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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. Such data is valuable for establishing a monitoring and management system of these fish species.

Keywords – Population Dynamics, Local Fish Resources, Indonesian Endemic Fish.

I. Introduction

The Indonesian leaffish (*Pristolepis grootii*), popular 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

Data on environmental parameters were collected as an indicator of *P. grootii* living conditions, such as the physical chemical factors that affects the conditions for the survival of *P. grootii*. Seven environmental parameters that were measured 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)

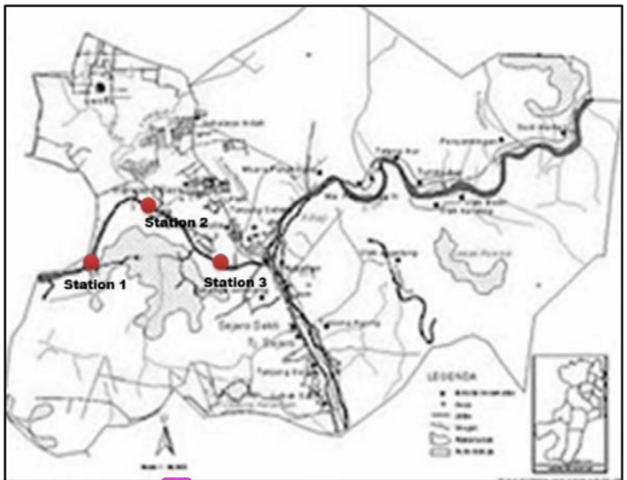

Figure 1. Map of research location

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 ones of the main landing sites in the sub-region and are the main landing ports for *P. grootii* on the Ogan Ilir. After the collection of the fish, samples were temporarily placed in cooling box filled with ice and transported to the laboratory. For each individual the total length (TL, cm) and total weight (TW, g) were measured. The total body length (TL) of each fish was taken from tip of snout (mouth closed) to the extended tip of the caudal fin. TL was measured using a digital caliper (standard errors: 0,1 mm) and wet body weight was measured using a precision digital scale (range: 0,01 g).

2.4. Data Analysis

The analysis of the length-weight relationship was conducted by using the allometric linear model to calculate parameters a and b, by measuring the changes in weight and length. The bias correction on the change in mean weight of the logarithmic unit was 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

The fish growth patterns are determined based on the value of b. When it equals 3, then the growth pattern is isometric, or weight gain is equivalent to the length of the fish, and when the value of b $\neq$ 3, then the growth pattern is allometric. These growth patterns are divided into two, namely positive and negative allometric. Whenever the value of b is less than 3 (b 3), it is called a positive allometric (increase in length is less than the weight gain) (Kirankaya et al., 2014).

The significance of the length-weight relationship of the specimens were tested among stations by means of one-way Analysis of Variance (ANOVA) and the values for each station were tested by Fisher's LSD (Least Significant Difference) test to verify its significance level in different months of a year. All the statistical analysis was done in statistica software package (Version 7).

III. RESULTS AND DISCUSSION

3.1. 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.

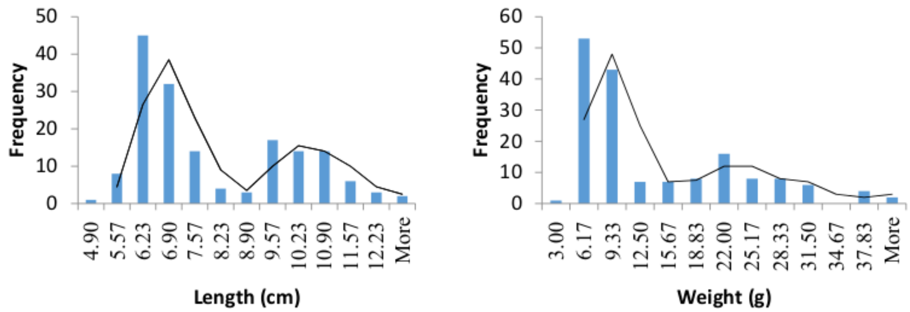

Figure 2. Length and weight distribution of *Pristolepis grootii* samples (n = 164)

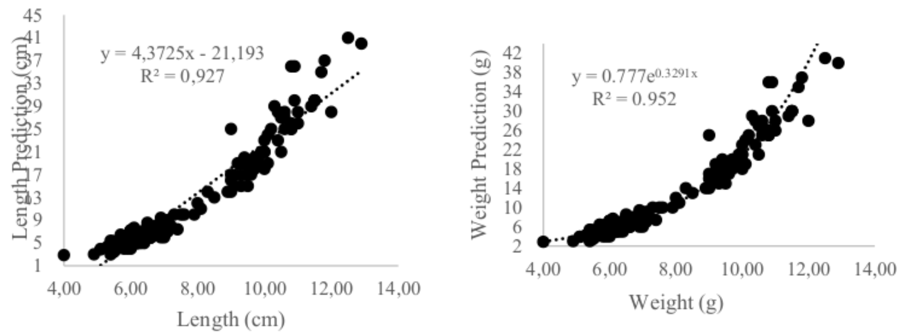

Figure 3. Length and Weight prediction model linier of *Pristolepis grootii* (n = 164)

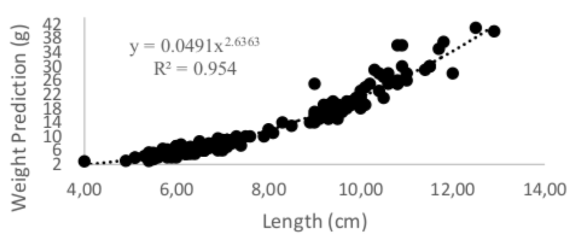

Figure 4. Weight prediction model power of *Pristolepis grootii* samples (n = 164)

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 3. 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 = 0.0491x2.6363 (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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