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Length-weight Relationship, Condition Factors, and Reproductive Biology of Kissing Gourami (*Helostoma temminckii*) from Celikah Swamp, Ogan Komering Ilir

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Abstract

Kissing gourami (*Helostoma temminckii*) is one of freshwater fish species that has a high economic value in Indonesia. This study aims to assess the length-weight relationship, condition factors and reproductive biology of *H. temminckii* from Celikah floodplain, Ogan Komering Ilir Regency, Indonesia. This study was conducted from July to September 2024 (dry season). The sampling site was determined using purposive sampling technique based on the catch area of local fishermen. A total of 64 *H. temminckii* samples were used in this study. Measurements of total fish length, weight, and fish dissection were conducted at the Fisheries Laboratory of the Universitas Islam Ogan Komering Ilir Kayuagung. The results showed that the total length of the fish obtained ranged from 12.2 cm to 17 cm, and the weight ranged from 34.1 g to 96.6 g. Most total lengths ranged from 12.1 to 13 cm (30.4%), and least from 16.1 to 70 cm (4.6%). Fish weights ranged mostly from 40 to 50 g (34.9%) and least from 90 to 100 g (1.6%). The length-weight relationship analysis showed that the a-value was 0.0389, the b-value was 2.631, and the R^2-value was 0.3669. The growth pattern of *H. temminckii* in this study is negative allometric. The sex ratio in this study was 1:3.7, with 14 males (21.2%) and 52 females (78.8%).

Keywords: Length-weight relationship; Condition factor; Reproductive biology; Kissing gourami; Lebak swamp

1. Introduction

The area of Ogan Komering Ilir (OKI) Regency is 21,689 km^2 or about 19.1% of the area of South Sumatra, with a population density of 46 people per km^2. OKI area is mostly ± 65% or 164,034 hectares is a swamp area, while the land is ± 35% (Djamhari, 2009). Lebak swamp is a swamp that is influenced by river overflow. Lebak swamp is an aquatic ecosystem that is utilized as a fishing ground that provides fish either for local needs or as a trade commodity (Muthmainnah, 2013). Celikah swamp located in OKI Regency contains resources of freshwater fish species diversity. Lebak swamp not only plays an important role for fish life, but also for the local population for aquaculture, fishing, agriculture, livestock and water transportation.

The potential as a source of fisheries in OKI is very large. This potential can be seen from several research results that show the abundance and diversity of fish species in the swamp area of OKI. The potential fisheries that have economic value are climbing perch (*Anabas testudineus*), snakeskin gourami (*Tricopodus pectoralis*), kissing gourami (*Helostoma temminckii*), snakehead fish (*Channa striata*), and rice eel (*Monopterus albus*) (Muslim, 2012).

The kissing gourami (*H. temminckii*) is one of the most important freshwater fish species. It is also of significant importance in Indonesia. Some of the important values of *H. temminckii* are its high economic value in the fish market.

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It also contains high protein and is an important source of protein for people living around the waters where it lives. It has the potential to be cultivated commercially because it can grow quickly and has a high selling value. Ecologically, *H. temminckii* have an important role in maintaining the balance of aquatic ecosystems as plant and invertebrate waters, as well as prey for predators in the waters (Ahmadi 2021; Gustiano *et al*, 2015; Ubamnata *et al*, 2017).

The decline in the *H. temminckii* population is inseparable from the capture by fishermen. The catch is an important part for fishermen, it is not uncommon for fish that are maturing gonads to be caught, so that fish cannot spawn, this is what is meant by uncontrolled fishing which causes the population of a fish species to decline.

Apart from fishing, one of the main threats to biodiversity and natural ecosystems is the introduction of invasive species. The intentional or unintentional introduction, spread and use of various foreign species that later become invasive has caused considerable ecological, economic and social losses. Damage to the environment or fish habitat caused by the introduction of exotic fish can be in the form of disintegration of local fish communities, genetic damage to local fish (due to hybridization), disease transfer, and socio-economic impacts on the surrounding aquatic communities (Welcomme, 1988).

This study aims to examine the length-weight relationship, condition factors and reproductive biology of *H. temminckii* from Celikah swamp, OKI Regency, Indonesia. The length- weight relationships are important in fisheries resource management (Fauzi, 2021). Length-weight relationships provide information on the growth and condition of fish in a population. Condition factors, which are calculated based on this relationship, describe how well fish use resources for growth, reproduction, and maintenance.

2. Research Method

2.1. Time and Location

This research was conducted in Celikah swamp in OKI Regency from July to September 2024. Determination of sampling site using purposive sampling technique based on the catch area of local fishermen. Sampling in this study consisted of 3 stations: station 1 (-3°36′533″,104°833′502″), station 2 (-3°375′022″,104°828′016″) and station 3 (-3°375′29″,104°825′505″). Fish sampling results obtained were documented and put in plastic bags for further analysis at the Fisheries Laboratory of the Universitas Islam Ogan Komering Ilir Kayuagung .

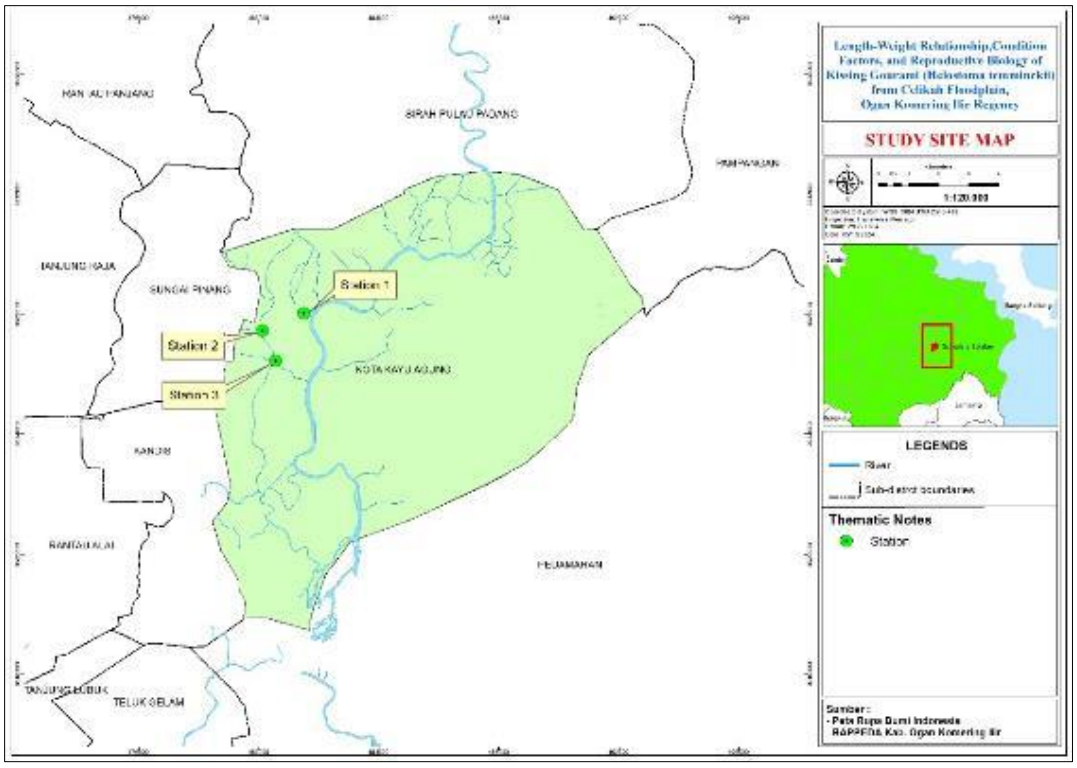

Figure 1 Map of the research location

2.2. Sampling of fish

Fish samples were collected from 3 stations spread across the Celikah swamp. A total of 66 fish samples were taken, consisting of 52 female fish and 14 male fish. The captured fish were put into plastic and then brought to the Fisheries Laboratory, Faculty of Fisheries, of the Universitas Islam Ogan Komering Ilir Kayuagung to be observed for each parameter. The length of - *H. temminckii* was measured with a caliper and the weight was weighed using a 0.1 g digital scale. Fish to be dissected were first documented using a camera in the form of photographs. Existing fish samples were then dissected using surgical scissors starting from the anus then heading towards the head. The dissected fish then took the gonad organs for observation.

2.3. Length-Weight Relationship

Calculation of the length-weight relationship of *H. temminckii* using the linear allometric model according to De Robertis and William (2008):

$$W = aL^b$$

Description:

- W is the weight of the fish (gr),
- L is fish length (cm),
- a and b are constant values
- The value of b as an estimator

Where:

- A value of b = 3 means that the fish has an isometric.
- The value of b > 3 is that the fish has a positive allometric
- The value of b < 3 is that the fish has a negative allometric

2.4. Condition Factor

The Fulton formula (Kn) is used to calculate the condition factor proposed by Le Crenn(1951):

$$Kn = \frac{W}{a\ L^b}$$

Description

- Kn is the value of the fish condition factor,
- W is fish weight (gr),
- L is the standard length of fish (cm),
- a and b are constant values

2.5. Reproductive Biology

To determine the sex of *H. temminckii* is done by dissecting and looking at the gonads of male and female fish (testes and ovaries). The sex ratio was calculated by comparing the number of male fish with the number of female fish caught during the study.

2.6. Data Analysis

The data from the observation of *H. temminckii* obtained at each station were tabulated in the form of Microsoft Excel. Data of kissing gourami that have been measured in length and weighed in body weight, calculated based on sex and presented in graphical form and then analyzed descriptively.

3. Results and Discussion

The results showed that the total number of fish caught in the study was 66 fish consisting of 14 male fish and 52 female fish. The length of the fish caught ranged from 12.2 - 17 cm and the weight of the fish caught ranged from 34.1 - 96.6 g. The results of the observation of the frequency distribution of the length and body weight of *H. temminckii* during the study showed in Table 1.

Table 1 Frequency distribution of length and weight of kissing gourami (*Helostoma temminckii*).

Length interval class (cm)	Frequency	%	Weight interval class (g)	Frequency	%
12,1 - 13,00	20	30,4	30 - 40	10	15,3
13,1 - 14,00	18	27,4	40 - 50	23	34,9
14,1 - 15,00	15	22,3	50 - 60	9	13,8
15,1 - 16,00	10	15,3	60 - 70	15	22,7
16,1 - 17,00	3	4,6	70 - 80	5	7,6
			80 - 90	2	3,1
			90 - 100	1	1,6
Total	66	100		66	100

The results of the study showed that the frequency distribution of the length of the most is 12.1-13 cm, which is 30.4% while the least is 16.1-70 cm, which is 4.6%. The frequency distribution of the weight of the most was 40 - 50 grams, which 34.9% and the least was 90 - 100 grams, which 1.6%. The weight of the fish, the greater the weight of the fish, the fewer the number of fish. This is because the fish before reaching the optimal size has been caught by fishermen, so it does not have time to grow to reach the maximum size. According to Gurning et al., (2019), the size of the fish is inversely proportional to the amount, the larger the size of the fish, the less the catch tends to be, and vice versa. The length-weight relationship equation of *H. temminckii* showed in Figure 2.

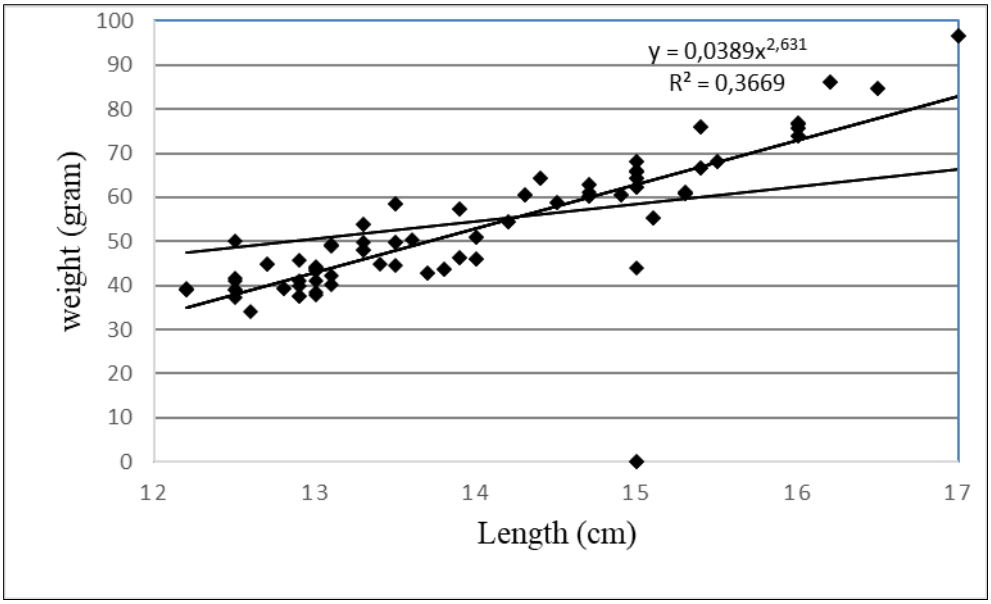

Figure 2 The Length-weight relationship of kissing gourami (*Helostoma temminckii*)

The results showed that the value of a = 0.0389 and the value of b = 2.631, R^2 of 0.3669 (Figure 2). The value of b < 3 indicates a negative allometric fish growth pattern, which means that fish have a smaller weight gain (slow) than the increase in length. Parameter b is divided into 3, namely: b = 3, meaning the fish has a weight gain balanced with the increase in length; b > 3, meaning the fish has a weight gain greater than the increase in length; and b < 3, meaning the fish has a weight gain smaller than the increase in length.

During the study, the captured fish had a relatively small body size, indicating that the growth pattern of long fish is faster than its weight. According to Saputra *et al*. (2009), the difference in the increase between weight and length can be caused by fish caught dominated by small fish, whose length growth is faster than their weight. According to Suruwaky and Gunaisah (2013), weight gain is slower than length gain, this can be caused by excessive exploitation of fish through fishermen's catch that affects the length-weight of fish.

Condition factor is a measure used to evaluate the health and fitness of fish by comparing the weight of fish measured with the length of fish measured. From the analysis, the condition factor of kissing gourami ranged from 0.910 - 1.677 with an average of 1.315. Morton and Routledge (2006) divided the value of fish condition factor into five categories: very poor (0.8-1.0), poor (1.0-1.2), balanced (1.2-1.4), good (1.4-1.6) and very good (> 1.6). The results of calculating the condition factor value in *H. temminckii* show a value in the range of 0.910 - 1.677, which means that the fish are in good condition. According to Gunadi *et al* (2021), fish that have a condition factor value of 0-1 are classified as lean or not fat fish, while fish that have a condition factor value of 1-3 are classified as fish with a fatter body shape. The greater the condition factor means the higher the level of feasibility of the environment where the fish lives, that is, almost all the needs for fish survival can be met, both the adequacy of food and nutrients and supporting environmental conditions such as temperature, pH, and other physical conditions of the waters.

Condition factor values also illustrate the resilience status of fish in a water body. Condition factor values greater than 1 may indicate that the fish have better access to food sources and an environment that supports their growth. A condition factor of less than 1 indicates that the fish are emaciated or suffering from nutrient deficiencies. Condition factor values less than 1 may also indicate that the fish are stressed or that the environment is not favorable for growth. Differences in condition factor between different fish populations can be used to compare the health and overweight of fish from one population to another (Migiro Kembenya *et al*, 2014; Oliveira *et al*, 2018; Van, Gümüş, and Süer, 2019). The sex ratio of *H. temminckii* in this study showed in Figure 1.

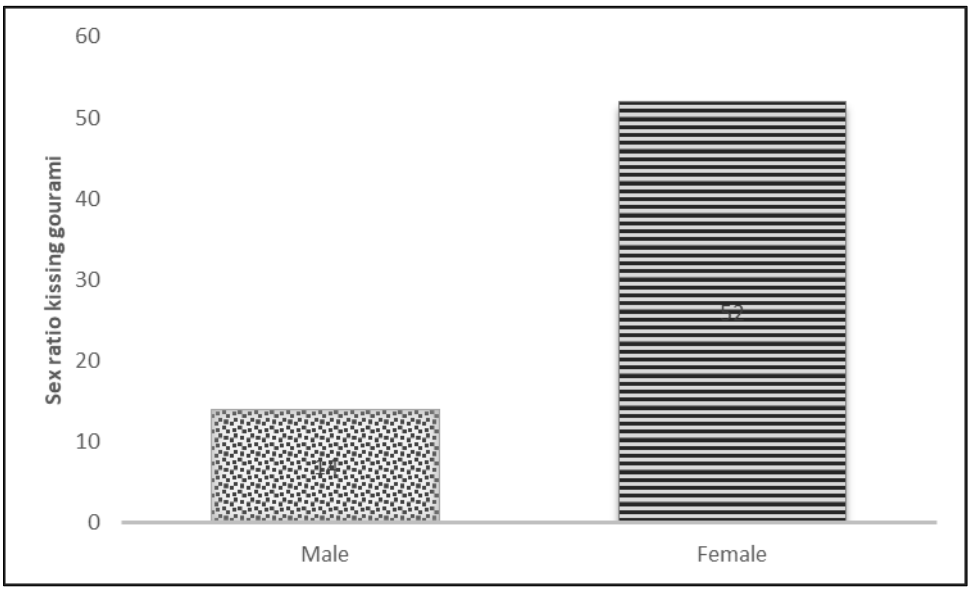

Figure 3 Sex ratio of kissing gourami (*Helostoma temminckii*)

Sex ratio is the ratio of the number of male and female individuals in a population. The sex ratio of - *H. temminckii* during the study showed that the sex ratio of female fish was greater than male fish, which amounted to 1: 3.7 (male: female). There were 14 male fish (21.2%) and 52 female fish (78.8%) (Figure 3). This shows that the sex ratio of *H. temminckii* in an unbalanced state is dominated by female fish. According to Effendie (2002), the sex ratio of male and female fish in a water body is - balanced at 1: 1, where the number of male and female fish is equal. Sex ratio deviations arise due to several conditions such as differences in distribution, activity and movement of fish. Added by Sulistiono *et al*. (2001), the difference in the number of female and male fish caught is related to the behavioral patterns of fish roaming, both for spawning and foraging.

The dominant sex ratio of female fish caught in Celikah swamp in OKI Regency indicates that the sustainability of the *H. temminckii* population can still be maintained. According to Sulistiono *et al,* (2001), if the ratio between male and female fish is the same or female fish are more numerous in the waters the population can still be maintained in the waters. Added by Saputra *et al*, (2009), if the sex ratio of male fish and female fish is the same or the sex ratio is greater than the female, this indicates that the fish population in a body of water is still ideal or balanced to maintain its sustainability and with such a ratio resulting in the opportunity for fertilization of eggs by spermatozoa to become new individuals will be greater.

4. Conclusion

The frequency distribution of the length of the *H. temminckii* was 12.1 - 13 cm (30.4%), while the least was 16.1 - 70 cm (4.6%). The frequency distribution of the weight was 40 - 50 g (34.9%), while the least was 90 - 100 g (1.6%). The length-weight relationship showed that the a-value was 0.0389, the b-value was 2.631, and the R^2-value was 0.3669. The growth pattern of *H. temminckii* in this study is negative allometric. The sex ratio in this study was 1:3.7.

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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