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Growth Characteristics and Condition Factors Of Red Snapper (*Lutjanus campechanus*) Landed at PPI Cikidang Pangandaran West Java

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Abstract

Pangandaran waters is one of productive fishing ground for Indonesian fisheries. One of potential catch in this area is red snapper. Red snapper (*Lutjanus campechanus*) is a type of demersal fish. This species can live in shallow waters to deep seas. Growth measurement is carried out as an anticipation on the presence of overfishing which causes red snapper stocks to decline. Hence, current field work focused on the growth characteristics and factor conditions of red snapper which landed in PPI Cikidang Pangandaran west Java. Present study may provide information related on fish species production. The survey and observation methods were used to collect the data in February 2021. The sampling location was carried out at the PPI Cikidang, Pangandaran. The data of weight and length of red snapper landed at PPI Cikidang were recorded and analyzed descriptively. The results revealed that growth of red snapper landed at the PPI Cikidang was categorized as negative allometric with b < 3, at 1.92. The condition factor has an average of 1.29 which means that the fish are classified as fat or not flat.

Keywords: Growth Characteristics; Condition Factor; Red Snapper; *Lutjanus Campechanus*; PPI Cikidang.

Abstrak

Perairan Pangandaran merupakan salah satu daerah penangkapan ikan yang produktif bagi perikanan Indonesia. Salah satu potensi tangkapan di daerah ini adalah ikan kakap merah. Ikan kakap merah (*Lutjanus campechanus*) merupakan salah satu jenis ikan demersal. Spesies ini dapat hidup di perairan dangkal hingga laut dalam. Pengukuran pertumbuhan dilakukan sebagai antisipasi adanya overfishing yang menyebabkan stok ikan kakap merah menurun. Oleh karena itu, kerja lapangan saat ini difokuskan pada karakteristik pertumbuhan dan kondisi faktor ikan kakap merah yang didaratkan di PPI Cikidang Pangandaran Jawa Barat. Kajian ini dapat memberikan informasi terkait produksi spesies ikan. Pengambilan data dilakukan dengan metode survei dan observasi pada Februari 2021. Lokasi pengambilan sampel dilakukan di PPI Cikidang, Pangandaran. Data bobot dan panjang ikan kakap merah yang didaratkan di PPI Cikidang dicatat dan dianalisis secara deskriptif. Hasil penelitian menunjukkan bahwa pertumbuhan ikan kakap merah yang didaratkan di PPI Cikidang tergolong alometrik negatif dengan b < 3, sebesar 1,92. Faktor kondisi memiliki rata-rata 1,29 yang berarti ikan tergolong gemuk atau tidak pipih.

Keywords: Karakteristik Pertumbuhan; Factor Kondisi; Kakap Merah; *Lutjanus Campechanus*; PPI Cikidang.

1. Introduction

Red snapper is a type of demersal fish. These fish have relatively low movement activity, form groups that are relatively not large, migrate not far, and have a stable life cycle because the habitat on the seabed is relatively stable. Red snapper can live in shallow water areas to the deep sea (Dafiq *et al.,* 2019). Red snapper has high economic value and delicious meat taste. The total production of red snapper in Indonesia in 2015 reached 140,101 tons from the capture fisheries sector and 2,827 tons from the aquaculture sector (Department of Marine Fisheries, 2015). Foreign market demand for red snapper production in Indonesia also reaches more than 100,000 tons per year (Dafiq *et al.,* 2019).

The number of fishing activities and the high demand for red snapper can lead to high levels of exploitation. Therefore, better managements on fisheries resources are required in order to protect the number of the high demand of fish species such as red snapper

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remain sustainable and far from extinction. One of the red snapper landing sites in Indonesia is the Cikidang Fish Landing Base (PPI Cikidang). The Cikidang Fish Landing Base (PPI Cikidang) is located in Babakan Village, Pangandaran District. The number of fishermen who carry out fishing operations and anchor at PPI Cikidang, makes PPI Cikidang the ce

nter of capture fisheries activities in Pangandaran District (Syauqi *et al.,* 2020). As a form of anticipation of overfishing which causes the stock of red snapper in the waters to decrease, it is necessary to conduct a study regarding the growth characteristics and condition factors of red snapper as an effort to maintain its sustainability. It is also very important as an information base for sustainable management of fisheries resources. Therefore, the aim of study is to understand growth characteristics and condition factors of red snapper which landed at PPI Cikidang Pangandaran, West Java.

2. Material and methods

2.1 Materials

The materials used in this research includes digital scales, rulers, measuring instruments, writing instruments, millimetre block, and red snapper (*Lutjanus campechanus*) which landed at PPI Cikidang Pangandaran.

2.2 Method

The method used in this practical work is a field survey method. The survey was conducted by sampling red snapper (*Lutjanus campechanus*) with a random sampling method from fish caught by fishermen at PPI Cikidang Pangandaran. Primary data collection is done by measuring fish samples randomly as much as 20% of the fish catch red snapper (*Lutjanus campechanus*) off the ship in one day. Sampling was carried out at PPI Cikidang Pangandaran in February 2021.

2.3 Data Analysis

2.3.1 Length-Weight Relationship Analysis

First, red snapper is separated from other types of fish caught by fishermen at PPI Cikidang. The selected fish samples were measured for total length (TL) using a ruler and weighed using a digital scale. The length and weight of the fish were measured by the author. Second,The length-weight relationship was calculated using the equation according to Richter (2007) in Fafioye and Oluajo (2005):

$$W = aL^b$$

Information:
W = Fish weight (grams)
L = total length of fish (cm)
a and b = constant

When the general formula is transformed into logarithms, we will get the equation Log W = log a + b log L, which is a linear equation or a straight line equation. Then from the equation it can be determined the value of a, while W and L are known. Here's how to find Log a:

$$Log\ a = \frac{\sum \text{Log W x} \sum(\text{Log L})2 - \sum \text{Log L x} \sum(\text{Log L x Log W})}{\text{N x} \sum(\text{Log L})^2 - (\sum \text{Log L})^2}$$

The value of b is determined by the formula:

$$b = \frac{\sum \text{Log W} - (\text{N Log a})}{\sum \text{Log L}}$$

Based on the above calculation, the type of growth is determined based on the value of b. each value is interpreted, among others, namely the pattern of the length - weight relationship is positive allometric, if b > 3 (weight gain is faster than length gain), then isometric with a value of b = 3 (the increase in fish length and weight gain is balanced) and negative allometric , if b < 3 (length gain is faster than weight gain) (Effendie, 1979 in Prihatiningsih *et al.,* 2017).

2.3.2. Relative Weight and Condition Factor

The relative weight was calculated based on the Rypel and Richter (2008) equations as follows:

$$Wr = \frac{W}{Ws} x\ 100$$

Information :
Wr = relative weight
W = weight of each fish
Ws = predicted standard weight, where Ws = aLb
The Fulton Coefficient K (Fulton condition factor) was calculated based on Okgerman (2005) using the following formula:

$$K = WL\text{-}3 \times 100$$

Information :
K = Fulton's condition factor
W = weight of fish (g)
L = fish length (cm) and -3 is the length coefficient or correction factor.

3. Results and Discussion

3.1 Overview of Cikidang Fish Landing Base (PPI)

The Cikidang Fish Landing Base (PPI Cikidang) is located in Babakan Village, Pangandaran District. The number of fishermen who carry out fishing operations and anchor at PPI Cikidang, makes PPI Cikidang the center of capture fisheries activities in Pangandaran District. PPI Cikidang has five types of fishing business units, namely drift gillnets, liong buns, basic longlines, trammel nets, and vessel seines (Syauqi *et al.,* 2020).

3.2 Fish Catch Red Snapper (*Lutjanus campechanus)*

The number of red snapper that landed at PPI Cikidang in February 2021 was 18 fish. The low number of catches is influenced by the season. At the time of sampling was carried out in February and was in a famine season so that there was a decrease in the number of catches. This is in accordance with the statement Sondit et al., (2011) that the snapper (Lutjanus sp.) fishing season consists of three seasons, i.e. the peak season (July-October), the medium season (April-June), and the famine season (November-March).

In general, the oceanographic conditions of the waters in Indonesia are influenced by two seasons, namely the west monsoon and the east monsoon. Oceanographic conditions of the waters that change according to the seasons either directly or indirectly affect the productivity of the waters which in turn will affect the behavior of fish grouping. In the east season (June-August) the number of fish catches will increase because in the east season the wind blows is not too big so it does not cause big waves and is relatively calm so that many fishermen are fishing. In addition, in the east monsoon there is a movement of seawater masses which dynamically causes the oceanographic conditions in the waters to also change (Ningsih *et al.,* 2020). A high value of chlorophyll-a indicates a high value of water productivity. If the water productivity is high, the water area is an area that has a good food source. Therefore, the area will have a high density of fish considering the behavior of fish which tends to be distributed in places that have good food sources (Bayurini, 2006). While in the west season (December – February) the number of catches will decrease due to high wave conditions due to wind and very bad weather conditions. So that only a few fishermen who do fishing. In addition, in the west monsoon, the water temperature rises, the chlorophyll-a value and salinity are low so that not many demersal fish can be caught in the waters (Ningsih *et al.,* 2020). A low value of chlorophyll-a indicates a low value of water productivity. If the productivity of the waters is low, then the water area is an area that has poor food sources. Therefore the area will have a low fish density ikan (Bayurini, 2006).

Red snapper fishing areas are in rocky areas, sea near corals, have a depth of 10-40 m, sea surface temperatures range from 28 - 29.5°C, salinity ranges from 30-32‰ which is higher in waters that are farther from the shoreline, the degree of acidity ranges from 7 -

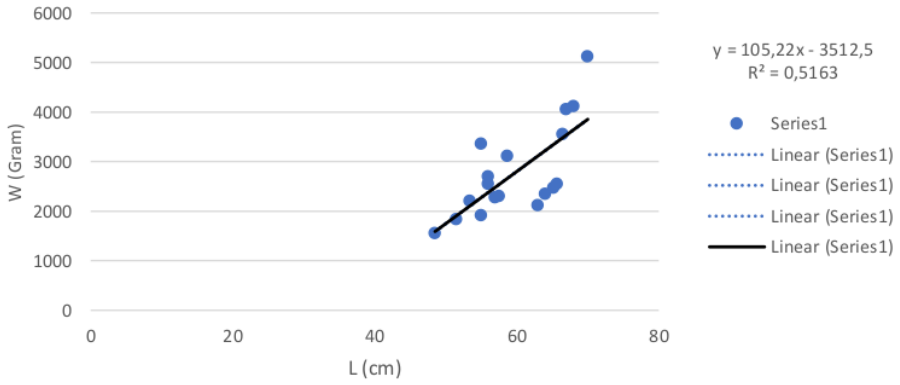

Figure 1. Graph of Relationship Length and Weight of Red Snapper (*Lutjanus campechanus)*

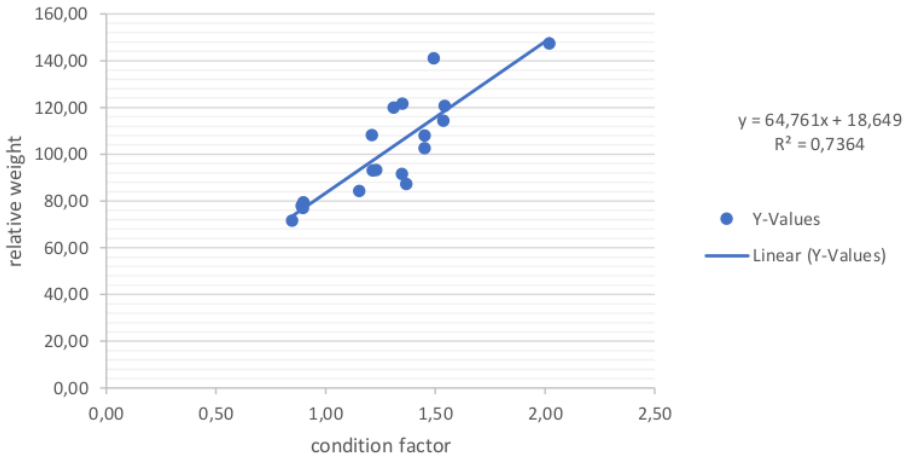

Figure 2. Graph of Relationship between Condition Factors and Relative Weight of Red Snapper (*Lutjanus campechanus*).

8, and the brightness of the waters ranges from 5 - 5.5 m with the deeper the brightness level in the waters that are farther from the shore (Noija *et al.,* 2014). The ideal size for catching red snapper is 54 – 57.6 cm (Mustofa, 2015). Based on the measurement of the length of the red snapper that landed at PPI Cikidang, the size of the red snapper is still in accordance with the ideal size of catching and there has not been overfishing in Pangandaran Waters. This is in accordance with the statement Noija *et al.,* (2014) that growth overfishing occurs when the catch is dominated by small fish or young fish.

3.3 The Relationship of Length and Weight of Red Snapper (*Lutjanus campechanus*)

The weight of the red snapper landed at PPI Cikidang ranged from 1,560 – 5,124 grams with an average of 2,789.1 grams. While the length of the red snapper ranges from 48.5 - 70 cm with an average of 59.89 cm. From the data from the measurement of the length and weight of the red snapper, the R^2 or determinant value of 0.5163 or 51.63% shows that the relationship between length and weight of red snapper has a moderate level of relationship (Fig.1). This is in accordance with the statement (Halin, 2017) that the coefficient interval 0 – 0.19 is very low, the coefficient interval 0.2 – 0.39 is low, the coefficient interval 0.4 – 0.59 is moderate, the coefficient interval 0.6 – 0.79 is strong, and the interval coefficient is 0.6 – 0.79. coefficient 0.79 – 1 is classified as very strong.Based on the graph above, the value of R^2 or the coefficient of determination is 0.5163 or 51.63% which shows the relationship between length and weight of red snapper has a moderate level of relationship. This explains that there is a fairly close relationship between length growth and fish weight. So if there is an increase in length it will be followed by an increase in weight. This is in accordance with the statement Wujdi et al., (2012) that the R^2 value close to 1 indicates that the relationship between length and weight is very close. Meanwhile, the R^2 value of 0.5 indicates that the relationship between length and weight is quite close.

Growth Characteristics *Red Snapper (Lutjanus campechanus)* Based on the results of practical work that has been carried out, data on growth characteristics are obtained Red snapper (*Lutjanus campechanus*) which landed at PPI Cikidang obtained a b value of 1.92. The value of $b < 3$ indicates the growth characteristics of red snapper is a negative allometric which indicates that the increase in length is more dominant than the increase in weight. This is in accordance with the statement (Hartini *et al.,* 2019) that if the value of $b < 3$ then it can be said that allometric is negative, if the value of $b = 3$ is isometric, and if the value of $b > 3$ is positive allometric. Factors that affect fish growth are food availability, temperature, dissolved oxygen, water quality, age and gonad maturity.

In a study entitled "Analysis of Catching Red Snapper and Grouper in Barru Waters, South Sulawesi" obtained growth characteristics of red snapper, namely positive allometric ($b > 3$)

with a total catch of 150 fish. The time of catching red snapper is done in October, which is during the peak season. The average length is 48.11 and the average weight is 1,800 *grams* (Sumiono et al., 2010). While at PPI Cikidang Pangandaran the growth characteristics of red snapper were allometric negative (b < 3). The time of catching red snapper is done in February, which is during the famine season. The difference in the growth characteristics of red snapper in PPI Cikidang and Barru Waters is thought to be due to the influence of food availability. In the lean season the water temperature increases, the chlorophyll-a and salinity values are low so that not many red snapper can be caught in the waters (Ningsih *et al.,* 2020). A low value of chlorophyll-a indicates a low value of water productivity. If the productivity of the waters is low, then the water area is an area that has poor food sources so that the growth characteristics are negative allometric. Meanwhile, October is the peak season. In this peak season there is a movement of seawater masses which dynamically causes the oceanographic conditions in the waters to also change, in the east monsoon an upwelling phenomenon occurs where an increase in seawater mass into the water column causes the temperature to be low, chlorophyll-a and salinity to be higher (Ningsih *et al.,* 2020). A high value of chlorophyll-a indicates a high value of water productivity. If the water productivity is high, then the water area is an area that has good food sources so that the growth characteristics are positive allometric. This is in accordance with the statement This is in accordance with the statement (Hartini *et al.,* 2019) that the factors that affect the growth of fish are the availability of food, temperature, dissolved oxygen, water quality, age and maturity of the gonads.

3.4 Condition Factors and Relative Weight of Red Snapper (*Lutjanus campechanus*)

Based on the results practical work that has been done obtained the value of relative weight. The red snapper (*Lutjanus campechanus*) landed at PPI Cikidang ranged from 71.5 to 147.4. The average relative weight (Wr) in Pangandaran waters is more than 100 which can be indicated by Pangandaran waters supporting the growth of red snapper. This is in accordance with the statement Gani et al., (2020) The relative weight (Wr) and coefficient (K) of the condition factors were used to evaluate the value of the condition factors of each individual. The observed average weight value (W) is lower than the predicted average weight value (Ws) or the relative weight (Wr) less than 100 can indicate that the waters are less supportive for growth and vice versa.

The results of the calculation of condition factors obtained from this practical work ranged from 0.85 to 2.02 with an average of 1.29**.** The condition factor value states that the fish is classified as less flat or fat. This is in accordance with the statement of Effendie (2002), that the K value in slightly flat-bodied fish ranges from 2 to 4 while in less flat fish it ranges from 1 to 3. The growth shows that the length increase is more dominant than the weight. It is suspected that one of the effects is that the fish caught are dominantly female and the gonads mature so that the condition factor value is classified as less flat. This is in accordance with the statement Aisyah *et al.,* (2017) that the increase in the value of the condition factor can occur along with the increase in gonadal maturity and will reach its peak before spawning occurs. A high condition factor in fish indicates that the fish is in gonad development, while a low condition factor indicates that the fish is not getting enough food intake. The difference in the value of this condition factor can be influenced by differences in age, environmental conditions, gonadal maturity level, food availability and behavior.

The relationship factor value of the condition was calculated based on the average of the relative weights. The calculation results show that the relative weight value obtained is an average of 102.2. The average value of the condition factor is 1.29, which means the fish are classified as less flat. The results of the regression analysis from the graph of the relationship between relative weight and condition factors get a determinant value of 0.7364 or 73.64% (Fig. 2). This shows that the relative weight relationship with the condition factor of red snapper is included in the strong category. This is in accordance with the statement Wujdi et al., (2012) that the R^2 value close to 1 indicates that the relationship between length and weight is very close. Meanwhile, the R^2 value of 0.5 indicates that the relationship between length and weight is quite close.

4. Conclusions

Current study suggested that the characteristics of the red snapper's growth landed at PPI Cikidang was negative allometric, and the condition factors value showed that the environment still full fill the requirement as a healthy habitat for the red snapper. Current experiment was a first step to observe the overfishing state of the captured fisheries based on the morphometric characteristic. Further study related to the state of overfishing of the

capture fisheries resource at PPI Cikidang are required to be investigated.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6