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Analysis of Length-Weight Relationship of Mackerel Scad Scad (*Decapterus* sp.) Landed in Ampenan Fish Market, West Nusa Tenggara Province

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ABSTRACT

The catch of fishermen around Ampenan waters is dominated by Mackerel scad and rucah. Fish caught by fishermen around Ampenan waters are usually landed at the Ampenan fish market to be traded. Mackerel scad (*Decapterus* sp.) is a pelagic fish that lives in groups and is spread out. Mackerel scad (*Decapterus* sp.) In addition to having a cheap price, Mackerel scad (*Decapterus* sp.) also has good nutritional value so that Mackerel scad is included in important economic products. The biological aspect in the form of the relationship between length and weight in Ampenan waters is important to study in efforts to manage fisheries in West Nusa Tenggara, especially Ampenan. Efforts to manage fisheries through fisheries biology information related to the relationship between length and weight aim to determine the variation in weight and length of Mackerel scad (*Decapterus* sp.) individually or in groups as an indicator of the productivity, health and growth conditions of Mackerel scad obtained in these waters. The study was conducted in March 2024 using survey methods and regression analysis. The number of samples used in this study was 50 Mackerel scad (*Decapterus* sp.) which were taken randomly at the Ampenan fish market. The results of linear regression and graphs of the relationship between the length and weight of Mackerel scad samples (*Decapterus* sp.) in this study produced a regression equation Y = 0.04855x 2.2973 with a coefficient of determination (r2) of 62% and a b value of 2.29, meaning b <3 which means negative allometric which means that length growth is faster than weight growth.

INTRODUCTION

Ampenan is one of the coastal areas in West Nusa Tenggara which has fisheries potential in the capture fisheries, cultivation and processing sectors.Ampenan has the characteristics of a coastal area with a coastline of approximately 11 km so that some of the Ampenan people work as fishermen (Wilandari *et al*., 2020) Fish obtained from Ampenan fishermen are usually landed to be traded at the Ampenan dawn market which is not far from the Ampenan

waters.The catch of fishermen around the Ampenan waters is dominated by Mackerel scad and rucah fish. Fish caught by fishermen around the Ampenan waters are usually landed at the Ampenan fish market to be traded. Mackerel scad (*Decapterus* sp.) is a pelagic fish that lives in groups and is spread out (Kusumanigrum *et al*., 2021). Mackerel scad (*Decapterus* sp.) In addition to having a cheap price, Mackerel scad (*Decapterus* sp.) also has good nutritional value so that Mackerel scad is included in important economic products. According to Br Perangin-angin *et al*.(2021)(Pinandita Faiz, 1998)(Perangin-angin *et al.*, 2021) the nutritional content of Mackerel scad is 22% protein, 1% fat and 109 calories of energy. In addition, based on the Central Statistics Agency (BPS) of Mataram City, Mackerel scad production in the Mataram city area in 2022 reached 38.39 tons, increasing in 2023 to 126.67 tons. This shows that the existence of Mackerel scad in Ampenan waters is still abundant, but this needs to be supported by data on the biological aspects of Mackerel scad which have not been widely studied.

Biological aspects in the form of length and weight relationships in Ampenan waters are important to study in efforts to manage fisheries in West Nusa Tenggara, especially Ampenan. Efforts to manage fisheries through fisheries biology information related to length and weight relationships aim to determine variations in weight and length of Mackerel scad (*Decapterus* sp.) individually or in groups as indicators of productivity, health and growth conditions of Mackerel scad obtained in these waters. Many researchers have conducted analyses of the relationship between length and weight in several fish, including research by Magwa *et al*., (2023) on Mackerel scad (*Decapterus russelli*) landed in Kaliadem and Muara Angke Market, Jakarta showed a negative allometric length relationship, while Muhammad et al., (2017) study showed that the blue Mackerel scad (*Decapterus macarellus* Cuvier, 1833) in the waters of Majene Regency, West Sulawesi was positive allometric where the increase in body weight was faster than the increase in body length. Based on the description above, it is necessary to conduct research on the analysis of the length-weight relationship in Mackerel scad (*Decapterus* sp.) to determine the length-weight relationship of Mackerel scad (*Decapterus* sp.) in Ampenan waters.

METHODS

Time and Place

This research was conducted in March 2024. The research sample was taken at Ampenan market. Length and weight measurements were carried out at the Fish Health Laboratory, Department of Fisheries and Marine Sciences, University of Mataram.

Tools and materials

The tools used are digital scales, rulers, stationery, trays and cameras (cellphones). Digital scales are used to weigh the weight of the sample fish with an accuracy of 1 gram and a ruler with an accuracy of 0.1 cm to measure the length of the sample fish. The materials used are 50 samples of Mackerel scad (*Decapterus* sp.) obtained at the landing site at the Bintaro Ampenan fish dawn market from collectors of catches from fishermen around the Ampenan waters.

Data analysis

Measurement data on the relationship between length and weight is expressed using a logarithmic formula, which is used to predict weight at length through an allometric equation based on (Mulfizar *et al*., 2012), namely:

$$W = \text{Log } a\ Lb$$

Where:
W : Heavy
a : Scalecoefficient for length at a given size
b : Parameterfor the body shape of the species being measured
The formula above is transformed into logarithmic form and a linear equation is obtained, namely:

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

Where:
W : Fish weight (grams)
L : Fish length (mm)
α : Intercept (intersection of the length-weight relationship curve with the Y-axis)
b : Length-weight growth pattern predictor.

The data obtained were analyzed using the analysis of regression design in Microsoft Excel.

RESULTS

The regression results of the relationship between length and weight of Mackerel scad (*Decapterus sp.*) can be seen in Table 1.

Table 1. Statistical Results of Regression of the Relationship between Length and Weight of the Flying Fish (*Decapterus sp.*)

Regression Statistics	
Multiple R	0.819725274
R Square	0.671949525
Adjusted R Square	0.66511514
Standard Error	0.515917229
Observations	50

The results of linear regression and graph (Figure 1) of the relationship between the length and weight of Mackerel scad samples (*Decapterus sp.*) landed at the Ampenan market produced a regression equation Y = 0.04855 x 2.2973 with a determination coefficient of 0.6857 and a b value of 2.29, meaning b <3.

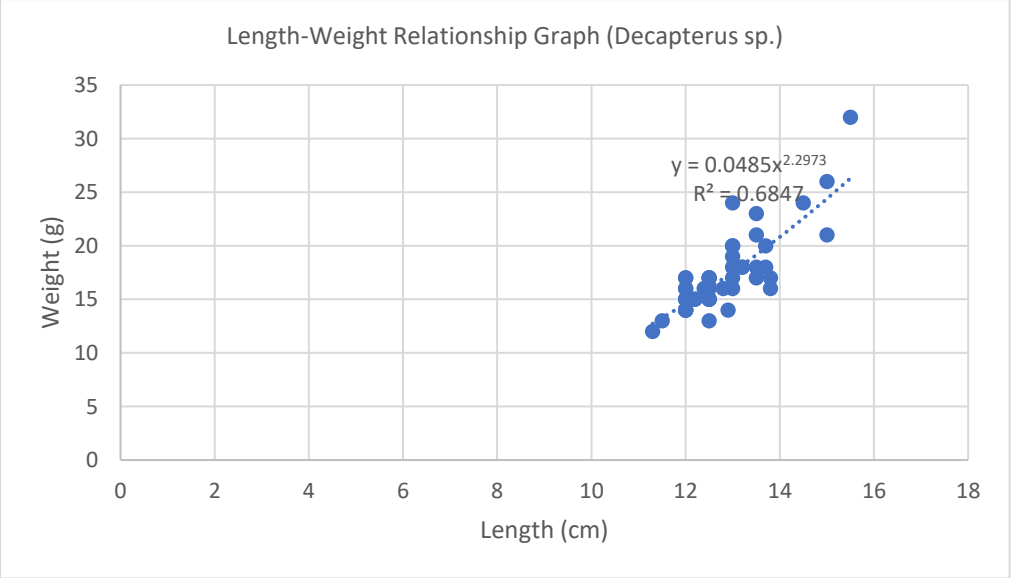

Figure 1. Length-Weight Relationship Graph (*Decapterus* sp.)

DISCUSSION

The weight measurement of the scad (*Decapterus* sp.) in this study ranged from 14-32 grams with a length of 12-15.5 cm. The results of the measurements of the scad in the study showed that the size of the fish was still not at the adult stage according to *Retnoningtyas et al*. (2024) adult scad has a length ranging from 19.40-38.20 cm with a weight ranging from 73.71-555.65 grams, while the length of adult female scad ranges from 17.20-32.50 cm and a weight ranging from 48.19-361.46 grams.*Polanunu et al*. (2020) stated that the difference in the number and size of scad in a population in waters can be due to growth patterns, migration and changes and additions of new fish in an existing scad population. The scad (*Decapterus* sp.) is one of the pelagic fish that are commonly found in Indonesian waters. This scad (*Decapterus* sp.) is in accordance with the statement of (Hasan & Afriani, 2021) who stated that the scad is a group of small pelagic fish that are available throughout the year without being affected by the season and are spread throughout Indonesian waters.

The Mackerel scad landed at the Ampenan market has a general morphology such as having a fusiform body, namely a long and flat body shape with a forked tail which is a characteristic of fast-swimming pelagic fish. This is in accordance with the statement of Setya & Susiloningtyas (2022) that Mackerel scad is included in small fish that are pelagic and a type of fast-swimming fish that like to flock and move (migrate). The Mackerel scad obtained in this study has the characteristics of a silver-white color on most of the body and a dark dorsal fin, the body is covered with fine scales that are round (cycloid). This is also found in the results of the morphometric study of the blue Mackerel scad Kusumanigrum *et al*., (2021); Karundeng *et al*. (2022) where the morphometric Mackerel scad has the characteristic of a black spot behind the operculum with a very fine circular scale shape (cycloid) on the upper body part which is metallic blue, the lower part is white and silvery on the pelvic fins. Sampling of Mackerel scad in this study was taken at the market Ampenan fish not far from Ampenan Beach. The existence of Mackerel scad in Ampenan waters is not surprising because this fish likes to move (migrate) according to (Winata, 2024) the existence of Mackerel scad is often found on the island of Lombok, this is evidenced by the many captures of Mackerel scad from small to juvenile age looking for food.

The length-weight relationship in fish refers to the correlation between the length of the fish's body and its weight. Usually, there is a certain pattern in fish growth where the size of its body (length) is directly proportional to its weight. The relationship between length and weight in some cases is not linear, but follows a more complex pattern that can be explained through mathematical equations, such as allometric equations. In other words, the longer the fish, the greater its weight.Based on the results of statistical regression of the relationship between the length and weight of Mackerel scad (*Decapterus* sp.) with the regression equation analysis, it was obtained that Log W=0.0485L 2.2973 with a correlation (R^2) = 0.6847 where the correlation value (R^2) states that the coefficient of determination R2 = 0.62 means that 62% of the increase in fish body weight occurs due to the increase in fish body length, while 38% of the increase in fish weight is caused by other factors. This is in line with the statement from Rofi'i *et al*. (2022) which states that the correlation R2 value approaching one means that the total length of the fish is directly proportional to the increase in fish weight, in the statement of Nur *et al*. (2017) stated that the relationship between this relationship proves that the total length of the fish affects the body weight of the Mackerel scad, and generally the increase in length is always followed by an increase in fish weight.

Based on the graph in Figure 1. it can be seen that the b value of the regression equation of the relationship between the length and weight of the Mackerel scad (*Decapterus* sp.) is b = 2.29, meaning the b value <3, so this shows that the growth pattern of Mackerel scad (*Decapterus* sp.) is negative allometric, where the growth in length is faster than its weight. This is in line with the statement from Pratama & Farhan (2023) who states that allometric growth patterns are divided into two, namely positive allometric and negative allometric. If the value of b < 3 is called negative allometric, namely, the increase in length is faster than the increase in weight, and if the value of b > 3 is called positive allometric, namely, the increase in weight is faster than the increase in length. Negative allometric growth patterns often occur when fish grow larger, but their weight gain is not proportional to their length gain. This is thought to be caused by several factors, including changes in body tissue proportions (such as muscle to fat ratio), different energy requirements at different stages of growth, or environmental factors that affect the efficiency of energy use. This is in line with the statement from Triantini *et al*., (2021) which states that differences in fish growth pattern values reflected in b values can be caused by various factors, such as differences in age, gonad development, sex, habitat conditions, stomach fullness, disease and parasite factors, food availability, pH, temperature, and dissolved oxygen in the waters, and the ability of fish to swim actively or passively. In addition, Mackerel scad is a pelagic fish that swims actively, this is also thought to affect the weight of Mackerel scad, this is in line with the statement of Hasan & Afriani (2021) the size of the b value can be influenced by the movement behavior of fish such as fish that actively swim (pelagic fish) show lower b values when compared to demersal fish that swim passively.

The growth pattern of the flying fish (*Decapterus* sp.) is also negatively allometric. found in the research of Magwa *et al*. (2023) obtained a relationship between the length and weight of the Mackerel scad (*Decapterus russelli*) landed in the Angke estuary in Jakarta of b = 2.17 which is negative allometric, the relationship between the length and weight of Mackerel scad (*Decapterus macrosoma.)* which is negative allometric can also be found in the research of Basir *et al.*, (2024) which was caught in the Banda Sea waters. The growth pattern of active warfish or pelagic fish tends to be negative allometric. However, not all Mackerel scad (*Decapterus* sp.) have a negative growth pattern, this is proven in the research of Senen & Aci (2020) in the waters of the Banda Islands; Romdoni *et al*. (2023) in the waters of

Sukabumi ; and Ima *et al*. (2023) in Banda waters showed that the growth pattern of Mackerel scad obtained positive Allometric with a b value > 3. Differences in the results of the relationship between the length and weight of fish can be caused by various environmental and biological factors that influence. According to (Soukotta *et al*., 2024) factors that influence the relationship between length and weight include temperature, feed availability, and fish health conditions play a role in influencing the relationship between body length and weight. As a result, the growth coefficient (b value) is not always at 3 and can change depending on environmental conditions and physiological aspects of the fish.

The relationship between fish length and weight is often complex and influenced by various factors. One of them is based on species factors, fish species have different proportions between their length and weight, with some species showing a linear relationship while others do not. Furthermore, environmental factors such as food availability, water temperature, water quality, and other environmental factors can affect fish growth. Good environmental conditions usually support optimal growth. This is in line with the statement of (Shasia *et al*., 2021) which states that differences in water types cause fish that live in flowing waters to spend more energy to carry out their foraging activities than fish that live in calm waters.

According to Katarina *et al*. (2021) genetic factors are internal factors that also contribute, because some individuals may have a genetic inheritance that makes them tend to grow larger or smaller. In addition, the availability and quality of food are external factors that influence the relationship between length and weight in fish growth, where access to abundant food sources and nutrients can affect body growth. According to (Ramses *et al*., 2020) the use of available food is used to increase growth and energy. Environmental factors such as water temperature, water quality, and population density also play a role, with a stable and conducive environment for growth tending to produce larger fish. This is in accordance with the statement of Tukan & Tallo (2021) namely environmental factors, fish development stage, sex, gonad maturity level. In addition, the age of the fish also plays an important role, because older fish tend to have larger body sizes and weights. However, stress and disease factors can also affect fish growth, with fish experiencing chronic stress or disease may not grow optimally. A thorough understanding of these length-weight relationship factors is important for understanding fish population dynamics, predicting population growth, and designing appropriate management strategies to ensure the sustainability of fishery resources.

CONCLUSION

This study concludes that the relationship between the length and weight of the Mackerel scad (*Decapterus sp.*) landed at the Ampenan market in Mataram City has a b value of 2.29, which means b <3 is negative allometric, where the growth in length is faster than the weight. The correlation value of the determination coefficient in this study is (R2) = 0.62, meaning that 62% of the increase in fish body weight occurs due to the increase in fish body length, while 38% of the increase in fish weight is caused by other factors.

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