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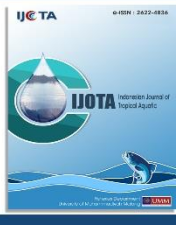

Study of the long weight of baderbang fish (*Barbodes schwanenfeldii*) in the Dempok river flow, Gampingan village, Pagak district, Malang regency, East Java

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ABSTRACT

Baderbang fish (*Barbonymus schwanenfeldii*) is one of Indonesia's endemic fish which has a great opportunity to be cultivated as consumption fish. The success of fish farming is supported by information about the growth patterns in the area of origin of the fish. The study of the relationship between fish length and weight is one indicator to determine the growth pattern of Baderbang fish (*Barbonymus schwanenfeldii*). This research was conducted with the aim of knowing the morphometrics and growth patterns of Baderbang fish in the Dempok river, in the side of the Pagak village, Malang district. The data analysis was performed, namely the LAM (Linear Allometric Method) data analysis. This model was used to determine the values of a and b. Baderbang fish regression for 6 months is in the range of 1.0558-3.1947, this shows that the growth pattern of Baderbang fish varies every month which includes an isometric growth pattern which is a parallel growth pattern between length increase and increase, growth pattern Positive allometric is a growth pattern with weight gain faster than length gain, while negative allometric growth is a growth pattern with a faster increase in length than weight gain. The long-weight relationship of fish in the Dempok river flow has R^2 results ranging from 0.2079-0.9409.

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1. Introduction

Baderbang fish (*Barbodes schwanenfeldii*) can be found in the downstream waters of the river, one of which is in the waters downstream of the River Dam, Pagak District, Malang Regency, in this area most of the reidents work as river fishermen. One of the high catches compared to other types

of fish is baderbang fish. In Kusmini's opinion (2018), the *Barbodes schwanenfeldii* is one of the many fish found in lakes and rivers, large, small as well as in canals and in ditches. Baderbang fish is one of the freshwater fish that has a fairly high level of consumption, this is due to several factors such as relatively economical prices ranging from Rp. 15,000/Kg to Rp. 20,000/Kg, in addition to the economical price of fish. Baderbang also has pretty good taste so that many consumers like it. Lack of socialization in marketing baderbang fish so that many consumers do not recognize it.

Fish growth is divided into 2 growth groups, namely isometric growth and allometric growth. Allometric growth is divided into 2 types, namely positive allometric and negative allometric. Fish that are classified as positive allometric growth are fish with faster weight growth than length growth, and negative allometric growth is fish length growth is faster than fish weight growth, while fish with isometric growth are fish that experience equality in length and weight growth (Fuadi, 2016).

Baderbang fish have a silver body with the tip of each fin red. Fish baderbang have a body shape similar to a Tawes fish but the difference in Tawes with fish baderbang is in color the tip of the fin, where the Tawes ends of the fins do not have the red color as the opinion Kusmini (2018) which states that the fish tinfoil barb (*Barbodes schwanenfeldii*) is a type of fish that are similar to Tawes fish that are usually cultivated in ponds, only the difference is in the color of the tip of the fins.

In terms of aquaculture handling technology, the cultivation of baderbang fish (is still far from perfect. So far, people consume a lot of baderbang fish which is obtained from the catch of fishermen, not from cultivation. So far, baderbang fish cultivation has not been carried out, to do baderbang fish cultivation first know the growth pattern and environment of baderbang fish in the wild. The purpose of doing research on the relationship between length and weight of baderbang fish is to find out the growth patterns that occur in baderbang fish, especially baderbang fish in the Dempok river basin. Based on the determination of the growth pattern of the baderbang fish, it is possible to determine the cultivation pattern that can be applied by looking at the life habits of the baderbang fish in the natural environment. According to Eslamloo *et al.* (2012), scallop fish have good prospects to be cultivated both for consumption fish and as ornamental fish.

2. Material and methods

Research sampling on the study of the length and weight relationship of baderbang fish was carried out in the Dempok river flow, Gampingan Malang village from February to July 2020, while the observations were carried out in the fisheries laboratory of the University of Muhammadiyah Malang. The sampling location can be seen in (figure 1).

The method used in sampling is by using a simple random sampling method of various sizes. Sampling using gill nets measuring 1.5 and 2.5 inches, sampling for 6 months with the number of fish samples each month ranging from 20 to 50 fish. To keep the samples during the journey from the sampling location to the fisheries laboratory, fish were stored in styrofoam boxes with the aim of maintaining the quality of the fish during the journey. The method used in processing the data is using a quantitative descriptive method.

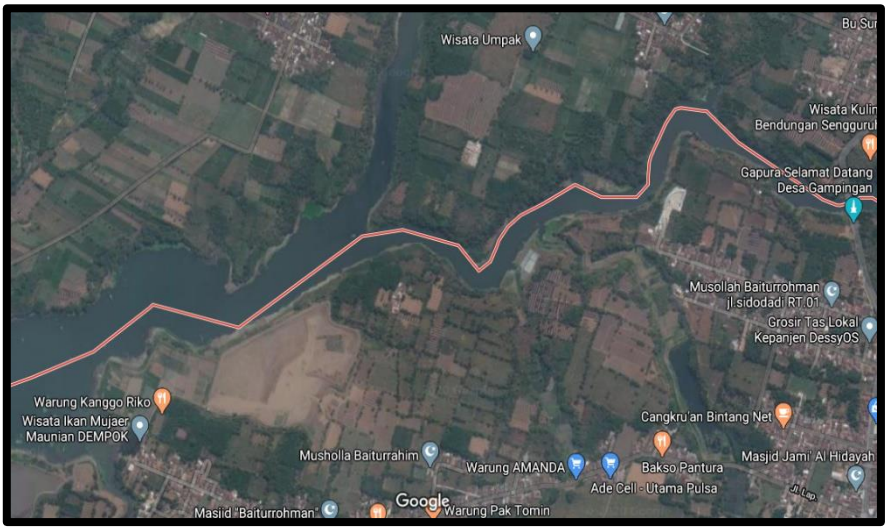

Figure 1. Research Sampling Locations in the Dempok River Flow, Pagak District, Malang Regency, East Java (Google Maps 2020 Documentation).

Determination of morphometric characteristics was carried out based on the morphology of the fish. According to Priyanie (2006), the determination of morphometric characteristics can be done with 34 morphometric characters in Kurisi fish, and According to Widianto (2008), there is no fixed standard in determining the number of morphometric characters to be measured or calculated in each fish species but adjusts the morphology of the observed fish, while according to Schindler & Schmidt (2006), there are 14 characters that can be counted in determining the morphometric character of fish. In this study, measurements of 20 morphometric characters of Baderbang fish were carried out.

Data Analysis

analysis was carried out on measuring the relationship between length and weight of fish using the liner allometric (LAM) method, this model was used to determine the value of a and value of b by measuring the weight and length of the fish. The relationship between the length and weight of fish can be determined using the calculation model of De Robertis and William (2008) as follows:

$$W = a\ L^b$$

Where:

W = Weight (g)
L = Length (mm)
a = Intercept (Intercept of the curve of the relationship between length and weight with the axis y)
b = Length-weight growth pattern estimator
To obtain a linear equation the following equation is used:

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

To get the values of a and b are used regression analysis with Log W as 'y' and Log L as 'x', then the regression equation is obtained (Effendie, 1997):

$$Y = a + bx$$

Value b > 3 is a fish with positive allometric growth and a value of b < 3 is a fish with negative allometric growth, while b = 3 is a fish with isometric growth.

3. Results and Discussion

Morphometric Baderbang fish

The results of morphometric measurements of baderbang fish are presented in table 1. results of morphometric measurements of baderbang fish.

Table 1. Average (mm and gr).

Month	Symbol	Feb	Mar	Apr	May	Jun	Jul
Total Lenght	TL	212.0	197.8	228.4	186.1	195.4	1954,2
Standart Lenght	SL	163.0	152.0	170.0	142.7	149.7	1497,3
Head Lenght	HL	36.42	33.54	38.75	33.61	33.35	33.05
Head Depth	HD	3.36	37.16	39.23	29.54	29.52	28.82
Body Depth	BD	6.27	60.13	62.56	59.01	59, 94	56.25
Caudal Peduncle Depth	CPD	2.22	22.05	22.21	20.79	21.67	20.21
Body Width	BD	3.06	26.57	27.84	23.47	23.33	21.74
Eye Diameter	ED	1.21	11.92	12 ,97	11.11	11.03	10.95
Dorsal Fin Lenght	DFL	1.82	37.07	41.57	32.59	32.76	30.84
Dorsal Fin Height	DFH	3.70	17.28	15.72	16.98	15.24	20.79
Pectoral Fin Lenght	PFL	31.08	31.05	36.13	0.94	35.84	29.58
Pectoral Fin Height	PFH	3.20	6.43	10.17	10.30	9.21	8.73
Anal Fin Length	AFL	27.83	28.42	34.05	29.06	27.72	27.34
Anal Fin Height	AFH	3.35	16.36	8.55	12.49	8.02	7.74
Ventral Fin Length	VFL	0.76	30.00	34.18	27.66	27.56	27.23
Ventral Fin Height	VFH	3.17	6, 25	14.88	10.21	12.16	17.48
Caudal Fin Length	CFL	4.69	47.34	52.13	47.94	45.36	45.06
Caudal Fin Height	CFH	103.48	45.36	47.93	47.90	51.24	52, 57
Top Jaw Length	TJL	1.13	9.93	10.15	10.88	10.78	10.55
Bottom Jaw Length	BJL	0.79	6.02	8.83	8.43	7.80	8.33
Body Weight	BW	123.82	97.32	168.09	104.46	114.30	89.13

Table 2. Total length and body weight relations

Parameter	Unit	Fish Baderbang
TL	mm	184.46 - 228.35
BW	gr	89.13 - 168.09
Predicted Weight (Ws)	gr	86.17 - 167.21
Value *(b)*	-	1.0558 - 3.1947
Determinant Coefficient (R^2)	-	0.2079 - 0.9409
Correlation Coefficient (r)	-	0.4639 -0.9610

Table 3. Results of measuring linear equations during the research time

Month	TL mm	W	WS	b	R^2	Growth
February	212.04	125.47	124.87	2.99	0.87	Isometric
March	203.18	128.15	123.54	3.19	0.60	Allometric Positive

April	228.35	168.09	167.21	3.19	0.22	Allometric Positive
May	184.46	94.85	92.92	3.17	0.83	Allometric Positive
June	195.42	114.30	113.68	2.92	0.92	Isometric
July	190.00	89.13	86.17	1.06	0.36	Negative Allometric

Table 4. Growth Pattern of Baderbang Fish

Month	b		Growth Pattern	
	Male	Female	Male	Female
February	3.0195	2.6858	Allometric Positive	Allometric Negative
March	3.4934	3.3305	Allometric Positive	Allometric Positive
April	2.7456	3.4134	Allometric Negative	Allometric Positive
May	2.802	3.1008	Allometric Negative	Allometric Positive
June	2.7665	2.9443	Allometric Negative	Isometric
July	1.2561	0.3612	Allometric Negative	Allometric Negative

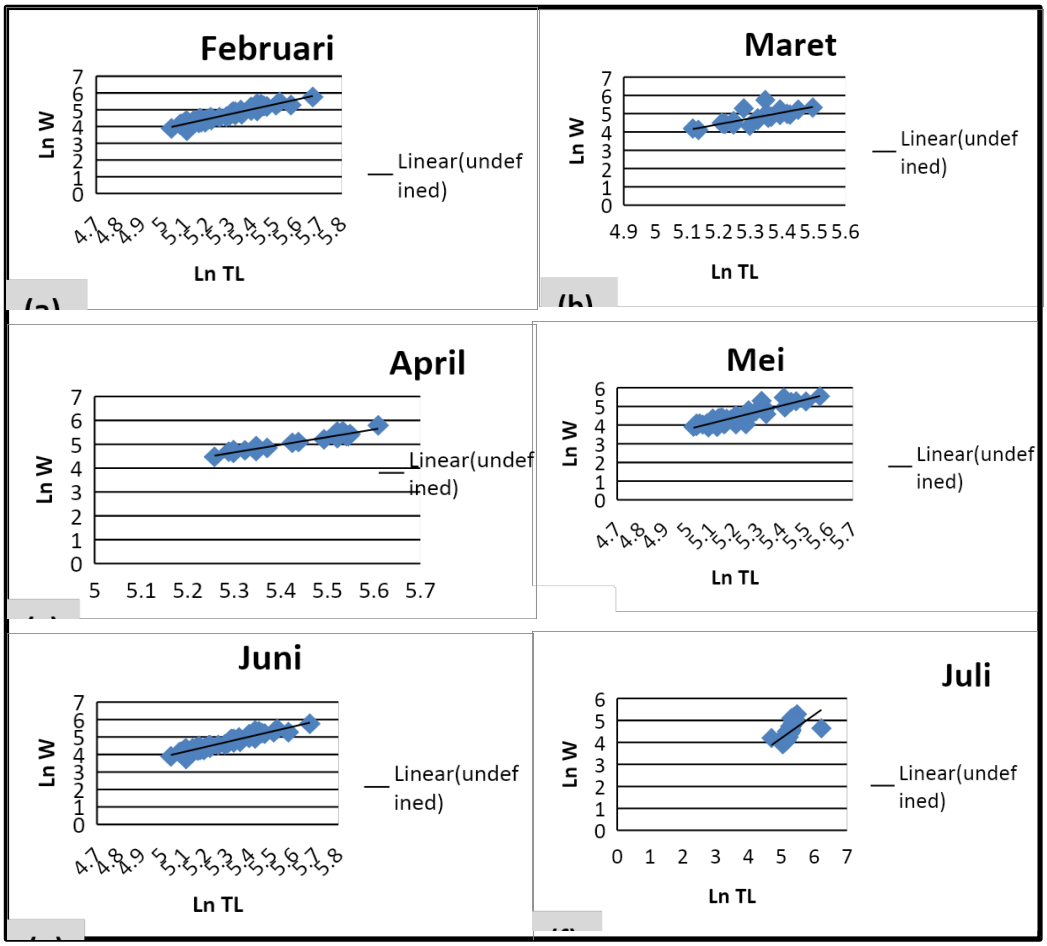

Figure 2. Long-Weight Relationship of Baderbang Fish

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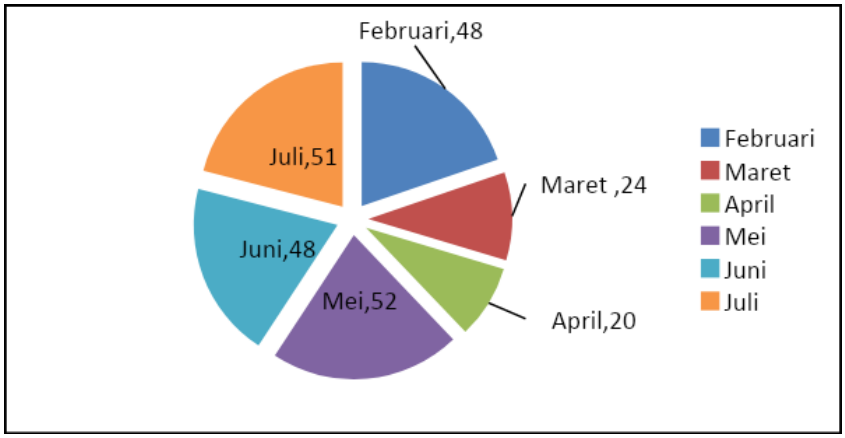

Figure 3. Monthly Fish Catch Results

Measurement of Water Quality in the Dempok River Stream

The results of the measurement of the water quality in the Demok River flow are in good water quality levels for aquatic biota as shown in (table 4).

Table 4. Results of Water Quality Measurement

Parameters	Feruary	March	April	May	June	July
Temperature (^{0}C)	25.6	26.1	26.2	27.1	24.7	25.3
pH	7.8	7.2	7.8	7.7	7.4	7.5
DO (mg/L)	15.2	10.1	10.1	10.6	10.6	10.6

Discussion

Based on the results of the study, the results of measuring the relationship between length and weight of fish and fish growth patterns during the six months of the study were as presented in (Tables 3 and 4). Based on the results of the growth pattern of Baderbang fish in the Dampok River, the growth patterns of allometric positive and allometric negative. This can be seen based on the calculation of the linear equation presented in (Figure 2). The value of *b* generated each month has a different value which is in the range of 1.0558 to 3.1947.

Data analysis that has been carried out shows that the growth pattern of Baderbang fish is an allometric growth pattern (positive allometric and negative allometric) and an isometric growth pattern. Negative allometric growth is growth that illustrates that the energy obtained from the nutritional intake given to fish tends to be used more for physiological activities and movement (Kusmini, 2018). Growth patterns can be determined by knowing the value of *b* where the size of the value of *b is* influenced by the behavior of fish in water, as in the opinion of Muchlisin (2010) the size of the value of *b* can be influenced by the behavior of fish. Meanwhile, according to Okgerma (2005), the difference in the value of *b* can be caused by differences in the number and variation of fish observed.

Based on the observations that have been made, the value *b* is in the range of 1.0558-3.1947, where the value of b > 3 is a fish with a positive allometric growth pattern and for a value of b < 3 it is a fish with a negative allometric growth pattern, while for a value of b 3 it is a fish with a growth

pattern. isometric. As stated by Effendie (2002) that the value of b = 3 is an isometric growth pattern, namely the increase in length is balanced with weight gain, on the contrary, if the value of b 3 the length increase is not balanced with the weight gain which is expressed as allometric growth, b > 3 is a positive allometric which indicates that weight growth is faster than length growth, while the value of b < 3 is a negative allometric which indicates that length growth is faster than weight growth.

The pattern of growth shown in February and June is an isometric growth pattern, whereby the measurement results on February linear equation which shows the results of *b* at 2.9865, the value of R^2 0.8694, 0.9324 r value, and the value of Ws by 124, 87, while for the month of June the results of *b* at 2.9187, the value of R^2 0.9236, 0.9610 and r value Ws value of 113.68. it indicates that the value of *b* in two months is a fish with isometric growth, meaning that growth in weight and length of fish accreting simultaneously as opinions expressed by Nurhayati (2016) that the value of R^2 is closer to +1 indicates a relationship between the variable-length correlation coefficient and weight have a very strong relationship.

The pattern of growth that occurred in July a negative allometric growth pattern in July gain of 89.13 Ws value of R value of^2 0.3628, 0.6023 r value and the value of *b* 1.0558, this case shows that the pattern of growth in July is a negative allometric growth, this is in accordance with the opinion of Nurhayati (2016) that the value of *b* < 3 then the fish growth pattern is negative allometric so that the length increase is faster compared to the relatively flat fish body weight gain, while according to Kusmini (2018) that the allometric growth pattern is negative illustrates that the energy obtained from the nutritional intake given to fish tends to be used more for physiological activities and movements.

The growth pattern is shown in March, April, and May is a positive allometric growth pattern, where the results of linear measurements in March, April, and May are as presented in (Figure 2 and Table 4). The value of *b* in March, April, and May shows that the growth pattern in these three months is a positive allometric growth pattern, where the result of gains *b* > 3. As stated by Nurhayati (2016) that positive allometric growth is growth with faster weight compared to an increase in length so that the physical fish looks plumper.

The number of Baderbang fish caught during the study period was 243 fish. In February, we got 48 fish samples from fishermen's catch, in March 24 fish, in April 20 fish, in May 52 fish, in June 48 fish, in July 51 fish as shown in (figure 3). The total length of Baderbang fish ranged from 184.46-228.35 mm and weight ranged from 89.13-168.09 gr. The results of data analysis showed that there were variations in growth patterns in Baderbang fish each month as the results of the data presented in (table 4).

Based on the weight of the fish length relationship Baderbang get a range of R^2 is 0.2079 - 0.9409 for 6 months and the range of r is 0.4639-0.9610 for 6 months which is presented in (table 3), this explains that the variable total length of Baderbang fish can determine the variable weight of Baderbang fish ranging from 20% - 94%. This is in accordance with Nurhayati's (2016) statement that the value of the correlation coefficient ranges from 0.405 to 0.997 indicating that the weight gain of about 41% to 100% can be explained by the magnitude of the increase in length through a regression relationship.

The growth pattern of Baderbang fish when viewed based on the sex of Baderbang fish in each month has different growth patterns such as in February male Baderbang fish are allometric

positive but female fish are allometric negative, in March male and female fish are both positive allometric, in March April male Baderbang fish are allometric negative and female fish are allometric positive, in May male Baderbang fish are negative allometric and betide fish are positive allometric, in June male Baderbang fish are negative allometric and female fish are isometric, while in July Male Baderbang fish are allometric negative as well as female fish as shown in table 5.

Based on the measurement results of male Baderbang fish observed for 6 months tend to be negative allometric because only in February and March are allometric positive Even from April to July, male baderbang fish are negative allometric, this is different from the results of Aisyah (2017) observations in the Bedai river where the relationship between the growth patterns of male baderbang fish in the Yetai river B is 2.4487 and female fish is 2.6451. male and female fish are allometric negative. The growth pattern of fish in each place will be different where the growth pattern of fish is influenced by the difference in food.

Water Quality Measurement

Research conducted in the Dempok river for 6 months has a different growth pattern in each month this shows that the growth of Baderbang fish is influenced by environmental factors and fish behavior. The environment is very supportive of fish growth, an unfavorable environment can also inhibit fish growth. Based on the results of water quality observations carried out during the study period, the results obtained a temperature range of 24.7 ^{o}C-27.1^{o}C, pH in the range of 7.4 to 7.8, and DO range from 10.1 mg/L-15.2 mg/L, as presented in (table 5), this shows that the water quality of the Dampok river is still in good condition for aquatic biota. This is reinforced by Mahyudin's opinion (2015) that water with a pH value ranges from 6.5 to 7, 5 and DO > 5 are normal waters that meet the requirements for biota.

Conclusion

The results of the study for 6 months showed different growth patterns in each month, in February and June the growth pattern of Baderbang fish was isometric, from March to May the Baderbang fish were in a positive allometric growth pattern while in June the Baderbang fish was in a positive allometric growth pattern. on the negative allometric growth pattern. The range of weight (W) of Baderbang fish during the research period was 89.13 – 168.09, total length (PT) of fish was 184.46 - 228.35, predicted weight (Ws) 86.17 – 167.21, b 1.0558 – 3, 1947, the determinant coefficient (R2) is 0, 2079 – 0.9409, and the correlation coefficient ® ranges from 0.4639 – 0.9610.

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