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EFFECT OF SHELTER AND SUBSTRATE FOR GONADAL DEVELOPMENT SNAKEHEAD, *Channa striata* IN CONTAINERS

Untung Bijaksana

Aquaculture Departement, Faculty of Fisheries, University of Lambung Mangkurat
Jl. A. Yani Km 35,8 Banjarbaru, Kalimantan Selatan

ABTRACT

This study aims to see the effect of giving nauangan and substrate on the development of snakehead gonad, *Channa striata* in the container cultivation. The research was conducted at the Laboratory of Wetlands Faculty of Fisheries Aquaculture Lambung Mangkurat University. Several indicators were observed in body weight, gonad weight, liver weight, IGS, IHS, estradiol-17β, egg diameter and fecundity. The results obtained are providing shelter and substrate has a weak association of the observed indicators. Provision of shade and the substrate is more directed to the maintenance of ideal conditioning cork in a container of fish farming. Provision of shade or part shade ¼ with mud substrate may provide natural conditions for fish farming cork inside the container. With an altitude of low water (10-15 cm) in a container of fish farming is to survive and can berkembangan gonadnya maturity.

Keywords: shade, substrate, gonadal development, Snakehead

INTRODUCTION

Based on FAO (2000) and Allington (2002), snakehead has a wide distribution from China to India and Sri Lanka and eastern India, the Philippines, Nepal, Burma, Pakistan, Bangladesh, Singapore, Malaysia and Indonesia. In Indonesia there is a lot of fish on the island of Sumatra, Kalimantan, Sulawesi and Java. This fish is a freshwater fish species that can live in rivers, lakes, dams, wetlands, flood areas, fields and even ditches and brackish water (Syafei et al., 1995; Anonymous 2002; Alington 2002). These fish are very tolerant of environmental conditions of "extreme" or anaerobically, as it comes with extra breathing system on the top of the gills (Allington, 2002).

Snakehead to make a nest for fish spawning around the water plant or the outskirts of a rather shallow waters (10 cm to 15 cm). Several studies have been conducted with regard to reproduction but the sires used are fish that mature gonads of arrests in nature. Size of the fish when first ripe gonad is not always the same

(Effendie, 1979). Furthermore Blay and Egeson (1980), that the difference in size is due to differences in ecological conditions of the waters. Based Kartamihardja (1994), that in the reservoir in Central Java Kedungombo obtained female fish gonad maturity index of 1.16% on maturity level I to 4.15% on maturity level V which then declined sharply on the maturity level VI, since the release of eggs on when spawning. Snakehead with a length of fish 28 cm to 35 cm had an average fecundity 17 273 grains with fertilization rate 58.83% and 62.33% Hatching rate (Khossain et al., 2008). Hatching from the fertilization rate and *Pygocentrus nattereeri* Kner, with a range of 58 to 67% and 50 to 59% is good enough (Rahman & Ahmed 2007). In the natural environment, spawning not only depend on the process of gametogenesis but is closely related to behaviors such as migration before spawning, habitat selection, nest-building activities, and the presence of mating partners. Psychological conditions of fish reproduction and behavior will affect the regulation of the nervous system and endocrine system (Evans 1993). Spawning is an event that has its own separate control of the process of ovulation. Some fish can spawn several times teleostei in one spawning season. Snakehead can do spawning fish two to three times in one spawning season (Bijaksana, 2006).

This study aims to determine the effect of the combination of shade and the substrate on gonadal development of culture snakehead in the container. Some of the parameters to be evaluated are body weight, gonad weight, liver weight, egg diameter, fecundity, somatic gonado index, hepato somatic index and concentrations of estradiol-17β.

MATERIALS AND METHODS

Time and Place

Wet Laboratory experiments conducted at the Department of Aquaculture Faculty of Fisheries at the University of Lambung Mangkurat Banjarbaru from October 2006 until March 2007.

The design of experiments

The method used in this experiment were experimentally by applying a variety of cover shelter / shade, namely: 1/4 of a sealed container shelter, 1/2 the sealed container shelter and 3/4 of a sealed container shelter, and substrate, namely: mud, mud sand and sand. Comparison of males and females used were 1: 1. Used according to design, data analysis used was a factorial with randomized complete design. Each treatment was repeated 4 times to obtain 36 units of the experiment. Each treatment combination represents an experimental unit, so it takes 36 snakehead male and 36 female snakehead. Fish will be placed on the environmental conditions and feeding the conditional.

Implementation Procedures

Fish catches in natural snakehead adapted and maintained in cement tanks with the given fresh worms feed and trash fish as well as a conditional water quality. The feed is given four times a day as much as 4% of body weight / day with a frequency of 4 times / day. Observations conducted on body weight, gonad weight, liver weight, IGS, IHS, estradiol-17β, egg diameter and fecundity.

The content of estradiol-17β was measured with a kit COAT-estradiol-17β-made acount Diagnostic Product Corporation Los Angeles, USA. And quantitative measurements performed using 125I radioactive substances. (Nur et al., 1992; Bintang, 2006). Blood samples were centrifuged at 5000 rpm for 5-10 minutes. Plasma collected and stored at -20 ° C, while waiting for the measurement of Radio Immuno Assay (Rouger & Liley 1990; Zanuy et al. 1999). Egg diameter was measured by taking samples of eggs with surgery at the beginning and end. Eggs were taken, fixed with buffered formalin solution. Subsequently made an egg diameter frequency distribution (Tamaru et al., 1991). IGS measurement is then performed by surgery compared with gonads weighing and IHS body weight, liver weight compared with body weight. To stress the fish test mengeleminir anesthetized with benzocaine solution of 100 ppm.

Fecundity was calculated based on the weight of individual eggs per gonad (g) multiplied by the number of egg samples (grains) divided by the weight of the egg sample (g) further in the individual body weight (g).

Data Analysis

Data from the combined treatment is displayed in graphical form so that the picture looks the best results in the observation, namely: body weight, gonad weight, liver weight, IGS, IHS, estradiol-17β, egg diameter and fecundity.

To determine the effect of shade and a substrate for the observation parameters, was tested using variance (ANOVA). To find the best treatment of advanced test performed DUNCAN. Furthermore, to determine the pattern of responses produced followed by an orthogonal polynomial contrast test (Gomez & Gomez 1995). Data processing for statistical testing used SPSS 15.0 program.

RESULTS

The results of experimental observation of the influence of shade and the substrate to gonadal development of culture snakehead in a container is presented in Table 1.

Perlakuan	Bobot Tubuh/g/ekor	Bobot Gonad/g/ekor	Bobot Hati/g/ekor	IGS (%)	IHS (%)
A1B1	250.00 ± 0.00	5.65 ± 0.13	**1.75** ± 0.13	2.26 ± 0.05	0.70 ± 0.05
A2B1	245.00 ± 0.00	4.83 ± 0.05	**1.45** ± 0.06	1.95 ± 0.06	0.60 ± 0.03
A3B1	250.00 ± 0.00	4.85 ± 0.06	1.58 ± 0.05	1.94 ± 0.02	0.62 ± 0.01
A1B2	250.00 ± 0.00	**6.85** ± 0.06	1.73 ± 0.05	**2.74** ± 0.02	**0.69** ± 0.02
A2B2	245.00 ± 0.00	4.58 ± 0.10	1.65 ± 0.06	1.86 ± 0.04	0.67 ± 0.02
A3B2	250.00 ± 0.00	4.68 ± 0.10	1.63 ± 0.10	1.87 ± 0.04	0.65 ± 0.04
A1B3	245.00 ± 0.00	4.63 ± 0.05	1.68 ± 0.05	1.88 ± 0.02	0.68 ± 0.02
A2B3	250.00 ± 0.00	4.65 ± 0.06	1.68 ± 0.05	1.86 ± 0.02	0.67 ± 0.03
A3B3	245.00 ± 0.00	**4.58** ± 0.05	1.63 ± 0.05	1.86 ± 0.02	0.66 ± 0.02

Perlakuan	E2 (pg/ml)	Diameter Telur(mm)	Fekunditas (butir)
A1B1	172.81 ± 2.85	1.48 ± 0.05	4150.00 ± 45.64
A2B1	118.85 ± 4.75	1.08 ± 0.05	2980.00 ± 10.80
A3B1	95.50 ± 3.98	0.83 ± 0.05	2560.00 ± 47.43
A1B2	167.26 ± 2.32	1.43 ± 0.05	3955.00 ± 40.41
A2B2	120.06 ± 4.08	1.10 ± 0.00	2883.75 ± 7.50
A3B2	92.59 ± 2.93	0.73 ± 0.05	2490.00 ± 4.08
A1B3	161.29 ± 2.71	1.33 ± 0.05	3712.50 ± 358.29
A2B3	113.10 ± 2.02	0.93 ± 0.05	2782.50 ± 6.45
A3B3	82.69 ± 6.30	0.55 ± 0.06	2405.00 ± 52.12

Table 1. Average value observed in the experiments the influence of shade and substrate

Results of analysis of gonad weight range of substrates showed that the sludge treatment was significantly different to the other treatment but the treatment of sandy silt and sand substrates were not significantly different. (P <0.05). Further treatment of ½ part shade / shelter significantly different from other treatments and treatment ¼ significantly different from the shelter for treatment ¾ the shelter.

Results of analysis of gonad weight range on a combination of shelter and substrate shows ½ the shelter and mud (A1B2) was significantly different to the other treatments. (P <0.05). Shelter and treatment ¾ the sands (A3B3), ½ the shelter and sandy mud (a2b2), three quarters of the shelter and mud (A1B3), three quarters of the shelter and sandy mud (A2B3) and ½ the shelter and sand (A3B2) is no different real. ¼ the treatment of shelter and sandy mud (A2B1) with ¼ the shelter and sand (A3B1) is not significantly different but significantly different to A3B3, a2b2, A1B3, A2B3 and A3B2. Treatment of the shelter and mud ¼ significantly different to the treatment A3B3, a2b2, A1B3, A2B3, A3B2, A2B1 and A3B1 with a value of r2 = 0.2 (Figure 1).

Note: Different letters indicate significant different at level (P> 0.05)

Figure 1. Shade and substrate relationships of gonad weight

Results of analysis of various liver weights showed that the treatment of sludge substrate significantly different to the other treatment but the treatment of sandy mud substrates and sand substrates were not significantly different. (P <0.05). Further treatment ¾ ½ the shelter and the shelter was not significantly different but significantly different to the treatment ¼ the shelter.

The results of careful analysis of

various weights to shelter and substrate combinations showed that the treatment A3B1, A3B2, A3B3, a2b2, A2B3 and A1B3 are not significantly different but significantly different to the treatment A2B1. Treatment A3B2, A3B3, a2b2, A2B3, A1B3 and A1B2 are not significantly different but significantly different to the A2B1 and A3B1. A2b2 treatment, A2B3, A1B3, A1B2 and A1B1 are not significantly different but significantly different to the treatment A2B1, A3B1, A3B2 and A3B3 with r2 = 0.25 value. (Figure 2).

Note: Different letters indicate significant different at level (P> 0.05)
Figure 2. Histogram shading and substrate relationships of liver weight

Various IGS analysis results showed that treatment sludge substrate significantly different to the other treatments but the treatments of the substrate and the substrate sand sandy mud were not significantly different. (P <0.05). ½ the shelter further treatment was significantly different to the other treatments and ¼ significantly different from the shelter for treatment ¾ the shelter. The results of various IGS analysis of shelter and substrate combination treatment showed that treatment A2B3, a2b2, A3B3, A3B2 and A1B3 are not significantly different (P <0.05). A3B1 and A2B1 treatment was not significantly different but significantly different to the treatment A2B3, a2b2, A3B3, A3B2 and A1B3. Treatment was significantly different to the treatment A1B1 A2B3, a2b2, A3B3, A3B2, A1B3, A3B1 and A2B1. Treatment A1B2 (half the shelter and mud) were significantly different for all treatments with a value of r2 = 0193. (Figure 3).

Note: Different letters indicate significant different at level (P> 0.05)
Figure 3. Histogram shading and substrate relationship with IGS

Results of analysis of IHS variety of treatments of the substrate showed that the treatment of sludge substrate significantly different to the other treatment but the treatment of sandy silt and sand substrates were not significantly different. (P <0.05). Further treatment of shelter / shade indicates that the treatment ¾ ½ the shelter and the shelter was not significantly different but significantly different to the treatment ¼ the shelter.

Results of analysis of IHS variety of shelter and substat komdinasi treatment showed that treatment of A2B1 and A3B1 are not significantly different. Treatment A3B1, A3B2 and A3B3 are not significantly different but significantly different to the treatment A2B1. Treatment A3B2, A3B3, A2B3, a2b2, A1B3 and A1B2 are not significantly different but significantly different to the treatment of A3B1 and A2B1. Treatment A3B3, A2B3, a2b2, A1B3, A1B2 and A1B1 are not significantly different but significantly different to the treatment A3B2, A3B1 and A2B1 with a value of r2 = 0033. (Figure 4).

Note: Different letters indicate significant different at level (P> 0.05)
Figure 4. Histogram relationship with the IHS shelter and substrate

Results of analysis of various E2 to the substrate treatment showed that treatment sludge substrate significantly different to the other treatment and sludge treatment was significantly different to the treatment gritty sand. Shelter next to the treatment showed that treatment ¼ ½ parts of the shelter and shelter were not significantly different but significantly different to the treatment ¾ the shelter. (P <0.05).

Results of analysis of various treatment combinations of E2 to the shelter and substrate A1B1 showed that the treatment was significantly different to the other treatments. A3B2 and A3B1 treatment was not significantly different but significantly different to the treatment A3B3. Treatment was significantly different to the treatment A2B3 A3B2, A3B1 and A3B3. A2b2 A2B1 and treatment are not significantly different but significantly different to the treatment A2B3, A3B2, A3B1 and A3B3. Treatment was significantly different to the treatment A1B3 A2B1, a2b2, A2B3, A3B2, A3B1 and A3B3. Treatment was significantly different to the treatment A1B2 A1B3, A2B1, a2b2, A2B3, A3B2, A3B1 and A3B3 with a value of r2 = 0184. (Figure 5).

Note: Different letters indicate significant different at level (P> 0.05)

Figure 5. Histogram relation to shade and substrate concentration of estradiol-17ß

Results of analysis of egg diameter range of treatments of the substrate showed that the treatment of sludge substrate significantly different to the treatment of sandy silt and sand substrates. Further treatment of shelter showed that the treatment ¼ significantly different from the shelter of the shelter and treatment ¾ ½ the shelter (P <0.05).

Results of analysis of egg diameter range of shelter and substrate combination treatment showed that treatment of A1B2 and A1B1 were significantly different to the other treatments. Treatment A3B2 A3B3 significantly different to the treatment. Treatment was significantly different to the treatment A3B1 A3B2 and A3B3. Treatment was significantly different to the treatment A2B3 A3B1, A3B2 and A3B3. A2b2 A2B1 and treatment are not significantly different but significantly different by treatment A2B3, A3B1, A3B2 and A3B3. Treatment was significantly different to the treatment A1B3 A2B1, a2b2, A2B3, A3B1, A3B2 and A3B3 with a value of r2 = 0302. (Figure 6).

Note: Different letters indicate significant different at level (P> 0.05)
Figure 6. Histogram shading and substrate relationships of egg diameter

Results of analysis of fecundity to the treatment of various substrates showed that the treatment of sludge substrate significantly different to the other treatments. Treatment was significantly different sandy mud to sand substrate treatment. Further treatment of the shelter shows that ¼ significantly different from the shelter to the other treatments and the treatment of ½ the shelter were significantly different for treatment ¾ the shelter. (P <0.05).

Results of analysis of fecundity range of shelter and substrate combination treatment showed that A1B1 was significantly different to the other treatments. Treatment A3B3, A3B2 and A3B1 are not significantly different. A2b2 A2B3 and treatment are not significantly different but significantly different by treatment A3B3, A3B2 and A3B1. A2b2 and A2B1 treatment was not significantly different but significantly different by treatment A2B3, A3B3, A3B2 and A3B1. Treatment A1B3 a2b2 significantly different to the treatment, A2B1, A2B3, A3B3, A3B2 and A3B1. Treatment was significantly different to the treatment A1B2 A1B3, a2b2, A2B1, A2B3, A3B3, A3B2 and A3B1 with a value of r2 = 0214. (Figure 7).

Note: Different letters indicate significant different at level (P> 0.05)
Figure 7. Histogram shading and substrate relationships of fecundity

DISCUSSION

Fish in their natural habitat are among the more foam and water plants or shade. Function of aquatic plants or shade is as lookout or hiding when will prey or as a place of care at the larval phase, up to fingerling size

Snakehead is a freshwater fish species that can live in rivers, lakes, ponds, reservoirs, marshes, flood, rice and even ditches and brackish water Sjafei et al. (1995); Anonymous (2002); Allington, (2002). According to Le (1999) and Allington (2002), that snakehead can has a high adaptive to anaerobic conditions due to its additional respiratory system at the top of the gills. The presence of a substrate for fish shelter and snakehead is a condition that can be adapted both to the larval phase, the growth even during the process of development of gonad maturity. In extreme conditions with low pH as a result of weathering of aquatic plants or matrial water, fish are able to tolerate (Sampath 1985).

Snakehead behavior in natural waters are generally located between the water and when the plant was directly threatened to immerse themselves into the mud. Mud substrate is an adaptive condition for fish such as snakehead decline in water levels air. Lack even the ability of fish to use oxygen directly from air.

Treatment provided no direct influence on gonadal development of fish farming in the container cork, but the conditions of the treatment is part of the triggers or things that are needed by snakehead. Inside the container cultivation of shade and substrate by using the fish over to "tame". In the natural condition of the snakehead begins to develop fish gonad maturation in the early dry season until the end of the peak of the dry season. These fish are found in the "beje" with the reproductive status of gonadal maturity level IV.

Provision of shade or part shade ¼ with mud substrate may provide natural conditions for fish farming snakehead inside the container. With an altitude of low water (10-15 cm) in a container of fish farming is to survive and can berkembangan gonadnya maturity.

CONCLUSION

Snakehead is a fish that can survive in conditions of "extreme". The presence of shade and the substrate is a requirement for multiple purposes such as hiding and spawning. Shade and the substrate does not indirectly influence on indicators of aspects of fish reproduction in the snakehead on container cultivation. More shade and substrate serves as the "ideal environment" in extreme circumstances tolerate in their natural environment.

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