

Gonad Maturity of Bonti-bonti Fish *Paratherina striata* in Towuti Lake, Southeast Sulawesi

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Abstract—*Paratherina striata* is an endemic fish at Towuti lake that have a tasty meat, and it sells as the dried fish. The study aims to analyze gonad maturity of *P. striata*, i.e., gonad maturity stage and gonad maturity index. The specimens were collected at different site of Towuti Lake, Southeast Sulawesi Regency from July to September 2007 by using gill net. Total length, body wet weight, and gonad wet weight were measured for each specimen. Gonad maturity stage classified into five phases, i.e., immature, early development, developing, mature, spawning. Gonad maturity index were calculated by using the Johnson equation. The study revealed that gonad maturity index were abundance in July and August, in which the peak spawning season occurs; and at the same GS, the GI at the female fish was bigger than at the male. The GI maximum can reached 3.89 percent.

Keyword : *Paratherina striata*, gonad maturity stage, gonad maturity index

gonad maturity stage of population in the wile [10, 11]. Low quality of genitor could cause the problem in fish breeding.

GI is also an important gonad maturity parameter. This index describes the condition of gonad development. High gonad maturity index means that important energy portion is allocated to reproductive process. Fish that have a high index value usually have important eggs number [8, 9].



Fig. 1. Bonti-bonti fish, *Paratherina striata*

I. INTRODUCTION

Sulawesi Island has very high diversity of endemic fauna. Sulawesi Island have 52 species freshwater endemic fish [14]. Some of endemic fish species have been listed in the IUCN (Red List of Threatened Species in 2002), e.g., *Paratherina striata*, *P. wolterecki*, *Telmatheirina abendanoni*, *T. celebensis*, *T. lagidesi*. Bonti-bonti fish *P. striata* is an endemic species at Towuti Mahalona Lake. *P. striata* have a tasty meat. The local community sells Bonti-bonti fish as dried fish.

Actually, Bonti-bonti fish in Towuti lake is already at high level exploitation. The Towuti lake ecosystem is endanger due to sedimentation from saw-mill industry. The lake became shallow and shallow due to sawdust [6]. Although Bonti-bonti fish is an endemic fish, and its quality habitat is decrease, but until present, its biological aspects is poorly analyzed. The reproductive biology, especially the gonad maturity, is an important information for fish sustainable use policy development. This study aims to analyze gonad maturity of *P. striata* in the Lake Towuti, i.e., gonad maturity stage (GS) and gonad maturity index (GI).

GS is an important reproductive biology parameter in fish resources management, especially in fish breeding. The performance fish genitor could catch in good maturity stage condition by referring to evolution or progress of

II. METHODOLOGY

The specimens were collected at different site in the Towuti lake, Southeast Sulawesi Regency (Fig. 2) from July to September 2007 by using gill net. Total length and wet weight were measured for each specimen.

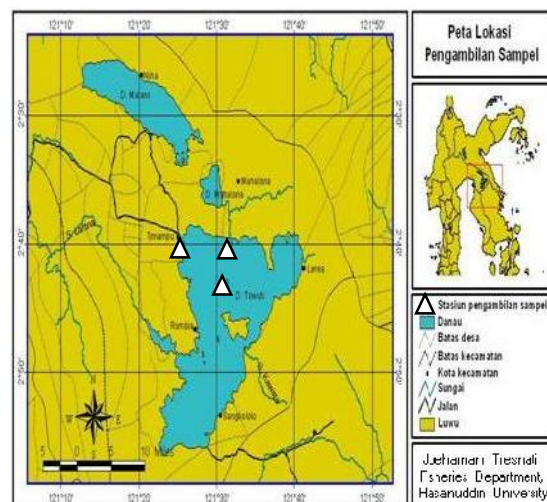


Fig. 2. Sampling area *Paratherina striata*

Gonad maturity stage classified into five phases, namely: (a) immature, Stage I; (2) early development, Stage II; (3) developing, Stage III; (4) mature, Stage IV, and (5) spawning, Stage V [8, 10]. Gonad maturity index (GI) were calculated by using the Johnson equation [4, 5], namely: $GI = (WG)/WB) \times 100\%$ where WG is the gonad wet weight and WB is body wet weight.

III. RESULTS AND DISCUSSION

A. Gonad Maturity Stage

During this study, all gonad maturity stage (GS) were observed, i.e., GS I, II, III, IV and V. GS I, at the female, the ovary is look like a long yarn in the body cavity. At the male, the testes is also look like a yarn but shorter then ovary. The ovary and testes colors were clear. GS II, at the female, the ovary size became bigger and the color is a yellowish; the egg could not seen by eyes. At the males, the testes size getting bigger and more obvious; the gonad color was milky. GS III, at the female, the ovary color was yellow, and the oocyte can be seen by eyes. At the male, the testes surface was serrated; the testes size was getting larger. GS IV, at the female, the ovary size increased, and its color was yellow. The eggs can be separated easily; ovary filled two-thirds the abdominal cavity. At the male, the testes surface was jagged; the testes size was very large. GS V, at the female, ovary was wrinkled, wall became thickness, and some oocytes were in early development (stage II). At the male, the testes the front part was flat, and the back part still contained sperm. Gonad maturation stage of *P. striata* were similar to the fish gonad development in other species of tropical fish [2, 7, 10].

GS were synchronous between male and female, although the percentage at the stage II, III and IV at the male and female were very different. During the sampling periods, the female was always more abundance than the male (Table I). For the total sampling of *P. striata*, there was 278 fishes that consisted by 67 males (24%) and 211 females (76%).

GS III and IV were abundance on July and August (Table 1), in which the spawning peak season occurs. It seem that the *P. striata* spawning period was earlier than marine fish species. Marine fish species generally spawn in October or later [8, 13]. *P. striata* probably restart the gonads growth after the spawning. The gonads growth could be indicated by intensive spermatogenesis and vitellogenesis at GS III [1]. At GS III, the spermatocytes are already abundance in the testes (Fig. 3). At the female, the oocyte primary and secondary are dominant and growing fast to become oocyte mature (fig. 4).

At the mature stage (GS IV), the ovocyte became mature. The ovocytes mature were dominant in the ovary (Fig. 5). This process happen commonly at the fish species that have multiple spawning periods in a year [8, 11]. The aquatic organisms that undergo full GS cycle are

only found at the organism that have primitive reproductive system, such as sea cucumbers [12, 13]. Various percentage existence of GS and synchronous GS between males and females indicates that *P. striata* can spawn more than once a year. The fish species that have different GS percentage in the same time, it have several spawning in a year [4]. The similar reproductive patterns were commonly observed at the tropical fish species [2, 10, 15].

TABLE I

GONAD MATURITY STAGE (GS) DISTRIBUTION OF *PARATHERINA STRIATA* BASED ON SAMPLING PERIOD

Sampling	Sex	GS					Σ
		I	II	III	IV	V	
14/07/2007	Male	4	4	1	-	-	9
	Female	4	10	8	2	1	25
28/07/2007	Male	6	6	3	-	-	15
	Female	5	18	22	7	1	53
11/08/2007	Male	4	2	3	-	-	9
	Female	9	17	15	7		48
25/08/2007	Male	5	3	3	-	-	11
	Female	7	10	15	16	2	50
08/09/2007	Male	6	9	1	-	-	16
	Female	-	8	7	3	-	18
22/09/2007	Male	3	2	2	-	-	7
	Female	4	7	5	1	-	17



Figure 3. Testes structure of *Paratherina striata*. Sc: Spermatocyte.

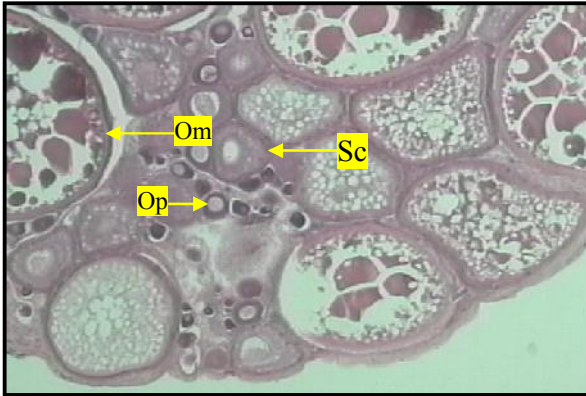


Figure 4. Ovary structure of *Paratherina striata* at Stage III. Om : Ovocyte mature; Op: Ovocyte primary; Os: Ovocyte secondary.



Figure 5. Ovary structure of *Paratherina striata* at Stage V. Om : Ovocyte mature; Op: Ovocyte primary; Os: Ovocyte secondary.

B. Gonad Maturity Index

The study indicated that gonad maturity index (GI) were related to GS. At GS I, GI at the female was 1.48, and ranged from 0.14 to 4.16. At GS III, GI at the female was 2.34, and ranged from 0.72 to 7.47, while at the male was 0.160, and ranged from 0.06 to 0.70. At GS IV, GI at the female was 3.75, and ranged from 1.54 to 7.92; while at the male was 0.176, and ranged from 0.07 to 1.20. At At GS V, GI at the female was 3.89, and ranged from 3.59 to 4.05. At the same GS, GI values of the female were larger than at the male (Table 2). It was caused by the different of gonad wet weight at the male and female. The similar case are commonly observed at fish species [4, 8, 10, 15].

TABLE II.
GONAD AND MATURITY INDEX (GI) OF
PARATHERINA STRIATA AT DIFFERENT GONAD
STAGE (GS)

GS	Female GI		
	Range	Average	Σ (Individu)
II	0.14 – 4.16	1.48	70
III	0.72 – 7.47	2.34	72
IV	1.54 – 7.92	3.75	36
V	3.59 – 4.05	3.89	4

GS	Male GI		
	Range	Average	Σ (Individu)
II	0.06 – 0.70	0.160	28
III	0.01 – 1.57	0.176	26
IV	0.07 – 0.12	0.183	13

IV. CONCLUSIONS

The study revealed that: (1) GS III and IV were abundance in July and August, in which the spawning peak season occurs, and (2) at the same GS, the GI at the female fish was bigger than at the male. The GI maximum can reached 3.89.

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