Egg diameter of female silver rasbora (*Rasbora argyrotaenia*) at different gonadal maturity stage

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**Abstract.** As a new aquaculture species, silver rasbora (*Rasbora argyrotaenia*) has a high demand for consumption and ornamental fish in Indonesia and its surroundings [1,2]. The culture production of silver rasbora is limited, so fishing in wild is the primary source to fulfill the demand [3]. The silver rasbora farming still developing, rare in biology data, and several studies have obtained to complete cultural information; such as gonadal maturation and breeding optimization [2,4–8]. The study about the maturity criteria of silver rasbora needs to be conducted to support maturation and breeding research. Ovarian maturity criteria should be known to observe the maturation periods for gonadal investigations [9].

Egg diameter is one of the parameters that can be measured to determine the gonadal maturity stage in fish [10]. The diameter of the egg gets bigger as the gonadal maturity stage increases [11,12]. The aim of this study was to measured egg diameter in female silver rasbora at different maturity stages. It will reach our knowing of the maturation cycle of silver rasbora and also improve artificial techniques of culturing fish for commercial purposes and conservation stocking.

**1. Introduction**

As a new aquaculture species, silver rasbora (*Rasbora argyrotaenia*) has a high demand for consumption and ornamental fish in Indonesia and its surroundings [1,2]. The culture production of silver rasbora is limited, so fishing in wild is the primary source to fulfill the demand [3]. The silver rasbora farming still developing, rare in biology data, and several studies have obtained to complete cultural information; such as gonadal maturation and breeding optimization [2,4–8]. The study about the maturity criteria of silver rasbora needs to be conducted to support maturation and breeding research. Ovarian maturity criteria should be known to observe the maturation periods for gonadal investigations [9].

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**2. Material and Methods**

**2.1. Fish origin and egg diameter observation**
This study was conducted in February 2020 at instrument laboratory Universitas Airlangga, Banyuwangi Campus, Indonesia. A total of 16 females of silver rasbora with a weight of 1.73±0.08 g and length of 5.39±0.13 cm was obtained from the aquaculture installation of Universitas Airlangga, Banyuwangi Campus, Indonesia.

Macroscopically, the maturity stage was determined based on fish maturity criteria [13] with some modification (Table 1). The belly of the fish was dissected to get the gonads. Anterior, posterior, the middle part of the gonads was cut into smaller pieces and placed in NaCl 0.9% for egg diameter measuring using compound Nikon Eclipse E200-LED light microscope connected to a video monitor (100x magnification) with OptiLab image raster software (Nikon).

Table 1. Morphological characteristics for different maturity stages for female silver rasbora (Rasbora argyrotaenia).

| Maturity stage         | Morphological characteristics                          |
|------------------------|--------------------------------------------------------|
| Immature (I)           | Ovaries were very thin semi-transparent tubes           |
| Maturing (II)          | The ovaries increase in size. The coloration is darker yellowish, the eggs are not clearly visible |
| Nearly ripe (III)      | Ovary becomes yellow, the egg granules are visible     |
| Ripe and running (IV)  | The larger ovary fills ½-2/3 of the abdominal cavity, the egg is yellow and can be separated. |
| Spent (V)              | Ovaries wrinkled. The remaining eggs are found in the genital opening. |

3. Results and Discussion

Based on the data, the egg diameter tends to be increase directly proportional to maturity stage. The mean ± standard deviation and range of silver rasbora egg diameter in 3 different maturity stage (II, III, and IV) are 17.96 ± 1.89 µm and 14.02 - 20.56 µm, 47.15 ± 10.07 µm and 30.12 - 60.76 µm, 83.02 ± 4.40 µm and 71.76 - 90.45 µm (Table 2). The gonads in different maturity stage showed in Figure 1. Ovary size was increased following the maturity stage.

![Figure 1](image-url) Ovary (indicate by arrow) of silver rasbora (Rasbora argyrotaenia) in different maturity stage. A: maturing (stage II), B: nearly ripe (stage III), C: Ripe and running (stage IV). Bar: 1.0 cm.

The results showed that the higher the maturity stage of the gonads, the larger the egg size was measured. The same results were observed in red cherry shrimp (Neocaridina davidi) [9] and rainbow trout (Oncorhynchus mykiss) [14]. Egg size increases with the increase in ovary size according to the stage of maturity of the gonads. Increased egg diameter in the maturation of the ovary is caused by the
accumulation of vitellogenin from the process of vitellogenesis, vitellogenin will be used by the embryo as energy to grow and develop [14,15].

Table 2. Egg diameter of silver rasbora (*Rasbora argyrotaenia*) in different maturity stage (n = 30).

| Maturity stage          | Egg diameter (µm) | Range      |
|-------------------------|-------------------|------------|
| Maturing (II)           | 17.96 ± 1.89      | 14.02 - 20.56 |
| Nearly ripe (III)       | 47.15 ± 10.07     | 30.12 - 60.76 |
| Ripe and running (IV)   | 83.02 ± 4.40      | 71.76 - 90.45 |

4. Conclusion
The egg diameter of female silver rasbora (*Rasbora argyrotaenia*) tends to increase directly proportional to the maturity stage. Ovary size was increased following the maturity stage. This information will reach our knowing of the maturation cycle of silver rasbora and also improve artificial techniques of culturing fish for commercial purposes and conservation stocking.

5. References
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