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Analysis of growth and reproduction of yellowstripe scad (*Selaroides leptolepis*)

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ABSTRACT

The waters of Tomini Bay are waters that have quite a lot of natural resources. One of the resources in these waters is the yellowstripe scad fish (*Selaroides leptolepis*). This observation aims to study the reproductive biology aspects of the yellowstripe scad fish, including length and weight, sex ratio, gonadal maturity level, gonadal maturity index, and fecundity in order to provide information for planning options for the management of yellowstripe scad fish resources so that they can be utilized optimally and sustainably. The observation was conducted on May 4, 2019. Fish sample analysis was carried out at the Hydrobiology and Biometrics Laboratory, Gorontalo State University. The results of the observation showed that the average length of the yellowstripe scad fish was 200 mm and the weight was 104.5 g. The length-weight relationship of yellowstripe scad fish (*Selaroides leptolepis*) is categorized as negative allometric with $b = 1.04$. The gonadal maturity index of male yellowstripe scad fish ranged from 0.008-0.034, while in females it ranged from 0.011-0.056. The average condition factor of male and female fish is 0.9962, respectively.



INTRODUCTION

Indonesia has a significant potential of marine resources in terms of both quantity and diversity. Based on the distribution of fishing grounds, the potential of Indonesia's marine capture fisheries is divided into 9 Fishery Management Areas (WPP). The potential Maximum Sustainable Yield (MSY) of Indonesia's marine fish resources is estimated to be 6.4 million tons, and one of the exploited fish species is the yellowstripe scad (*Selaroides leptolepis*) (Dahuri, 2004 in Patawari, 2018).

The yellowstripe scad is one of the important economic fish species, which is widely used for cooking as well as for consumption in the form of smoked, grilled, or salted fish due to its delicious taste. In addition, yellowstripe scad is traded in fresh (wet) and frozen conditions, or after being processed with various treatments, such as salting or drying (Huda et al., 1998 in Sharfina et al., 2014).

The province of Gorontalo has fishery potential in three waters, namely Tomini Bay, Sulawesi Sea, and the Indonesian Exclusive Economic Zone (ZEEI) of Sulawesi Sea. Based on the open access nature of the area, the fishery potential in Tomini Bay is not only utilized by fishermen in Gorontalo Province but also by fishermen from several other regions, including North Sulawesi, Central Sulawesi, Maluku, and even South Sulawesi (Olij, 2007).

The reproductive biology aspect is fundamental and important information for the management and utilization of yellowstripe scad (*Selaroides leptolepis*). Information on reproduction can estimate spawning season and potential, and plays a crucial role in determining survival (Wibowo et al., 2013). This study aims to investigate the reproductive biology aspects of yellowstripe scad, including length and weight, sex ratio, gonadal maturity level, gonadal maturity index, and fecundity, to provide information for planning options for the management of yellowstripe scad resources to ensure optimal and sustainable utilization."

MATERIAL AND METHODS

Study site. This study was conducted in May 2019. Sampling of yellowstripe scads (*Selaroides leptolepis*) and gonads were carried out at the Fish Landing Port (TPI) in Tenda Sub-district, Hulonthalangi District, Gorontalo City. Fish sample analysis was conducted at the Hydrobiology and Biometric Laboratory, Gorontalo State University. A total of 60 fish samples were collected, and 4 gonads of yellowstripe scads (*Selaroides leptolepis*) were used for fecundity analysis.

Length-Weight Relationship. The calculation of the length-weight relationship of yellowstripe scad fish used the following equation (Effendie, 2002):

$$W = aL^b$$

where; W = Weight (g), L = Total length (mm), a = Intercept and b = Slope Length-Weight Relationship.

Gonadosomatic Index (GSI). The gonadosomatic index was calculated according to Effendie (2002) using the formula:

$$GSI = (Wg/Wt) \times 100\%$$

where GSI = gonadosomatic index, Wg = gonad weight (g), and Wt = total body weight (g).

Fecundity. Fecundity and TKG were calculated according to Effendie (2002) using the formula:

$$F = (G \cdot x) / g$$

where: F = fecundity, x = number of eggs in the sample, G = total gonad weight, and g = gonad weight in the sample.

Condition Factor. Condition factor was calculated by (Hacer Okgerman, 2005) with the equation:

$$K = (W \cdot L^{-3}) \times 100$$

where in this case: K = Fulton Condition Factor, W = Weight (g), and L = Length (mm).

RESULTS AND DISCUSSION

Length-Weight Relationship. Based on the observation results, the average length and weight of *Selaroides leptolepis* were 200 mm and 104.5 g, respectively (Figure 1). The length-weight relationship of *Selaroides leptolepis* was found to be negative allometric ($b=0.784$), indicating that the growth in length is faster than the growth in weight. This result is different from the study conducted by Nasution et al. (2015) in Sinaga et al. (2018) who obtained the coefficient regression values of 3.082 and 3.263 for males and females, respectively, indicating a positive allometric growth pattern. However, according to Ibrahim et al. (2017) in Sinaga et al. (2018), the value of b for male and female *Selaroides leptolepis* in the Sunda Strait was 2.7871 and 2.7176, respectively, indicating a negative allometric growth pattern."

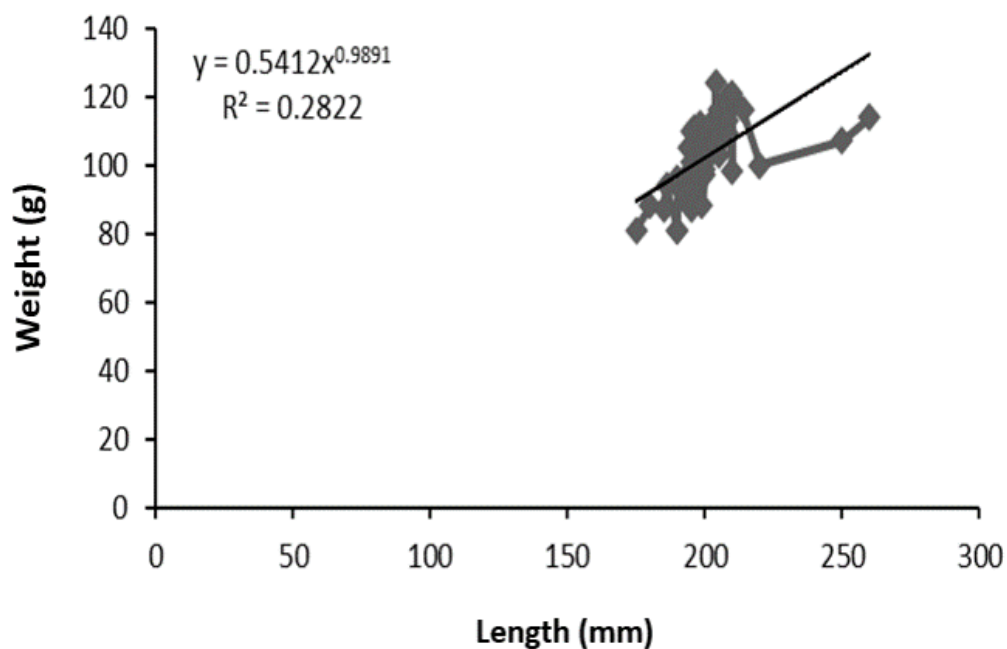


Figure 1. Relationship between length and weight of yellowstripe scad fish

Gonad Maturation Index (GMI). The results showed that the gonad maturation index of male yellowstripe scads ranged from 0.008-0.034, while in females it ranged from 0.011-0.056. According to Sharfina et al. (2013) in Sinaga et al. (2018), the research on the size at first maturity of gonads in female yellowstripe scads ranged from 131.39-134.64, while in males it ranged from 156.10-159.75. This indicates that female yellowstripe scads mature their gonads faster than males.

The level of gonad maturation in yellowstripe scads showed that the highest percentage was GMI 1 and the lowest was GMI 4. The level of gonad maturation in yellowstripe scads can be seen histologically in the ovaries, where in GMI 1, the gonads were immature and dominated by oogonia with a few oocytes. In GMI II, the egg cells became larger and were dominated by oocytes with more nuclei. In GMI III, ootids were formed, and the egg diameter became larger, with yolk and oil droplets beginning to form. In GMI IV, the ootids developed into mature eggs, with the number of yolk and oil droplets increasing in both size and quantity (Sinaga et al., 2018)."

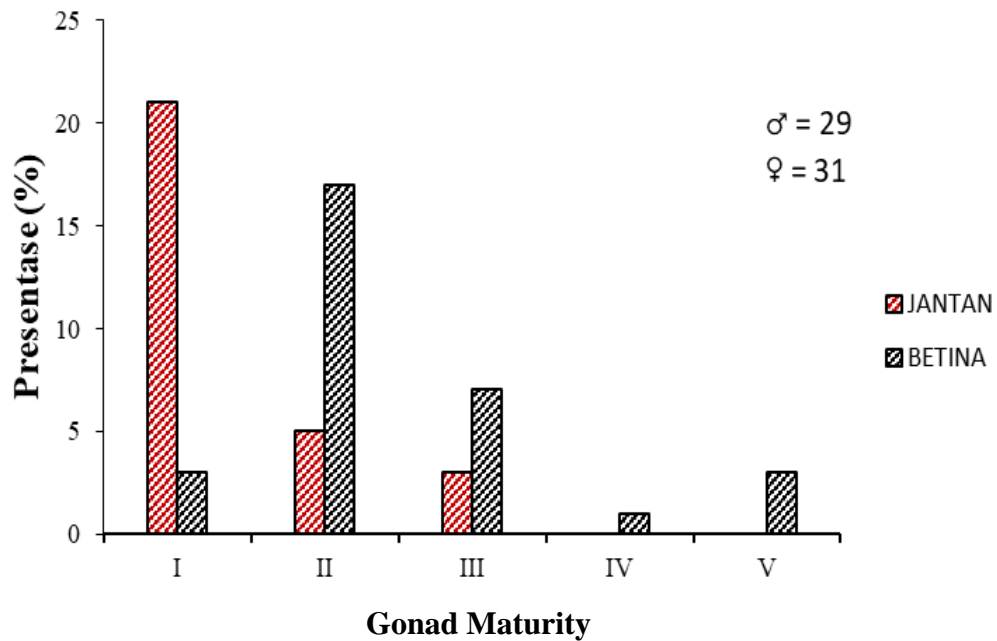


Figure 2. Gonad maturity stages of yellowstripe scad fish

Fekunditas. Fecundity. The fecundity of *Selaroides leptolepis* caught in the waters of Tomini Bay ranged from 23,760 to 78,000 eggs with an average of 51,705 (Table 1). This is different from the findings of Sinaga et al. (2018) who reported that the fecundity of *Selaroides leptolepis* caught in the waters of Tomini Bay ranged from 1,960 to 29,145 eggs with an average of $11,716 \pm 6,088$.

Table 1. Fecundity of yellowstripe scad fish

Sample	Gonad Weight		Partial gonad count	Fecundity
	Total	Partial		
1	3	1	31,875	95,625
2	4	2	71,535	142,710
3	3	2	78,000	117,000
4	4	3	23,760	31,680

Condition factor. The average condition factor of male and female *Selaroides leptolepis* was 0.9962 each (Table 2). Similarly, in the study conducted by Sinaga et al. (2018), the average condition factors of male and female fish were 0.9 and 1.3, respectively.

Table 2. Condition factors of yellowstripe scads

Sex	Length Range (mm)	Weight Range (g)	Condition Factor	
			Range	Average
Male (♂)	185 - 260	87 - 114	0.9243 - 0.8476	0,981931565
Female (♀)	175 - 214	81 - 116	0.9122 - 1.0579	1,023691622

CONCLUSION

Growth and reproduction analysis of yellowstripe scad (*Selaroides leptolepis*) landed at Gorontalo City Fish Landing Site, obtained an average length and weight of 200 and 104.5, respectively. The length-weight relationship of yellowstripe scad is categorized as allometric with a coefficient of 1.04. The gonad maturity index of male yellowstripe scad ranged from 0.008-0.034, while that of females ranged from 0.011-0.056. The fecundity of yellowstripe scad ranged from 1,960-29,145 eggs with an average of 51,705 eggs. The average condition factor of male and female fish is 0.9962.

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