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*by* Muslim Et Al.,

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# Length-weight relationship and environmental parameters of Indonesian leaffish (*Pristolepis grootii*, Bleeker 1852) in Kelekar river, South Sumatera, Indonesia

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***Abstract***

The Indonesian leafffish (*Pristolepis grootii*, Bleeker 1852) is one of the native Indonesian freshwater fish species. It's have a high economic value. The habitat of the fish is rivers, lakes and swamps. The study of the length-weight relationship and environmental parameters an important and fundamental component of fisheries resource management. The purpose of this study was to analyze length-weight relationship of *P. grootii* and water quality of the fish habitat. A total of 164 samples were used in this study. The results showed that length-weight relationship of the *P. grootii*, the predictive model of the weight of the fish from the length of the fish is in the exponential form with the equation y = 0.0491x2.6363 (R2 = 0.9536: P < 0.01), with a coefficient of (a) 2.636 and a constant (b) of 0.049. The *P. grootii* weight gain was slower than the increase in length. Environmental parameters such as water temperature, dissolved oxygen, alkalinity, nitrate, and phospate are within acceptable limits. *P. grootii* are found in Kelekar river. The current study provided the first baseline data about length-weight relationship and environmental parameters of *P grotii* from the the Kelekar river, Ogan Ilir Regency, South Sumatra, Indonesia. The data obtained are very useful for the sustainable management of *P grootii* resources.

*Keywords*: population dynamics, local fish resources, Indonesian endemic fish

## I. INTRODUCTION

The Indonesian leaffish (*Pristolepis grootii*), populary called pritolepis or sepatung fish is fast becoming an important fish species in Indonesia. This species is one of the native Indonesian freshwater fish species. This fish are found in open waters on the Sumatra and Kalimantan islands (. The habitat of *P grootii* are rivers, lakes, cannal, and swamps (Muslim & Syaifudin, 2022). This species has high economic value. Local people use this fish as side dishes, fresh, preserved, and processed. In addition, this fish is also used as a display fish in the aquarium. *P.*

*grootii* is easy to adapt in the cultivation environment, it can be fed with artificial feed. *P. grootii* is a native Indonesian fish that has the potential to be developed into an aquaculture commodity (Muslim et al., 2021).

The length-weight relationship is an important and fundamental component of fisheries management tools (Kumari et al., 2019). The study of the length-weight relationship of fish is of great importance in fisheries as it helps to understand the growth, maturity, reproduction, and general health of fish (Bhattacharya & Banik, 2012; Soni & Ujjania, 2017), assisting in biometric and morphological comparisons of the fish species being studied. different from the same taxonomic group (Sibina et al., 2019), helps in the assessment of fish stocks (Borah et al., 2017). Length-weight relationships and condition coefficients provide useful information for understanding fish biology and ecology (Zolkhiflee et al., 2017), fish population characterization in terms of health assessment, stock conditions (different stock units of the same species), biological traits (recruitment, growth and mortality of fish) and breeding protocols solely depend on the structure of the fish population in a waters (Jewel et al., 2019).

Data on length-weight of fish and enviromental parameters are very necessary for the management of fish resources in a waters. The purpose of this study was to analyze the length-weight relationship and enviromental parameters of *P. grootii* in the Kelekar river, Ogan Ilir Regency, South Sumatra, Indonesia.

## II. MATERIALS AND METHODS

### *2.1. Site and Time*

This study was conducted in Kelekar river, Ogan Ilir regency, South Sumatera on May 2019 to May 2020 (rainy and dry season). The samples were collected from three stations with different attributes: Station 1 Tanjung Pring village (3°14'36.2"S 104°38'58.8"E), is upriver; Station 2 Tanjung Raya village (3°14'41.0"S 104°39'28.4"E)) is midriver with anthropogenic influence; Station 3 Indralaya Mulya village (3°23'89.8"S 104°64'94.8"E) is downriver (Figure 1.).

### *2.2. Environmental Parameters*

Environmental physico-chemical parameter data were measured in-situ and ex-situ. The data is an indicator of the condition of the water quality of the P. grootii habitat. These parameters affect the survival, growth, health, and meat quality of P. grootii. The measured environmental physico-chemical parameters are presented in Table 1.

Table 1. Environmental parameters that measured in Kelekar river

| Parameters | Unit | Description | Instruments/Methode |
|---|---|---|---|
| Temperature | °C | In situ | Thermometer |
| Water level | Cm | In situ | Tongkat kedalaman |
| Tranparancy | % | In situ | Secci disk |
| pH | - | In situ | pH meter |
| Dissolved oxygen | $mg.L^{-1}$ | In situ | DO meter |
| Total ammonia | $mg.L^{-1}$ | Ex situ | Spectrophotometer/ Laboratory (APHA, 2012) |
| Phospate | $mg.L^{-1}$ | Ex situ | Spectrophotometer/ Laboratory (APHA, 2012) |

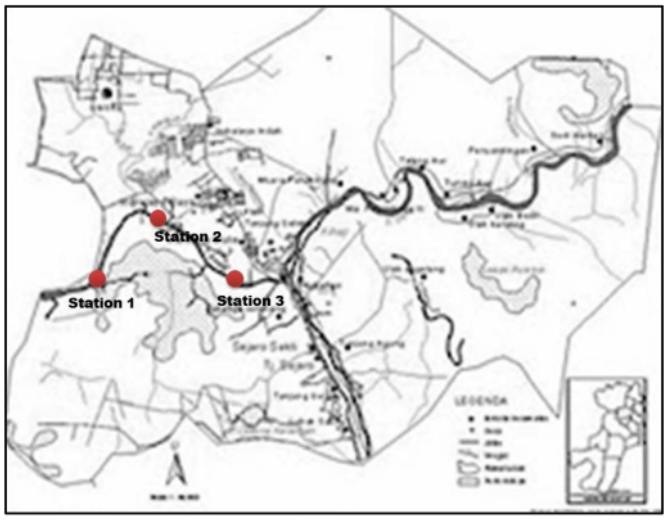

Figure 1. Map of research location

### *2.3. Data Collection*

The fishes were collected using gill nets, hooks and lines, bamboo traps, and barrier traps. Fish samples analysis was done in the fish breeding unit, fisheries service of Ogan Ilir Regency. Water quality analysis was done in the Fishery Laboratory of Agriculture Faculty, University of Sriwijaya. A total of 164 *P. grootii* were obtained from three fish landing stations (Tanjung Pring, Tanjung Raya, and Indralaya Mulya), sampled monthly from January to December 2019 in order to calculate the length-weight relationship. These stations are locations where local fishermen carry out fishing activities for *P. grootii* in Ogan Ilir. The fish caught by the fishermen were collected, only *P grootii* were selected. The sample fish were put into a cooler filled with ice and transported to the Fish Breeding Center laboratory, Ogan Ilir regency. Fish samples were measured for total length (TL, cm) and total weight (TW, g) for each individual. The total length of the sample fish (TL) was measured from the tip of the mouth to the tip of the tail fin. TL was measured using a digital caliper (accuracy 0.1 mm) and the weight of the sample fish was measured using a digital scale (0.01 g accuracy).

### *2.4. Data Analysis*

Analysis of the length-weight relationship was performed using an allometric linear model to calculate parameters a and b, by measuring changes in weight and length. Bias correction on the change in the average weight of the logarithmic unit is used to predict the weight and length parameters according to the following allometric equation (De-Robertis & William, 2008).

$$W = a L^{b}$$

Where: W = weight of fish (gram)

L = fish length (mm)

a, b = constant

Fish growth pattern is determined based on the value of b. If it is equal to 3, then the growth pattern is isometric, or the weight gain is equal to the length of the fish, and if the b value is 3, then the growth pattern is allometric. This growth pattern is divided into two, namely positive and negative allometric. Whenever the b value is less than 3 (b 3), it is called positive allometric (length gain is less than weight gain) (Kirankaya et al., 2014). The correlation analysis of the length-weight relationship of the sampled fish was analyzed using one-way analysis of variance (ANOVA). Statistical analysis was carried out using the SPSS program.

## III. RESULTS AND DISCUSSION

### *3.2. Length-Weight Relationship*

A total of 164 specimens of *P. grootii* were collected from 3 station study. The specimen were collected from station 1 consisting of 40 specimens taken in the rainy season and 20 specimens taken in the dry season. The specimen were collected from station 2 consisting of 38 specimens taken in the rainy season and 16 specimens taken in the dry season. The specimen were collected from station 3 consisting of 37 specimens taken in the rainy season and 13 specimens taken in the dry season. All specimens were assessed for the relationship between the body length and weight. The examined specimens exhibited total length and weights varying between 4.0 and 12,9 cm (Mean = 7.69 ± 2.02) and 2.89–41.0 g (Mean = 12.43 ± 9.18), respectively (Table 2 and Table 3).

Table 2. Descriptive analysis, weight relative and coefficient

| Data | n | Average | Std | CV (%) | Min | Max | Median |
|---|---|---|---|---|---|---|---|
| Length sampling (cm) | 164 | 7.69 | 2.02 | 26.29 | 4.00 | 12.90 | 6.75 |
| Weight sampling model (g) | 164 | 12.43 | 9.18 | 73.86 | 2.89 | 41.00 | 7.32 |
| Weight linier model (g) | 164 | 12.43 | 8.84 | 71.11 | -3.70 | 35.21 | 8.32 |
| Weight exponential model (g) | 164 | 12.42 | 9.66 | 77.74 | 2.90 | 54.20 | 7.16 |
| Weight power model (g) | 164 | 12.26 | 8.70 | 70.95 | 1.90 | 41.59 | 7.54 |
| Weight Relative1 ($Wr_1$)[a] | 164 | 1.01 | 0.15 | 14.92 | 0.65 | 1.66 | 1.00 |
| Weight Relative2 ($Wr_2$) [b] | 164 | 1.01 | 0.15 | 14.54 | 0.64 | 1.40 | 1.00 |
| Coefficient 1 ($K_1$)[c] | 164 | 2.40 | 0.44 | 18.41 | 1.62 | 4.52 | 2.32 |
| Coefficient 2 ($K_2$)[d] | 164 | 2.38 | 0.31 | 13.12 | 2.06 | 4.53 | 2.34 |
| Coefficient 3 ($K_3$) [e] | 164 | 2.38 | 0.21 | 9.02 | 1.94 | 2.97 | 2.45 |

[a]Wr = (W/Ws) x 100 (Rypel & Richter, 2008).
[c]$K = WL^{-3}$ x 100 (W = weight sample (g), L= length sample (cm) (Okgerman, 2005).
[d]$K = WL^{-3}$ x 100 (W = weight exponential model (g), L= length sample (cm).
[e]$K = WL^{-3}$ x 100 (W = weight power model (g), L= length sample (cm).

Table 3. ANOVA and regression model weight prediction of *Pristolepis grootii* samples (n = 164)

| Model | Coefficient (a) | Constanta (b) | $R^2$ | $Pr > F^*$ |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Linier | 4.373 | - 21.193 | 0.927 | 0.00 |
| Exponential | 0.329 | 0.777 | 0.952 | 0.00 |
| Power | 2.636 | 0.049 | 0.954 | 0.00 |

* Probability associated with the F statistic.

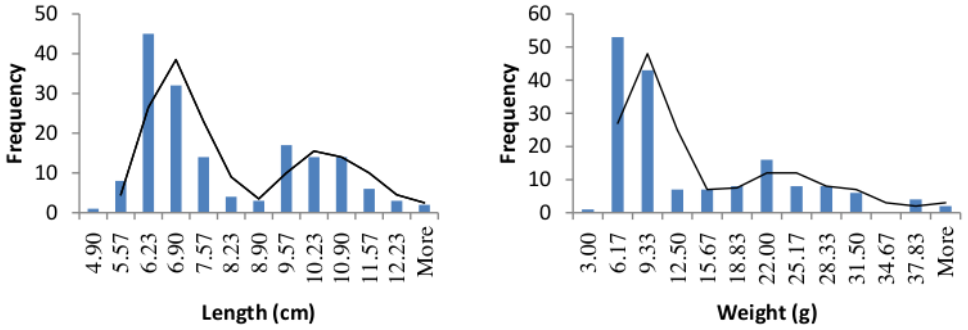


Figure 2. Length and weight distribution of *Pristolepis grootii* samples (n = 164)

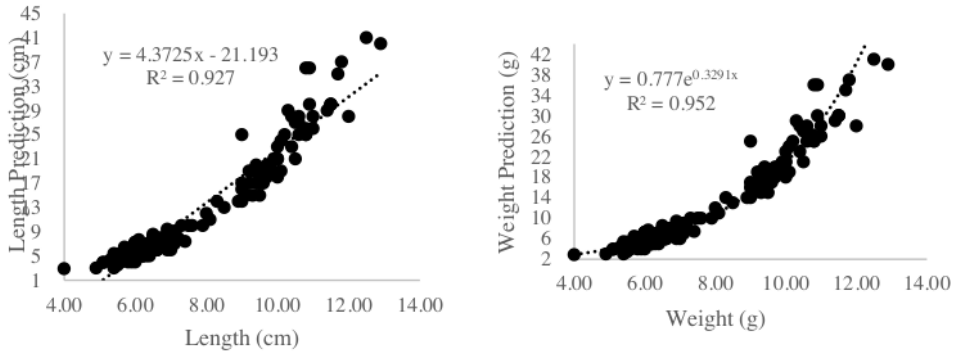


Figure 3. Length and Weight prediction model linier of *Pristolepis grootii* (n = 164)

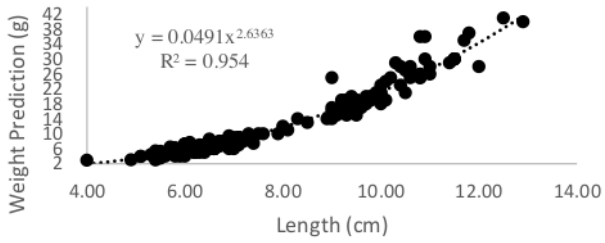


Figure 4. Weight prediction model power of *Pristolepis grootii* samples (n = 164)

### *3.2. Enviromental Parameters*

All environmental parameters are shown in Table 1. Temperature in dry season ranged between 31.5°C – 32.4°C and in rainy season between 27.3°C – 28.6°C. Water level in dry season ranged between 234-254 cm and in rainy season between 400-467 cm. Tranparancy value in dry season ranged between 57.64-75.54% and in rainy season between 50.11-58.31%. The range of pH value in dry season were between 4.7-6.7 and in rainy season were between 6.7-7.0. Dissolved oxygen value in dry season ranged between 5.84-6.31 mg.$L^{-1}$ and in rainy season between 6.34-7.14 mg.$L^{-1}$. Ammonia total value in dry season ranged between 0.25-0.96 mg.$L^{-1}$ and in rainy season between 0.13-0.24 mg.$L^{-1}$. Phospate value in dry season ranged between 0.017-0.0025 mg.$L^{-1}$ and in rainy season between 0.036-0.082 mg.$L^{-1}$.

Table 1. Enviromental parameters value in Kelekar river, the habitat of *P. grootii*

| Season/Parameters | Station 1 | Station 2 | Station 3 |
|---|---|---|---|
| | Tanjung Pring | Tanjung Raya | Indralaya Mulya |
| Dry season | | | |
| Temperature (°C) | 31.5±0.15 | 31.9±0.12 | 32.4±0.11 |
| Water level (cm) | 254±85.65 | 247±102.12 | 234±89.14 |
| Tranparancy (%) | 75.54±10,25 | 65.24±20,45 | 57.64±34,25 |
| pH (unit) | 6.7±0.43 | 5.6±0.54 | 4.7±0.23 |
| Dissolved oxygen (mg.$L^{-1}$) | 6.31±0.31 | 6.21±0.13 | 5.84±0.42 |
| Total ammonia (mg.$L^{-1}$) | 0.25±0.11 | 0.67±0.18 | 0.96±0.21 |
| Phospate (mg.$L^{-1}$) | 0.017±0.002 | 0.018±0.008 | 0.025±0.016 |
| Rainy season | | | |
| Temperature (°C) | 27.3±0.11 | 28.5±0.15 | 28.6±0.18 |
| Water level (cm) | 467±70.67 | 450±60.32 | 400±50.21 |
| Tranparancy (%) | 58.31±24,22 | 56.45±21.11 | 50.11±20,42 |
| pH (unit) | 7.0±0.21 | 6.8±0.13 | 6.7±0.11 |
| Dissolved oxygen (mg.$L^{-1}$) | 7.14±0.21 | 6.89±0.32 | 6.34±0.38 |
| Total ammonia (mg.$L^{-1}$) | 0.13±0.01 | 0.18±0.02 | 0.24±0.03 |
| Phospate (mg.$L^{-1}$) | 0.036±0.005 | 0.043±0.012 | 0.082±0.012 |

Information about the length-weight relationship of *P. grootii* from the Kelekar river is the newest information. The length-weight relationship of individuals in a population is important for estimating the population size of stock, both for conservation and exploitation purposes. The length-weight relationship was considered suitable for evaluating the *P. grootii* population and assessing its stock.

The length-weight relationship of fish and length distribution is useful for converting catch statistics, estimating population size and mortality rates. In addition, the length and weight relationship are needed in fisheries management, namely determining the selectivity of fishing gear so that only fish that are caught are of suitable size. The length-weight relationship value reflects physiological conditions such as body shape, fat content, and growth rate.

All organisms (including fishes) generally increase in size length and weight during development. The factors that influence the increase in weight and lenght of fish are the age,

size, sexual maturity, quantity of food available, the presence of competitors there is a habitat, and some water quality parameters (temperature, dissolved oxygen, pH, ammonia, etc).

## IV. CONCLUSIONS

This study provided the first data on length-weight relationship and environmental parameters for *P grootii* species collected from the Kelekar river, Ogan Ilir regency, South Sumatera, Indonesia. The best model for predicting the bodyweight of the fish from the length of the fish is in the exponential form with the equation $y = 0.049x^{2.6363}$ ($R2 = 0.9536$: $P < 0.01$), with a coefficient (a) 2.636 and Constanta (b) 0.049. Thus, the weight gain of the *P. grootii* is slower than the increase in body length because the b value of 0.049 is smaller than 3. Environmental parameters such as temperature, water level, tranparancy, pH, dissolved oxygen, total ammonia, and phosphate showed that the parameters were suitable for *P. grootii*.

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