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Botia (*Chromobotia macracanthus* Bleeker, 1852) Potential Broodstock Rearing With and Without Shelter

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Abstract

Botia also called clown loach (*Chromobotia Macracanthus*) growth is relatively slow, taking 4-5 months to reach marketable size (2 inch) and 3 years to achieve initial gonad maturation in female and 1 year in male fish. Environmental degradation and overfishing are factors triggering the production of newly potential broodstock. This study aimed to observe the growth response of potential broodstock through rearing technique with and without shelter. Fish were kept inside the aquaria sized 80x40x30 cm with 20 cm water height on the recirculation system. Fish was used for shelter treatment are: Total length ± 7.7 cm, height ± 2.09 cm, and weight ± 7.33 g; for no shelter treatment were: Total length ± 6.7 cm, height ± 1.88 cm, and weight ± 4.59 g. Fish were stocked 10 fish/aquarium and fed 3 times/day by at satiation method. Parameters were observed are total length, height and weight improvement also water quality. The results was showed that growth and feed efficiency had better value when reared with shelter than without shelter.
Keyword: *Grow-out, Chromobotia macracanthus, shelter*

INTRODUCTION

Botia fish (*Chromobotia macracanthus* Bleeker, 1852) is native fish species in Sumatra and Kalimantan (Kottelat *et al*. 1995), which is very popular among ornamental fish hobbyists and major commodity of aquatic exported product in Indonesia (Slembrouck, 2010). The growth of Botia fish is relatively slow (Baras *et al*. 2012), taking 4-5 months to reach the marketable size (2 inches) and 3 years to obtain firstly matured fish on female fish and one year on male fish (Permana, 2015). Environmental degradation and overfishing are factors threatening botia sustainability (Blabber, 2000), therefore triggering culture production. Depok Ornamental Fish Culture Research Institute has managed to domesticate botia, starting from adaptation, gonad maturation, spawning, mass production, as well as even technical transfer to various regions, especially botia endemic regions. Various studies have been conducted including efforts to

accelerate the growth rate of botia culture either on environmental, feeding, or hormonal factor.

One of environmental factors closely related to botia natural habitat is the existence of shelter in the rearing media, as botia fish are ornamental fish living at the water base area (demersal) (Axelrod and Vordenwinkler, 1986). The preferred habitat for botia fish is small current and clear water (Kamal, 1992) around rocky and sandy areas or *Napal* (Grzimex, 1968; Kamal 1992). Botia actively feeds at night (nocturnal) and hides at daytime (Satyani *et al*. 2006).

Based on this information, the existence of shelter on botia rearing media becomes very important to comfort the fish and minimize the fish stress, whereas well adapted botia will optimize the growth level. Environmental factor in the form of shelter was attempted in the rearing efforts for botia broodstock potential with the aim to observe the growth response and survival rate on the rearing with and without shelter.

MATERIAL AND METHOD

Place and Period of Trial

This trial study was conducted on January, 2018 in Depok Ornamental Fish Research Center.

Rearing media preparation

Media used were aquaria sized 80x40x30 cm with 20 cm water height and 64 L water volume on recirculation system. Rearing system were performed by differing among trial media with and without using shelter

Figure 1. Botia (*Chromobotia macracanthus* Bleeker, 1852) rearing tank with a shelter (a), and without shelter (b)

Fish stocking

Fish used in this study were approximately 7.7 cm total length, 2.09 cm height, and 7.33 g weight for shelter treatment, while non shelter treatment used approximately 6.7 cm total length, 1.88 height, and 4.59 g weight. Fish were stocked 10 fish/aquarium. Fish were stocked into the rearing media using plastic container, after acclimatized for 10 minutes.

Feeding frequnty

The feed given in this study was bloodworm. Bloodworm was given three times a day, namely 08.00, 12.00, and 16.00 (GMT +7) with *at satiation* method.

Growth and survival rate sampling

Growth sampling containing body length, weight, and height was performed to determine the rearing treatment with and without shelter response. Growth sampling was performed once in 10 days on the fish used, while survival rate was calculated from the fish total on initial and final rearing.

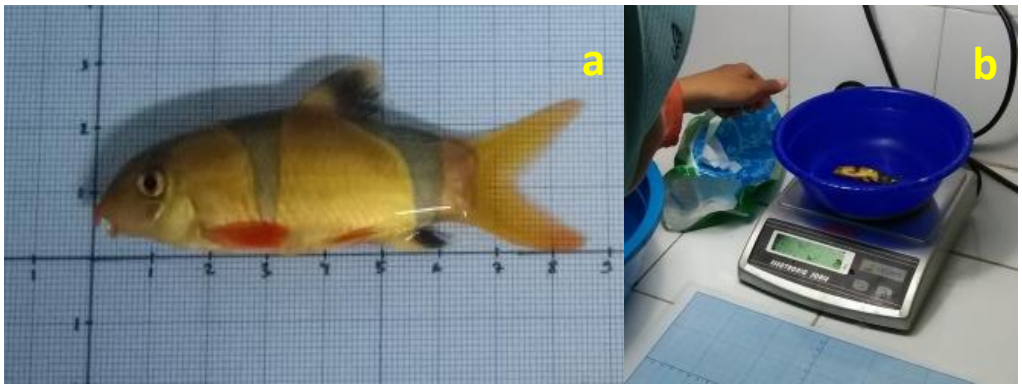

Figure 2. Total length and body height sampling (a), and sampling measurement body weight (b) of botia (*Chromobotia macracanthus* Bleeker, 1852)

Water quality monitoring

Water quality parameter monitoring was performed to maintain the rearing media water quality to be in the optimum range. Water quality parameters comprised temperature, dissolved oxygen (DO), pH, and ammonia.

Gonad maturity

Fish gonad maturity level was observed on the final rearing either in male or female fish. Observation on male fish was performed using stripping technique, while female fish using catheterization.

Data analysis

Data obtained from the observational results containing increased total length, body height, weight, and survival rate were analyzed descriptively by comparing between two different treatments, i.e with and without shelter.

RESULT AND DISCUSSION

Growth

Growth is described as increased size or volume higher or greater than before. Botia fish growth showed isometric growth (increased length was balanced with increased weight), following the negative allometric growth (length growth was faster than weight growth) (Kamal, 1992). Botia fish broodstock potential in this study were stocked into the rearing media with recirculation system on two rearing methods, i.e with or without shelter. Four week botia rearing resulted fish groth data containing total length, body height, and weight as presented on Figure 3.

In the prospective expansion of botia reared using shelter showed increased total length with 0.38 cm, while the total length obtained on rearing without shelter was 0.26 cm, indicating 0.12 total length growth difference. Botia body height increased 0.09 cm on rearing with shelter and 0.08 cm on rearing without shelter, resulting 0.01 cm body height difference. Botia gained 0.25 g weight on rearing with shelter and 0.23 g without shelter, resulting 0.02 g weight difference. Based on these values, botia broodstock potential growth in the study trial showed negative allometric growth pattern.

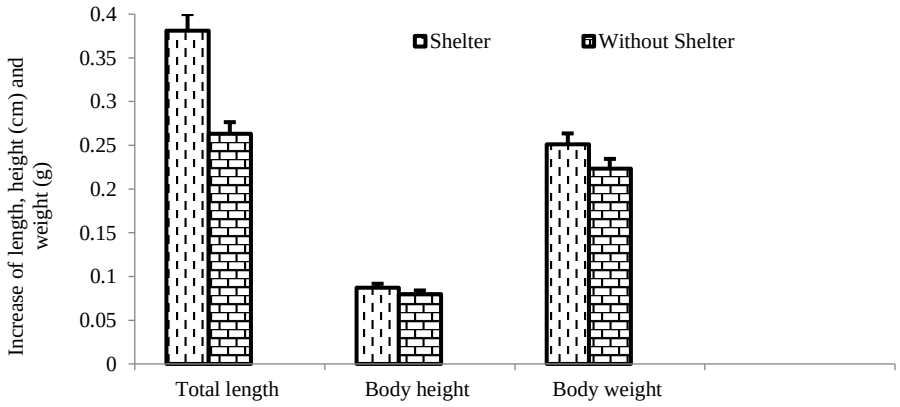

Figure 3. Growth of Botia (*Chromobotia macracanthus* Bleeker, 1852) reared with or without shelter

Botia reared with shelter had faster growth than without shelter. This might happen as botia activity influence. Botia fish habit reared with shelter often hides in shelter and inactively swims, while fish will actively swim when reared without shelter, spending more energy for swimming.

Swimming is the characteristic in almost all species of fish to find food, avoid predation, or engage in social interactions, such as territorial defense or reproduction. Swimming requires energy as requiring muscle work, especially by large blocks of axial muscles arranged on each side of the body, known as myotom, the dominant anatomical feature in most fish (McKenzie, 2011).

This means that active swimming fish will need more energy than passive swimming fish as spending more time in the shelter. Therefore, the energy gained from the food is more used for growth than movement. Some studies have succeeded to provide the connection between shelters with growth rate, such as Atlantic salmon (Millidine *et al*. 2006), turbot (*Lotalota*) (Fischer, 2000), stone loach (*Nemacheilus barbatulus*) (Fischer, 2000; Guan and Wiles, 1997), and bullhead (*Cottus gobio*) (Guan and Wiles, 1997).

There is a positive relationship between the existence of shelter and fish growth rate (Finstad, 2007; Olsson and Nystrom, 2009). The absence of shelter can have indirect negative impact on metabolism, growth, performance, and demographic population level. Mud eel (*Monopterus cuchia*) showed the best growth rate in water when giving hyacinth as the shelter (Narejo *et al*. 2003). The highest body weight gain was also found in estuarine grouper (*Epinephelus salmoides*) after given car tire as a shelter during rearing (Chua and Teng, 1979); Water plants used as shelters for *Penaeus monodon* provided the highest growth and survival rate (Ali *et al*. 1999); And the highest average larval growth rate of *Clarias batrachus* was obtained from larval rearing with floating shelters, such as water weeds (Sahiduzzaman *et al*. 2018).

The interesting thing on this study was that there were results where botia fish growth at shelter treatment was faster than without shelter, but the amount of feed given was less. This suspectively happened as botia in

shelter treatment required less energy for swimming, therefore only spending the energy efficiently and vice versa on rearing without shelter.

This result is certainly very beneficial to reduce the feed cost of feed in botia culture to obtain optimum growth. Anonymous (2019) stated that fish as aquatic organism requires feed to provide the energy needed. Energy coming from the feed will be converted into chemical energy and stored in body as adenosine tri-phosphate (ATP).

Energy is required to perform mechanical (muscle activity), chemical work (body chemical process), electrical (nerve activity), and osmotic (balance maintenance in the rearing medium of freshwater, brackishwater or seawater). This means that there is a correlation where the shelter causes botia fish to dwell and rarely swim to efficiently use the energy gained from feed fro growth. The effectiveness of this energy utilization causes the feed efficiency utilization, reducing the amount of feed required during rearing.

Survival rate

Survival rate was observed on the final rearing day. The survival rate of botia reared with and without shelter were 100%. This means that there were no dead fish either on rearing with or without shelter. This high survival rate shows that fish live comfortably on the rearing environment, making good water quality and energy efficient feed for body maintenance and growth. Moreover, rearing did not occur any disease attacks.

Water quality

Water quality measurement results performed during the study can be seen on Table 1. Based on the measurement results, all water quality parameters were at tolerance range for botia. This means the water quality value in this study was in good condition and suitable for botia culture. This is certainly related to the high survival rate (100%), as the water quality supports the fish to live comfortably and unsusceptible to disease.

Gonad maturity observation

At the end of rearing period, gonad maturity observation on botia broodstock potential was performed on the treatments with or without shelter. The results showed that fish that firstly matured was observed on male fish, while female fish was still immature. Matured gonad fish can be seen on Figure 3.

Table 1. Water quality parameters during botia broodstock potential rearing

Parameter	Value during rearing	Tolerance range for botia fish **Satyani *et al.* 2007**
DO (mg/l)	5.96	5-8
Temperature °C	29	26-30
Ph	7.5	5.5-7.0
Ammonia (mg/L)	0.02	<1.0

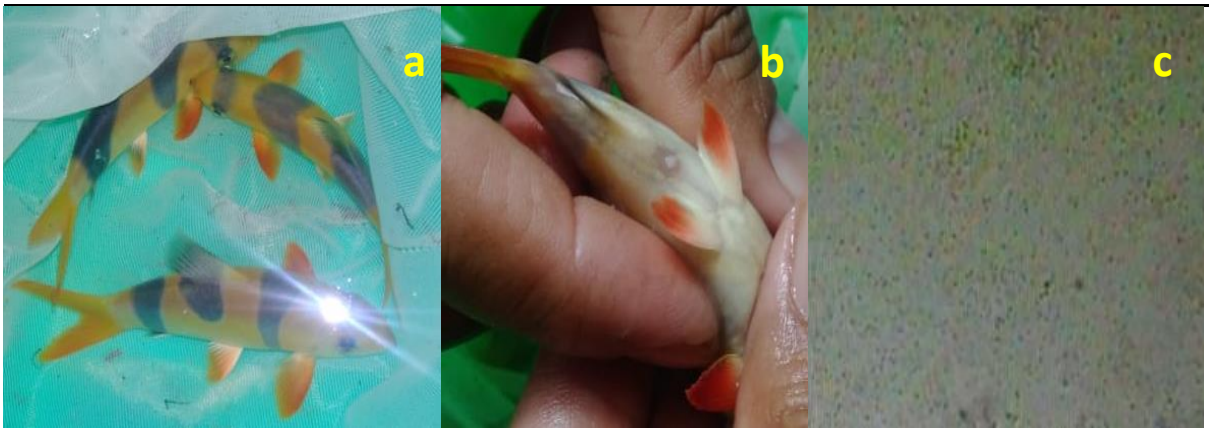

Figure 4. Gonad maturity observation in botia on the final rearing period; botia fish (a), matured male fish (b), male fish sperm motility under the microscope with 80% motility (c).

The presence of matured male fish was marked sperm discharge during stripping, indicating that the fish reared had optimum growth rate, specifically gonadal growth in male fish. The presence of sperm in male fish indicates that fish is categorized as broodstock potential. This is quite natural as fish age is one year old as stated by Permana (2015) that male botia broodstock will have firstly matured gonad at one year old.

CONCLUSION

Botia broodstock potential rearing with shelter is better than without shelter based on the growth rate and feed efficiency with indifferent survival rate. First matured gonad was found in male fish both on the rearing with or without shelter treatment.

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