Fecundity and size the first maturity of the gonad of Yellowstripe Scad (*Selaroides leptolepis*) at Belawan Aquatic, North Sumatera

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Abstract. The process of maintaining existencial, each of the species have a reproduction strategy. Reproduction strategy is all the pattern and identity of reproduction which is shown by each individual from a species including complex inherited traits. Especially for yellowstripe scad fish at Belawan aquatic, North Sumatera. This research conducted from March to May 2017. The sampling was taken three times with one-month interval. The location of the research divided into 3 stations with each respective characteristic. Fishing gear used during the research is nets and gill-nets. The gill-net are installed in the morning and removed in the afternoon. Management recommendation which is given for catch fish in size selection are spawned fish and catchable fish must pass the size of the first gonads maturity was found of 143 – 151 mm for female fish and 144 – 151 mm for male fish. If the fish which is gained bellow the first size of gonads maturity with GML is not yet mature gonads, then necessary increasing the size of the nets in the fishing gear used in Yellowstripe scad fish captured.

1. Introduction

One of the potentials of pelagics aquatic at Belawan aquatic is Yellowstripe scad fish. These fish are expected to be captured exceeding the conservation potential. If the captured fish are dominantly by a small size with gonads maturity could lead to the growth overfishing. Demand of yellowstripe scad fish is higher community because it has a good taste and contains complete nutrition for human need.

In the process of maintaining existencial, each species has a reproduction strategy. The reproduction strategy is all of the pattern and reproduction characteristics which are seen by an individual from one species including the complex inherited characteristic, i.e gonads maturity level, gonads maturity index, the size of the first gonads maturity, fecundity, diameter of egg, etc.

[1] States that fecundity is a commonly used size to know the production potential of the fish. Generally, fecundity will increase according to the size of the fish body. [2] states that the number of eggs produced form mature female very influenced by the mature eggs, size, condition, and species and dispersal or incubate spawning pattern.

The size of the first gonads maturity is often a difference, even in the same species. The size of the first gonads maturity have a relationship with the environmental effect and growing to the growth and reproduction strategy. Fish that are under pressure due to catch are smaller gonad size [3].

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2. Materials and methods
This research conducted on March to May 2017 at Belawan aquatic, North Sumatera. The following is the research location:

![Research Location Diagram](image)

**Figure 1.** The research location (Station 1<sup>st</sup>: 3°48′11,12″ NL and 98°44′55″ EL ; Station 2<sup>nd</sup>: 3°50′6,8″ NL and 98°49′36,3″ EL ; Station 3<sup>rd</sup>: 3°49′3,3″ NL and 98°51′32″ EL)

The equipment used in the field and laboratory is GPS (global positioning system), gill nets, analytic scale, and fisurgical instrument. As of the materials which are used of Yellowstripe scad fish (*Selariodes leptolepis*), alcohol 70%, and ice cub.

Sampling for fish and water conducted 3 times in 3 months with once a month sampling intervals for each station using nets and gill nets (2 inch mesh size and 4 meter stocking diameter). The gill nets installed in the morning and removed in the afternoon. Every fish sampling were taken, then putted in the cool box filled with ice.

Fecundity calculation conducted with combined methods (volumetric and gravimetric method) which consists of three stages. The first stage is raising eggs GML III and GML IV from the ventral side. The second stage was taken three parts at the posterior, anterior, and middle of the gonads. The third stage is sample weighing (sample gonads weight), after that, it is placed inside the bottle than be diluted with 10 ml of water whereupon a 1 ml of dilution was taken by a dropping pipette to calculate the amount of the eggs.

2.1. Data analysis
The size of the first gonads maturity. Determination of the size of the first gonads maturity using Spearman Karber methods [4]. Gonads maturity characteristics in GML III, IV, and V using a formula
\[ \log M = Xk + \frac{X}{2} - X \sum Pi \]  

Where:

- \( Xk \) = the middle value logarithm of the fish in a 100% gonads maturity
- \( X \) = logarithm deviation in the middle value of the class
- \( Pi = \frac{ri}{ni} \) = quantity of the gonads maturity fish in the i-class
- \( Ri = \) quantity of the fish in the i-class

Fecundity calculation of fish egg conducted using a combined method, i.e. gravimetric and volumetric [5]:

\[ F = \frac{G \times X \times V}{Q} \]  

Where:

- \( F \) = fecundity (particle)
- \( G \) = gonads weight (gram)
- \( Q \) = egg weight sample (gram)
- \( V \) = dilution volume (ml)
- \( X \) = quantity of eggs which is in 1 cc

3. Result and discussion

3.1. The catch of Yellowstripe scad (Selaroides leptolepis)

The total captured fish during the research are 360 fish. The most captured fish specifically on May at 135 fish and on April at 127 fish, while on March only of 98 fish (Figure 2).

![Figure 2](image)

**Figure 2.** The catch result of yellowstripe scad fish according to the month of observation

The quantity of the female fish which is the most captured found in the class interval 122 – 127 mm are 42 fish and the fewest in the class interval 152 – 157 mm are 0 fish. While the most captured of fish male were found in the class interval 128 – 133 mm and 134 – 139 mm both are in the same quantity at 53 fish and the fewest in the class interval 158 – 163 mm of 3 fish (Figure 3).
3.2. The size of the first gonads maturity

Determination size of the first gonads maturity using a Sperman Karber method [4]. Gonads maturity criterion in GML III and IV could be seen from the relationship between total length and gonads maturity level in GML III and IV which is adequate. Size of the first gonads maturity on the male fish is 144 mm and on the female fish is 143 mm. This shows the difference in rapidity of growth between male and female of yellowstripe scad fish. The differences are expected because the differences of the aquatic condition so that the younger fish from the egg which is hatching at the same time could achieve the level of gonads maturity indifference in sizes. Thus it can be suspected that the female of yellowstripe scad fish in the aquatic of malacca strait are faster experience in gonads maturity than the male.

Overall the yellowstripe scad fish have a size of the first gonads maturity in the class interval were found of 145 – 151 mm. The average size of captured is the most important thing to be learned because with related the average size of captured, size of the first gonads maturity could be concluded whether it was a sustainable resource or not. The meaning can be known whether on the size of that captured fish have experienced spawning or not [6].

According to the research which is conducted, the quantity of the captured fish in size interval of 145 – 151 mm are 49 fish at GML III and 19 fish at GML IV. The most captured quantity of male fish are in class interval 131 – 137 mm at 61 fish, while the female at the same class interval is 38 fish. The fewest male captured fish in the class interval 159 – 165 mm. On the other research, yellowstripe scad fish at Rembang north sea which is conducted by [7] obtained that the size of the first gonads maturity for the female selar fish is 161 mm with the interval size 153 – 169 mm and for the male of the yellowstripe scad fish are 191 mm with the interval size 183 – 200 mm. Furthermore, [8] researched java sea aquatic with samples from offshore aquatic of the java sea obtained the size of the first gonads maturity for the female at 180 mm and male of 200 mm. [7] along to [8] shown that the female fish starting to mature in gonads were smallest size than the male fish. The yellowstripe scad fish which is contained at Sunda strait aquatic in 2013 has the smallest size than which is captured at north Rembang aquatic on 1992 and offshore aquatic of java sea on 1993. The differences in size could be affected by the condition of the environment, abundance, and availability of food, temperature, and light in each of the different aquatic [9].

The size of the first gonads maturity for each species was different also with the same species if more than 5-degree different latitude are spread will have differences in size and age of the first gonads maturity. Factor affecting the first gonads maturity is divided into 2 factors, i.e. external factor as temperature and current along with the internal factor as age, gender, species differences, size, and physiological personalities of the fish such as adaptability with the environment [5].
3.3. Fecundity

Fecundity of the yellostripe scad fish at GML III and IV obtained during the research are 10.346 – 99.905 eggs.

| Station | GML | Total length (mm) | Body weight (gr) | Gonads weight (gr) | Fecundity (eggs) |
|---------|-----|-------------------|------------------|-------------------|-----------------|
| I       | III | 132-163           | 27-63            | 1.004-1.909       | 12.171-86.165   |
|         | IV  | 143-155           | 34-43            | 1.889-1.994       | 43.116-73.662   |
| II      | III | 118-155           | 20-42            | 0.989-1.942       | 10.346-99.905   |
|         | IV  | 145-153           | 35-36            | 1.952-1.971       | 48.400-74.563   |
| III     | III | 131-163           | 31-46            | 1.025-1.925       | 18.829-48.630   |

Fish fecundity strongly related to the environment, because the environment influences the length and weight of the fish. Fecundity is often being related to the weight, because the weight is closer for the fish condition than the length, whereas the weight temporary changed if there is a change in environment and fish physiological condition. Yellostripe scad fish fecundity which is obtained at GML III and GML IV for 60 fish are 26.283 – 74.563 particles with total length at 153 – 163 mm, and the bodyweight at interval 42 – 63 gram, and the weight of gonads at 1.032 – 1.971 gram. The highest fecundity founded at a total length of 163 mm with the body weight at 63 gram and gonads weight at 1.241 gram. The lowest fecundity is at 118 mm in length with 2.35 mm in diameter.

The fecundity of yellostripe scad fish increased during the increasing of total length and body weight. [5] reveal that fecundity are often being related to the weight, because the weight is closer the fish condition better than the length. according to [10], fecundity are often being related to the total of length. However relationship of the both has a little coefficient correlation. This is because the models which is used not accordance to indicate the fecundity relationship with the total of length, because there is a the variation of fecundity and the differences in ages in similar length size fish. According to [1], Several factors play a role in the number of eggs produced by female fish, namely fertility, spawning frequency, parent protection, egg size, fish size, environmental conditions, food, and population density. Other research on the Yellow Selar Fish fecundity was also conducted by [11] with the lowest fecundity of 69.225 items, the highest of 489.675 items and an average of 359.417 items. Smaller fish size uses its energy for growth and at a larger size, fish uses more energy for reproduction [12].

3.4. Resources management of Yellostripe scad fish (S. leptolepis)

Catching of Yellow Selar Fish resources occurs high fishing pressure or in overfishing conditions. Overfishing is defined as the amount of fishing effort so high that fish stocks do not have the opportunity (time) to develop.

As a selection base of captured fish size, the fish that has been pawning and the fish which can be caught must through the size of the first gonads maturity, for the female fish at 143 – 151 mm and the male at 144 – 151 mm. If the fish which is obtained still below the size of the first gonads maturity with unmatured gonads TKG then it needs to be conducted a magnification of the size of the mesh in the fishing gear used in catching a yellostripe scad fish.

Some of the actions and efforts that can be taken to manage yellostripe scad fish resources in Belawan aquatic are limited fishing efforts, the need to implement a systematic monitoring and data collection system for fish production, both of which were sale, consumption and wasted value. Based on the conditions in the field, it shows that there are still many fish catches that have not been recorded. This is very important to do to obtain accurate data as a basis for making yellostripe scad fish of fisheries resource management planning.
4. Conclusion

Overall quantity of captured fish during the research are 360 fish. In May there were 135 fish, April at 127 fish, and March at 98 fish. The female fish are dominantly captured in class interval 122 -127, the male fish at 128 - 133 mm and 134 - 139 mm. The size of the first gonad maturity in male fish is larger than female fish. Yellow Selar fish Fecundity in GML III and IV obtained during the study ranged from 10.346 – 99.905 items.

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