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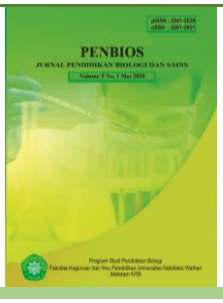

Research Article

Morphometric, Meristic Characters, and Gonad Maturity Level Of Pepudah Fish (*Rasbora lateristriata*) From Sokong Rivers, North Lombok District

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ABSTRACT

This study aims to obtain information about the morphological characters (morphometric and meristic) and the maturity level of the gonads of pepudah fish in North Lombok. The data relating to the morphology obtained is expected to be used as basic information in management and cultivation activities in the future. Data collection was carried out in the basic science laboratory of the Faculty of Fisheries, University of 45 Mataram. Morphometric and meristic data were obtained by measuring and calculating the morphological characters present in the pepudah fish and followed by the t-test to see the growth pattern. Gonad maturity data were obtained by comparing the TKG value with the GSI value. The results of the morphological data obtained indicate that the pepudah fish obtained in the Sokong River have a negative allometric growth pattern and are still in their infancy.

INTRODUCTION

Pepudah fish or which has the Latin name *Rasbora lateristriata* is a freshwater fish that can be found in several rivers on the island of Lombok. Pepudah fish is included in the Rasbora genus and is scattered in Sumatra, Kalimantan, Java, Bali, and the island of Lombok. This fish is included in the Cyprinidae family which is one of the main families in the Southeast Asia region. This fish has various names in several regions of Indonesia and is a popular consumption fish and has a high market demand (Budiharjo, 2002). In the Yogyakarta area, this fish has become an important commodity for residents (Djumanto et al., 2008).

Until now, the use of Pepudah fish as consumption fish is still through fishing activities in the wild. This situation certainly has the potential to cause threats to the existence of these fish in nature. According to IUCN data, this fish red list is in the

vulnerable category, which means that its existence in the wild is disturbed by human activities. Meanwhile, the relatives of this fish, Rasbora tawarensis or depik fish, are already in the "critically endangered" category (www.fishbase.de). The use of these fish as consumption fish should not only rely on fishing from nature but also be supported by cultivation activities. However, there is still a lot of basic information needed related to morphology, reproduction, and the life cycle that has not been well documented which will later play a role in management and conservation. Cultivation activities are also still constrained by the lack of complete information regarding reproduction, cultivation techniques, feed nutrient needs, and the number of populations in nature. Initial studies on several aspects of this fish such as ecology, habitat, and gonad development have been carried out (Ahmad and Nofrizal, 2011). However, not much data related to Rasbora fish on the island of Lombok has been obtained. Based on these conditions, preliminary research was carried out to obtain morphological data in the form of morphometric, meristic characters, and the maturity level of Pepudah fish gonads on the island of Lombok. This initial research is expected to provide supporting data for the cultivation and domestication of Pepudah fish on the island of Lombok in the future.

METHOD

Time and Location of Research

Samples were taken at Sokong River, Tanjung Subdistrict, North Lombok Regency (08033'30,8 "South Latitude, 116011'32,7" East Longitude) in March 2017 (**Figure 2.1**). The location of the measurement is in the Basic Laboratory of the Faculty of Fisheries, University of 45 Mataram.

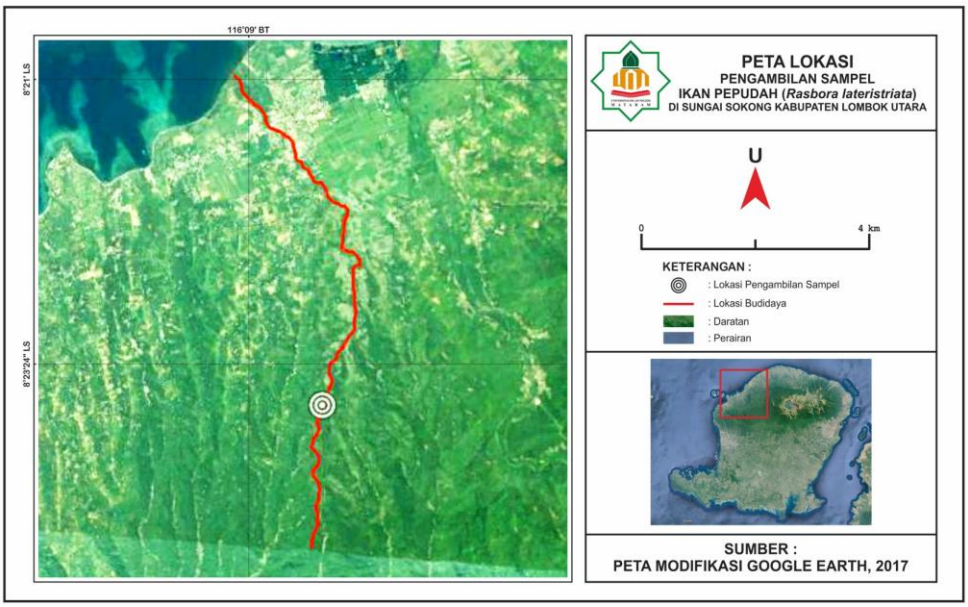


Figure 2.1. Sampling location

Tools and Materials

The tools and materials used are digital calipper with Digital scale (IL-100P, accuracy 0.01 gr), surgical tool set, fishnet (2 x 2 meters), small aquarium (15 x 15 cm), portable aerator, thermometer, digital camera and pepudah fish.

Research Methods

Pepudah fishing is done by using a net. The fish obtained are temporarily accommodated in an aquarium that has been given a portable aerator to maintain the condition of the fish. Furthermore, the fish are accommodated in the wet laboratory of the Faculty of Fisheries, University of 45 Mataram. The morphological data used are morphometric and meristic character data. Morphometric data were obtained by measuring using a digital caliper of 29 morphometric characters (Asrial et al., 2017) (**Figure 2.2**). Meristic data of pepudah fish were obtained by counting the number of dorsal, anal, ventral, pectoral, and caudal fin radii (Omar, 2011). Gonad Maturity Level (TKG) data were obtained by weighing the gonad weight and body weight to obtain the Gonado Somatic Index (GSI) value. The GSI value obtained was then compared with the GSI *Rasbora tawarensis* value (Muchlisin et al., 2010) to determine the TKG.

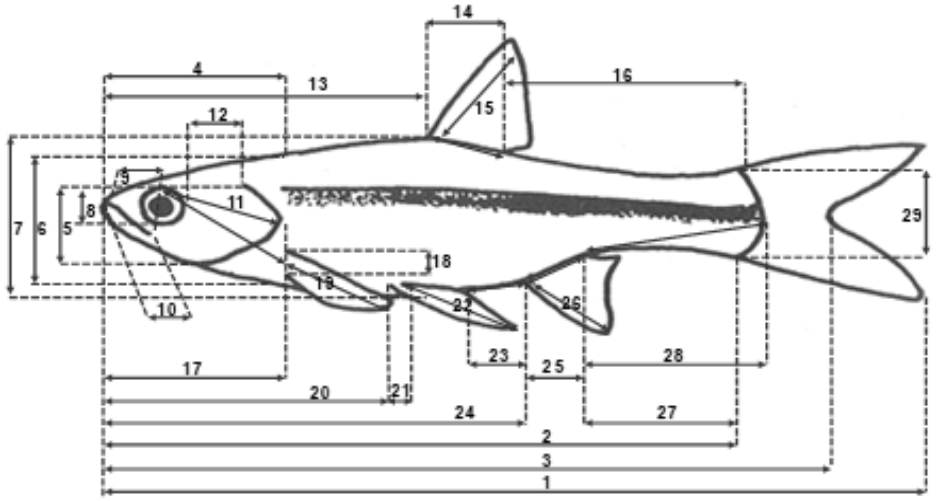


Figure 2.2. Measurement of the morphometric characters of the pepudah fish
Captions: 1) Total Length (PT), 2) Standard Length (PB), 3) Tail Fin Slit Length (PC), 4) Head Length (PK), 5) Head Width (LK), 6) Head Height (TK), 7) Height (TB), 8) Eye Width (LM), 9) Upper Jaw Length (PRA), 10) Lower Jaw Length (PRB), 11) Length between Eyes and Gill Cover (PaM), 12) Length of the Head behind the Eyes (PKBM), 13) Length Before the Dorsal Fin (PSSD), 14) Length of the Dorsal Fin Base (PDSD), 15) Dorsal Fin Height (TSD), 16) Length of the Dorsal Fin to the Beginning of the Tail (PtSDdPE), 17) Length before Pectoral Fin (PsSP), 18) Base Length of Pectoral Fin (PDSP), 19) Pectoral Fin Height (TSP), 20) Length before Ventral Fin (PsSV), 21) Base Length of Ventral Fin (PDSV)), 22) Ventral fin height (TSV), 23) Last length of ventral fin with anal fin start (PtSVdSA), 24) Anal fin length (PsSA), 25) Anal fin base length (PDSA), 26) Anal fin height (TSA), 27) Last Anal Fin Length to Base Tail (PtSAdPE), 28) Length of Tail (PBE), 29) Height of tail (TBE). *Source: Asrial et al., 2017*

Data Analysis

The data obtained in this study are quantitative and qualitative. Morphometric data related to growth patterns were analyzed using the t-test. Meanwhile, morphological and meristic data were analyzed using descriptive analysis. The TKG analysis was carried out in a descriptive comparative manner with the GSI values. The determination of the GSI value uses the formula (Effendie, 2002) is as below.

$$GSI = \frac{Wg}{W} x\ 100\%$$

Information:
GSI : *Gonado Somatic Index*
Wg : Gonad weight (gr)
W : Body weight (gr)

The growth pattern of length and weight as part of the morphological data was determined using a formula is as below.

$$W = aL^b$$

Information:
W : Fish weight (gr)
L : Fish lenght (cm)
a : intercept
b : coefficient

Determination of the sex ratio, which is to see the ratio of male and female fish obtained using the following formula (Kandeel et al., 2013) is as below.

$$X = \frac{J}{B}$$

Information:
X : Gender Ratio
A : Number of Male Fish
B : Number of Female Fish

RESULTS AND DISCUSSION

Physical Character

The results of direct observations of the morphology of the pepudah fish showed that the pepudah fish from the Sokong river had a bright silver base color. It has an elongated oval body with a slightly darker color on the back and a lighter color on the abdomen and slightly yellowish in color. Around the lateral line, there is a faint blue color. The color on the fins looks yellowish. The pepudah fish has black round eyes, hovering pectoral fins, cyloid-shaped dorsal fins, oval-shaped anal and belly fins and pole-shaped tail fins. The appearance of the pepudah fish morphology can be seen in **Figure 3.1**.

The results of observations on the morphological characteristics of the pepudah fish are in accordance with those described by Kottelat et al (1993), namely preserved color dark brown dorsally, whitish to yellowish on sides and below; scales margined with minute dark spots; opercle with silvery black spot. 12 scales between nape and dorsal. Mouth strongly oblique with the anterior end as high as the upper margin of a pupil. The maxillary extends posteriorly below the anterior margin of the eye. Lateral line complete, reaching caudal, with 7 rows of scales between lateral lines over the middle of caudal peduncle. The yellow color on the fins and belly along the bottom line of the lateral line is what makes the pepudah fish called yellow rasbora.

Figure 3.1. Pepudah fish (*R. lateristriata*)

Morphometric Characters

Morphometric measurements of each individual fish resulted in 29 characters. The shortest (minimum), longest (maximum) size, and average size of the pepudah fish from the Sokong River which was used as sample fish can be seen in **Table 3.1**.

Table 3.1. Morphometric Characters of Pepudah Fish from the Sokong River

Characters	Size (cm)			Characters	Size (cm)		
Morphometric	The shortest	The longest	Average	Morphometric	The shortest	Terpanjang	Rerata
PT	5.37	8.73	7.06	PtSDdPE	1.56	2.77	1.98
PB	4	6.91	5.6	PsSP	1.14	1.67	1.33
PC	4.76	7.76	6.31	PDSP	0.18	0.43	0.29
PK	0.56	1.5	1.08	TSP	0.69	1.35	1.07
LK	0.2	1.1	0.71	PsSV	1.96	3.42	2.59
TK	0.3	1.34	1.03	PDSV	0.14	2.93	0.41
TB	1.07	1.74	1.36	TSV	0.56	1.16	0.83
LM	0.33	0.52	0.41	PtSVdSA	0.78	1.36	1.03
PRA	0.28	0.57	0.45	PsSA	3.09	4.83	3.89
PRB	0.17	0.67	0.35	PDSA	0.4	0.68	0.55
PaM	0.39	1.16	0.65	TSA	0.54	1.21	0.97
PKBM	0.23	0.7	0.37	PtSAdPE	0.82	1.52	1.14
PSSD	2.51	3.49	2.92	PBE	0.92	2.44	1.57
PDSD	0.34	0.7	0.57	TBE	0.56	1.32	0.74
TSD	0.71	1.66	1.18				

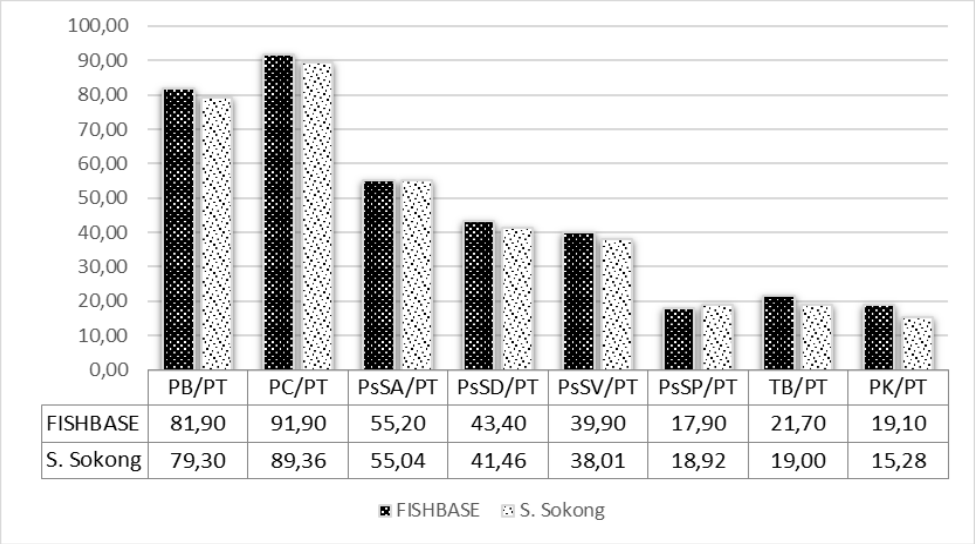
All data in **Table 3.1** are used to determine the character value of the Pepudah fish ratio (**Table 3.2**). From the ratio character values obtained, as many as 8 (eight) ratio characters were used to compare with the ratio character values of Pepudah fish in Fish Base (**Figure 3.2**).

Table 3.2. Morphomteric ratio characters of pepudah fish from the Sokong River

Ratio	Value Character Ratio (%)			Ratio	Value Character Ratio (%)		
Character	The shortest	The longest	Average	Character	The shortest	The longest	Average
PB/PT	74.49	83.21	79.30	PTSDdPE/PT	32.08	33.15	27.98
PC/PT	84.65	92.72	89.36	PsSP/PT	2.21	23.28	18.92
PK/PT	10.36	19.65	15.28	PDSP/PT	8.40	42.66	5.98
LK/PT	3.72	12.60	9.94	TSP/PT	12.26	17.94	15.18
TK/PT	5.59	17.91	14.45	PSSV/PT	52.38	40.97	38.01
TB/PT	12.42	21.47	19.28	PDSV/PT	5.97	42.66	5.98
LM/PT	4.86	6.89	5.86	TSV/PT	7.60	14.34	12.15
PRA/PT	4.61	8.26	6.36	PtSVDSA/PT	13.42	16.87	14.57
PRB/PT	2.64	7.67	4.95	PsSA/PT	14.97	57.97	55.04
PaM/PT	6.42	13.49	9.19	PDSA/PT	9.15	9.35	7.83
KBM/PT	3.32	8.14	5.22	TSA/PT	0.08	17.13	13.79
SSD/PT	37.24	46.74	41.46	PTSAdPE/PT	0.13	20.27	16.12
DSD/PT	5.39	9.75	8.00	PBE/PT	0.15	30.89	22.10
TSD/PT	11.21	20.48	16.63	TBE/PT	0.09	15.35	10.48

Based on the data in **Figure 3.2**, it can be seen that there are 7 (seven) character ratios that have quite a large difference between the pepudah fish from the Sokong River and the FishBase. The differences in these ratio characters were PB (2.60%), PC (2.54%), PsSD (1.94%), PsSV (1.89%), PsSP (1.02%), TB (2.42%). %) and PK (3.82%). These

differences can be caused by differences in the growth of *R. lateristiata* obtained in the Sokong and *R. lateristiata* rivers which were recorded in the FishBase. According to Effendie (2002) growth is influenced by internal and external factors. External factors that most influence growth are food and water temperature. Meanwhile, internal factors are related to heredity, age, and disease. This condition also shows that the habitat of the pepudah fish in the Sokong River has not been disturbed by human activities.



	PB/PT	PC/PT	PsSA/PT	PsSD/PT	PsSV/PT	PsSP/PT	TB/PT	PK/PT
FISHBASE	81,90	91,90	55,20	43,40	39,90	17,90	21,70	19,10
S. Sokong	79,30	89,36	55,04	41,46	38,01	18,92	19,00	15,28

Figure 3.2. Graph of Comparison of the Character Ratio of Pepudah Fish in the Sokong River with Fishbase

Meristic Characters

Meristic characters are morphological characters that are determined by calculating the body parts of the fish. The body parts of the fish that are counted include the number of fin radius, the number of body scales, the number of head scales, the number of operculum scales, and the number of teeth. However, in this study only the number of radii on each fin is present. The number of radii counted can consist of hard fin radius, weak fin radius, or hardened weak fin radius. Meristic character representation of fin radius is shown in the form of fin formula (**Table 3.3**).

Table 3.3. The Meristic Character of Pepudah Fish in the Sokong River

No	Meristic Character	Fin Formulas
1.	Dorsal fin	D.3.6
2.	Caudal fin	C.4.17-18
3.	Anal fin	A.2.6
4.	Ventral fin	V.3.5
5.	Pectoral fin	P.4.8

The results of the calculation of fin radius show that the dorsal fin has 3 hardened soft fin radii, which resembles spines, and 6 soft fin radii. On the caudal fin, there are 4 hardened soft fin radii and between 17 to 18 soft fin radii. On the anal fins, there are 2 hardened soft fin radii and 6 soft fin radii. On the ventral fin, there are 3 hardened soft fin radii and 5 soft fin radii, and on the pectoral fin, there are 4 hardened soft fin radii and 8 soft fin radii. The data obtained are in line with the description of Kottelat et al (1993) in

which R. *lateristriata* has 2 hard radii and 7 soft radii on the dorsal fin. Meanwhile, the anal fin has 3 hard and 5 soft radii.

Growth Pattern

The description of the growth pattern can be seen from the analysis of the length and weight relationship at a certain time and location. The result is a practical value that can be interpreted as a conversion of length value to fish weight value or vice versa. The data used for the analysis of the relationship between length and weight are primary data from the measurement results.

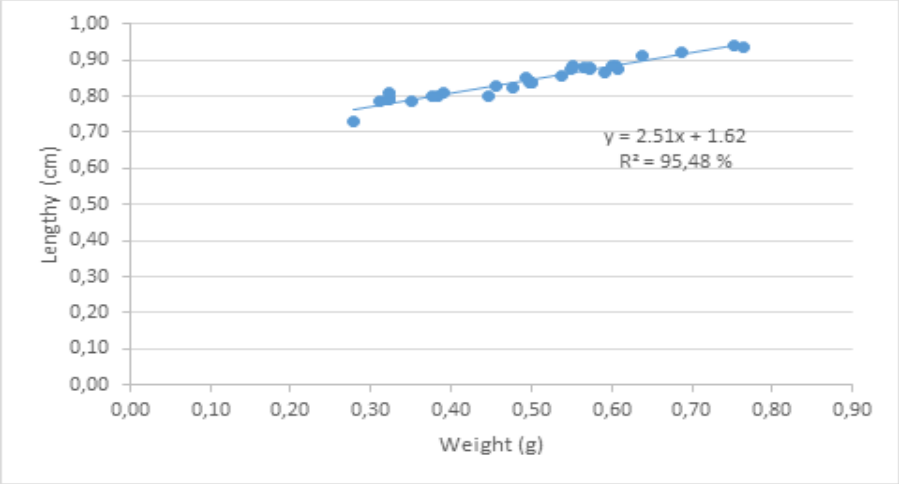


Figure 3.3. The Relationship Pattern Of Length And Weight Of Pepudah Fish in the Sokong River

The results of the analysis of the relationship between total length and total body weight of pepudah during March 2017 were the value of r = 96.16%, R2 = 95.48%, Adjusted R2 = 92.20%, and Standard Error = 3.46%, and the value of b = 2.51. The mathematical equation is BT = 1.62 + 2.51 PT (**Figure 3.3**).

All values of the analysis of length and body weight of the pepudah fish are significant as follows, (1) The r value which is close to 1 (100%) shows that there is a very close relationship between weight and total length variables (80% -100%),) The value of R2 is significant as follows: (i) the total length variable used in the equation is very dominant / strongly influences the variation of the weight variable (7.52%) the equation is determined by other variables not included in this study), (ii) almost all data (92.48%) are able to explain the equation, and (iii) this equation can be used for forecasting because the value of R2 is> 60%, (3) The value of Adjusted R2 is described as 92.20% of the sample (sample fish) able to find the required answer from the population, which means that the sample has a "high level of accuracy", (4) The Standard Error (SE) value means that there is a very small deviation (<10.0%) from the regression coefficient of the variable length of fish and fish. was a significant contribution to the variable bodyweight of fish, (5) The value of b = 2.51 indicates a growth pattern. The value of b is in the duration of 2.5-4.0, meaning that allometric is "negative allometric" because b <3 (Effendie, 2002). This means the weight growth rate is not as fast as the length growth. The equation shows, if the total length variable increases by one unit, the total weight variable will also increase as much as the total length variable increases (Effendie, 2002).

Gonado Somatic Index (GSI)

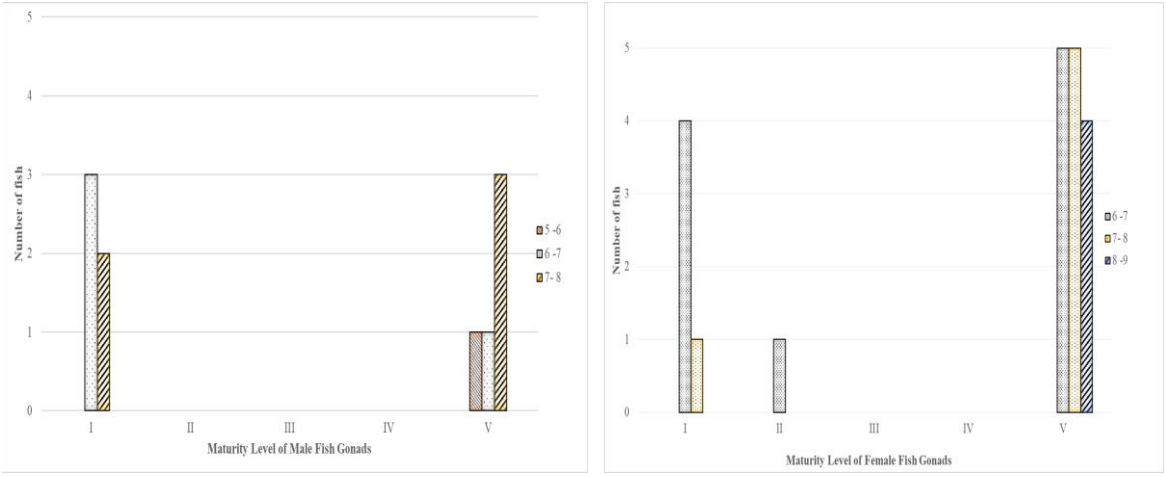


Figure 3.4. Gonad Maturity Level In Male And Female Pepudah Fish

The graph in **Figure 3.4** shows that the number of samples of female pepudah fish is more than the number of samples of male pepudah fish. In addition, female pepudah fish have a larger size than male pepudah fish. The large body size in female pepudah affects the number of eggs produced. Because the larger the size of the female fish, the more eggs that can be produced. This condition is related to the size of the abdominal cavity that can be used to accommodate eggs. This condition, as stated by Bulanin et al (2016), states that the amount of fish fecundity will increase according to the size of the fish. Research conducted on mingkih fish (*Cestraceus plicatilis*) showed that the greater the size and bodyweight of the fish, the more eggs it has. Some researchers also reported that fecundity increases with increasing fish size such as blue malalugis fish (Unus & Omar, 2010) and snakehead fish (Kartamiharja, 1994). The amount of fecundity of mingkih fish is also thought to be caused by differences in length, weight, and age of the fish. This is like the results of research on snakehead fish where the number of snakehead fish fecundity fluctuates due to differences in fish age and size (Makmur, 2006). This shows that large fish will produce a higher number of eggs, as well as being influenced by the age of the fish.

Figure 3.4 also shows that the fish caught in the Sokong River in March 2017 were on average at TKG I and V. This indicates that Pepudah fish caught in March is experiencing the spawning season. These fish spawn in a partial spawner or spawn gradually, not all at once. So that in the fish samples obtained, there are fish that have released their gonads. The drastic change in TKG is due to the fact that the fish have undergone spawning and the size of the gonads has returned to their original size. Muchlisin et al (2010) reported the same thing that Rasbora fish will experience an increase in TKG in March, September, and December. The increase in TKG in March will usually be followed by a decrease in April. This condition is thought to have something to do with the beginning and end of the rainy season. Generally, the spawning activities of Southeast Asian cyprinids are carried out in various ways, such as carrying out longitudinal migrations from downstream to upstream and vice versa or even laterally from rivers to riparian areas or tributaries which are temporarily inundated. Many studies have reported correlations of the height of the rainy season with spawning peaks of tropical fish

associated with river and lake flooding, or in the spring. The results of research by Sentosa and Djumanto (2010) stated that *R. lateristriata* fish in the Ngrancah River, Kulon Progo spawned at the end of the rainy season. At that time, the water conditions were clean, clear, and fresh with water temperatures that were quite low and the water flow conditions were not too fast. This condition will not be dangerous for the larvae. Fish larvae will also have time to grow to a size to survive the rainy season. The point is that cyprinids and fish, in general, will produce eggs and do spawning in safe environmental conditions and the availability of sufficient food so that the eggs and/or larvae produced can develop and survive.

CONCLUSION

The conclusion in this study is that the morphological characters of the pepudah fish (morphometric and meristic characters) are in accordance with the characters possessed by the fish Rasbora lateristriata or yellow rasbora. As well as the growth pattern of the pepudah fish in the Sokong river shows a negative allometric growth pattern, and the mathematical equation shows a close relationship between the increase in length and weight.

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REFERENCES

Ahmad, M. N., & Nofrizal. (2011) Pemijahan dan penjinakan ikan pantau (*Rasbora lateristriata). Jurnal Perikanan dan Kelautan, 1*(16), 71-78.

Asrial, E., Harris, A., & Abdollah. (2017). Fisheries biology aspect of yellow rasbora (*Rasbora lateristriata*, Bleker 1854) from central Lombok, Indonesia. *International Journal of Recent Scientific Research, 11*(8), 21547–21553.

Budiharjo, A. (2002). Selection and potential aquaculture of "wader" fish of the Genus Rasbora. *Biodiversitas Journal of Biological Diversity, 3*(2), 225-230.

Bulanin, U., Eriza, M., Masriza., & Maiyadi, E. (2016). Fekunditas dan Diameter Telur Ikan Mingkih *Cestraceus plicatilis* dalam Rangka Pelestarian Plasma Nutfah.

Djumanto., Setyobudi, E., Sentosa, A.A., Budi, R., & Nirwati, N. (2008). Reproductive biology of the yellow Rasbora (*Rasbora lateristriata)* in habitat of the Ngrancah River, Kulon Progo Regency. *Jurnal Perikanan, x*(2), 261-275.

Effendie, M.I. (2002). Biologi Perikanan. Yogyakarta: Yayasan Pustaka Nusatama.

Kandeel, K. E., Mohammed, S. Z., Mostafa, A. M., & Abd-Alla, M. E. (2013). Reproductive biology of the cockle Cerastoderma glaucum (Bivalvia:Cardiidae) from Lake Qarun, Egypt. *Egyptian Journal of Aquatic Research, 39*(4), 249–260.

Kartamihardja, E.S. 1994. Biologi reproduksi populasi ikan gabus, Channa striata di Waduk Kedungombo. *Bull. Perik. Darat*. 12 (2), 113-119.

Kottelat, M., Whitten, A.J., Kartikasari, S.N., & Wirjoatmodjo, S. (1993). Freshwater fishes of Western Indonesia and Sulawesi. Periplus Editions, Hong Kong.

Lumbantobing, D. 2019. *Rasbora tawarensis*. *The IUCN Red List of Threatened Species* 2019: e.T19316A2204120. https://www.iucnredlist.org/species/19316/2204120.

Makmur, S. 2006. Fekunditas dan diameter telur ikan gabus, Channa striata, di daerah Banjiran Sungai Musi Sumatera Sellatan. *J. Fish Sci*. 8(2): 254-259.

Muchlisin, Z. A., Musman, M., & Azizah, M. S. (2010). Spawning seasons of Rasbora tawarensis (Pisces: Cyprinidae) in Lake Laut Tawar, Aceh Province, Indonesia. *Reproductive Biology and Endocrinology*, *8*, 1–8.

Omar, S.B.A. (2011). Iktiologi. Makassar: Universitas Hasanuddin.

Rasbora lateristriata. Retrieved March 17, 2021.Website: https://www.fishbase.de.

Sentosa, A.A., & Djumanto. (2010) Spawning habitat of *Rasbora lateristriata* in Ngrancah River, Kulon Progo Regency. *Jurnal Iktiologi Indonesia,* 10(1), 55-63.

Unus., F. & Omar, A.S.2010. Analisis fekunditas dan diameter telur ikan malalugis biru, Decapterus macarellus, di perairan Kabupaten Banggai Kepulauan, Provinsi Sulawesi Tengah. Torani. *J. Ilmu Kelautan dan Perikanan* 20 (1).