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The Effect of Parental Length and Weight on Fecundity of Betta sp.

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Abstract

Betta fish are fish that have high economic value because market demand is always increasing. However, to get high quality betta fish, efforts are still needed by importing from Singapore and Thailand so that a sustainable betta fish hatchery business is needed. To develop this betta fish hatchery business, the first thing that must be considered is the value of fecundity. Fecundity plays an important role in supporting the success of fish growth. This study aims to determine the relathion between the length and weight of betta fish broodstock to the value fecundity as an effort to develop in the field of aquaculture, especially atthe hatchery stage. The method used in this research is descriptive method which is then analyzed using linear regression, namely the relationship between length and weight on the fecundity of betta fish. The data is presented in the form of tables and graphs which are then analyzed descriptively to draw conclusions form the resulting data. In this study, 30 betta fish brooders were used with weights ranging between are 1,39-1,73gr, and the length ranges from 4,5-5,2cm and the resulting fecundity ranged from 166-366 eggs. The resilt showed that fecundity had a close relationship with fish body weight where the correlation coefision (r) was 0,9653 and the coefficient of determination (R^2) was 0,9319. While the length relationship with fecundity has a moderate relation where the corcorrelation coefficient value (r) obtained is 0,4079 and the coefficient of determination is 0,1664. This indicates that fish weight is better used to estimate the value of fish fecundity than body length.

Keyword: Betta fish, Fecundity, Body weight, Body length

INTRODUCTION

Betta fish (*betta sp.)* is an ornamental freshwater fish that originated from southeast Asia, including Indonesia, Thailand, Malaysia, and Vietnam. Betta fish cultivation in Indonesia has a highly encouraging prospect because it is supported by the Indonesian climate which is suitable for betta fish to live and breed, moreover there are many supporting factors that can be continously optimize, which is sufficient water, large tracts of land, and local government support with the existence of fish cultivator groups that can increase the hope of fishery sector workers (Abidin and Hutami, 2018). Betta fish have a high economic value because the demands for betta fish is always intensifying, but to get high quality betta fish there is still need an additional effort to import it from Singapore and Thailand thereby sustainable betta fish hatchery business is needed (Abidin and Hutami, 2018). To develop this betta fish hatchery business the first sting that must be considered is the value of fecundity. Fecundity plays an important role in supporting the success of fish growth. The ultilization of betta fish in the comunity has not been maximized. betta fish seed stage is the most important step becase in this step betta fish require good nutritional value to support efficacy in aquaculture (Syahfrizal et al., 2021). Fecundity is the total egg contained in female ovarium fish that has mature gonads and is ready to be expelled at spawning time (Wahjudy, 2016). In its breeding,

the influence of internal and external factors plays an important role related to fecundity (Miranti and Abdul, 2018). The value of fish fecundity can vary among the same fish as a result of adaptation to the habitat, age of fish, the size of egg, food, and climate (Wahyuni et al., 2015). According to Muslim et al., (2019) the total of eggs tends to increase along increasing in body size which is affected by the amount of feed and environmental factors such as temperature and water level. This is also in line with the opinion of Ath-thar et al., (2014).

The differences in fecundity quantity in fish are usually affected by the size of the parents. In general, the larger the brood size, the higher the fecundity. Based on the description above, it is necessary to study the relationship between the length and the weight of betta fish broodstock and to value of fecundity to develop in the field of aquaculture, especially at the hatchery stage.

RESEARCH METHODS

Research Place and Time

This research was conducted on 16 August to 2 October 2021 at Pusat Pelatihan Mandiri Kelautan dan Perikanan (P2MKP) Tugu Mina Asri Boyolangu district, Tulungagung regency.

Material and Equipment

As much as 30 betta fish broodstock with a length of the body reaching 4,82 ±0.22 cm and 1,49 ±0.19 gr in weight is used as a sample in this research. The betta fish broodstock is kept for about 2 months. Material and equipment that has been used in this research is a digital scale to measure the weight of parents, and a block millimeter to measure the length of parents. Moreover, substrate and a bucket as spawning media along with egg maintenance, hand counter to calculate the number of eggs. The water quality measurement tools consist of a DO meter to measure dissolved oxygen, a thermometer to measure water temperature, and a pH pen to measure the acidity of the maintenance media. Water quality measurements are carried out every day except for dissolved oxygen measurements.

Observed Parameters

The variable observed during this study was Fecundity which was calculated using the following formula (Lathif, 2021). Furthermore, according to Soekiswo et al., (2014) fish fecundity is often associated with the length and weight of the fish formulated by the equation.

$$F = \frac{\mathrm{Wo} - \mathrm{Wt}}{\mathrm{Wtelur}}$$

Description:

F = Fecundity
Wo = Fish weight before spawning (g)
Wt = Fish weight after spawning (g)
Wtelur = Weight of 1 egg (g)

Relationship of Fecundity with Length and Weight

$F = a. L^b$

$F = a. W^b$

Description:

F = Fecundity
L = Fish length (mm)
W = Fish weight (g)
A = *Intercept*

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B = *Slope*

Data Analysis

Data analysis used linear regression, namely the relationship between length and weight on the fecundity of betta fish. The data is presented in the form of tables and graphs which are then analyzed descriptively to conclude the resulting data.

RESULTS AND DISCUSSION

Fecundity

Based on the research of the study showed that each broodstock betta fish has a different fecundity value, i.e.it ranges between 166 - 366 eggs. This is caused by the difference in length and weight of betta fish. Difference fecundity value is generally caused by the size of betta fish parents, the larger the brood size, the higher the fecundity. It is influenced by internal factors and external factors such as age, size, and hormones (Ath-thar et al., 2014).

Moreover, external factors that influenced include the quality of water and the availability nutrional feed. Fish fecundity is related with environment which species of fish will change its fecundity if the environment changes as well (Wahyuni, 2015). Fecundity is also influenced by the availability of food. In optimal condition, Fish will reduce the allocation of energy from feed to balance the body's processes with its environment so that energy is focused on egg formation to increase the number of eggs (Muslim et al., 2019). On the other hand, if the environmental conditions are not optimal, the energy allocation is mostly used to balance the body's processes with its environment. Thus, the egg formation process will be disturbed and affect the number of eggs produced (Muslim et.al, 2019).

Relationship of Fecundity with Fish Length

Research results showed that betta fish fecundity ranges between 166-366 eggs with total body size ranging between 4,5-5,2 cm. The graph above shows the relationship between fecundity and the length of betta fish, F = 0,0692. L1,3920 with R^2 value (determinant coefficient) i.e. 0,1664 and r value (correlation coefficient) i.e. 0,4079. The correlation coefficient value (r) shows that the total length of betta fish influenced its fish fecundity as big as 40,79%. The relationship between body length and the number of eggs produced can be moderately correlated.

The statement above follows Fadillah's (2018) opinion that the correlation coefficient value (r) which ranges between 0,40-0,69 has a close correlation value, which means an increase in betta fish body length moderately correlated with the number of eggs produced. Pratiwi et.al, (2016) also stated that the number of produced eggs influenced by the brood fish itself, the heavier and longer the brood fish will increase the value of its fecundity, it can be concluded that betta fish body length can influence the number of egg produced.

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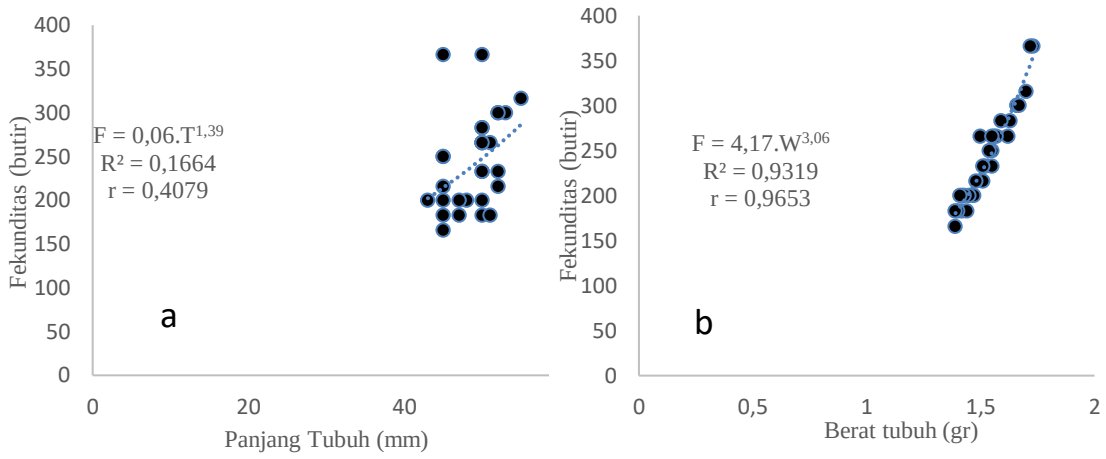

Figure 1. Graph of relationship (a): length of betta brood with fecundity and (b): weight of broodstock with fecundity during the study

Relationship of Fecundity with Fish Weight

Research results showed that betta fish fecundity ranges between 166-366 eggs with a total body mass ranging between 1,39 – 1,73 gr. The graph above shows the relationship between fecundity and the weight of betta fish, F = 4,1746. W3,0687 with R^2 value (determinant coefficient) i.e. 0,9319 and r value (correlation coefficient) i.e. 0,9653. The correlation coefficient value (r) shows that the mass of betta fish influenced its fish fecundity by as big as 96.53%. The relationship between body mass and the number of eggs produced is closely related.

The greater the weight of the fish, the greater the value of fecundity, the increase in betta fish body length and mass, tends to increase with the increase in gonad weight and the amount of fecundity. Fish fecundity value is influenced by total length and body mass (Kusmini et al, 2018). By contrast, in this research shows that determinant coefficient value of fish weight is greater (0,9319) than determinant coefficient value of fish length which is 0,1664.

This indicates that the weight of the fish is better used to estimate the value of fish fecundity. The statement above follows research from Bulanin et al., (2016) which used the sample in the form of mingkah fish stated that the coefficient of determination of length was smaller than body weight, where the value of the coefficient of determination of length was (R^2=0.9) and body weight (R^2= 0.912). This indicates that fish weight is better for predicting the value of fecundity than body length. Fish fecundity is often associated with fish weight because fish weight reflects more on the condition of the fish than length (Kusmini et al., 2016).

CONCLUSION

Fecundity has a close relationship with the weight of the fish with a correlation coefficient value (r) as big as 0,9653 and a determinant coefficient value (R^2) as great as 0,9319. On the other hand, the

relationship between length and fecundity has a weak relationship where the correlation coefficient value (r) is as big as 0,4079 and a determinant coefficient value (R^2) as great as 0,1664. This shows that the weight of the fish better be used to surmise the fish fecundity value rather than using the length of the fish as fecundity value because the weight of the fish has a close relationship with the fish fecundity value.

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