LENGTH-WEIGHT RELATIONSHIPS AND CONDITION FACTOR OF MALAJA FISH (*Siganus canaliculatus*) IN LUWU REGENCY WATERS

Hubungan Panjang Bobot dan Faktor Kondisi Ikan Malaja (*Siganus canaliculatus*) di Perairan Kabupaten Luwu

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ABSTRACT

Malaja fish or baronang lingkis (*Siganus canaliculatus*) is a typical fish of the Luwu Regency community. This fish is favored in fishing activities by the local community because of its delicious taste. The main problem experienced by this fishery resource is that high fishing activities and increasing production volumes can result in stock decline. Therefore, it is necessary to study the growth patterns and condition factors of malaja fish in the waters of Luwu Regency as a basis for information for management activities. The purpose of this study was to determine length weight relationship and condition factor of malaja fish in Luwu Regency waters. Sampling was conducted from Mei to August 2024 with stratified random sampling method from catch landed at Karang-Karangan Village, Bua Sub-district, Luwu. The results showed that 168 fish captured consists of 88 males and 80 females. The length weight relationship was $W = 0,000001L^{3,4556}$ for male and $W = 0,00001L^{3,0421}$ for female. The results indicated that the length weight relationship was highly correlated ($r > 90\%$). The relative condition factors of fish varied from 0,4475-2,6567.

Keywords: Condition Factor, Length Weight Relationship, Luwu Regency, Malaja Fish

ABSTRAK

Ikan malaja atau baronang lingkis (*Siganus canaliculatus*) merupakan ikan khas masyarakat Kabupaten Luwu. Ikan ini menjadi primadona dalam kegiatan penangkapan oleh masyarakat sekitar karena rasanya yang enak. Permasalahan utama yang dialami sumberdaya perikanan ini yaitu kegiatan penangkapan yang tinggi dan volume produksi yang terus meningkat dapat mengakibatkan penurunan stok. Oleh karena itu perlu dilakukan penelitian pola pertumbuhan dan faktor kondisi ikan malaja di perairan Kabupaten Luwu sebagai dasar informasi untuk kegiatan pengelolaan. Penelitian ini bertujuan untuk menganalisis pola pertumbuhan dan nilai faktor kondisi terhadap ikan malaja di perairan Kabupaten Luwu. Sampel dikumpulkan dari bulan Mei sampai Agustus 2024 dengan metode penarikan contoh acak berlapis (PCAB) dari

hasil tangkapan yang didaratkan di Desa Karang-Karangan Kecamatan Bua, Kabupaten Luwu. Selama penelitian ditemukan 168 ekor ikan yang terdiri atas 88 ekor ikan jantan, dan 80 ekor ikan betina. Hubungan panjang bobot adalah W = 0,000001L^{3,4556} untuk jantan dan W = 0,00001L^{3,0421} untuk betina. Hasil ini menunjukkan bahwa hubungan panjang bobot mempunyai korelasi yang sangat kuat (r > 90%). Faktor kondisi relatif beragam dari 0,4475-2,6567.

Kata Kunci: Faktor Kondisi, Hubungan Panjang Bobot, Ikan Malaja, Kabupaten Luwu

INTRODUCTION

The waters of Luwu Regency have a variety of capture fishery commodities, one of which is the baronang lingkis fish (*Siganus canaliculatus*) or locally known as "malaja fish" (Halid et al., 2016) which is a typical fish in Luwu Regency. Malaja fish, which is the favorite fish of the people of Luwu Regency, has the characteristic of having meat that is tastier and more savory than in other areas which taste blander (Khaeruddin, 2012). This fish is usually served fried, grilled or parede and cooked sour. This fish is found in areas around coral reefs and seagrass beds (Sari et al., 2019) and is also found in waters where there is a lot of seaweed (Turang et al., 2019).

Malaja fish as a mainstay fishery commodity in Luwu Regency makes this fish a favorite in fishing activities so that it is currently in the over-exploited category (Marhayana et al., 2021). The tendency of high intensity of catching malaja fish in Luwu Regency is feared to disrupt its stability and growth. This condition has an impact on the marine ecosystem which is experiencing a decline in its natural conditions, both degradation of species diversity and decreased biomass (Jemi et al., 2022). Furthermore, continuous fishing efforts cause aquatic resources to decrease in size over time and decrease production so that special attention is needed by managing fish for malaja fish aquatic resources.

One of the efforts to manage malaja fish aquatic resources requires management based on biological information in a population to determine the characteristics of the resources to be managed. Therefore, it is necessary to carry out fisheries management through an ecosystem approach, one of which is by estimating biological parameters as a basis for management.

This study was conducted to produce information related to the biological parameters of malaja fish in the waters of Luwu Regency, including fish growth patterns and condition factors. The growth pattern of malaja fish is obtained through the analysis of the relationship between length and weight of fish. From the analysis of the relationship between length and weight, we can also determine environmental changes to organisms. Furthermore, from the results of the analysis of the relationship between length and weight obtained, we can determine the condition factor of the fish. The condition factor indicates the physical condition of the organism to survive and reproduce.

METHODS

Time and Location of the Research

This research was conducted in May - August. Fish collected during the research came from fishermen's catches in the waters of Luwu Regency which were landed in Karang-karangan Village, Bua District, Luwu Regency (Figure 1). Fish samples were analyzed at the Fisheries Laboratory, Faculty of Fisheries, Cokroaminoto University of Makassar, Makassar City.
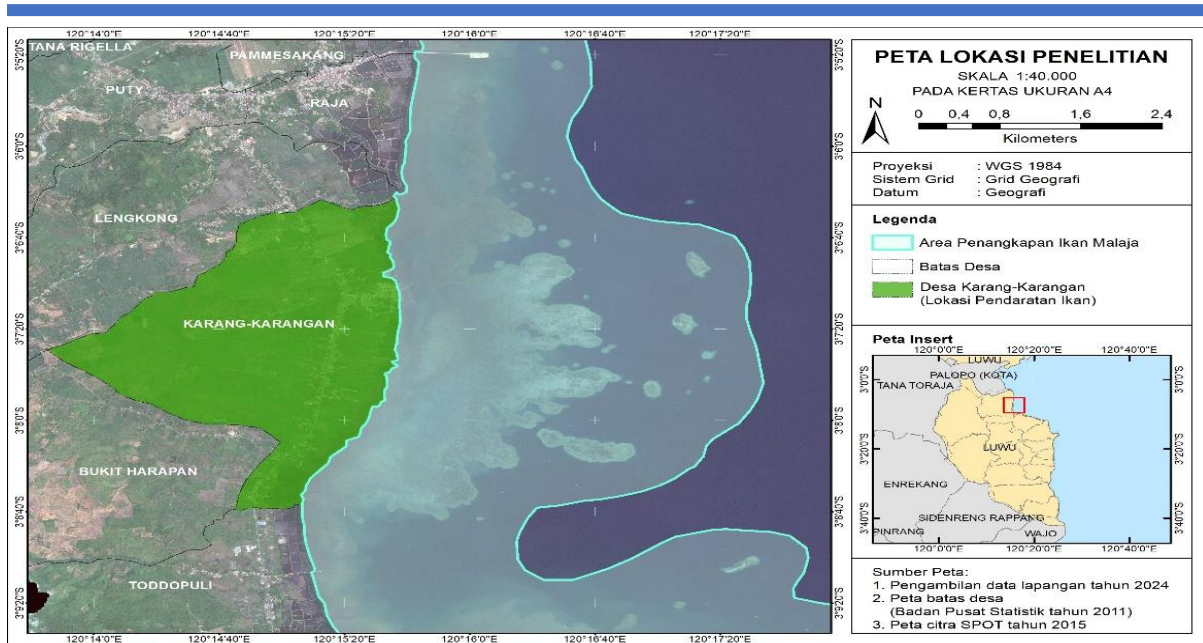
Figure 1. Sampling Location Map

Data Collection

Fish sampling was conducted for four months with a 30-day interval. Fish were taken randomly using the Stratified Random Sampling (PCAB) technique, and the sizes of fish taken consisted of medium, small, and large sizes. Fish obtained at each sampling were then taken to the laboratory for analysis.

Laboratory Analysis

Every month, an analysis was carried out on malaja fish samples. The total length of the fish was measured from the tip of the head to the tip of the tail fin using a ruler (accuracy level of 1mm). The weight of the malaja fish that was weighed was the wet weight (grams) using a digital scale (accuracy 0.1 grams).

Data Analysis

The model used in estimating the relationship between length and weight is the exponential model, as follows (Effendie, 1979):

$$W = a \, L^b$$

Description:
W   : Fish weight (g),
L   : Total length of fish (mm),
a and b : Constants.

The condition factor is calculated using the metric system based on the relationship between the length and weight of the sample fish. If the increase in weight is balanced with the increase in length, then the fish growth is isometric so that the equation for calculating the condition factor becomes (Effendie 2002):

$$K = \frac{W}{L^3} \; x \; 10^5$$

Whereas if fish growth is allometric then the relative condition factor calculation method is used:

$$K = \frac{W}{aL^b}$$

Description:
W   : Fish weight (g),
L   : Fish length (mm)

RESULT

Malaja fish is a herbivorous fish that lives in groups and is often found in seagrass beds and coral reefs. This fish has a body part that is silver gray on the upper part while the lower part is silver, slightly greenish on the nape and top of the head (Figure 2).

Figure 2. Malaja Fish (*Siganus canaliculatus*)

The number of malaja fish obtained during the study was 168 consisting of 88 male fish and 80 female fish. The malaja fish caught had a body length range of 104 - 180 mm and a body weight of 14.22 g - 84.42 g.

The results of the analysis of the relationship between the length and body weight of male malaja fish and female malaja fish obtained in the waters of Luwu Regency during the study can be seen in Table 1.

Table 1. Results of the Analysis of the Relationship Between the Length and Body Weight of Malaja Fish (*Siganus canaliculatus*) in the Waters of Luwu Regency

Parameter	Male	Female
Number of samples (tail)	88	80
Average total length (mm)	138.57	148.35
Average body weight (g)	35.66	45.83
log a	-5.8582	-4.9567
a	0.000001	0.00001
Regression coefficient (b)	3.4556	3.0421
Correlation coefficient (r)	0.9178	0.8958
Regression equation	$W = 0.000001L^{3,4556}$	$W = 0.00001L^{3,0421}$
t test	$t_{hit} > t_{tabel}$	$t_{hit} > t_{tabel}$
Growth type	Positive allometric	Isometric

Based on the analysis of the relationship between the length and weight of the malaja fish, the b value was obtained as 3.4556 for male malaja fish and 3.0421 for female malaja fish, so that the equation for the relationship between the length and weight of male malaja fish becomes $W = 0.000001L^{3.4556}$ and $W = 0.00001L^{3.0421}$ for female fish (Figure 3).

The relationship between the length and body weight of male and female malaja fish caught in the waters of Luwu Regency is presented in Figure 3.
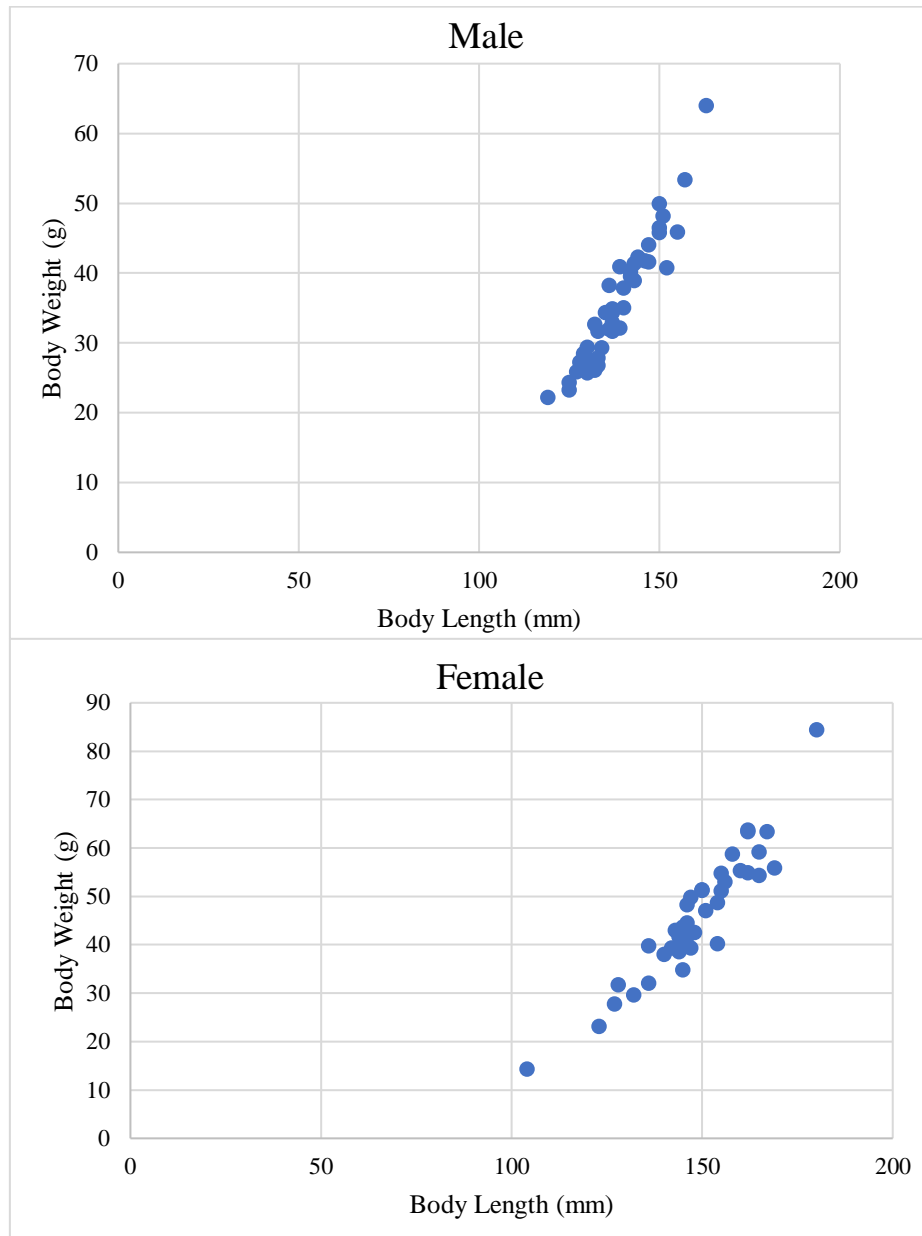

Figure 3. Relationship Between Length and Weight of Male and Female Malaja Fish (*Siganus canaliculatus*) Caught in the Waters of Luwu Regency

The condition factor values of male and female malaja fish caught in the waters of Luwu Regency can be seen in Table 2.

Table 2. Condition Factor Values of Male and Female Malaja Fish (*Siganus canaliculatus*) in the Waters of Luwu Regency

Gonad Maturity Level	Male			Female		
	n	Range	Average	n	Range	Average
I	12	0.8457-1.6120	1.1677±0.2725	4	0.4475-0.8730	0.6602±0.3009
II	34	0.8858-1.7483	1.1653±0.241	16	0.7254-1.2635	0.8618±0.1929
III	18	1.0842-2.0337	1.41886±0.2633	14	1.2487-1.3992	1.2993±0.0714
IV	16	1.5598-2.4417	1.7678±0.2935	40	1.1952-2.6567	1.2527±0.0812

Table 2 shows that in general the condition factor of male malaja fish is greater than the condition factor of female malaja fish in GML I and II, but smaller in GML III and IV. Based on the results obtained, the condition factor value increases along with increasing gonad maturity, both in male and female fish.

DISCUSSION

The average size of male and female malaja fish caught in the waters of Luwu Regency was 138.57 mm and 148.35 mm. The average body weight of male and female malaja fish was 35.66 g and 45.83 g. Male malaja fish in the waters of Luwu Regency had an average length and body weight that was smaller than female fish. A similar thing also happened to *Siganus canaliculatus* fish in Totok Bay (Turang et al., 2019) where male fish had a length range of 127-270 mm and female fish 191-210 mm.

The catch of malaja fish from May 2024 to August 2024 in the waters of Luwu Regency was more abundant in July. The abundance of fish in that month is thought to be due to the spawning process in the previous months. Differences in the number of catches can be influenced by several factors such as characteristics of the place of residence, habitat shifts, and fish reproductive activities (Jianguo et al. 2018).

In Table 1, it is known that the correlation coefficient (r) of the relationship between the length and body weight of male malaja fish in the waters of Luwu Regency is 0.9178 and female malaja fish is 0.8958. This value shows that the relationship between the length and weight of male and female malaja fish has a very strong correlation, which means that if the length of the fish increases, it will affect the increase in body weight (Figure 3).

Furthermore, it can be seen in Table 1 that the regression coefficient value in male malaja fish (b = 3.4556) is greater than that of females (b = 3.0421). The growth pattern of male malaja fish is positive allometric, namely the rate of weight growth is faster than the growth in length, while female malaja fish show an isometric growth pattern where the rate of length growth is the same as the rate of weight growth. The results of the analysis of the relationship between the length and weight of male *Siganus canaliculatus* fish which showed a positive allometric growth rate were also obtained from the research of Turang et al., 2019 in Totok Bay Waters with a value of b = 3.1964 different from the research of Anand et al. (2012) in the Gulf of Mannar, India with a b value of 3.0304, which is isometric. The results of the analysis of the relationship between the length and weight of female *Siganus canaliculatus* fish showed an isometric relationship with the same results in female *Siganus guttatus* fish in the waters of Sei Carang (Indriyani et al., 2020) with a b value of 2.9575.

The growth patterns obtained between male and female malaja fish vary. Based on the b value in the relationship between the length and weight of male and female fish, it is known that male fish have a higher growth rate than females. The difference in the b value obtained is generally the influence of several factors such as fish physiology, food availability, salinity, water temperature, fish sex and gonad maturity, season, habitat type, and sex (Sudarno et al. 2018).

Saleh et al. (2012) stated that endemic species are fish that have ecological and commercial influences on their habitat areas so that the population of these fish needs to be studied as input in fisheries management so that it is sustainable, therefore research related to the growth pattern of this malaja fish is very important to study, especially the conservation of its natural habitat.

The results of the analysis of the relative condition factors of male and female S. canaliculatus fish obtained average FK values of 1.3844 ± 0.3452 and 1.4424 ± 0.4018, respectively. The condition factor value for male fish is lower than the condition factor for female fish. The condition factor value obtained is the same as the condition factor value of female and male rabbitfish (*S. guttatus*) in the waters of Sei Carang (Indriyani et al., 2020), namely 1.735 and 1.633, respectively. The condition factor value of female *S. guttatus* fish is greater than that of male *S. guttatus* fish. This is thought to be because female fish have better conditions for reproduction and survival than male fish (Effendie, 2002). The high value of this condition factor is related to the gonad status of female fish which is dominated by Gonad Maturity Level (GML) IV in the fishing area (Table 2). In general, the condition factor of fish will increase when they are adults, especially during gonad development (Sudarno et al., 2018).

The condition factor is defined as a condition that indicates the fitness of the fish with the assumption that fish that have a heavier body weight at a certain length are fish that are in better physiological condition (Famoofo & Abdul 2020). This condition factor can be closely influenced by several factors, including the season which can cause a decrease in food abundance and the magnitude of the current.

Fish growth patterns and condition factors are greatly influenced by food. The male and female malaja fish analyzed had positive allometric and isometric growth patterns, which means that their weight growth is faster than their length growth and the weight growth rate is the same as the length growth rate. Pertami & Parawangsa (2021) stated that this can be an indicator of ecosystem health in supporting fish growth so that ecosystem health in this study can be estimated from the condition factor value which is in the range of 0.8457-2.6567. In addition, the condition factor can also indicate the health condition of the fish which can be seen from the physical ability of the fish to grow and reproduce (Harteman, 2015).

CONCLUSION

Male and female Malaja fish in Luwu Regency Waters have a positive allometric growth pattern, which means that weight gain is more dominant than length gain, and an isometric growth pattern, namely that weight gain is the same as length gain. Female Malaja fish have a greater condition factor than male fish and are in good condition during the study.

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REFERENCES

Anand, M., Reddy, P. S. & Rami. (2012). Length-weight Relationship of the Whitespotted Rabbitfish *Siganus canaliculatus* (Park, 1797) from Gulf of Mannar, south India. *Journal of the Marine Biological Association of India, 54*(1).

Effendie, M. I. (1979). Metode Biologi Perikanan. Bogor: Yayasan Dewi Sri.

Effendie, M. I. (2002). Biologi Perikanan. Yogyakarta: Yayasan Pustaka Nusatama.

Famoofo, O., & Abdul, W. O. (2020). Biometry, Condition Factors and Length-Weight Relationships of Sixteen Fish Species in Iwopin Fresh-Water Ecotype of Lekki Lagoon, Ogun State, Southwest Nigeria. *Heliyon*, 96(1), e02957

Halid, I., Mallawa, A., & Amir, F. (2016). Population Dynamic og Rabbit Fish (*Siganus canaliculatus*) In Gulf of Bone Luwu Regency, South Sulawesi. *Journal of Scientific & Technology Research, 5*(5), 52– 58.

Harteman, E. (2015). Korelasi Panjang-Berat dan Faktor Kondisi Ikan Sembilang (*Plotosus canius*) di Estuaria Kalimantan Tengah. *Jurnal Ilmu Hewani Tropika, 4*(1), 6-11.

Indriyani, Y., Susiana S., & Rochmady R., (2020). Hubungan Panjang-Bobot dan Faktor Kondisi Ikan Baronang (*Siganus guttatus*, Bloch 1787) di Perairan Sei Carang, Kota Tanjungpinang, Indonesia. *Agrikan: Jurnal Agribisnis Perikanan, 13*(2), 327-333.

Jemi, Karlina, I., & Nugraha, A. H. (2022). Struktur Populasi Ikan Baronang pada Ekosistem Lamun di Pesisir Pulau Bintan. *Journal of Marine Research. 11*(1), 9-18

Jianguo, D. U., Yanguo, W., Teguh, P., Jianji, L., Christianus, M. P., Ricardo, H., Peilong, J. U., Hoe, L. O. H. K., & Bin, C. (2018). Tem-poral and Spatial Variation of Fish Community and Their Nursery In A Tro-Pical Seagrass Meadow. *Acta Oceano-logica Sinica, 37*(12), 63–72.

Khaeruddin. (2012). *Malaja' Ikan Pavorit Datu Luwu*. Palopo: Palopo Pos.

Marhayana, Halid, I., Bakti, F. K., & Halid, I. (2021). *Pengelolaan dan Pola Pemanfaatan Ekosistem Lamun untuk Perikanan Baronang Lingkis Berkelanjutan*. Yogyakarta (ID): Penerbit Deepublish.

Pertami, N. D., & Parawangsa, I. N. Y. (2021). Length-weight Relationship, Condition Factor, and Distribution of Spotted Barb (*Barbodes binotatus* Valencien-nes, 1842) in Lake Tamblingan Bali. *Jurnal Iktiologi Indonesia, 21*(2), 185-97.

Saleh, F A., Hammoud, V., Hussein, A. A., & Alhazzaa, R. (2012). On the Growth and Reproductive Biology of Asp, *Aspius vorax*, Population from the Middle Reachesof Euphrates River. *Turkish Journal of Fisheries and Aquatic Sciences, 12*, 149-156.

Sari, S. P., Budimawan, & La Nafie, Y. A. (2019). Struktur Jenis dan Ukuran Ikan Siganus spp. Pada Ekosistem Padang Lamun di Teluk Maccini Baji, Pulau Tanakeke, Kabupaten Takalar. *Jurnal Ilmu Kelautan, 5*(1), 29-36.

Sudarno, Asriyana, & Arami, H. (2018). Hu-bungan Panjang-Bobot Dan Faktor Kondisi Ikan Baronang (*Siganus* sp.) di Perairan Tondonggeu Kecamatan Abeli Kota Kendari. *Jurnal Sains dan Inovasi Perikanan, 2*(1), 30-39.

Turang, R., Watung, V. N. R., & Lohoo, A. V. (2019). Struktur Ukuran, Pola Pertumbuhan dan Faktor Kondisi Ikan Baronang (*Siganus canaliculatus*) dari Perairan Teluk Totok Kecamatan Ratatotok Kabupaten Minahasa Tenggara. *Jurnal Ilmiah Platax, 7*(1),193-201.