DISTRIBUTION AND HABITAT CHARACTERISTICS OF ENDEMIC FISH BILIH (Mystacoleucus padangensis Blkr.) IN LAKE SINGKARAK, WEST SUMATRA

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Abstract. Lake Singkarak is one of the volcanic lakes in Solok Regency, West Sumatra Province. Bilih (Mystacoleucus padangensis) is an endemic fish species and has important economic value in Lake Singkarak. Concerning will be occurred degradation of the fish population in nature due to change of environment and intensive fishing. The aim of this research to obtain information on distribution and habitat characteristics of endemic fish Bilih in Lake Singkarak on May 2021. The fish captured with experimental gillnet mesh size 0.625; 0.75; and 1.0 inches at four stations. The number of Bilih fish caught during the study was 521 fish, most were found at Sumani station was 332 fish with a grain value of 45% sand, 37% silt, and 18% clay. The highest average length of male and female Bilih were 77.9 and 80.7 mm, and the highest average weight size of male and female fish was 41 and 46 mg, respectively, which was found at Sumani station. The highest GMS IV Bilih were found at Sumani station and at Paninggahan station dominated GMS III. The length and weight of male Bilih in GMS IV were the highest at 77.3 mm and 42 mg as well as female Bilih in GMS IV were at 80.6 mm and 46 mg at Sumani station. Bilih are distributed in all stations in the waters of Lake Singkarak.

In general, the measurement results of water quality in Lake Singkarak during the study ranged from 27.87 – 28.91 °C for temperature, pH 8.59 – 9.24, Dissolved Oxygen ranged from 4.56 – 7.02 mg/L, Oxidation Reduction Potential ranged 30 – 155 mV, Conductivity ranges from 0.137 – 0.145 mS/Cm, Total Dissolved Solid ranges from 0.089 – 0.093 mg/L and the Secchi depth ranges from 2.27 – 3.78 meters.

1. Introduction
Lake Singkarak is located between the administrative areas of Solok Regency and Tanah Datar Regency, West Sumatra. The lake with a height of 362.5 m above sea level has a distinctive and endemic fish species known as Bilih fish (Mystacoleucus padangensis) which is one of the attractions of this lake. Bilih fish has important economic value and is in great demand, so the price is quite high.

The development of the size of Bilih fish from year to year continues to decrease both in population and in individual sizes of Bilih fish. This is thought to have occurred in the overfishing of Bilih fish population and degradation of their habitat. [1] stated that there was a decrease in the individual size of Bilih fish from 18.6 cm to 5.9 cm [2].

The spatial distribution of fish or the presence of fish based on the place (space) in a waters and the temporal distribution of fish (based on the time when the fish are present) are limited by various factors such as behavior in choosing habitat, physiological needs, and interactions with their environment. Likewise with the size, where at a certain place and time the size is large, while others are small in size. Such distribution will provide an overview of the development of fish to environmental changes [3]. The distribution of fish is thought to be uneven at each station in the waters of Lake Singkarak. Bilih fish spawn in river areas where the current is not too heavy, the water is clear, and has a substrate of rocks and sand.
In general, it is known that both fishing communities and fishermen support efforts to protect Bilih fish, but the level of knowledge about the methods and objectives of Bilih fish conservation is still lacking, so that the protection programs carried out by the government are not implemented properly. This study was conducted to determine the distribution and habitat characteristics of endemic fish Bilih fish in Lake Singkarak as the basis for in situ and ex situ conservation and domestication efforts (habitat engineering) so that Bilih fish can be sustainable.

2. Material and methods

2.1. Study Site

This research was conducted in Lake Singkarak, South Sumatra in May 2021. The research was conducted using a survey-analytic method. Data collection was carried out on several different habitat types found in the lake at four stations (locations), namely: St. 1. Sumani (around the mouth of the river, its surroundings there are many aquatic plants such as water hyacinth (Eichhornia crassipes), household waste and wood carried from the upper reaches of the Sumani River), St.2. Batu Taba (residential areas, tourism and agriculture or padi fields, the Paninggahan watershed which contributes to the flow to Lake Singkarak and this area has a rock structure of a combination of granite and limestone), St. 3. Paninggahan (areas where there are lots of charts and fish trap), and St.4. Intake PLTA (Intake Hydropower Station, the edge of the lake around the intake of this hydropower plant is overgrown with shady trees and agricultural/plantation areas). Sample analysis was carried out directly at the survey location. The sampling station can be seen in Figure 1.

![Fish sampling location in Lake Singkarak](image)

Figure 1. Fish sampling location in Lake Singkarak

2.2 Research Focus

This paper to determine include data on number of Bilih fish caught, the size structure (length and weight), the gonadal maturity stage (GMS), and habitat characteristics of Bilih fish in its conservation and domestication efforts.
2.3 Data Collection and Analysis
2.3.1. Fish sampling
A survey-analytic approach was used as a method of this research. These observations include data on number of fish caught, fish size distribution, and growth patterns (length-weight relationship). Bilih fish were caught using gill nets with seven mesh sizes of 5/8, 3/4, and 1 inch. The length of the net for each mesh size is 50 m, so the total length is 150 m and the height is 2 m. The gill nets were installed for a minimum of two hours (from 06:00 - 9:00) [3]. In the field the fish caught are separated according to their type. Then the total length and total wet weight were measured. Total length is the length of the fish measured from the leading end of the head to the last end of the tail. The total length can be measured to the nearest unit below it [4] or to the nearest unit [5].

In this case the total length is measured to the nearest unit below it. The weight of the fish to be measured is the total wet weight. Total wet weight is the total weight of fish body tissue and the water contained in it. Measurement of total wet weight is the easiest way to measure weight in the field [6]. The measuring instrument used is a measuring board (1 mm accuracy) to measure the length of the fish and the ACIS BC 500 series digital scale (accuracy 0.1 g) to measure the weight of the fish. Another tool used is a surgical tool to determine the Gonad Maturity Stage (GMS). Furthermore, GMS was determined morphologically by following Cassie's classification in [7].

Data on length, weight, and GMS of fish were analyzed using descriptive statistics. To test the null hypothesis that $\beta_0 = 0$ can be calculated $t$. If the value of $t > t(\alpha/2, n-2)$ then the null hypothesis is rejected and if $t < t(\alpha/2, n-2)$ the null hypothesis fails to be rejected [8], in this case $0 = 3$.

2.3.2 Water quality measurement
The environmental parameters measured from each station consist of water physics, water chemistry, and surface sediment parameters. Direct measurements in the field which include Temperature, pH, Dissolved Oxygen (DO), Conductivity, Oxidation-Reduction Potential (ORP), and Total Dissolved Solid (TDS) using the Water Quality Checker-Horiba U 20, and Secchi depth using a scaled rope.

Surface sediment was taken using an Eckman grab as much as ± 1000 grams of wet weight and put into a plastic bag for further drying in an oven at 100-105 °C. Determination of grain size of sediment was carried out by dry sieving method. About 500 g of dry sediment was sieved for 10 minutes using a sieve net in layers with sizes of 1 mm, 0.5 mm, 0.125 mm, 0.063 mm and 0.002 mm for further analysis. Grain size of the sediment using the classification method [9]. Each fraction of sediment retained on each sieve was weighed and classified according to grain size. The formula used to determine the percentage of weight and species dominance in the sediment is as follows:

$$\% Weight \ of \ sediment = \frac{\text{sieve \ weight}}{\text{total \ weight \ of \ sieve}} \times 100 \%$$

3. Results and Discussion
3.1 Fish distribution
The spatial distribution of fish or the presence of fish based on place (space) in a waters is limited by various factors such as behavior in choosing habitats and interactions with their environment such as temperature, water depth, light, pH, dissolved oxygen, food, and aquatic plants [9].
Bilih fish obtained during the study amounted to 521 fishes. Bilih fish distribution data between stations (expressed in abundance). The highest abundance of Bilih fish was found in St.1. Sumani as many as 332 fishes, followed by St.2. Batu Taba (113 fishes), St.3. Paninggahan (60 fishes) and St.4. Hydropower Intake (16 fishes). Bilih fish were distributed at all observation stations.

Sumani station has the highest abundance with habitat characteristics as follows: pH value (8.59), dissolved oxygen value (7.02 mg/l, the highest among dissolved oxygen values at other stations), Total dissolved solids value (0.089 mg/L, the lowest compared to the TSD value at other stations). The substrate is in the form of sedimentary particles, with a grain value of 45% sand, 37% silt, and 18% clay (Figure 5,6,7 and Table 3).

The difference in fish abundance is especially evident at St.4 where the number of fish caught is very small compared to other stations. This is due to the physical condition of the station, especially its depth reaches 4 m and the edge of the lake around the intake of this hydropower plant is overgrown with shady trees and agricultural/plantation areas.

Differences in fish abundance between stations were caused by differences in depth. Depth of St. Sumani (2 m), St. Batu Taba (3 m), and St. Paninggahan (3 m). Shallow areas are very important for aquatic biological systems because in addition to functioning as spawning grounds, they also serve as shelters for fish, juveniles and fish food bodies, as well as maintaining the oxygen content in the water through the process of photosynthesis.

3.2 Fish size distribution

3.2.1 Length frequency distribution

The distribution of the length of Bilih fish in all stations was analyzed to determine whether the abundance of fish in that station was the same as at other stations (Figure 2 and Table 1). The total length of Bilih fish caught during the sampling period ranged from 40.0 – 92.0 mm with an average range of 61.1 – 77.9 mm for male Bilih fish, while for female fish it ranged from 55.0 – 95.0 mm with a mean ranging from 61.7 to 80.7 mm. Spatially, the average size of the largest male and female Bilih fish is at Sumani station, which is 77.9 mm and 80.7 mm, respectively, while the average size of the smallest male and female Bilih fish is at Paninggahan station, which is 40 mm and 55 mm, respectively (Figure 2 and Table 1).

In a period of 14 years the size of the Bilih fish decreased by 127 mm from 186 mm to 59 mm [1], [2]. Bilih fish population in Lake Singkarak has a length ranging from 57.54-112.08 mm. From the results of this study, the length of Bilih fish was in the size of 40.0 mm - 95.0 mm. It can be seen that the length of bilih fish has decreased from year to year. This shows that the recruitment process is not going well.
Figure 2. Total length of *M. padangensis* at each station in Lake Singkarak

Table 1. Data on length and weight of Bilh fish at each station in Lake Singkarak

| Parameter          | St. Sumani | St. Batu Tabas | St. Paninggahan | St. PLTA |
|--------------------|------------|----------------|-----------------|----------|
|                    | Male       | Female         | Male            | Female   | Male      | Female   | Male     | Female |
| Total length (mm)  |            |                |                 |          |           |          |          |        |
| Average            | 77,9       | 80,7           | 75,9            | 78,1     | 62,8      | 61,7     | 61,1     | -      |
| Min                | 62         | 70             | 65              | 70       | 40        | 55       | 52       | -      |
| Max                | 92         | 95             | 90              | 93       | 80        | 73       | 67       | -      |
| Total weight (mg)  |            |                |                 |          |           |          |          |        |
| Average            | 41         | 46             | 40              | 44       | 27        | 17       | 18,5     | -      |
| Min                | 19         | 27             | 22              | 32       | 24        | 17       | 12       | -      |
| Max                | 59         | 74             | 60              | 72       | 54        | 34       | 28       | -      |
3.2.2 Weight frequency distribution

The total weight of Bilih fish caught during the sampling period ranged from 12.0 to 60.0 mg with an average of 18.5 to 41.0 mg for male Bilih fish, while for female fish it ranged from 17.0 to 74.0 mg with a mean ranging from 17.0 to 46.0 mg. Spatially, the largest average size of male and female Bilih fish is found at Sumani station, which is 41.0 mg and 46.0 mg, respectively, while the smallest average size of male and female Bilih fish is found at Paninggahan station, each of which is 27.0 mg and 17.0 mg (Figure 3 and Table 1).

Bilih fish population in Lake Singkarak has a weight ranging from 17.2 to 143.0 mg [11]. The results of this study measure the weight of the fish in the size of 12.0 mg - 74.0 mg. It can be seen that the weight of Bilih fish has decreased by 5.2 – 69 mg. It is estimated that the recruitment process is not going well.

Figure 3. Total weight of *M. padangensis* at each station in Lake Singkarak
3.3 The gonadal maturity stage (GMS)
Gonad maturity stage (GMS) is one of the basic knowledge of fish reproductive biology. According to [12] gonad maturity is one part of fish such as reproduction before spawning. Gonad maturity can be used as a predictor of the reproductive status of fish, determining the size and age at first maturity of the gonads, the proportion or number of reproductively mature populations, and understanding the reproductive cycle of a population or species. Fish that live in the tropics tend to have a long spawning period, usually during high rainfall and flooding. This is supported by the statement [13]. Fish spawning in the rainy season is caused by environmental factors such as temperature stimuli, changes in water chemistry, and water flow. These factors directly affect or stimulate fish to lay eggs.
GMS frequency IV (highest) which means fish are ready to spawn, in St. Sumani found as many as 63 fish and dominated by female Bilih fish, in St. Batu Taba found as many as 42 fish also dominated by female Bilih fish, in St. Paninggahan found as many as 6 fish dominated by female Bilih fish, in this station found 20 fish at GMS III which were dominated by male Bilih fish, and in St. PLTA Intake, only 10 gonadal mature fish were found in male fish (Figure 4).

![Figure 4. Gonadal maturity stage of male and female Bilih fish at each station in Lake Singkarak](image-url)
According to [14] that the testes and ovaries in most teleost fish are a pair of organs located in the body cavity. But in some types of fish, the pair of testes and ovaries only develops one organ. Endemic fish such as Bonti-bonti (*Paratherina striata*) fish have one of the developing reproductive organs. The same thing according to [15] was found in endemic fish opudi fish (*Telmatherina antoniae*) from Lake Matano, [16] endemic fish rainbow selebensis (*T. celebensis*) from Lake Towuti, and [17] reported endemic fish besengbeseng (*Marosatherina ladigesi* Ahl) from several rivers in Maros, South Sulawesi. This fish is classified as sexual dimorphism, which means: Fish have traits that can be used to distinguish male and female fish. In endemic fish Bilih, there are a pair of reproductive organs in both male and female Bilih fish which are located in their body cavity.

Bada fish (*Rasbora maninjau*) is an endemic fish in Lake Maninjau is a type of total spawner fish so that it can produce juveniles simultaneously [18]. Bilih fish such as Bada fish are classified as true bony fish (Teleostei), according to [19] teleostei fish usually have a pair of elongated ovaries and are found in the abdominal cavity. According to [20], Bilih fish spawn more than once a year, and the nature of the spawning is partial, meaning that mature eggs are not released at once in one spawning period.

Table 2 shows the length and weight of Bilih fish at various stages of gonadal maturity (GMS) in Singkarak Lake. The length and weight of the male Bilih fish at GMS 4 (the highest) were at a size of 77.3 mm and 42 mg and similarly to the female fish at GMS 4 at a size of 80.6 mm and a weight of 46 mg at Sumani Station. [21] found bilih fish with a length of 82 mm that were ready to spawn. In 2010 the length of mature female bilih fish ranged from 70 - 109 mm and body weight ranged from 64 - 87 mg, male fish were between 70 - 89 mm in length and weighed between 45 - 66 mg [22]. It can be seen that the Bilih fish reaching gonadal maturity from year to year experienced a decrease in size both in length and weight of male and female Bilih fish. This will affect the sustainability of the Bilih fish population because the fish are small but have matured gonads.

Table 2. The length and weight of Bilih fish at different stages of gonad maturity (GMS) in Lake Singkarak

| Sex | GMS | St. Sumani TL (mm) | TW (g) | St. Batu Taba TL (mm) | TW (g) | St. Paninggahan TL (mm) | TW (g) | St. PLTA TL (mm) | TW (g) |
|-----|-----|-------------------|--------|-----------------------|--------|------------------------|--------|------------------|--------|
| Male | 1   | 62,0              | 1,90   | 74,9                  | 3,75   | 56,5                   | 2,06   | -                | -      |
|     | 2   | 77,5              | 3,75   | 75,8                  | 3,96   | 62,5                   | 2,55   | 52,0             | 1,20   |
|     | 3   | 81,3              | 4,55   | 76,5                  | 4,14   | 66,0                   | 3,02   | 61,0             | 1,78   |
|     | 4   | 77,3              | 4,20   | 76,3                  | 4,07   | 65,8                   | 3,26   | 62,0             | 1,95   |
| Female | 1 | -                 | -      | 74,2                  | 3,90   | 73,0                   | 3,40   | -                | -      |
|      | 2   | 80,5              | 4,18   | 75,8                  | 4,09   | -                      | -      | -                | -      |
|      | 3   | 81,0              | 4,60   | 78,8                  | 4,47   | 57,0                   | 2,10   | -                | -      |
|      | 4   | 80,6              | 4,60   | 79,3                  | 4,67   | 55,0                   | 1,70   | -                | -      |

3.4 Habitat characteristics

Lake Singkarak is one of the lakes in West Sumatra that is used by the community as a source of water to support their lives such as domestic activities, tourism, agriculture, and fisheries. Anthropogenic activities around the Singkarak River have the potential to reduce the quality of the lake water so that it is not in
accordance with its designation. The decrease in water quality can have an effect on aquatic organisms, especially organisms whose lives are relatively sedentary, such as fish, macrozoobenthos and other benthic animals.

Water quality assessment can be done by measuring physical, chemical, and biological parameters. The results of the physical and chemical water quality assessment only show the condition of the water body for a moment and do not represent fluctuations in environmental conditions that determine the presence of aquatic organisms [23]. According to [24], the approach to assessing the quality of lake water in Indonesia refers more to the physical and chemical assessment of water, while the biological assessment is limited to Escherichia coli parameters, as stated in Government Regulation No. 22 of 2021 concerning the implementation of environmental protection and management.

The temperature in Lake Singkarak ranges from 27.87 to 28.91 °C, with an average value of 28.28 °C. The temperature value in each location is relatively the same because at the time of measurement the weather conditions were cloudy and rainy in several locations (Table 3). [25] suggests that a good water temperature ranges from 20-25 °C for the survival and productivity of cultured carp (Cyprinus carpio). [26], [27] states that a good temperature range for growth, especially goldfish fry is 25-30 °C. In addition, the difference in maximum and minimum temperature will also affect the survival rate of fish and drastic changes in temperature reaching 5 °C can cause fish death. The ideal water temperature for cultured aquatic organisms should be no significant temperature difference between day and night (no more than 5 °C). Temperature can also affect the physical, chemical and biological processes of waters.

Table 3. The results of the average physical and chemical conditions of Lake Singkarak

| Location          | Temp. °C | pH  | DO (mg/L) | ORP (mV) | Conductivity (mS/cm) | TDS (mg/L) | Sand (%) | Dust (%) | Clay (%) |
|-------------------|----------|-----|-----------|----------|----------------------|------------|----------|----------|----------|
| Ds. Sumani        | 28,91    | 8,59| 7,02      | 152,3    | 0,137                | 0,089      | 45       | 37       | 18       |
| Ds. Batu Taba     | 28,14    | 9,24| 4,68      | 145,0    | 0,141                | 0,092      | 30       | 55       | 15       |
| Ds. Paninggahan   | 28,21    | 8,67| 4,56      | 155,3    | 0,145                | 0,093      | 65       | 22       | 13       |
| PLTA Intake       | 27,87    | 8,63| 4,68      | 30,0     | 0,143                | 0,092      | 55       | 33       | 12       |

The degree of acidity (pH) of water has a fairly important meaning for detecting the potential for pond productivity. Slightly alkaline water can encourage the process of disassembling organic matter in water into minerals that can be assimilated by plants (ammonia and nitrate salts). In waters that do not contain enough organic matter, minerals in the water will not be found [28]. The pH value in Lake Singkarak ranged from 8.59 - 9.24 with an average value of 8.78 (Figure 5 Table 3). The condition of this pH value is relatively the same in every location except in Ds. Batu Taba tend to be higher (9.24). This is presumably because this location is an agricultural area so there is a lot of waste from agricultural fertilizers that enters water bodies and creates a high pH value. However, this pH value has passed the PP No. 22 of 2021, which is 6 - 9. The optimal pH value for the growth of freshwater fish is around 6.5 - 8.5. The fish death point at an acidic pH value is around 4 and at an alkaline pH it is 11. Most freshwater fish live well at a slightly acidic neutral pH. As for the process of reproduction and breeding, the optimal pH is around 6.4 – 7.0 [28].
Oxygen in natural waters fluctuates, it is influenced by water temperature, salinity, water turbulence and atmospheric pressure. Oxygen is also used by aquatic microorganisms to decompose organic matter in an aerobic manner. Dissolved Oxygen (DO) values in Lake Singkarak ranged from 4.56 - 7.02 mg/L with an average value of 5.23 mg/L (Figure 5 and Table 3). The highest DO value is in Ds. Sumani where this location is a watershed area that is quite heavy so that this will facilitate the occurrence of aeration which will increase the DO value at this location. In addition, around the river flow in this location there is a lot of vegetation and also has low water turbidity. This can cause the DO value at that point to increase. However, in general, the DO value at each location is relatively good and still suitable for the life of benthic animals in these waters.

Oxidation-Reduction Potential (ORP) is a picture of electron activity in waters. [29] explains that ORP is the potential of a solution to transfer electrons from an oxidant to a reductant. The ORP value needs to be measured to determine the ability of a waters to decompose organic waste. If the ORP value is high, the oxygen levels in the waters are also high. Conversely, if the ORP value is low, the dissolved oxygen level in the waters is also low so that the organic matter content will be high due to not being decomposed, it can also increase the toxic levels in the waters. ORP values in Lake Singkarak range from 30.0 – 155.3 mV with an average value of 120.7 mV (Table 3). The value of ORP>100 mV is the lower optimum limit value where the nitrification process by autotroph bacteria and the decomposition of organic matter by aerobic bacteria occurs. According [28], explaining that the process that occurs at ORP > 100 mV is the occurrence of an
oxidation process in the water column when the dissolved oxygen content is abundant so that it supports other processes that require dissolved oxygen as the main requirement such as nitrification and decomposition processes. Organic matter into compounds that are relatively non-toxic aerobically. On the other hand, if the ORP <100 mV, the nitrification and decomposition of organic matter will run slowly, so that the quality of the pond water will decrease and will make the fish uncomfortable which will affect the growth of the fish.

Figure 6. Conductivity and Total Dissolved Solid (TDS) values in the waters of Lake Singkarak

Determination of suspended solids (Total dissolved solids - TDS) is very useful in the analysis of polluted waters and discharges and can be used to evaluate the strength of water, domestic discharges, as well as determine the efficiency of treatment units. Suspended solids affect the turbidity and brightness of the water. Therefore, the deposition and decay of organic matter can reduce the use value of waters. Figure 7 and Table 3 shows TDS values ranging from 0.089 - 0.093 with an average value of 0.092 mg/L. The maximum content of TDS in waters for aquatic biota according to PP 22 of 2021, the water quality standard is 1000 mg/L, meaning that the smaller the concentration in the waters, the better for fish growth. The main cause of TDS is inorganic materials in the form of common ions found in waters such as detergents and water-soluble surfactants, for example in household wastewater and industrial washing [28].
Water masses always contain physical, chemical components, both biotic and abiotic, which are generally referred to as sediments. This sediment load in water is found in various grain sizes, from very coarse to very fine and even in suspension, colloid, and solution levels. The grain size of the sediment on the bottom load can be in a very coarse level such as boulders, gravel and gravel to sand. Sand size is usually separated from very coarse, coarse, medium, fine and very fine sand grades. There are several grain size classifications, but what is often used is the method classification [8]. The Wentworth size range used to measure sediment particles in Lake Singkarak is classified from groups including clay particles measuring 0.0005 – 0.002 mm in diameter, dust measuring 0.002 – 0.062 mm, to coarse sand having a diameter of 0.5 - 1 mm. The results of grain values in Singkarak Lake show that sandy sediment types are generally found in all research locations with a range of 30 – 65%, only at Ds. Batu Taba type of sand is smaller that is equal to 30% (Figure 7 and Table 3). This lower value is thought to be due to the influence of the surrounding area which is generally an agricultural area and rice fields, so that erosion and erosion of groundwater often occur and enter water bodies.

[30] stated that water quality of Lake Singkarak generally fluctuates, especially on chemical parameters. Chemical parameters that are outside the Water Quality Standards according to PP No. 82 of 2001 include BOD (Biochemical Oxygen Demand), pH, COD (Chemical Oxygen Demand), total phosphate as P, free ammonia, nitrate as N, and Nitrite as N.

![Figure 7. Sediment grain value in the waters of Lake Singkarak](image-url)
4. Conclusion
The number of Bilih fish caught during the study was 521 fish, most were found at Sumani station was 332 fish with a grain value of 45% sand, 37% silt, and 18% clay. The highest average length of male and female Bilih were 77.9 and 80.7 mm, and the highest average weight size of male and female fish was 41 and 46 mg, respectively, which was found at Sumani station. The length of Bilih fish was in the size of 40.0 mm - 95.0 mm. It can be seen that the length of bilih fish has decreased from year to year. The highest GMS IV Bilih were found at Sumani station. The length and weight of male Bilih in GMS IV were the highest at 77.3 mm and 42 mg as well as female Bilih in GMS IV were at 80.6 mm and 46 mg at Sumani station. Bilih are distributed in all stations in the waters of Lake Singkarak. In general, the measurement results of water quality in Lake Singkarak during the study ranged from 27.87 – 28.91 °C for temperature, pH 8.59 – 9.24, Dissolved Oxygen ranged from 4.56 – 7.02 mg/L, Oxidation Reduction Potential ranged 30 – 155 mV, Conductivity ranges from 0.137 – 0.145 mS/Cm, Total Dissolved Solid ranges from 0.089 – 0.093 mg/L and the Sechi depth ranges from 2.27 – 3.78 meters. The results of grain values in Singkarak Lake show that sandy sediment types are generally found in all research locations with a range of 30 – 65%. The habitat characteristics (water quality and sedimen grain values) are within the normal range that supports M. padangensis life.

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