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Growth Pattern of Barb (*Barbodes balleroides*) at the Period of Inundation in Jatigede Reservoir, Sumedang Regency, West Java

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ABSTRACT

The purpose of this research is to determine the growth pattern of Barb (*Barbodes balleroides*) in the Jatigede reservoir, Sumedang regency Province of West Java at the period of inundation. The research was conducted using the survey method in April and June 2016. Fish identification, and data analysis was performed at Laboratory of Aquatic Resource Management Padjadjaran University. Data analysis included: size distribution, the length and weight relationship, and the condition factor using the method of Fisheries Biology. The largest groups of Barb were caught in April (sized 128-145 mm and 146-163 mm, 25% each) and June (sized 146-160 mm, 53%). Barb growth pattern in April follow the regression equation of y = 2,8753x – 4,5568 b = 2,8753, W= 3.10^{-5}. $L^{2,8753}$, whereas in June y = 2,8105x – 4,3927, b = 2.8105, W= 4.10^{-5}. $L^{2,8105}$. The pattern of growth was allometrically negative, indicating that growth in length was greater than growth in weight. Based on the present data, it can be concluded that Barb population caught in the Reservoir at the beginning of Jatigede inundations consisted of 6 - 7 size classes. Consideration for a correct environmental management are reported.

Keywords: Barb, environmental management, growth, jatigede reservoir, length, weight

INTRODUCTION

Jatigede reservoir was built in Sumedang and inaugurated on 31 August 2015. Jatigede reservoir includes 4 subdistricts with a total area of 3 035.34 ha (Centre Research of River Cimanuk-Cisanggarung [CRRCC], 2016). This reservoir was built with a steam flow from the Cimanuk River in Jatigede District, Sumedang Regency. Jatigede Reservoir is used for irrigation, serving a total area of 90 000 ha in the northern coast

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of West Java, water power plant with a capacity of 110 Mega Watt, and a reservoir of fresh water with a capacity of 3,500 litre per second serving Sumedang, Indramayu, Majalengka and Cirebon (CRRCC, 2016). Jatigede reservoir is also a tourist attraction and fisheries. The fish caught and identified in the Jatigede reservoir are from 9 families and consist of 17 species of fish; Lalawak/ barbs (*Barbodes balleroides*), Seren/seren Javanese (*Cyclocheilichthys repasson*), Hampal/Hampala barb (*Hampala macrolepidota*), Genggehek/Wader (*Mystacoleucus marginatus*), Nilem/Nilem Carp (*Osteochilus hasseltii*), Hike/Nilem Carp (*Osteochilus microcephalus*), Paray/ Carp (*Rasbora argyrotaenia*), Tawes/Barb (*Barbodes gonionotus*), Nila/Nile Tilapia (*Oreochromis niloticus*), Mujair/Nile (*Oreochromis mosambicus*), Sepat/Three Spot Gouramy (*Trichogaster pectoralis*), Gabus/Snakeheads (*Channa striata*), Sapu-sapu/ (*Liposarcus pardalis*), Patin/Strifed Catfish (*Pangasius hypophthalamus*), Senggal/catfishes (*Mystus nemurus*), Bandeng/Milkfish (*Chanos chanos*), Berod/ Spiny Eels (*Mastacembelus erythrotaenia*) (Andani 2016).

Barb is an indigenous fish species of the Cimanuk River. At the beginning of the inundation of Jatigede reservoir, this fish has adapted to changes in the ecosystem, from flowing water (lotic) to the inundated water (lentic). This species appears to be dominant, with a density of 27.50% evenly spread. The diet is mainly based on detritus (66.30%), integrated with Chlorophyceae 19.89%, Copepoda 12.15%, and Chrysophyceae (1.66%) (Herawati et al., 2016).

Sjafei et al. (2001) indicated Barb has the potential to become a species for habitual consumption. However, even though it is not classified as an endangered species it nevertheless requires suitable environmental management measures since in some areas their numbers have declined quite rapidly. The aim of this study is to examine the growth pattern of Barb to ensure its sustainability in the Jatigede Reservoir.

MATERIALS AND METHODS

The study was conducted in April and June 2016, in the following stations of the Jatigede Reservoir, West Java Province (Figure 1):

Station I: Jatigede waters area is at coordinates 6^0 51' 41" S, 108^0 6' 5" E,
Station II: Jatigede waters area is at coordinates 6^0 52'22" S, 108^0 6'48" E,
Station III: Jatigede is at coordinates 6^0 52'12 S, 108^0 5'10" E

Measurement and analysis of growth data were conducted in the Aquaculture Laboratory of Faculty of Fisheries and Marine Sciences, Padjadjaran University.

A survey method was used in this research using purposive sampling and census.

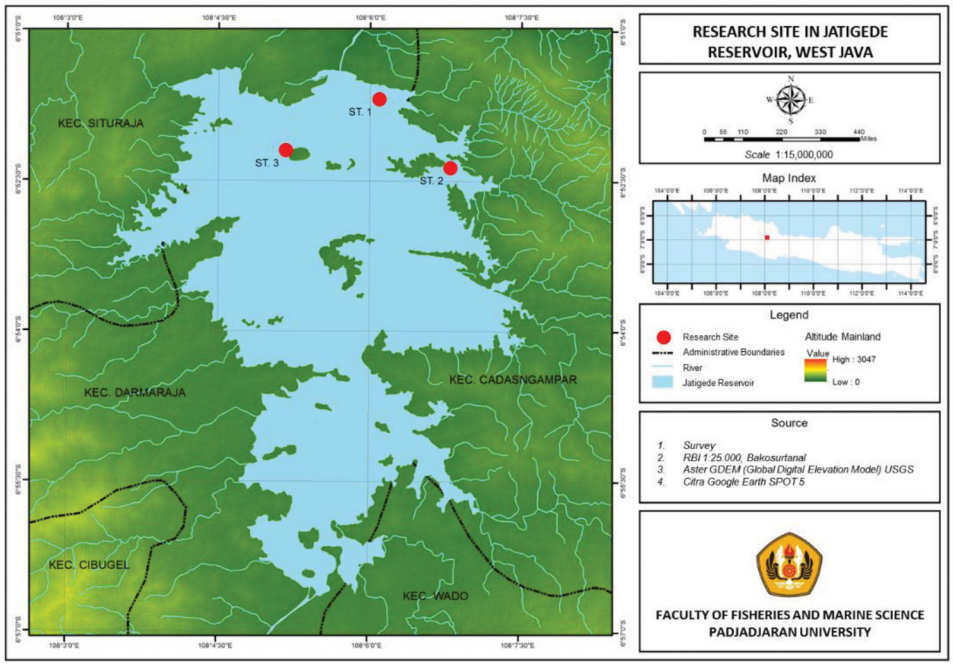


Figure 1. Research site in Jatigede Reservoir, West Java, Indonesia

Materials

A total of 79 specimens of Barb, 60 caught in April 2016 and 19 in June 2016, were employed. Instruments, used were: gillnets, electric scales (accuracy at 0.1 g), ruler (1 mm accuracy) and millimetre block (1 mm accuracy).

Method

The fish were caught using gillnets. Soon after capture they brought to the lab of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences Universitas Padjadjaran Jatinangor for measurement of the standard length, fork length and total length and weight.

Data Analysis

Determination of the growth pattern was done with calculation of length and weight relationship described in the form of the line equation (Effendie, 1979; Mamangkey, 2017; Herawati, 2017) as below:

$$W = a.L^b \quad [1]$$

Where: W = Weight (g)
L = Length (mm)
a,b = constants

Testing against the b values with decision making criteria according to Ricker (1975) in Effendie (1979). Testing against the b values with decision making criteria according to Ricker (1975) in Effendie (1979) :

If $t_{hit} < t_{tab}$ (0,05), then b = 3, Isometric growth pattern

If $t_{hit} > t_{tab}$ (0,05), then b ≠ 3, Allometric growth pattern

Length and weight relationship was analysed using regression equations. The influence of each variable was calculated by the coefficient of determination (R^2), and the level of relationships between variables by the correlation value (r). A value correlation between 0.80 – 1.00 was considered indicative of a very strong relationships between variables (Sugiyono, 2005).

Calculation of condition factor or ponderal index was carried out using metric system (K), according to Effendie (1979), and Herawati (2017):

$$\mathbf{K_n = \frac{W}{aL^b}} \quad [2]$$

Where:
K = Condition factor
W = The average weight of the fish (g)
L = The average length of the fish (mm)

RESULTS AND DISCUSSION

Weight Distribution

The total length of Barb caught in April 2016 ranged between 110 and 235 mm. According to the total length classes employed for the Sturge (Sudrajat & Achyar, 2010), 7 total length size class intervals were obtained (Figure 2a). the highest density (25%) belonging to the class intervals of 128-145 mm and 146-163 mm. Fish within the class interval of 218-235 mm showed the lowest density (2%). Fish within the class interval of 182-199 mm were not found.

Barb caught in June 2016 showed a total length ranging between 131 and 220 mm (Figure 2b). The highest density (53%) was found in the class interval of 146-160 mm. The class intervals of 131-145 and 176-190 mm showed the lowest density (5%).

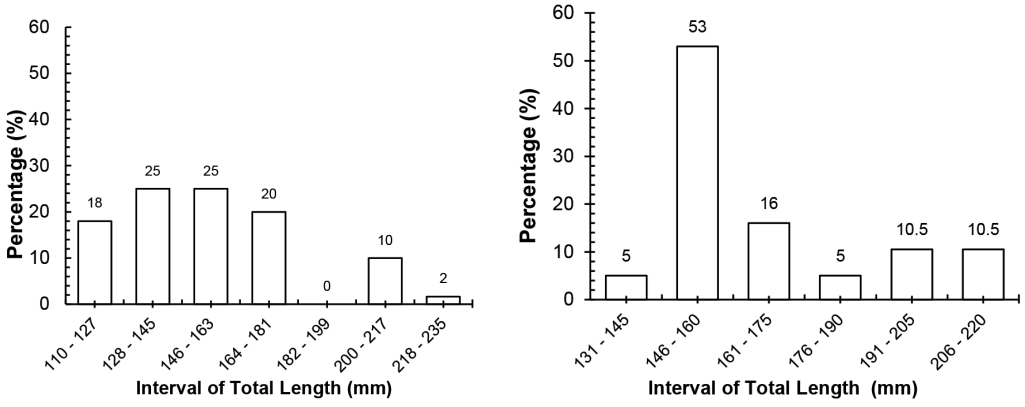


Figure 2. Total barb length distribution in (a) April and (b) June 2016

Relationship between Weight and Length

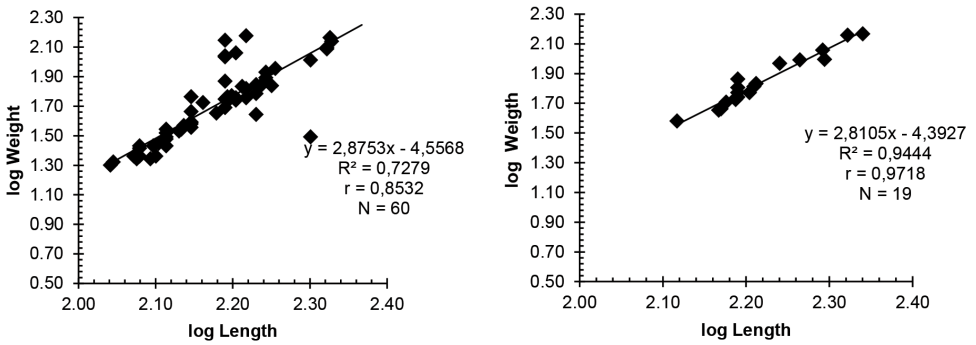
The results of the regression analysis on the relationship of Barb's length and weight are shown in Figures 3a and 3b. The relationship between length and weights of Barb in April followed a logarithmic equation y = 2,8753x – 4,5568 with coefficient of determination (R^2) = 0,7279, indicating that 72,79% of fish weight was influenced by length, and 27,21% was influenced by other factors. The coefficient of correlation (r) = 0,8532 indicate a strong relationship between length and weight. The relationship between length and weight of Barb in June followed a logarithmic equation y = 2,8105x – 4,3927 with coefficient of determination (R^2) = 0,9444, indicating that 94,44% of fish weight was influenced by length, and 5,56% was influenced by other factors. The coefficient of correlation (r) = 0,9718 indicate a strong relationship between weight and length.

Fish growth pattern can be determined from the b value that can be obtained in the regression line. Both in April and June, Barb was allometrically negative and have a very strong correlation (Figure 3a and 3b). Barb growth pattern in April followed the equation $W= 3.10^{-5}. L^{2, 8753}$ (r = 0,8532) and the pattern of growth in June followed the equation $W= 4.10^{-5}. L^{2,8105}$ (r = 0,9718).

The t-test analysis (at 95% of confident) value $t_{hit} > t_{tab\ (0,05)}$), indicates a pattern of growth allometrically negative (b≠3) in Barb, both in April and June. In synthesis this means that length increased more than weight. In April, the b value was 2, 8753 (t_{hit} = 10,048 > $t_{tab\ (0,05)}$ = 2,002 (Figure 4a). In June the b value was 2, 8105 (t_{hit} = 14,511 > $t_{tab\ (0,05)}$ = 2,110 (figure 4b). According to the b value, in the Barb caught in April the body weight wad larger than the body weight of Barb caught in June. This outcome can be explained by the fact that in April the area of Jatigede reservoirs is vast while the water is shallow, the availability of feed in the form of detritus is abundant and fish need small effort to feed , allowing for weight gain.

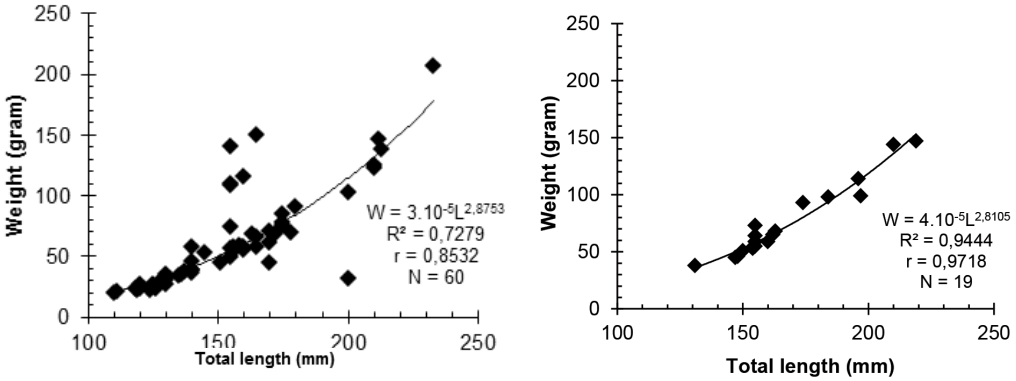
According to Effendie (1979) the relationship between length and weigh can change over time. This is likely due to environmental changes which have an impact on the availability of food. Moreover, Meretsky et al. (2000) reported that the weight change can result from feed change and allocation of energy between growth and reproduction resulting in differences in fish weight despite no changes in in their length.

This consideration is reinforced by Muchlisin et al. (2010), who showed that fish which swim actively have a b values lower compared with fish that swim passively; and likely the result of differences in the allocation of energy between movement and growth.



(a) (b)

Figure 3. Barb length and weight relationship in (a) April and (b) June 2016



(a) (b)

Figure 4. Barb length and weight relationship in (a) April and (b) June 2016

Condition Factor

The condition factor of Barb caught in April ranged between 0,87-1,24 where in June ranged between 1,01-1,20 (Figure 5a and 5b). Average condition factor of Barb increased from 1,09 in April to 1,12 to June. The condition factor increased in line with eight. This is not in agreement with Ali (1981) in Hutomo et al. (1985) who mentioned that the condition factor declines in line with the increase in length. Thus indicating weight maybe affected by time of spawning where the weight of the gonads affects the total weight of the fish.

According to Effendie (1979), the value of the condition factor is influenced by many factors, such the number of organisms in the environment and the health of the organism, the availability of food and the condition of the aquatic environment. The higher the value of the condition factor the stronger the match between fish and the environment.

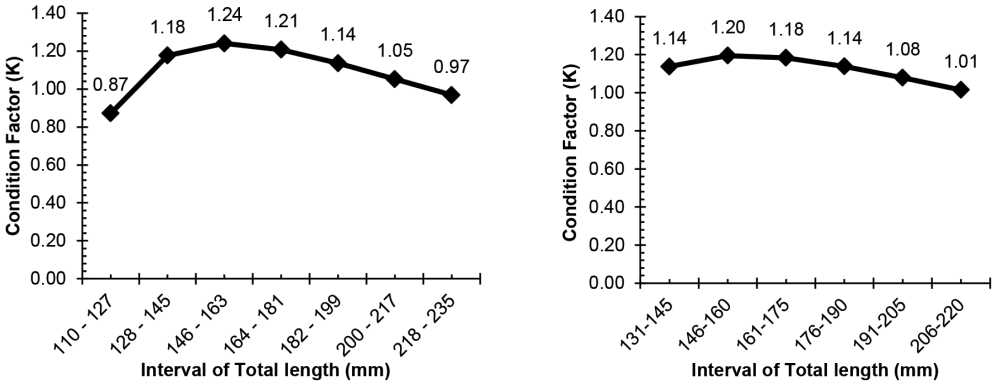


Figure 5. Barb conditional factor to (a) male fishes and (b) female fishes

CONCLUSION

Based on the results of this study, it can be concluded that Barb caught in the Reservoirs at the beginning of Jatigede inundation can be classified into 6-7 size category. The growth is allometrically negative, and Barb with the same length in April are heavier than those caught in June. However, more research on the specie reproductive pattern is needed in order for general guidelines on its management to be provided.

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