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BROODSTOCK GONADS MATURATION LEVEL OF CLIMBING PERCH (ANABAS TESTUDINEUS BLOCH) WITH ZINC SUPPLEMENTATION IN FEED

Bijaksana Untung, **Fatmawati**, **Fitriliyani Indira***
Department Aquaculture, Faculty of Fisheries and Marine Science,
University of Lambung Mangkurat, Banjarbaru, Indonesia
*E-mail: indira.fitriliani@ulm.ac.id

ABSTRACT
Climbing perch is one of the fish species that is in great demand by the public because of its distinctive taste, tasty and slightly fatty meat. A very important factor in ensuring the continuity of seed availability for cultivation activities depends on the readiness of the gonad-ripe parents, one of which is the female parent. Gonadal maturation can be increased by providing optimal feed for broodstock containing essential nutrients (protein, fat and vitamins). This study aims to analyze the effectiveness of adding zinc to the feed given and to analyze the optimal dose of zinc addition to the feed on the performance of the reproductive organs of female climbing perch. This study used a completely randomized design with 4 treatments and 3 replications. Treatment A commercial feed (CF)+0 mg zinc; B CF+100 mg Zinc; C CF+200 mg Zinc and D CF+Zinc 300 mg. The results of research on feeding zinc can improve the reproductive performance of climbing perch with a range of average levels of maturity and gonadal histology III-IV gonads.

KEY WORDS
Gonad, maturation level, zinc, feed.

Climbing Perc (Anabas testudineus) is a local fish species that is often found in the land waters of Kalimantan, especially swamp waters. Climbing perch fish is very popular with local people because of its distinctive taste, tasty and slightly fatty meat (Mustika, 2015). The Climbing perch (locally name Papuyu) in South Kalimantan consists of two variants based on body color, namely green papuyu and yellow papuyu, but both have the same morphological characters (Nurdawati et al, 2007). The Climbing perch galam fish has a smaller body shape compared to the green Climbing perch fish (Rohansyah et al, 2010). Climbing perch fish cultivation is currently still very limited, because people have not yet mastered the cultivation technology and the information is inadequate (Muslim et al, 2021).

A very important factor to ensure the continued availability of seeds for cultivation activities depends on the readiness of the parent with mature gonads, one of which is the female parent. The readiness of female fish to become prospective broodstock is an important factor in cultivation activities, because female fish will produce eggs and fry. (Kiran et al, 2017) referred to in (Hariani, Kusuma 2016) the development of aquaculture activities can be carried out by manipulating the parent's gonads to mature quickly so that the reproduction time matches the production cycle. Apart from environmental signals and responses, providing high protein feed can also be done to accelerate gonad maturity.

Gonad maturation can be increased by providing parent feed that contains optimal nutrients (protein, fat and vitamins). Nutrients in parent feed can influence gonad development, fecundity and embryo development. Improving parent feed not only affects the quality of eggs and sperm, but also the quality and number of seeds produced. Lack of required nutrients in feed can be the main factor causing failure of fish to mature gonads, especially due to vitamin deficiencies (Tahapari et al, 2019; Paul et al, 2017; Putra et al, 2016). Providing feed at the right time is related to the frequency of feeding, namely the number of times feed is given in one day to cultivated organisms. Fish food consumption is influenced by a number of factors including body size, stage, food availability, gastric emptying rate, water temperature, activity and fish body health (Wardhani et al, 2011; Safarini et al, 2017).

Mineral needs in aquatic organisms also need to be considered. Zinc (Zn) is a mineral element which is an essential nutrient needed by humans and animals for various physiological functions of the body, including growth, development of the reproductive system and immune function. Zinc can be used as a nutrient, antioxidant and even as a poison. The role of zinc in increasing growth and digestibility in fish has been reported (Denstadlin et al, 2006; Thangapandiyan & Monika, 2020; Ramseyer et al, 1999; Wekell et al, 1983; Wekell et al, 2016).

Excellent broodstock quality may be achieved through genetic modification and improving the quality of sperm and egg cells by increasing nutritional intake. Izquerdo et al (2001) stated that increasing nutritional intake significantly improves not only sperm and egg quality but also seed quality and quantity. Proteins, fats, carbohydrates and vitamins are important for reproduction, but without minerals, the reproductive process can be stranded. One of the micro minerals to induce reproductive performance is zinc (Zn). Zinc is involved in 300 different biological processes, including DNA transcription, protein translation, cell proliferation, differentiation and apoptosis (Kelleher et al, 2011).

Zinc interacts with DNA, regulates gene activity, maintains integration biology, protects against oxidative damage and physiologically zinc is very important for growth, sexual development and reproduction (Roy et al, 2013; Ramseyer et al, 1999). Several findings report that Zn can be beneficial in reproductive processes, growth performance and antioxidant responses. Zn is an essential micronutrient that functions as a metalloenzyme and cofactor in enzymatic systems (Jobling, 2011). Zn is involved in various enzymatic activities in DNA synthesis and signal regulation which are indirectly related to hormone regulatory activities and cell division (Chasapis et al, 2012).

Zinc plays an important role as a cofactor of several enzymes and also paracellular and intracellular signaling functions. In farmed fish, Zn deficiency has occurred in association with growth disorders, cataracts, bone abnormalities and decreased activity of various Zn metalloenzymes. The bioavailability of an element depends on the form of the chemical element. The aim of this research was to analyze the effectiveness of adding zinc to feed for rematuring the gonads of female Climbing perch fish. The benefits of this research will be important information to increase spawning frequency because of the role of zinc in shortening the rematuration time of female Climbing perch fish.

MATERIALS AND METHODS OF RESEARCH

This research was carried out for 3 months at the Wet Laboratory, Fish Nutrition Laboratory, Faculty of Marine Affairs and Fisheries, Lambung Mangkurat University, Banjarbaru City, South Kalimantan. The rearing container for female Climbing perch fish used in this research is a basin with a diameter of 50 cm with a container height of 28 cm and a water level of around 20-22 cm, totaling 12 broodstock. Then each treatment is labeled in the basin container. Each container contains 3 female Climbing perch females broodstock and is covered with a Happa so that the fish do not jump out, and is provided with sufficient aeration.

The fish used in this research were parent Climbing perch fish originating from BPAPL Karang Intan which had been domesticated with relatively the same size and weight, between 50-90 grams. Before the research is carried out, the parent Climbing perch fish is first subjected to surgery to determine Gonad Maturation Level (GML).

The feed used was commercial feed without added zinc as a control and commercial feed with zinc added at different doses according to the treatment. The commercial feed used has a high protein content (>30%). The zinc used in feed is L-Zinc syrup (100 ml), the composition of this ingredient, each teaspoon (5 ml) contains Zn sulphate monohydrate equivalent to 10 mg elemental zinc. The addition of zinc is done by spraying the solution onto commercial feed according to the dosage. This is in accordance with (Debnath et al, 2005), the zinc solution is sprayed using a sprayer. Fish food that has been mixed with a zinc solution is then air-dried until dry. Feeding is carried out twice a day in the morning at 08.00 WITA and in the afternoon at 16.00 WITA with an ad satiation system (as much as possible).

The design used in this research was a completely randomized design (CRD). That is the simplest design when compared to other experimental designs. The CDR used in this research was 4 x 3 (4 treatments and 3 repetitions) resulting in 12 experimental units, each containing 3 broodstock female Climbing perch fish. The treatment and repetition layout in this study was created by randomization in Microsoft Office Excel. The research used 4 treatments with 3 repetitions resulting in 12 experimental units, Treatment A: Control (Commercial Feed/CF without adding zinc); Treatment B: CF+ Zinc 100 mg/kg; Treatment C: CF + Zinc 200 mg/kg; Treatment D: CF + Zinc 300 mg/kg.

RESULTS AND DISCUSSION

Gonad Maturity Level (GML) of male and female fish is determined morphologically including color, shape and size of the gonads. Qualitative gonad development is determined by observing GML I-V based on gonad morphology, following the classification (Prianto et al, 2014). Gonad Maturity Level (GML) of fish is determined morphologically based on shape, color, size, gonad weight and development of gonad contents. The data needed is gonad size and gonad morphology. During the process of development and maturation of fish gonads, most of the growth energy will be diverted from somatic cell development to gamete cell growth (Jana et al, 2021). So that when the fish have mature gonads, the weight of the gonads in female fish can reach 10-25% of their body weight, while in male fish it is between 5-10% of their body weight (Effendie, 1997).

Table 1 – Results of Observation of Gonad Maturity Levels of Broodstock Female (*Anabas testudineus*) Climbing Perch (Ma'ruf, 2019)

GML	Gonad	Detail Information
I		The gonads are very small and like threads transparent. The cross-section of the gonad is round with a reddish color.
II		Gonads fill 25% of the body cavity. Gonads reddish and egg colored invisible.
III		Gonads fill 50% of the body cavity. Gonads yellow. The egg shape appears through the ovarian wall.
IV		Gonads fill 75% of the body cavity. Gonads yellow, almost clear or clear. Eggs can be seen.
V		Gonads are red. Gonads are soft and eggs are not visible.

The main factor that determines the speed of fish gonad maturation is the feed given during maturation. This is because the basic ingredients in the formation of egg cells and

sperm cells come from the metabolism of the feed provided, especially for female fish, this maturation process is known as the vitellogenesis process. In accordance with (Kamler, 2008) which states that the basic ingredients in the gonad maturation process consist of carbohydrates, fat and protein. So, when maturing potential broodstock for hatchery business, the seedmen usually always provide feed containing high protein in the pellets provided (Abidin et al, 2006; El-Sayed & Kawanna, 2008; El-Sayed, et al, 2003). In this research, the determination of gonad maturity level (GML) in female Climbing perch fish using the GML reference according to (Ma'ruf, 2019) can be seen in Table 2.

The research was carried out for 30 days, and then surgery was carried out on the female broodstock fish to determine the level of gonad maturity. The level of gonad maturity obtained different results. By using the standard used according to Bernal *et al*, 2015 and Ma'ruf, 2019, where in the initial sampling the GML II results were obtained, which had the characteristics of the gonads only filling 25%of the peritoneal cavity in the body fish, the gonads are reddish, the eggs are still not very visible and the walls covering the gonads (smooth muscle) are thick. The GML obtained after the research ranged between III-IV, where GML III had the characteristics that the gonads had filled 50% of the peritoneal cavity in the fish's body, the gonads were yellow and the shape of the eggs was visible through the ovary wall. Meanwhile, GML IV has the characteristics of the gonads filling 75% of the peritoneal cavity in the fish's body, the gonads are yellow, almost translucent or translucent and the eggs can be seen. Fishing season also influences GML, which was reported by Uddin *et al* (2017) Vietnam Climbing the Perch, GML showed higher grades during June to July.

Table 2 – Gonad Maturity Level (GML) each experimental unit

Treatment	GML Beginning	GML Final
A1	II	IV
A2	II	III
A3	II	III
B1	II	IV
B2	II	III
B3	II	IV
C1	II	IV
C2	II	III
C3	II	IV
D1	II	IV
D2	II	IV
D3	II	IV

a) GML II b) GML III c) GML IV

Figure 1 – Gonads of Climbing Perch Broodstock

The results of the research showed that the highest average level of gonad maturity of broodstock fish was found in treatment D using pelleted feed with the addition of zinc at a dose of 300 mg/kg feed. This shows the role of zinc as a cofactor in several enzyme systems and is a component of a large number of metalloenzymes which will increase the efficiency of absorption of feed nutrients so that fish gonad development is more optimal (Maage, 2001; Marimuthu et al, 2010; *Monadl* et al, 2010).

In another study (Uddin et al, 2017), the results of histological preparations of the gonads were reported *A. testudineus* females, found increased vitelline as a sign of the

process vitellogenic with increased yolk vesicles in number and size as shown in treatments C and D with the dominance of GML IV with egg yolks that are full and have begun to separate from each other. Also found in adult fish with primary, secondary and tertiary oocytes found in the early phase and visible gonads migration nuclei in peripheral areas with many vacuoles. This shows that the development of the gonads of A. testudineus is in groups is asynchronous. The same thing was also found in *Pangasianodon hypophthalmus* (Kabir et al. 2012) and Channa striatus is equipped with output that works with. Similar results also occurred observed for *C. striatus* (Ghaedi et. al, 2013) which shows asynchronous nature of ovarian development.

CONCLUSION

The reproductive performance of female climbing perch fish with feed plus zinc can effectively increase the level of gonad maturity from the rematuration process of GML II to dominant GML IV.

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