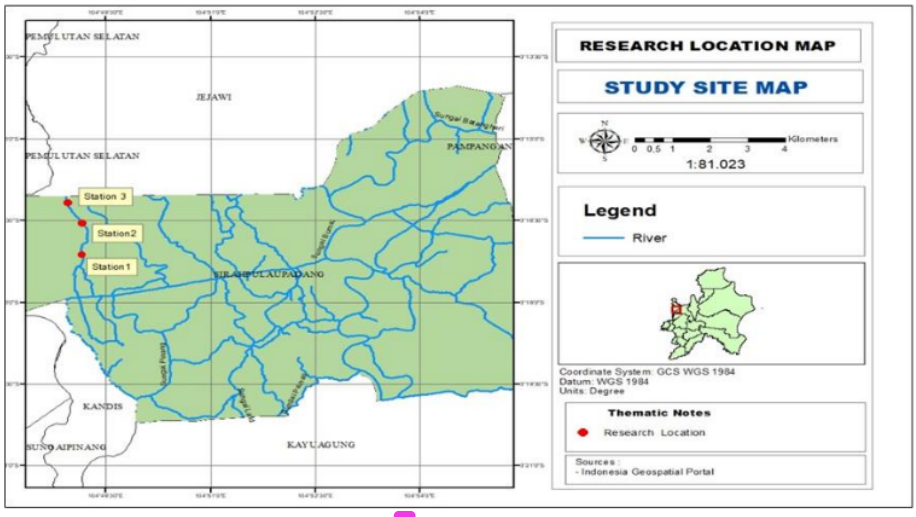

Figure 1. Map of *Osteochilus vittatus* collection sites in Kalong Floodplain, Ogan Komering Ilir Regency, South Sumatra, Indonesia

2.2. Collection of Specimen

A sample fish collection was conducted in collaboration with local fishermen. Fishing uses traditional fishing gear, namely nets, bubu, pengilar, and waring. Fishing was carried out during the research period from June to August 2023. Fish collection was conducted during the rainy season.

2.3. Specimen Measurement

The *O. vittatus* obtained was documented, put in plastic bags, and transported to the Fisheries Laboratory of the Faculty of Fisheries of the Universitas Islam Ogan Komering Ilir Kayuagung for measurement. Fish body weights were weighed individually using a 0.1 g digital scale. After weighing, the fish were dissected using a surgical tool. Dissection starts from the anus, then moves towards the head. The gonads and liver were separated from other internal organs. Gonads and liver were weighed separately per individual. Calculation of the gonadosomatic index using the formula: GSI= (Wg/W) x 100 (Parameswarn et al., 1974) where GSI is gonadosomatic index (%), WG is gonad weight (g), and W is

body weight (g). Calculation of the hepatosomatic index using the formula: HSI= (Wl/W) x 100 (Nikolsky, 1969) Where HSI is hepatosomatic index (%), Wl is liver weight (g), and W is body weight (g).

2.4. Data Analysis

The data obtained was tabulated with the help of the Microsoft Excel program. The data were grouped into male fish data and female fish data. Data is presented in the form of pictures and graphs and then analyzed descriptively.

3. Results and discussion

A total of 24 *O. vittatus* were collected in this study. The total length of *O. vittatus* ranged from 6,2 cm to 84,2 cm, and the body weight ranged from 8,2 g to 16,5 g. The body weights, gonad weights, and liver weights of *O. vittatus* obtained during this study period are presented in Table 1.

Table 1 Frequency distribution of body weight, gonad weight, and liver weight of bonylip barb (*Ostechilus vittatus*) from Kalong Floodplain during the sampling period

Interval class of body weight (g)	Frequency	%	Interval class of gonad (g)	Frequency	%	Interval class of liver (g)	Frequency	%
01.00- 10.00	3	12.5	0.00 - 1.00	3	12.5	0.0 - 0.2	8	33.3
11.00- 20.00	2	8.3	1.00 - 2.00	6	25	0.3 - 0.5	7	29.2
21.00- 30.00	7	29.2	2.00 - 3.00	4	16.6	0.6 - 0.8	6	25.0
31.00- 40.00	5	20.8	3.00 - 4.00	5	20.8	0.9 - 1.2	3	12.5
41.00- 50.00	3	12.5	4.00 - 5.00	2	8.3			
51.00- 60.00	2	8.3	5.00 - 6.00	2	8.3			
71.00- 80.00	1	4.2	6.00 - 7.00	1	4.2			
81.00- 90.00	1	4.2	11.0012.00	1	4.2			
Total	24	100		24	100		24	100

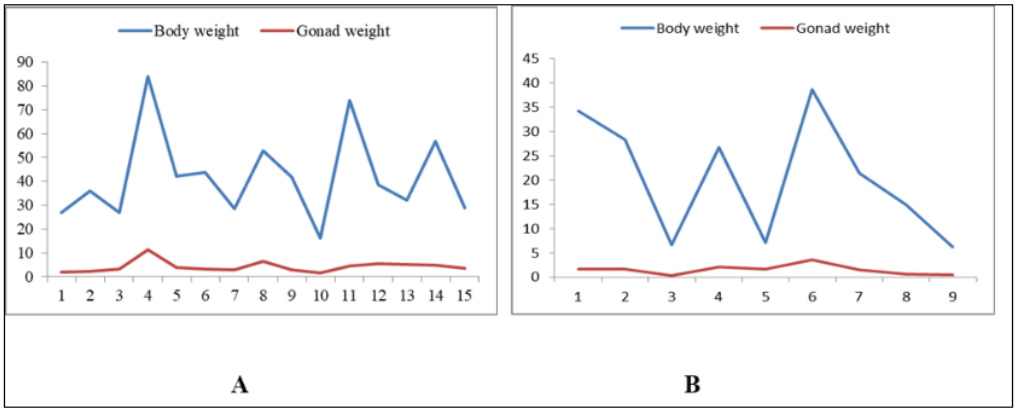

Figure 2 Body weight and gonad weight of bonylip barb (*Ostechilus vittatus*) from Kalong Flooadplain, Ogan Komering Ilir, South Sumatra, Indonesia (A= female, B= male)

The frequency distribution of body weight of *O. vittatus* was 21–30 g at 29.2%, while the least body weight was 71–80 g and 81–90 g at 4.2%. The frequency distribution of gonad weights was 1–2 g by 25%, and the least was 6–7 g and 11–12 g by 4.2%. The most frequent distribution of liver weight was 0.0–0.2 g by 33.3%, and the least was 0.9–1.2 g by 12.5%. Based on the body weight of the fish caught, the greater the body weight of the fish, the fewer the number of fish

caught. This is because *O. vittatus,* before reaching its maximum size, has been caught by fishermen, so it does not have time to grow to its maximum size. According to Jirs et al., (2018), the size of the fish is inversely proportional to the number, because the larger the fish, the smaller the number of catches tends to be, and vice versa. The results of body weight and liver weight measurements of *O. vittatus* during the sampling period are presented in Figure 2.

The highest female *O. vittatus* body weight was 84.2 g; the lowest was 16.2 g. The largest female *O. vittatus* gonad weight was 11.2 g; the lowest was 1.7 g. The highest male *O. vittatus* body weight was 38.6 g; the lowest was 6/2 g. The largest male *O. vittatus* gonad weight was 3.5 g; the lowest was 0.25 g. The results of this study indicate that the greater the body weight of the fish, the greater the gonad weight. According to Oso et al. (2013), the larger the fish, the larger the gonads in it, and the higher the gonadosomatic index value.

The increase in gonad weight will continue to grow until the fish are ready to spawn. Amtyaz et al. (2013) state that in line with the growth of gonads, the gonads will increase in weight and size to reach their maximum size when the fish spawn. According to Effendie (2002), the gonadosomatic index value will reach a peak when the fish will spawn and fall back after spawning. The results of the calculation of the gonadosomatic index of male and female *O. vittatus* during the sampling period are presented in Figure 3.

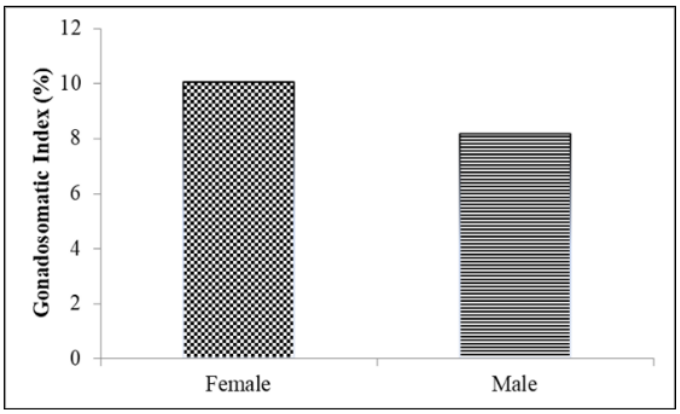

Figure 3 Gonadosomatic index of bonylip barb (*Ostechilus vittatus*) from Kalong Floodplain, Ogan Komering Ilir, South Sumatra, Indonesia.

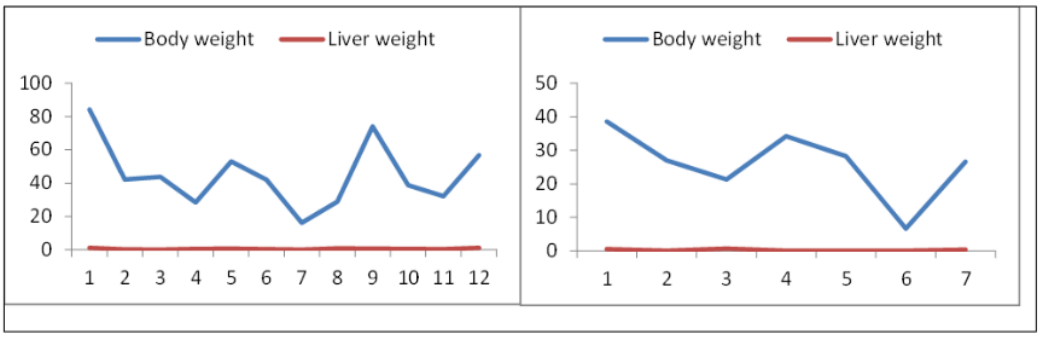

Figure 4 Body weight and liver weight of bonylip barb (*Ostechilus vittatus*) from Kalong Flooadplain, Ogan Komering Ilir, South Sumatra, Indonesia (A= female, B= male)

The female *O. vittatus* gonadosomatic index value was 10.05%, and the male *O. vittatus* gonadosomatic index value was 8.16%. This shows that the gonadosomatic index of female fish is greater than that of male fish. This condition is in accordance with the opinion of Effendie (2002), which states that female fish have a greater gonadosomatic index value compared to male fish, and the gonadosomatic index between one fish species and another is different. Effendie (2002) added that the weight of gonads in female fish ranges from 10–25% of their body weight, while in male fish it ranges

from 5–10% of their body weight. According to Sari et al. (2017), there is a direct relationship between energy from fat in the abdominal cavity and the process of gonad formation, where the fat acts as an energy reserve for gonad formation.

The increase in gonad weight also causes the gonadosomatic index value to increase. Wouters et al. (2001) stated that changes in the value of the gonadosomatic index are due to the increase in gonadal weight at the time of growth and maturation of the gonads. Flores et al. (2019) stated that the increase in the value of the gonadosomatic index is due to an increase in the amount of vitelogenin in the vitelogenesis process, which will be allocated to the gonads so as to increase the value of the gonadosomatic index. The results of the measurement of *O. vittatus* liver weight in this study are presented in Figure 4.

The highest female *O. vittatus* body weight was 56.8 g; the lowest was 16.2 g. The liver weight of female *O. vittatus* was highest at 1.2 g and lowest at 0.11 g. The highest male *O. vittatus* body weight was 21.3 g; the lowest was 6.7 g. The largest male *O. vittatus* liver weight was 0.7 g; the lowest was 0.08 g. The liver is a place of yolk formation and a place to store energy reserves for the growth and development of the gonads. According to Hara et al. (2016), the liver plays a very important role in the development of vitellogenin and is a place of yolk formation (vitellogenesis), and the value of the hepatosomatic index will increase with an increase in the vitelogenesis process. Sullivan & Yilmaz (2018) stated that the liver is an organ where energy reserves are very important, and these energy reserves will be unloaded to support oocyte development and other activities. The results of measuring the hepatosomatic index of *O. vittatus* in this study are presented in Figure 5.

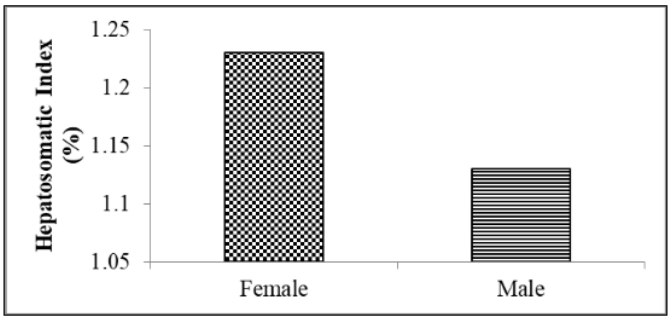

Figure 5 Hepatosomatic index of bonylip barb (*Ostechilus vittatus*) from Kalong Floodplain, Ogan Komering Ilir, South Sumatra, Indonesia

The hepatosomatic index is one of the important aspects of gonadal development because it can describe the energy reserves in the fish body when the fish undergoes the development of gonadal maturity. The hepatosomatic index value of female *O. vittatus* was 1.23%, and the hepatosomatic index value of male *O. vittatus* was 1.13%. The hepatosomatic index value of female fish was greater than that of male fish. The liver is generally red-brown in color and slightly yellowish if there is a lot of fat in it. According to Sari (2017), the liver tends to be red-brown due to vascularization and yellowish if there is a lot of fat stored. Fish liver weight will continue to increase along with the development of fish gonads. According to Effendie (2002), the hepatosomatic index value is a quantitative value that can describe the increase in liver weight along with gonadal development and an increase in the gonadosomatic index.

4. Conclusion

Frequency distribution of the weight of the most caught *O. vittatus* is 21-30 g, which is 29.2%, while the weight of the least caught *O. vittatus* is 71 - 80 g and 81-90 g, which is 4.2%. The frequency distribution of the gonad weight of *O. vittatus* which was caught the most was 1 - 2 g, which was 25% and which was caught the least was 6 - 7 g and 11 - 12 g, which was 4.2%. The frequency distribution of the liver weight of the most caught *O. vittatus* was 0.0 - 0.2 g, namely 33.3% and the least caught was 0.9 - 1.2 g, namely 12.5%. The GSI of female *O. vittatus* is 10.05 and the GSI of male fish is 8.16. The HSI of female *O. vittatus* is 1.23 and the HSI of male fish is 1.13.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declared that there is no any conflict of interest for publishing this article.

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