Global Scientific JOURNALS

GSJ: Volume 8, Issue 1, January 2020, Online: ISSN 2320-9186

www.globalscientificjournal.com

Growth Pattern of Silver Barb, *Barbonymus gonionotus* (Bleeker, 1950) in Downstream Cimanuk River of West Java Province

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ABSTRACT

Silver Barb (*Barbonymus gonionotus*) is one of the original fish in Indonesian waters, an important economical fish. Cimanuk River is one of the second largest rivers in West Java Province, upstream of Cimanuk River is in the Papandayan Mountain in Garut Regency and downstream which empties into the Java Sea in Indramayu Regency. Silver Barb are native fish of Indonesia, Silver Barb classified into species protected according to the IUCN red list with the category LC (Least Concern). Silver Barb in nature is difficult to find, allegedly due to drastic changes in environmental conditions. The research aims to analyze the growth pattern of Silver Barb in the downstream of the Cimanuk River in West Java Province in December 2018 until February 2019. This research uses field observation methods and census sampling techniques, sampling at coordinates between 6°39'38.01 " LS 107°13'52.33 " BT to 6°16'25.26 " LS 108°14'5.17 'BT. Silver Barb caught in the waters of the Cimanuk River consists of seven size classes. The smallest size has a size between 70-93 mm by 16% is a fish that is still in the growth stage. Fish growth patterns follow the regression equation $\text{Log } W = 3.2933 \text{ Log } L^{-5.5068}$. Value b = 3.2933 Silver Barb growth pattern is positive allometric, weight gain is faster than length increase. Condition factors of Silver Barb range from 1.05 to 3.17, fish with a total length between 94 mm - 117 mm have an optimum condition factor, with a condition factor value of 3,17. Silver Barb with a length of more than 117 mm, the condition has decreased.

Keywords: Positive Allometrics, Downstream of Cimanuk River, Growth, Weight Length, Silver Barb.

1. INTRODUCTION

The Cimanuk River is one of three major rivers in West Java Province and the Cimanuk River is the second largest river after the Citarum River which has a river length of about 358 km (Sjafei et al. 2001). The Cimanuk River Basin (DAS), passes through four districts namely Garut, Majalengka, Cirebon and Indramayu Regencies which consist of 68 sub-districts with an area of about 3.409.17 km2 (Andani 2016).

Sjafei et al. (2001) stated that in the Cimanuk River in the downstream / estuary segment (Indramayu) 15 species of fish were found. One of them is Silver Barb, Silver Barb is one of the natural wealth of Indonesian waters. Silver Barb into fish that is easily adaptable so that variations can occur easily. Variation is caused by isolation, which is a biological characteristic that can cause sympathetic species (species that occupy the same geographical area or species that cover each other with their distribution area) to survive (Widodo 2003).

Silver Barb is a native fish of Indonesia which has a natural habitat in watersheds with heavy currents. Silver Barb easily breed in nature and are not difficult to develop in ponds and rice fields (Susanto 2000). Silver Barb is included in the IUCN Red list in the Least Concern (LC) category, LC is the IUCN category given to species that have been evaluated but not in the threatened or near endangered category or conservation dependency. But in the Silver Barb realm is already difficult to find, allegedly because of the large number of fishing activities and environmental conditions that change dramatically.

Thus the Silver Barb population in the Cimanuk River is rare and there is no research on its growth and other biological aspects, therefore research is carried out on the growth pattern of Silver Barb downstream of the Cimanuk River in West Java Province as a basic ingredient in the management of fisheries resources in the Cimanuk River.

2. METHODOLOGY

2.1 Time and Place

The research was carried out in the Cimanuk River downstream from the Weirs of the Majalengka Regency to Indramayu Regency, West Java Province in December 2018 until February 2019. with consideration of easy access to locations and fishing activities are easily found. The research was carried out by taking three samples as a repetition. The sampling period is only once a month. A map of the research location can be seen in Figure 1.

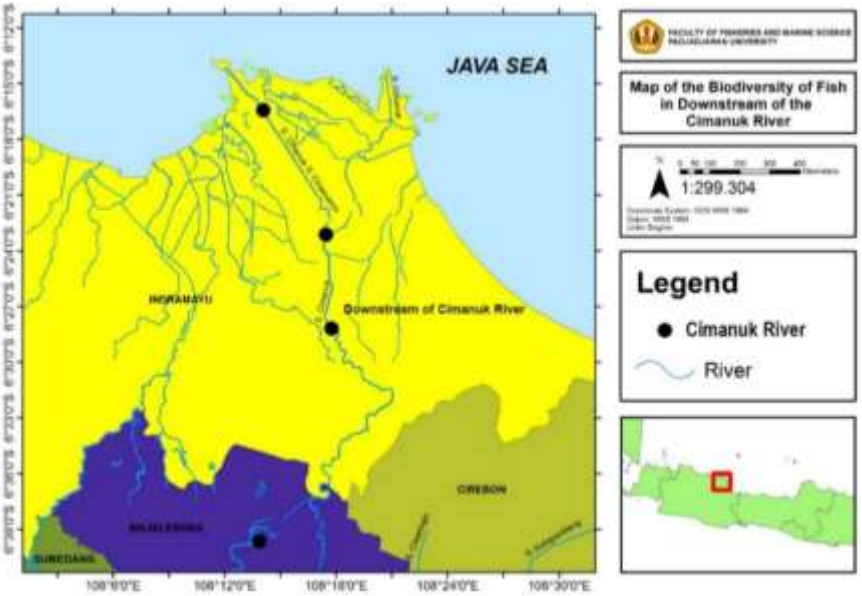

Figure 1. Map of Research Location in Downstream Cimanuk River

2.2 Methods and Data collection

Silver Barb primary data collection was obtained using field observation methods and sampling techniques by purposive sampling. Data collected includes observations on aspects of the length and weight of Silver Barb samples downstream of the Cimanuk River. The catch fish was analyzed to find out the growth aspects in the Laboratory of Aquatic Animal Physiology, Faculty of Fisheries and Marine Sciences, Padjadjaran University. The tools used are digital scales (0.01 g accuracy), millimeter blocks and rulers. The material used is Silver Barb as an object of observation.

2.3 Data analysis

Fish growth patterns can be determined by calculating the length-weight relationship using the equation (Effendie 1979) as follows:

$$W = aL^b \quad \text{.....(1)}$$

Information:
W = Fish Weight (grams);
L = Fish Length (mm);
a, b = Constant Factor.

The value of b refers to the appropriate criteria (Ricker 1975) (Effendie, 1979), which is as follows:
1. If b = 3, fish have an isometric growth pattern.
2. If b ≠ 3, fish have an allometric growth pattern.
3. If b > 3, allometric growth pattern is positive (weight growth is more dominant).
4. If b < 3, allometric growth pattern is negative (long growth is more dominant).

Regression equations are used to analyze the relationship between length and weight. the effect of each variable is known by analyzing the coefficient of determination (R^2) and the correlation value (r) is used to analyze the level of relationship closeness between variables. The suitability of the environment with the fish's living conditions is analyzed by the condition factor or the Ponderal index. The calculation of the condition factor or Ponderal Index uses a metric system (K) that refers to the calculation according to Effendi (1979):

$$K_n = \frac{W}{aL^b} \quad \text{.....(2)}$$

Information:
K = Condition Factor;
W = Average Fish Weight (grams);
L = Average Fish Length (mm).

3. RESULTS AND DISCUSSION

3.1 Length and Weight Distribution

The results of measurements of length and weight of Silver Barb fish obtained 68 fish samples grouped in seven classes that can be seen in (Figures 2 and 3).

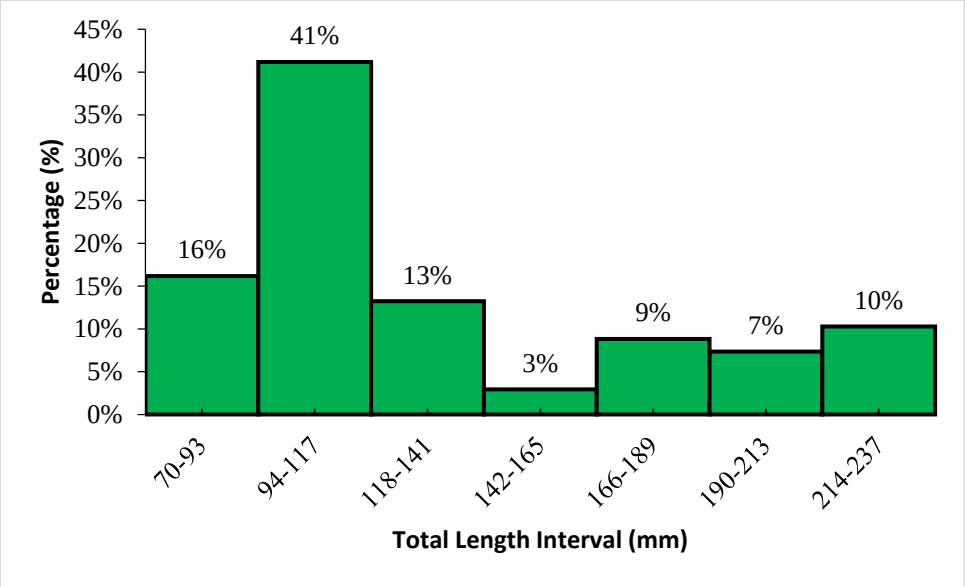

Figure 2. Total Length Distribution

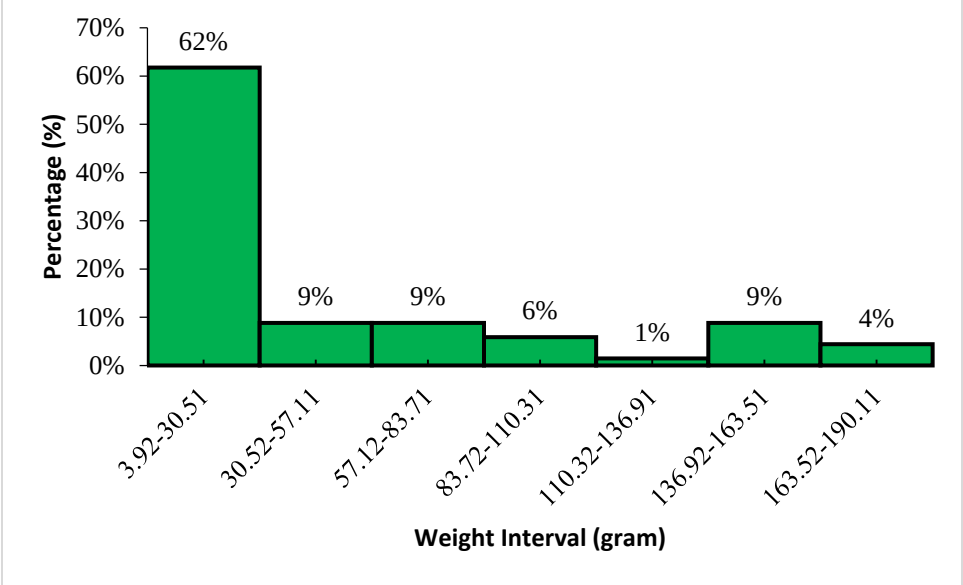

Figure 3. Total Weight Distribution

Silver Barb length distribution is mostly in the second class with a long interval between 94-117 mm with a percentage of 41%, the first class at 16%, the third class at 13%, the fourth class at 3%, the fifth class at 9%, the sixth grade is 7%, and the seventh grade is 10%. Based on the results of length measurements, the smallest Silver Barb fish caught has a total length of 70 mm and the largest fish caught has a total length of 236 mm. Compared with Syaiful (2019) who researched the Cipanas Reservoir plan of West Java Province, that the smallest Silver Barb fish caught in the Cipanas River had a total length of 125 mm and the largest fish caught had a total length of 278 mm. The maximum total length of a Silver Barb fish according to a FishBase is 40.5 cm for a long Silver Barb male.

The most weight distribution of Silver Barb fish is in the first class with a weight interval between 3.92-30.51 mm with a percentage of 62%, the second class at 9%, the third class at 9%, the fourth class at 6%, the class the fifth is 1%, the sixth grade is 9%, and the seventh

grade is 4%. Based on the weight measurement results, the smallest Silver Barb fish caught has a weight of 3.92 grams and the largest fish caught has a weight size of 187 grams. Compared with Syaiful (2019) who researched the Cipanas Reservoir plan of West Java Province, that the smallest Silver Barb fish caught in the Cipanas River weighs 28 grams and the largest fish caught weights 346 grams. The difference in size is thought to be due to the different environment or geographical location of the Silver Barb fish. Mejri et al., (2012) states that geographic isolation between populations can result in differences in morphometric and genetic characters both caused by gene drift and differences in environmental conditions.

3.2 Relationship Length and Weight

The relationship between length and weight of Silver Barb is calculated to find out the linear equation of the length and weight of the fish measured, and to know the regression and correlation of length and weight relationships of fish (Effendi 2002). The length and weight relationship of Silver Barb fish caught downstream of the Cimanuk River with a linear equation, namely Log W = 3.2933 Log L – 5.5068, can be seen in (Figure 4).

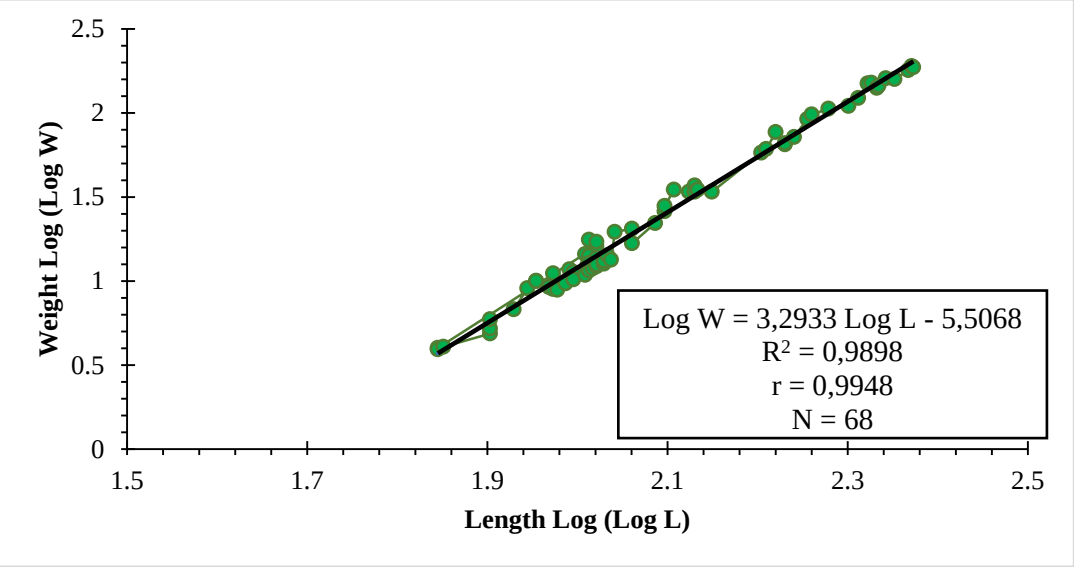

Figure 4. Relationship between Length and Weight of Silver Barb Fish

The relationship between length and weight of Silver Barb fish showed an R^2 value of 0.9898, which means that 98% of fish length affects fish weight and 2% is influenced by environmental factors. The correlation value is obtained from the root of the regression value. The value of r indicates 0.9948 which means that the associative level between the length and weight of the Silver Barb fish is close to the perfect value of r = 1. The closer to one, the long and heavy the relationship of Silver Barb fish has a high associative level or the closeness is very good. The value of b on the graph of the relationship between length and weight of the Silver Barb fish shows a (b) value of 3.2933, which means that the Silver Barb fish is positive allometric, ie the growth of weights is faster than the growth of length.

Compared to (Syaiful 2019) who researched the Cipanas Reservoir plan, that Silver Barb fish is included in fish that have positive allometric growth seen from the b value of 3.1692. This is thought to be because there are similarities in habitat and feed availability in these waters. Cimanuk River conditions are quite wide and calm to make Silver Barb fish not swim too actively so that the fish are easily caught. Strengthened by the statement Kusmini et al. (2014) that, a positive allometric growth pattern there is a tendency for fish to be more silent, so there is

an accumulation of energy and this condition is used for the formation of new cells so that an increase in body mass of the fish.

3.3 Condition Factors

Silver Barb fish condition factors that have been measured, it can be seen that fish in the interval between 94-117 mm have an optimum condition factor with a condition factor value of 3.17. The minimum value is found in the interval between 214-237 mm with a condition factor value of 1.05. The highest condition factor can indicate that fish are in gonad development, whereas the lowest condition factor indicates that fish have undergone a spawning process. Effendi (2002) states, that the condition factor is influenced by gender, season and location of capture. Catching season and location and condition factors are also influenced by the level of gonad maturity and abundance of food in these waters.

Compared with Syaiful (2019) who researched the Cipanas Reservoir Plan that the value factor of Silver Barb fish conditions ranged from 0.82 to 1.72, it was said that the growth and weight of Silver Barb were directly proportional to the increase in length. The condition factor graph can be seen in Figure 5.

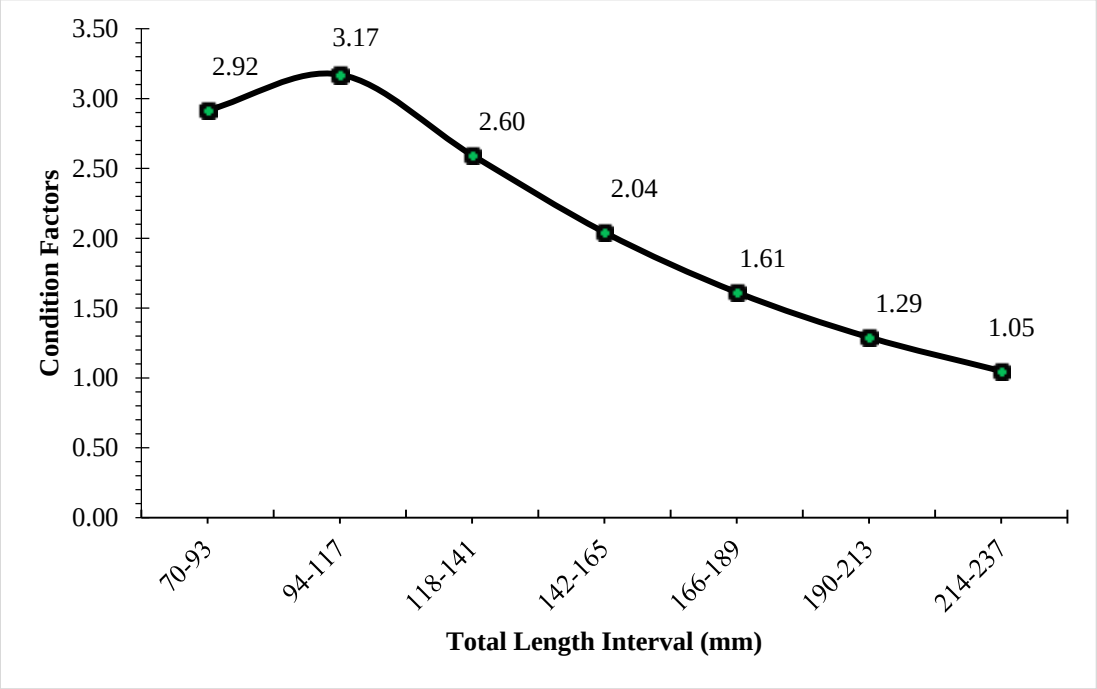

Figure 5. Factors Condition of Silver Barb Fish

The condition factor values obtained during the study showed a decrease along with the increase in the total length of the fish. In contrast to the research of Andy Omar et al (2012) on Silver Barb fish (*Barbonymus gonionotus*) in Lake Sidenreng waters, South Sulawesi, the condition of the condition increases with increasing total fish length. The condition factor values on the graph range from 1.05 - 3.17, when associated with growth patterns the Silver Barb fish has a thin and fat body, as seen from (k) value of less than three (thin) and more than three (fat).

Increasing the condition factor will be in line with the increase in fish weight. This is by the statement (Hutomo et. Al 1985 in Syaiful 2019), stating that the condition factor will decrease in line with the length of the fish. This can be caused by other factors, such as spawning time, energy used for gonad maturity so that it affects the total weight of the fish.

Herawati (2017) states that the condition factor is not constant at any time because it is influenced by biotic and abiotic factors.

Conclusion

Based on research results downstream of the Cimanuk River from 68 fish caught, it can be concluded that:

1. The growth pattern of Silver Barb (*Barbonymus gonionotus*) is positive allometric where the weight growth is faster than the long growth, with a (b) value of 3.2933.
2. Silver Barb fish with a total length of between 94 – 117 mm have the highest condition factor (k) value of 3.17.

Acknowledgment

We thank full the Faculty of Fisheries and Marine Sciences, Padjadjaran University, Indonesia for making this research possible.

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