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Growth Pattern and Condition Factor of Silver Rasbora (*Rasbora argyrotaenia*) in Teluk Kenali Lake Jambi City

Pola Pertumbuhan dan Faktor Kondisi Ikan Seluang (*Rasbora argyrotaenia*) di Danau Teluk Kenali Kota Jambi

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ABSTRACT

Teluk Kenali Lake is located in Teluk Kenali Village, Telanaipura District, Jambi City, with an area of approximately 30 ha, and has a water characteristic in the form of a basin. The main catch of fishermen in this lake is the seluang fish, which is popular with the community because of its taste and high economic value. This study used a purposive sampling method through direct observation of fishermen's catches. Samples were obtained from the catch of two fishermen using gillnet fishing gear with a mesh size of 1 inch during a 1-month study. The results showed that male seluang fish had an average length of 8.6 cm and an average weight of 4.9 g, with a b value in the length-weight relationship analysis of 2.88, a determination coefficient of 0.91, and a condition factor (K) of 1.75, indicating a less flat body. Female seluang fish had an average length of 9.04 cm and an average weight of 6.26 g, with a b value of 0.94, a determination coefficient of 0.18, and a condition factor of 1.99, indicating a less flat body. It was concluded that the growth pattern of male and female seluang fish was negatively allometric ($b < 3$), which means that length growth was more dominant than weight growth.

Keywords: Teluk Kenali Lake, silver rasbora, growth

ABSTRAK

Danau Teluk Kenali terletak di Kelurahan Teluk Kenali, Kecamatan Telanaipura, Kota Jambi, dengan luas sekitar 30 ha dan memiliki karakteristik perairan berupa cekungan. Salah satu jenis ikan yang menjadi hasil tangkapan utama nelayan di danau ini adalah ikan seluang, yang digemari masyarakat karena rasanya serta memiliki nilai ekonomi tinggi. Penelitian ini menggunakan metode purposive sampling melalui pengamatan langsung terhadap hasil tangkapan nelayan. Sampel diperoleh dari tangkapan dua nelayan menggunakan alat tangkap *gillnet* berukuran mata jaring 1 inci selama 1 bulan penelitian. Hasil penelitian menunjukkan bahwa ikan seluang jantan memiliki panjang rata-rata 8,6 cm dan berat rata-rata 4,9 g, dengan nilai b pada analisis hubungan panjang-berat sebesar 2,88, koefisien determinasi sebesar 0,91, dan faktor kondisi (K) sebesar 1,75 yang menunjukkan tubuh kurang pipih. Ikan seluang betina memiliki panjang rata-rata 9,04 cm dan berat rata-rata 6,26 g, dengan nilai b sebesar 0,94, koefisien determinasi sebesar 0,18, dan faktor kondisi sebesar 1,99 yang juga menunjukkan tubuh kurang pipih. Pola pertumbuhan ikan seluang jantan maupun betina bersifat alometrik negatif ($b < 3$), yang berarti pertumbuhan panjang lebih dominan dibandingkan pertumbuhan berat.

Kata Kunci: Danau Teluk Kenali, ikan seluang, pola pertumbuhan

INTRODUCTION

Teluk Kenali Lake is one of three lakes in the city of Jambi, along with Teluk Lake and Sipin Lake. This lake is located in Teluk Kenali Village, Telanaipura District, covering an area of approximately 30 hectares and characterized by a basin-shaped water body. The water supply for Teluk Kenali Lake originates from the Kenali River and the Beliung Patah River, which flow into the Batanghari River. This condition makes the lake rich in water resources utilized by local fishermen as a source of income and to meet daily consumption needs (Dinas Pertanian, Peternakan, Perikanan, dan Kehutanan Kota Jambi, 2015).

Most people around Teluk Kenali Lake depend on fishing and freshwater fish farming for their livelihoods. One of the characteristic catches consumed by the community is the seluang fish (*Rasbora argyrotaenia*). This species is highly sought after for its savory taste and high economic value (Anggraini, 2019). The nutritional content of seluang fish consists protein, fat, iron, and zinc. Seluang fish protein contains 7 types of essential amino acids and 7 types of non-essential amino acids, as well as fatty acids such as oleic, palmitic, stearic, palmitoleic, lauric, myristic, and eicosapentaenoic acid (Sogandi et al., 2019).

Based on field survey results, local fishermen mentioned that seluang fish has high market demand. This aligns with Saputra et al. (2017), who reported that communities around Teluk Kenali Lake are intensely interested in catching and selling seluang fish. Fishermen can easily choose bait to catch seluang fish because seluang is an omnivorous species whose main diet consists of green plants, arthropods, and annelids (Haris et al., 2018).

According to Suryani et al. (2019), seluang fish are found in Teluk Kenali Lake and spread across several Java and Kalimantan regions. Silitonga (2021) reported that local fishermen's catches range from 1-10 kg per day, and can reach more than 20 kg during the flood season. Based on their research, seluang fish contribute the highest percentage of catches using gillnets, at 15.76%. Lisna (2011) adds that seluang fish are crucial in improving community well-being due to their high economic value and contribution to nutritional needs. Moreover, seluang fish can serve as an effective bioindicator for assessing the level of heavy metal pollution in aquatic ecosystems (Hasanah et al., 2023).

Field observations indicate that seluang fishing in Teluk Kenali Lake is generally carried out using gillnets with a mesh size of 1 inch. The high market demand is feared to reduce the seluang fish population in the wild. Wulandari et al. (2020) explain that fishery resources are renewable if their balance is maintained. However, exploitation that exceeds its recovery capacity can lead to overfishing. Science-based fisheries resource management is needed to prevent this, including studies on length-weight relationships and fish condition factors. The length–weight relationship provides important information for the sustainable management of fish populations (Landa et al., 2018). To date, information on the condition of the seluang fish population in Teluk Kenali Lake remains limited. Therefore, this study examined the biological aspects of seluang fish, particularly their growth patterns and condition factors. This data is expected to serve as a basis for fisheries resource management and support efforts to conserve the seluang fish in the future.

RESEARCH METHOD

Time and Place of Research

This research was conducted from June 1 to July 1, 2024, at Teluk Kenali Lake, Telanaipura District, Jambi City.

Tools and Materials

The equipment used in this study included digital scales with an accuracy of 0.1 g, a ruler with a centimeter scale, a camera, and writing instruments. The research material was seluang fish (*Rasbora argyrotaenia*) obtained using a gillnet with a mesh size of 1 inch.

Research Method

This study used purposive sampling through direct observation of fish caught by fishermen. Samples were obtained from the catches of two fishermen who used gillnets with a mesh size of 1 inch. The number of samples taken was 10% of the total catch of fishermen during one month of research.

Data Collected

This study used primary data from the research site by measuring sample of seluang fish (*Rasbora argyrotaenia*). The primary data collected included:

a. Total length of seluang fish (TL): measured from the tip of the mouth to the tip of the longest tail fin using a ruler with a centimeter

scale.

b. Weight of seluang fish: measured using digital scales with an accuracy of 0.1 g.

Test Parameters

Determination of Class Intervals

Before analysis, the total length of each sample was measured, and then each fish was weighed to determine weight variation. The data obtained was processed using Microsoft Excel software to determine each fish's length and weight. To determine the class interval size of seluang fish, the Walpole (1992) formula was used: Class slang determination

$$\mathbf{n = 1 + 3{,}3\ Log\ N}$$

Explanation:
n = number of size classes
N = number of fish observed

1. Determining Class Width

To determine the width of each group, use the formula:

$$C = \frac{a - b}{c}$$

Explanation:
C = class width
a = maximum fish length
b = minimum fish length
c = number of classes

2. Length-weight relationship

To calculate the relationship between length and weight using the formula (De Robert and Wiliam, 2008):

$$\mathbf{W = aL^b}$$

Explanation:
W = fish weight (g)
L = total fish length (centimeters)
a and b = constants

The equation is linearized through logarithmic transformation:

$$\mathbf{Log\ W = Log\ a + b\ Log\ L}$$

The value of b as an estimator of the relationship between length and weight, with the criteria:
Value of b = 3, fish have an isometric growth pattern (weight gain is proportional to length gain).
For values of $b \geq 3$, fish have a positive allometric growth pattern (weight increase is faster than length increase).
Value of $b \leq 3$, fish have a negative allometric growth pattern (length growth is faster than weight growth). Condition factor

The relative weight (Wr) and condition factor coefficient (K) evaluate each individual's condition factor. Relative weight (Wr) is determined based on the equation using the following formula:

$$\mathbf{Wr = (W/Ws)\ x\ 100}$$

Explanation:
Wr = relative weight
W = weight of each fish
Ws = standard weight predicted from the same sample because it is calculated from the combined length-weight regression through the distance between species.

$$\mathbf{K = WL^{-3}\ x\ 100}$$

Explanation:
K = Fulton condition factor
W = fish weight (g)
L = fish length (cm)
-3 = length coefficient or correction factor

According to Effendi (2002) in Nurhayati et al. (2020), if the K value is between 1.0 and 3.0, the fish has a less flattened body, while if the K value is between 2.0 and 4.0, the fish has a slightly flattened body.

RESULTS AND DISCUSSION

General Conditions of the Research Location

Teluk Kenali Lake is geographically located in the city of Jambi at 1°30'2.98 "-1°40'1.07" LS and 103°40'1.67"-103°40'0.22" BT, covering an area of 205.08 km², with the northern, western, southern, and eastern parts of Jambi City directly bordering Muaro Jambi Regency (BPS Jambi City, 2022).Regency (BPS Jambi City, 2022).

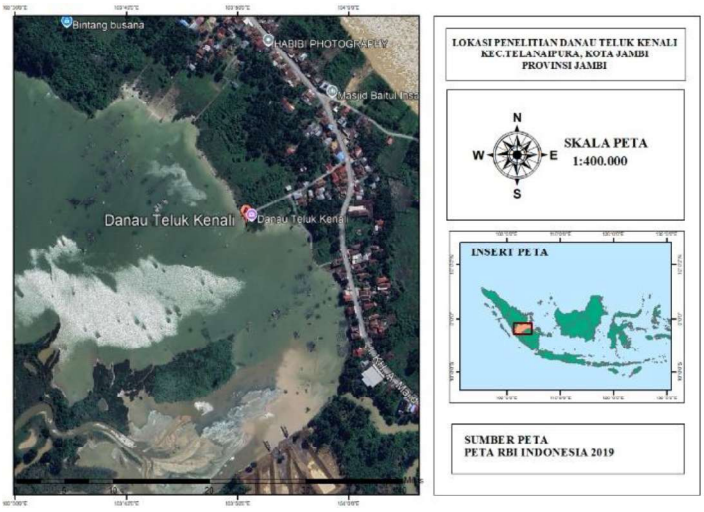

Figure 1. Map of Research Location
Source: Data Processing

The one fishing gear fishermen use is a gillnet with a mesh size of 1 inch, a length of 100-200 m, and a width of 1.5-2 m. Fishing is carried out one day, from morning to afternoon or afternoon to evening, depending on weather conditions. The research location is at coordinates (1°34′47.3″S 103°34′1.9″E, Indonesia).

Sample Measurement Procedure

The study measured seluang fish samples using two main parameters: total length and weight. Total length was measured using a ruler scaled in centimeters, from the front tip of the mouth to the rear tip of the tail fin. Fish weight was measured using digital scales with an accuracy of 0.1 grams. The total length and weight data obtained were then analyzed to determine the growth pattern of seluang fish (Dewiyanti et al., 2012).

Figure 2. Measurement of Seluang Fish
Source: Field Documentation

To determine the difference between male and female seluang fish, one can look at their physical characteristics and sex. Male seluang fish have a flat, elongated body, a bright yellow tail, but their pectoral fins are pale yellow. They have a superior head shape and minor scales, while female seluang fish have a flat, rounded body, a bright yellow tail and pectoral fins, a pale yellow body, a superior head shape, and larger scales (Suryani et al., 2019).

Seluang Fish Class Hose

The caught of seluang fish (*Rasbora argyrotaenia)* varied in size. The data is presented as a length distribution, consisting of eight classes for male seluang fish and seven classes for female seluang fish. The size distribution of male seluang fish can be seen in Table 1, while the size distribution of female seluang fish is presented in Table 1.

The length distribution data for male seluang fish (Table 1) was divided into 8 class intervals with a total length range of 70–109 mm and a weight range of 2.83–8.33 g. The length frequency data for male seluang fish shows that the highest number of male seluang fish samples was in the 80–84 mm class interval, with a percentage of 24%, and the lowest was in the 105–109

mm class interval, with a rate of 1% compared to other class intervals.

Table 1. Size range of male seluang fish

Class Hose (mm)	Total (Ekor)	Relative Frequency (%)	Average Weight (g)
70 – 74	6	6%	2.83
75 – 79	17	17%	3.40
80 – 84	24	24%	4.02
85 – 89	15	15%	5.03
90 – 94	14	14%	6.12
95 – 99	19	19%	6.62
100 – 104	4	4%	7.00
105 – 109	1	1%	8.33
total	100	100%	

Source: Data Processing

The length distribution data for female seluang fish (Table 2) was divided into 7 class intervals with a total length range of 70-104 mm and a weight range of 6.30-7.33 g. The length data of seluang fish shows that the highest number of female seluang fish samples is in the 95-99 mm class interval, with a percentage of 31%, while the lowest number is in the 70-74 mm class interval, with a percentage of 2% compared to other class intervals.

Table 2. Class intervals for female seluang fish

Clas Hose (mm)	Total (Ekor)	Relative Frequency (%)	Average Weight (g)
70 – 74	1	2%	6.30
75 – 79	7	11%	5.32
80 – 84	8	12%	6.21
85 – 89	9	14%	5.24
90 – 94	13	20%	6.13
95 – 99	20	31%	6.78
100 – 104	7	11%	7.33
total	65	100%	

Source: Data Processing

The Relationship Between Length and Weight of Seluang Fish

The relationship between fish length and weight is determined by separating male and female seluang fish. This is due to differences between male and female seluang fish.

The comparison of the length and weight of seluang fish using the equation $W = aL^b$ and R^2 (R *Squared*) is a value that shows the extent to which the independent variable (X = Length) affects the dependent variable (Y = Weight). The equation for male seluang fish is $W = 0.0097L^{2,8849}$, which has an $R^2 = 0.9158$.

Table 3. Comparison of the length and weight of seluang fish

Sex Tipe	Total (n)	$W = aL^b$	growth pattern
Male	100	$W = 0.0097L^{2.8849}$	negative allometric growth
Female	65	$W = 0.7705L^{0.9449}$	negative allometric growth

Source: Data Processing

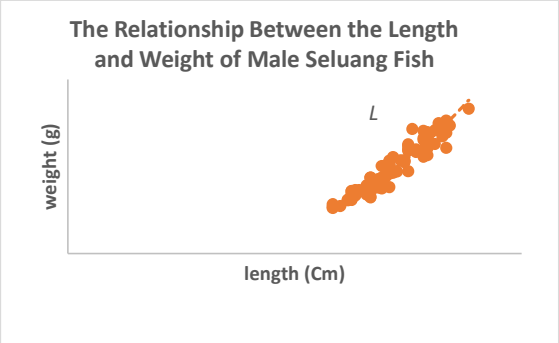

Figure 3. Relationship between the length and weight of male Seluang fish
Source: Data Processing

The study's results on the length-weight relationship of male seluang fish showed an average length of 8.6 cm and an average weight of 4.9 g. The analysis of the length-weight relationship of male seluang fish yielded a b value of 2.88, indicating that the length-weight relationship of male seluang fish is negatively allometric (b < 3, weight increase is slower than length increase).

Analysis of the relationship between the length and weight of male seluang fish samples in Figure 3 has a line equation of ($y = 0{,}0097L^{2.8849}$) This means that every 2.88 g increase in weight will increase the length by 0.0097 mm. The results of the graph analysis for male seluang fish obtained a coefficient of determination value (R^2) = 0.91 shows that the length variable has a 91% influence on the weight gain of male seluang fish with a correlation coefficient of 0.91, while 9% of the weight gain of male seluang fish is caused by other factors such as environmental factors, food availability, genetics, age, and others.

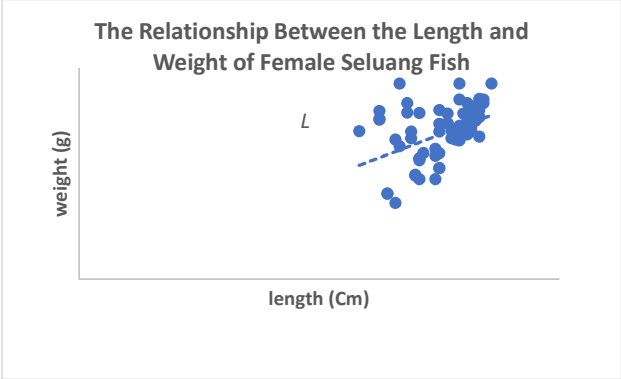

Figure 4. Relationship between the length and weight of female Seluang fish
Source: Data Processing

The study's results on the length-weight relationship of female seluang fish showed an average length of 9.04 cm and an average weight of 6.26 g. The analysis of the length-weight relationship of female seluang fish yielded a b value of 0.9449, indicating that the length-weight relationship of seluang fish is negatively allometric (b < 3, length increases faster than weight).

The analysis of the relationship between the length and weight of female seluang fish samples can be seen in Figure 4, which has a line equation of ($y = 0.7705L^{0.9449}$). This means that every 0.94 g increase in weight will increase the length by 0.7705 mm. The graph analysis results for female seluang fish obtained a coefficient of determination value of R^2= 0,18, showing that the length variable has an 18% influence on the weight gain of female seluang fish with a correlation coefficient of 0.18. In comparison, 82% of the weight gain of female seluang fish is caused by other factors such as environmental factors, food availability, genetics, age, and others.

The length-weight relationship shows a similar growth pattern between observed and predicted results. This pattern indicates that an increase in fish weight follows an increase in fish length. Intrinsic factors, such as gonadal development, organic energy reserves, and food availability in the water, influence fish growth. Additionally, the physiological

status of fish is also influenced by extrinsic factors, such as food abundance and variations in environmental conditions (Bertucci et al., 2019; Ragheb & Evelyn, 2023).

Factors Affecting Seluang Fish Conditions

Table 4. Factors affecting the condition of seluang fish

Sex Type	Range of Lengths (mm)	Weight Range (g)	Condition factors
Male	70-106	2.83-8.33	1.75
Female	70-103	5.24-7.33	1.99

Source: Data Processing

Table 4 shows the condition factor values obtained from each fish. These values are used to determine the fish's body shape (slightly flattened or less flattened) and the condition of the water (good or poor) (Okgerman, 2005). Based on the measurements of length and weight conducted, the average condition factor (CF) values for male and female seluang fish found in Teluk Kenali Lake ranged from 1.75 to 1.99, indicating a less flattened body shape. Based on the analysis of the results of fish length-weight measurements, the average condition factor (K) value for male seluang fish was 1.75, meaning that ≥1 indicates that the fish are less flat. Meanwhile, the analysis of female seluang fish length-weight results showed a value of 1.99, meaning that ≥1 indicates that the fish are less flat. This condition aligns with the analysis of the length-weight relationship of male and female seluang fish in Table 3, which exhibits negative allometry ($b < 3$, where length increases faster than weight). The results of this study are consistent with the previous research by Afriansyah and Cahyani (2024), which reported that seluang fish from the Komering Kayuagung River Basin exhibit a negative allometric length–weight relationship. The same result, namely negative allometric growth, was also found in seluang fish caught in the Barito River, South Kalimantan (Fitriyani et al., 2020). Slower weight growth compared to length growth can influence reproductive strategies and the ecological role of a species. Larger females, for example, tend to have higher reproductive opportunities (Vasconcelos et al., 2018). This growth pattern also indicates that environmental factors, such as temperature, can influence the allometric relationship, thereby adding complexity to growth dynamics (Márquez et al., 2024). The length–weight relationship is also influenced by water quality parameters such as temperature, turbidity, brightness, pH, and dissolved oxygen (DO) (Suraya, 2018). The growth of seluang fish can also be influenced by seasons. The weight growth of seluang fish is faster during the rainy season compared to the dry season (Sulistiyarto, 2012).

CONCLUSION

Based on the study's results, it can be concluded that the length-weight relationship of seluang fish shows a negative allometric growth pattern, both in males and females. The b value for male seluang fish is 2.88, while for females it is 0.94, indicating that length growth is more dominant than weight growth. The condition factor values for male seluang fish (1.75) and females (1.99) indicate that both body shapes tend to be less flattened.

RECOMMENDATIONS

A suggestion for further research is to conduct an analysis of the environmental and ecological factors that may influence the negative allometric growth pattern of seluang fish, such as food availability, water quality, and habitat conditions. This will provide a deeper understanding of whether the observed growth pattern is primarily driven by intrinsic biological factors or by external environmental pressures, and can also help formulate management strategies to maintain the health and sustainability of seluang fish populations in their natural habitats.

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