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# Morphometry and Lens of Eyes *Bilih* Fish (*mystacoleucus padangensis*, Bleeker) from Lake Toba, North Sumatra and Lake Singkarak, West Sumatra

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**Abstract.** This research has been carried out 2015. Bilih fish today need conservation and attention for sustainability. Habitat this fish is treated by human activities in Lake Singkarak, West Sumatera and Lake Toba in North Sumatera. The objectives of the research are describes morphometry of the body and relation with lens of eyes. The methods of the reasearch for measure all parts of surface body fish according [www. fishbase.org](http://www.fishbase.org). For measure and chemical composition of lens of eyes Bilih Fish (*M. padangensis*) are according Razak (2005). T he result of the research are indicated the size of morphology body Bilih Fish from Lake Toba and from Lake Singkarak is diffrent. Furthermore, diameter of lens is trend linier follow the growth of the body Bilih Fish from Lake Singkarak and Lake Toba. The chemical composition of lens of eyes Bilih Fish from Lake Singkarak contains Sulfur until 73.77% per 100 ppm, another substances like Calcium, Silicone, Magnesium, Phosporus 4.09%-4.83% per 100 ppm. The chemical composition of lens of eyes Bilih Fish from Lake Toba contains Sulfur only 50.08% per 100 ppm, another substances like Kalium, Calcium, Silicone, Magnesium, Phosporus 1.09%-10.43% per 100 ppm. Kalium substance only found in lens of eyes Bilih Fish from Lake Toba. As conclusion, morphometry body Bilih Fish from Lake Toba is bigger better than Bilih Fish from Lake Singkarak and chemical composition lens of eyes Bilih Fish from Lake Toba is influenced by environmental waters factors.

## 1. Introduction

Bilih fish (*Mystacoleucus padangensis*) is an important economic freshwater fish. Bilih fish is an endanger species only found in Lake Singkarak [1, 2, 3, 4]. Bilih fish at Lake Singkarak are overfishing and over exploitation, this is danger condition for Bilih fish life. Introduced bilih fish to Lake Toba is an alternative solution for conservation.

Since 2001, Bilih fish it was introduced in Lake Toba. Since then, Bilih fish population growing in Lake Toba until 2015. The introduce of bilih fish to Lake Toba, North Sumatra is done after some of the fisheries researchers consider the results of the study of Bilih fish in their natural habitat. Since there have been efforts to introduce bilih fish to Lake Toba in 2001, this fish can live and breed there. The habitat is suitable and the fish is much larger than the existing bilih fish in its own region. This fish is taken from the Lake Singkarak where on the basis of the results of studies of fisheries



researchers conducted the distribution of fish bilih to Lake Toba, North Sumatra. as a water candidate for the introduction of bilih fish. On January 3, 2003, there were 2,840 fishes with a total length of between 4.1 and 5.7 cm and weighing between 0.9 and 1.5 grams were scattered into Lake Toba [5].

Today, one problem at Lake Toba is overfishing. The research about morphometry and lens of eyes bilih fish at different habitat in Lake Toba and Lake Singkarak are important for sustainability and conservation bilih fish in the future. This matter related with objectives of the research are describes morphometry of the body and relation with lens of eyes bilih fish.

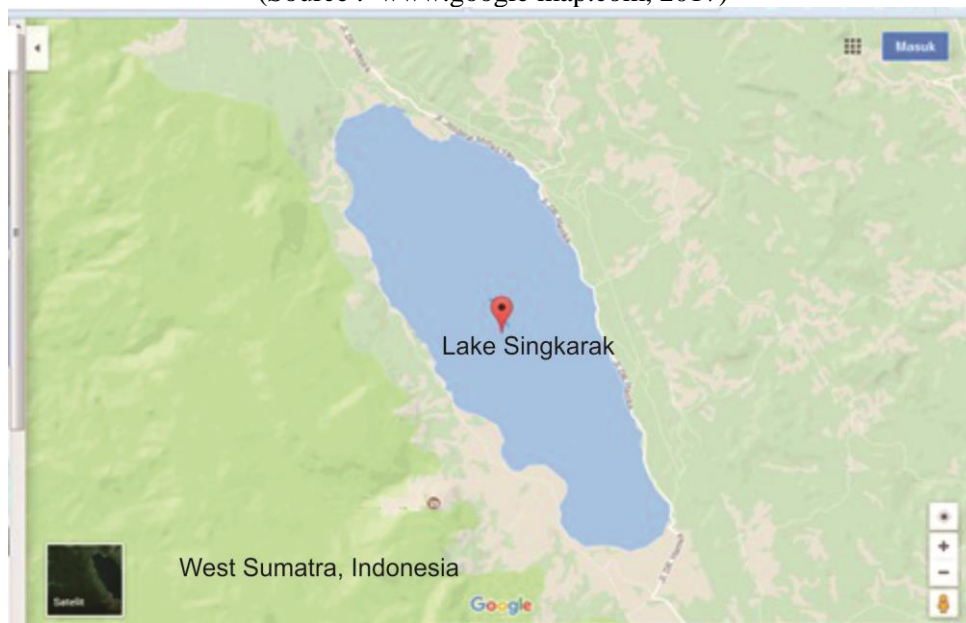
## 2. Materials and Methods

### 2.1. Collection Samples

We collected 100 fish samples from Lake Toba (  $2^{\circ} 36' 15.3''$  ( $2.6042^{\circ}$ ) N ;  $98^{\circ} 49' 24.2''$  ( $98.8234^{\circ}$ ) E and Lake Singkarak ( $1000 31020.10$  " E and  $000 38025.20$  S).



**Figure 1.** Maps of Lake Toba, North Sumatra with scale 1 : 5000 m  
(Source : [www.google.com/maps](http://www.google.com/maps), 2017)



**Figure 2.** Maps of Lake Singkarak, North Sumatra with scale 1 : 5000 m  
(Source : [www.google.com/maps](http://www.google.com/maps), 2017)

2.2. Methods for Measurements morphological character

We measure character morphology with digital clippers We measured 12 morphological character using digital calipers to an accuracy 0.01 mm following Zahorska [6]. We also measure relation size of body, diameter of lens Bilih fish and interaction both to environmental condition of waters in Lake Toba and Lake Singkarak.

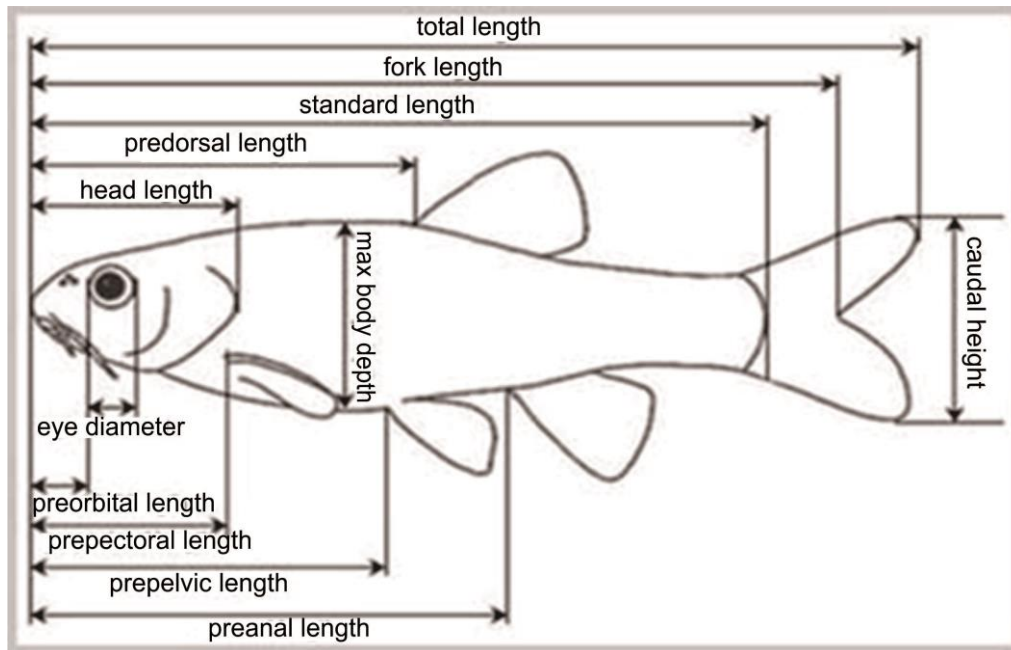


Figure 3. Measurements morphological character [7]

3. Results and Discussions

3.1. Mophometry of Body

The data of morphometric measurement of Bilih fish from Lake Singkarak and Lake Toba shows the difference. From the sample observed body size of Bilih fish from Lake Toba is bigger than Bilih fish from Lake Singkarak. Bilih fish Lake Toba long of body 2.80 cm and Bilih fish from Lake Singkarak only 2.40 cm. In general, the size of TL (Total Length, total body length ranges from 9.20 to 11.50) Bilih fish from Lake Toba. Bilih fish from Lake Singkarak 9.20-11.00 cm as seen in Table 1. For another character we know from Table 1. Table 1 is indicate all character morphometri Bilih fish from Lake Toba bigger than Bilih fish from Lake Singkarak. This condition showed Bilih fish was introduced to Lake Toba success use natural resources from water Lake Toba [5]. In other side condition from Lake Singkarak have damage from many human activities including pollution. This condition big problem in Lake Singkarak and cause reduce growth of bilih fish in this lake.

Table 1. Average measure Morphometri Character of Body Bilih Fish Toba and Bilih Fish Singkarak Following (www.fishbase.org, 2014)

Location	TL	FL	SL	PreL	HL	eL	PorL	PecL	PeLL	PeaL	MB	CH
Bilih Singkarak	9.90	8.40	7.40	3.50	1.90	0.40	0.50	2.60	5.00	5.00	2.80	2.20
Bilih Toba	10.30	8.90	10.30	4.40	2.70	0.60	1.60	4.20	5.80	5.80	2.40	2.00

Data in Table 2, that is fact, Bilih fish from Lake Toba bigger than Bilih fish from Lake Singkarak. Bilih fish that introduce to Lake Toba can adaptation and success life in new habitats. The same condition was found [8] when she and the team reserach bilih fish from 3 location : Lake Toba, Lake *Dibawah* and *Anai* river. The size of Bilih fish from Lake Singkarak is smallest than bilih fish from Lake Toba, Lake *Di Bawah* and *Anai* River. This condition is influenced by condition waters in Lake Singkarak. Overfishing and many human activities triggered some problems in this lake. Another factors, According Kartamihardja and Sarnita [5] in Lake Toba many natural foods and wide areal spawning Bilih fish. This is condition life and trigger growth performance *Bilih* fish in Lake Toba.

**Table 2.** Distribution Size of Bilih Fish in Two Location (L Toba and L.Singkarak)

Location	Length		Average $\pm$ SD	Weight	
	Min (mm)	Max (mm)		Max (mm)	Min (mm)
Lake Toba	92	123	111 $\pm$ 4.90	16.60	7.40
Lake Singkarak	92	110	101 $\pm$ 10.02	14.00	7.20

The data in Table 2 shows that the growth of fish body of Bilih fish is allometric positive. This condition is according researchs Efendie [9]. Allometric positive weight growth is more rapid growth compared to long growth. Furthermore, the length and weight of Bilih fish in Lake Toba is greater than Bilih fish located in Lake Singkarak. Bilih fish population in Lake Toba get more optimum some environmental factors. The factors are main menu foods of Bilih Fish, habitat and wider areal in Lake Toba more condusive than Lake Singkarak.

Many things can affect the growth and survival of the larvae, factors that can affect the feed and the environment. Environmental factors are very influential on the growth of fish. According to Boyd and Tucker [10], water quality is the main thing to consider in cultivation because water is a living environment of fish. Furthermore, water quality will affect the growth and survival of fish. Poor water quality can reduce the survival and growth. Therefore, good water management efforts are needed to accelerate growth and improve the quality of life of fish. One of the environmental factors that can affect the growth and survival of the fish is the flow. The movement of water causes an even distribution of oxygen, otherwise the current is capable of supplying natural feed.

### 3.2. Chemicals Composition of Lens of Eyes Bilih Fish

The diameter and chemicals composition of Lens Eyes Bilih Fish From Lake Toba and Lake Singkarak see in Table.3. Data in Table 3. shows that the range diameter of lens Bilih fish from Lake Toba 0.0030 to 0.0120 mm and diameter of Bilih fish from Lake Singkarak 0.0046-0.0079 mm. Furthermore, chemicals composition of lens eyes bilih fish from Lake Toba and Lake Singkarak have 8 element and higher prosentage are Sulfur, but smallest prosentage element is Kalsium (Ca) in lens of eyes Bilih fish Toba.

For lens of eyes Bilih Fish Singkarak smallest procentage s element Kalium (K). This condition is influenced by growth performance individual of Bilih fish and related environmental condition waters in Lake Toba and Lake Singkarak. Conditions of waters in Lake Toba better than the environmental conditions in the Lake Singkarak which pressure over exploitation by man around this lake. Some environmental factors associated with the growth of Bilih fish include lens diameter and its chemical content are water temperature, air temperature, pH, and hardness [8].



**Table 3.** Diameter and Chemicals composition of Lens Eyes Bilih Fish From Lake Toba and Lake Singkarak

Location	Diameter Lens			Chemicals Composition of Lensa (% per 100) ppm)		
	Min (mm)	Max (mm)	Average $\pm$ SD	number of elements	Max	Min
Lake Toba	0.0030	0.0120	0.0006 $\pm$ 0.0021	8	S: 50.8	K : 1.07
Lake Singkarak	0.0046	0.0079	0.0011 $\pm$ 0.0009	6	S: 74.8	Ca : 1.81

### 3.3. Interaction Water Quality to Growth Body and Lens of Eyes Bilih Fish

Any some environmental factors difference growth of Bilih fish habitat in Lake Toba and Lake Singkarak There are main natural foods, hardness, turbidity and water velocity. The growth of fish is affected by external factors in the form of food and environment [11]. Lake Singkarak has value the highest hardness (67.00 mg / L), followed by Lake Toba (25.63 mg / L) and the lowest of its hardness is Below Lake (7.73 mg / L). The hardness parameter is negatively correlated with a view of growth. Meaning that, Lake Singkarak contains high levels of hardness and have display growth of Bilih fish is isometric . For Bilih fish in the Lake Below and Lake Toba with relatively lower hardness has growth view allometric positive. This result leavesback with the existing theory, that of water the more sumptuous the better for health of the fish as it can provide calcium and other ions present in waters [8]. Hardnesses containing calcium, magnesium and carbonate ions and salinity containing the dominant elements of sodium and chloride ions result in the exchange of ions in the gill epithelium as the dividing membrane between blood and water. The exchange of  $\text{Na}^+ / \text{H}^+$  and  $\text{Cl}^- / \text{HCO}_3^-$  increases the excretion of ammonia so that its concentration in water increases. In addition, calcium and chloride ions cause competitiveness to compete in absorption by gill epithelium because gill epithelium tends to bind calcium and chloride ions rather than nitrites (Wedemeyer, 1996). This causes the concentration of nitrite in water to be high. The more lime contained in water that has a higher hardness, less good for fish growth, so that growth decreases sharply [12]. Relation turbidity and growth fish, increased turbidity will cause a sharp reduction of sunlight either in lakes, rivers or in any waters. Turbidity is associated with primary productivity and decreased zooplankton as fish food. This influences growth of fish. In Lake Toba, the waters have many sulfur compound, it is important for high indexrefractive index of lens. If the lenses of Bilih fish in Lake Toba have lenses with high index refraction then the ability is very useful to get more food and this is related to the growth rate of Bilih fish in Toba lake is greater in comparison with the lake singkarak. This is in the opinion according [13] recent research has shown that the high abundance of methionine (a protein containing Sulfur) is consistent with the need for refractive index crystallin on the lens. Methionine plays a role in high index refraction and reduces osmotic pressure.

## 4. Conclusion

Morphometry body Bilih Fish from Lake Toba is bigger better than Bilih Fish from Lake Singkarak and chemical composition lens of eyes Bilih Fish from Lake Toba is influenced by environmental waters factors. Environmental waters at Lake Toba is better than at Lake Singkarak.

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