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Preliminary Study on the Reproduction of Geso (*Hemibagrus wyckii*, Bagridae) Fish from Kampar Kanan River, Indonesia

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ABSTRACT

Hemibagrus wyckii is one of vulnerable Bagridae species that inhabit the Kampar Kanan Rivers, Riau, Indonesia. A preliminary study on the reproduction of the *H. wyckii* has been conducted from April to August 2015 in order to determine the reproductive aspects of this fish. The number of fishes sampled was 45. The fish was captured by fishermen using fishing lines. Parameters measured were total length (cm), body weight (g), sex and reproductive condition of the fish, including gonadal maturity stages, fecundity, egg diameter, and spawning type. The eggs were preserved in Gilson solution and the diameter was measured. The fecundity was calculated using a gravimetric method. Results obtained shown that 36 males (TL 42.9 to 65.2 cm and BW 961-2,898 g) and 9 females (TL 56.4 to 79.2 and BW of 1,910 to 4,710 grams) were captured. Gonadal Somatic Index of the male ranged from 0.6 to 2.00% and that of the female was 0.88-3.97%. The fecundity range from 3,876-9,588 eggs and the egg diameter was range from 1.04-2.81 mm. Data obtained indicate that the type of the oocyte development of *H.wyckii* is asynchronies with partial spawning.

Keywords : Reproduction, *Hemibagrus wyckii*, Bagridae.

INTRODUCTION

In the inland water of Riau Province, lived four families of Bagridae, namely *Hemibagrus nemurus*, *Hemibagrus wyckii*, *Mystus negricep* and *Mystus micracanthus* (Fithra and Siregar 2010; Aryani, 2015). Among the four families of the Bagridae, *H.wyckii* with local name "Geso" has been classified as vulnerable (Yustina 2001; Simanjuntak et al, 2006; Fithra and Siregar, 2010; Aryani, 2015), because of over fishing and habitat alteration (Aryani, 2014). Fish *H.wyckii* has the strategic value for cultivation because of economic value Rp 125000-150000, - (Aryani, 2015). For the success of breeding fish Geso while now underway for successful broodstock of domestication and culture. In order for the domestication process is successful, it would require a study of the reproductive aspects that somatic gonad index, fecundity, egg diameter and spawning type.

MATERIALS AND METHODS

Research was conducted from April to August 2015, the material used is fish Geso (Figure 1) were collected from the catch of fisherman with fishing lines from the water of the Kampar areas at Kouk village ($0^{\circ} 19' 23.44''$ N and $100^{\circ} 56' 40.05''$ E), Air Tiris village ($0^{\circ} 21' 24.77''$ N and $101^{\circ} 06' 06''$ E and Tarantang village $04.90''$ ($0^{\circ} 21' 05.32''$ N and $101^{\circ} 18' 43.96''$ E)). Other equipments such as meter with accuracy of 0.1 cm, electronic scales precision brands camry 0.01 g), sample bottles, surgical tool, Gilson solution and microscope Olympus CX 21 which has been calibrated to the scale of 0.025 mm. Fish Geso caught in fresh state was inserted into the cool box measuring 120x50x40 cm and taken to the Hatchery and Breeding Laboratory, Fisheries and Marine Sciences Faculty, University of Riau.

Fish Geso samples measured total length (from tip of nose to tip of the longest tail) and weighed weight, after measuring the fish dissected to see gender and maturity level gonad determined. Gonad maturity level (TKG) was determined morphologically include color, shape and size of the gonads (Effendie, 1979). Gonads removed from the body cavity and weighed using scales



with an accuracy of 0.01 g, which is then used to calculate gonad somatic index (IGS) with following formula: IGS = $\frac{\text{gonad weight (g)}}{\text{body weight (g)}} \times 100\%$.



Figure 1. *H. Wykii*; body weight= 1820 g, SL = 49,5 cm, Photographs by Aryani (2015)

To calculate the fecundity total with gravimetric method taken from the ovary as much as 1 gram of fish that have TKG IV (ready to spawn) and preserved with a Gilson solution (100 ml alcohol 60%, 880 ml of distilled water, 15 ml of nitric acid, 15 ml of glacial acetic acid and 20 ml of mercury chloride (Bagenal in Effendie, 1979). The use of the Gilson solution to harden the egg and to release the eggs from the ovary tissue. The absolute fecundity was determined by using a formula based Nikolsky (1963) as follows: $F: f = B: b$, where F = total fecundity (grains), f = number of eggs of example gonads (grains), B = weight of gonad entirely (gram) and b = weight of gonad sample (g).

Egg diameter was measured from the ovary which has been preserved as much as 30 grains of fish with high levels II-IV gonad maturity. To determine the type of fish spawning Geso analyzed histologically. For absolute fecundity suspect based on the total length and body weight were used equation Jhingran (1984) as follows: $F = a^1 L^b$ or $\log F = \log a + b \log L$, $F = a^2 B^t$ or $\log F = \log a + b \log W$, F = fecundity (grains), L = the total length of the fish (cm), Bt = body weight (grams), a and b = constants.

RESULTS

From 45 fish samples, obtained 9 females with a total length range 56.4-79.2 cm and body weight 1910-4710 grams, and 36 males with a length ranging from 42.9-65.2 cm and a weight of between 961-2898 g. Fish Geso classified as heterosexual namely sperm and egg cells produced by different individuals. Therefore ovaries and testes are found evolved separately since each individual phase of the larvae and remain androgynous female or male during its lifecycrle. Secondary sexual characteristics that can distinguish between male and female fish is on the female fish fatter female body and genital hole to hole distances shorter anus, while the male body is more slender fish in the hole there is a slight bulge genital and anus distance to the hole longer.

Somatic Gonad Index (IGS). Gonadal development can be seen from Somatic Gonad Index (IGS) along with increasing ripe gonad, the gonads will grow and gain weight. Tables 1 and 2 present the distribution of the size of the female and male fish length and the average IGS.

IGS value of Geso female fish TKG II average of $0.88\% \pm 0.42$, TKG III $2,62\% \pm 0.28$ on average, and the average TKG IV $3.35\% \pm 0.87$. While the value of IGS male fish TKG I 0, TKG II average $1.24\% \pm 0.81$, on average TKG III $1,43\% \pm 0.89$ and an average TKG IV $1,60 \pm 0.54$. IGS average value Geso female fish is greater than the value of IGS male fish at the same TKG (IV) it is associated with ovarian weight gain is always greater than the testis weight gain.

Table 1. Level of maturity and somatic gonad index Fish Geso female by total length

Class	Class bond (cm)	TKG				Total (tail) n	IGS (%)			
		I	II	III	IV		I	II	III	IV
A	56,4-61,9	3	3	0	0	6	0	0,88	2,46	0
B	62,1-68,9	0	1	0	0	1	0	0	2,79	0
C	69,8-74,5	0	0	0	0	0	0	0	0	0
D	75,6-80,2			2	2		0	0	0	3,35

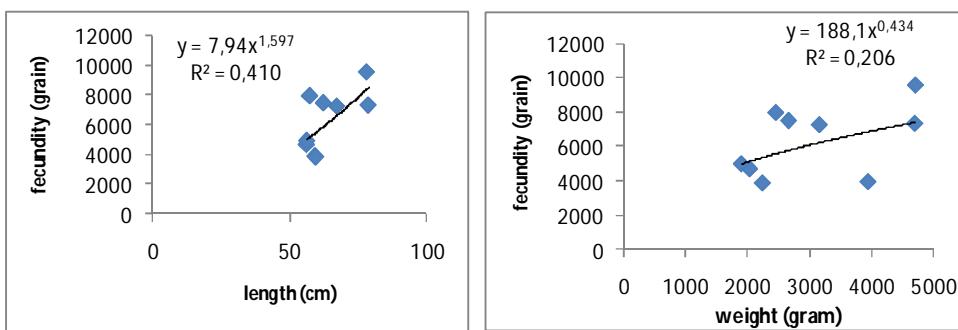
Table 2. Level of maturity and somatic gonad index Geso male fish by total length

Class	Class bond (cm)	TKG				Total (tail)	IGS (%)			
		I	II	III	IV		I	II	III	IV
A	42,90-48,8	0	11	3	3	17	0	1,29	1,15	1,32
B	49,48-54,76	0	1	6	1	8	0	0,6	1,17	1,59
C	55,77-61,34	0	0	2	5	7	0	0	1,57	2,00
D	62,34-67,92	0	0	0	4	4	0	0	0	1,22

Fecundity and Egg Diameter. Fecundity of fish Geso ranged between 2,943-9,558 granule/individual. This value indicates the potential of the eggs produced for one-time spawning. Fecundity mostly found in fish measuring 78.6 cm by 9558 the number of grains and eggs ranged from 1.04 to 2.81 mm in diameter. The value of absolute fecundity fish Geso total length presented in Table 1 and graphs fecundity relationship with the length and weight are presented in Figure 2 and 3. From Figure 2 obtained value of $R^2 = 0.410$ and Figure 3 the value of $R^2 = 0.206$. From the equation it is evident that Geso fish fecundity increases with increasing length of the body. R^2 values obtained showed that fecundity is determined by the length of the body. This parameter reflects that the length of the body is better to estimate the fecundity of fish Geso.

Table 3. fecundity fish Geso based on the length of the body

No	Class Length (cm)	Total (tail)	Fecundity (granule)	Average (granule)
1	56,4-62,7	6	3,943-7970	5,492
2	63,1-68,8	1	7,265	7,265
3	69,8-75,5	-	-	-
4	76,5-82,2	2	7,338-9,558	8,448

**Figure 2.** Regression of fecundity with body length.**Figure 3.** Regresion of fecundity with body weight

From observations of fish Geso diameter with a total sample size of 50 rounds there is a difference in diameter between the posterior and anterior median. Diameter size fish eggs Geso at Maturity Level gonads (TKG IV) on the posterior portion of 2.88 mm, at a median of 2.81 mm and 2.75 mm anterior and histologically presented in Figure 4. From the analysis of histologically known fish oocyt development Geso occurs par group, which found the population of oocytes with different sizes on the same TKG (Figure 4).

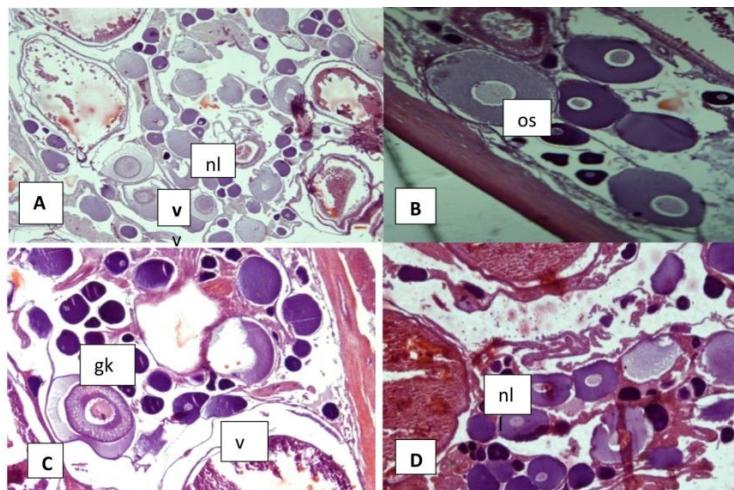


Figure 4. Histology Geso fish ovaries.

Description: TKG I (A) is dominated by the oocyte that has a nucleus (nl), TKG II (B) is dominated by the larger oocyte, TKG III (C) contained vacuoles (v) and granules yolk (gk), TKG IV (D) nucleus (nl) has moved to the edge.

DISCUSSION

Comparison Geso female fish with male fish overall is 9: 36 or 1: 4. It is thought to be related to the low rainfall in the months of April to August 2015 because when associated with the spawning season generally fish that live in tropical areas such as fish spawning baung do when the water level in the river rises (Welcome, 1986). It also relates to fish Geso populations in three habitats such studies are vulnerable (Yustina 2001; Simanjuntak et al, 2006; Fithra and Siregar, 2010; Aryani, 2015). According to Nikolsky (1969) when on the water there are differences in the size and number of one sex, possibly due to differences in growth patterns, different ages because the first gonadal maturation, different lifespan and the addition of a new individual.

Somatic Gonad index value (IGS) Geso female fish at TKG IV between 2.73 to 3.97% and males between 1.22 to 2.00%. Mean weight gain is greater than the ovary testis weight gain. The same was found in coaxing fish (*Channa Lucius*, Channidae), where the value of TKG IV IGS female fish ranged from 2.15 to 4.70% and 0.34 to 0.97% male (Azrita, 2012). Similarly, the value of IGS fish *Gobius niger* (Gobiidea, teleost) ranged from 3.25 to 4.0% females and males and from 0.3 to 0.6% (Louiz, Attia and Hassine, 2009). IGS value is different from the value of the fish IGS Baung (*Hemibagrus nemurus*) TKG IV females average of 10.78% and 3.46% male (Sukendi, 2001). As a comparison value IGS female Cyprinidae fish TKG IV higher than the IGS value of Belingka fish (*Puntius blinka*) females and males ranged from 3.39 to 6.78% from 2.42 to 3.57% (Azrita et al, 2010). Of the value of fish Geso IGS can be concluded that the value of IGS depends on the number of eggs and egg diameter.

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Fecundity related with age, length or weight and species of fish. (Azrita and Syandri, 2013; Syandri et al, 2013; Syandri et al, 2015). Bagenal (1978) stated that the body weight or total length of fish tends to increase fecundity. From the results of this study fecundity is affected by the length of the fish. Fecundity mostly found in fish measuring 78.6 cm by 9,558 the number of granules and the smallest with a length of 59.6 cm indigo fecundity of 3,943 granules. Fish Geso that fecundity increased with increasing length of the body. This parameter reflects that the length of the body is better to estimate the fecundity of fish Geso.

Fecundity of fish Geso ranged between 2,943-9,588 granules are smaller when compared to fish Baung between 34701-87118 granules (Muflikhah et al, 1998). In general, fish that has a diameter smaller fecundity large eggs. Such fecundity in fish bujuk (*Chana lucius*) ranged between 1,152-3,746 granules/individual, or 160-210 eggs per gram weight of the gonads with the average value of the relative fecundity of 183 eggs/gram (Azrita, 2012). Fecundity green snakehead fish (*Channa punctata*) in India ranged from 2,300 to 2,9,600 granules (Jhingran, 1984), 2 mm diameter eggs (Khan, 1924 in Courtenay and Williams, 2004), fecundity dwarfs snakehead (*Channa gachua*) in Berhampur India ranged between 2,539-7194 granules, egg diameter 2.1 to 2.6 mm (Mishra, 1991). Geso smaller fish fecundity of fish such as fish family Cyprinidae Belinka (*Puntius belinka*) ranges from 17,599 to 60,399 granules (Azrita et al., 2010), *Osteocillus kalabau* ranged from 130 thousand to 140 thousand eggs/kg body weight (Kris et al, 2010), *Osteochillus vitattus* of Koto Panjang Reservoir amounted to 96 880 granules/weight (Syandri et al, 2015).

There are differences in the size of fish eggs Geso diameter between the posterior and anterior median. The size of the diameter of the eggs on the level of maturity of gonads (TKG IV) on the posterior portion of 2.88 mm, at a median of 2.81 mm and 2.75 mm for anterior while the TKG IV baung fish size between 1.26 to 1.35 mm diameter Sukendi (2001) in contrast to persuade fish section 1.12 to 1.32 mm anterior and posterior sections 1.35 to 1.70 mm Azrita (2012). These data indicate fish spawning Geso do partially with large egg diameter and can be domesticated as a candidate for fish culture because large eggs will have larvae with a large mouth opening.

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International Proceeding

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