

FACTORS OF FISH CONDITION *Glossogobius matanensis* AS AN EFFORT TO DOMESTICATE ENDEMIC FISH IN LAKE TOWUTI

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Abstract

Glossogobius matanensis is one of the endemic fish species found only in Lake Towuti, South Sulawesi. Its limited population and environmental pressures make it necessary to conserve efforts through a domestication approach. This study aims to analyze the condition factor of *G. matanensis* fish as an indicator of health and biological readiness in the context of domestication. Sampling was carried out at several points in the waters of Lake Towuti using the purposive sampling method. The observed parameters included total length, body weight, and condition factor (K) which were calculated using the King formula. The results showed that the value of the condition factor ranged from 1.00–1.05 which indicated that the fish was in good physiological condition. The variation in K-values also reflects differences in habitat quality and availability of natural feed in each location. These findings provide an important basis for the development of early aquaculture technologies and support long-term conservation programs for this endemic species. The domestication of *G. matanensis* is seen as an adaptive strategy to maintain the sustainability of local genetic resources amid changes in the ecosystem of Lake Towuti.

Keywords: domestication of fish; endemic; fish; *Glossogobius matanensis*

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INTRODUCTION

Lake Towuti is in East Luwu Regency, South Sulawesi which is included in the Malili Lake group (Matano, Mahalona, and Towuti) and is the second largest tectonic lake in Indonesia, having a maximum depth of 203 m with an area of 560 km² (Harder *et al.*, 2012). Lake Towuti has many functions for the community because it is used as a source of drinking water, tourist attractions, power plants and fisheries (Sulistiono *et al.*, 2007). Lake Towuti is one of the aquatic ecosystems that has a functional role for the region and the surrounding population as a source of livelihood and regional assets because it has beauty and natural phenomena that store natural resources.

Lake Towuti is of conservation value because many of the organisms found are endemic, with a narrow distribution. Lake Towuti is connected by several rivers that enter the catchment area, with the main stream leading to Lake Mahalona and the second stream leading upstream into Lake Matano (Hasberg *et al.*, 2018) Lake Towuti has a rare record of tropical sedimentation spanning several glacial cycles, and the system has been used to study sediment responses to shortand long-term climate change (Russell *et al.* 2014; Vogel *et al.* 2015; Russell *et al.* 2016).

Glossogobius Matanensis is an endemic fish species in Lake Towuti, South Sulawesi (Mamangkey & Nasution, 2012) This fish is a valuable resource for the local community, because it is used by the community around the lake (Mamangkey, 2012). However, there is little information about the biological aspects of *Glossogonis matanensis* and other fish

species in Lake Towuti. Other fish species in Lake Towuti are important as food for larger fish and are valuable ecological indicators of water quality. In general, fish diversity plays a functional role in ecosystem dynamics in species-rich lakes. However, there is a need to understand the biological aspects of *the fish glossogobius matanensis* and in Lake Towuti.

There are several threats to the population of *glossogobius matanensis* fish in Lake Towuti, South Sulawesi. Human activities such as pollution and environmental degradation can lead to a decline in the population of *G. matanensis* fish and other fish species (Jayadi, *et.al.*, 2019). Another threat to *G. matanensis* fish in Lake Towuti is the introduced fish. The presence of introduced fish can lead to competition for resources and habitats which can lead to a decline in the population of *G. matanensis* fish and other native fish species. This introduced fish is not native to the area and can be considered an invasive fish, thus posing a threat to native fish species, including *G. matanensis* (Natasya, *et al.*, 2018). Until now, the management of *G. matanensis* fisheries has not received attention from local, national and provincial government agencies. Therefore, there is a need for a strategic direction for fisheries management involving all stakeholders because it has a complex nature so that the fisheries management goals of *G. matanensis* receive attention from the Regional Government.

In Indonesia, most of the use of fisheries is still sourced from natural catches, businesses that are completely dependent on these catches will have a less favorable effect on production continuity. Uncontrolled fishing activities can lead to overfishing, resulting in a decline in fish populations and threatening the sustainability of the source itself. Although fish is a biological resource that has renewable, if caught continuously it will result in a continuous decrease in production.

This type of *G. matanensis* fish is a rare fish that is only found in the Malili complex area and this fish has become a target biota to be conserved because it has been included in the IUCN Red Data Book list. Rare fish species in Indonesia are expected to increase over time along with the increase in exploitation activities carried out without being balanced with conservation activities. Therefore, to keep the population of *G. matanensis* fish high and sustainable, it is necessary to make efforts to know the biological and ecological aspects in the form of interaction between aspects of the lake water environment (abiotic and biotic aspects) and other fish organisms that have an important role, because knowledge and information related to the life of *Glossogobius matanensis* fish in these waters is very limited.

METHOD

This research was carried out from February to March 2025 in the waters of Lake Towuti, East Luwu Regency, as well as at the Biology, Physiology, and Freshwater Hatchery Laboratory of the Pangkajene Islands State Agricultural Polytechnic. Sampling of *Glossogobius matanensis* fish was carried out every month for two months at three purposively determined research stations based on the criteria of the existence of the natural habitat of the target species, operational feasibility of sampling, and representation of habitat diversity, namely Station I Tanjung Timbala, Station II Tanjung Lengkotutanga, and Station III Tanjung Bakara as shown in table 1 below:



Table 1:
Sampling coordinate point

Sampling location	Coordinate points
St.1. Tanjung Timbala	121° 26' 21.377" E 2° 49' 18.546" S
St 2. Tanjung Lengkobutanga	121° 27' 54.243" E 2° 44' 55.073" S
St.3. TanjungBakara	121° 25' 35.720" E 2° 41' 38.489" S

Sources: (Lagler et al., 1977; Effendie, 2002; King, 1995)

Fish sampling was carried out in conjunction with water quality sampling using a modified bagged seser fishing gear with a net size of 3/4 inch, a total length of 15 m, a height of 1.5 m, and a bag length of 3 m, a method commonly used in freshwater fish research to obtain representative samples (Lagler et al., 1977; Effendie, 2002). The catch from each station was separated by sex, the number of individuals was calculated, then preserved using 4% formalin and soaked in 90% alcohol before laboratory analysis (King, 1995). Each individual fish is coded and labeled according to the location of the catch. Laboratory analysis included measuring the total length of fish using a digital caliper with an accuracy of 0.01 mm and weighing body weight using a digital scale with an accuracy of 0.001 g. The length and weight data of fish were then analyzed to determine the condition factor as an indicator of the level of fish fatness, which was calculated using the formula:

$$CF = \frac{W_{cal}}{W_{pret}}$$

Where :

- CF = Condition factors
- W_{cal} = Average weight of fish sample (g)
- W_{pret} = the average weight of the fish obtained from the relationship of the length of the weight (g) or (aL^b)

So that the value of the condition factors obtained can reflect the physiological and ecological conditions of *G. matanensis* fish at the time and location of sampling (King, 1995; Weatherley & Gill, 1987; Froese, 2006).

RESULT AND DISCUSSION

The results of the analysis of the relative condition factors of *male and female Glossogobius matanensis* fish in Lake Towuti in Table 2 show that the average value of relative condition factors based on sampling time at all stations tends to be balanced from February 2025 to March 2025 sampling. The factor of the relative condition of female fish is greater than that of male fish.

Table 2:
Factors of Relative Conditions of *Glossogobius matanensis* in Lake Towuti

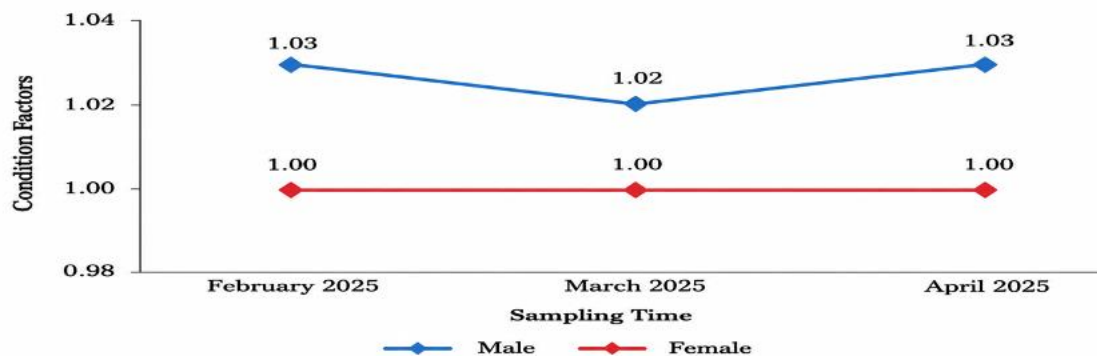
Moon	n (Fish)		Relative Condition Factors	
	Male	Famale	Male	Famale
February 2025	188	159	1,09±0.33	1,00 ±0.09
March 2025	123	129	1,04±0,30	1,00±0,08
April 2025	175	159	1,04±0,32	1,00±0,09

Source: research results



The results of the analysis of the condition factors of *male and female Glossogobius matanensis* fish at each station based on the sampling time can be seen in Figure 2-4. Figure 2 shows that the average condition factor value of male *Glossogobius matanensis* fish at station 1 of Tanjung Timbala was lowest in March (1.02 ± 0.19) and highest in February and March (1.03 ± 0.29), while the average condition factor value of female fish was the same in February, March and April (1.00 ± 0.09).

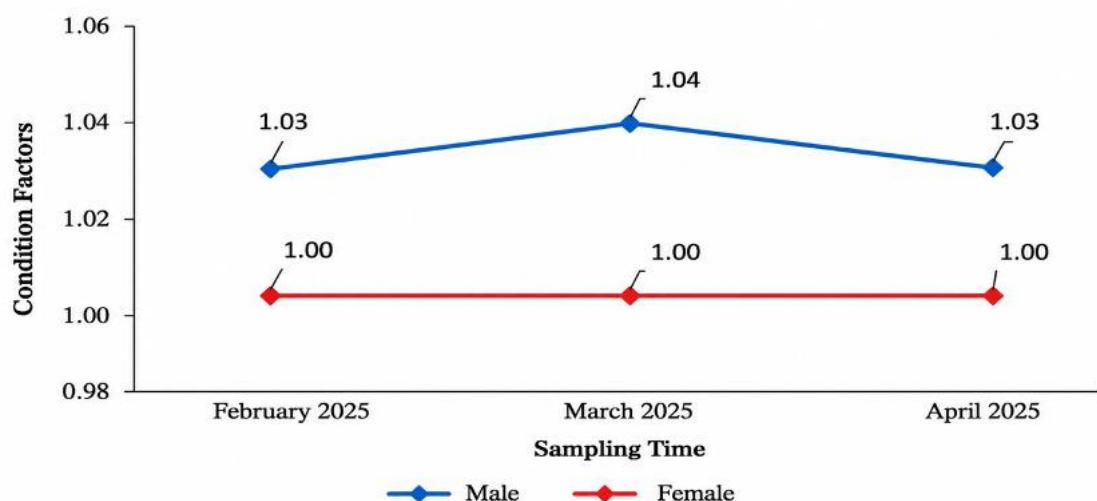
Figure 1:
The average value of the condition factor of male and female *Glossogobius matanensis* fish based on sampling time at Station 1 (T. Timbala)



Source: research results

The results of the analysis of the average condition factors of *male Glossogobius matanensis* fish at station 2 of Tanjung Lengkobagaya were lowest in February and April (1.03 ± 0.27) and the highest in March (1.04 ± 0.32), the average condition factor of female fish was the same in February, March and April (1.00 ± 0.09) (Figure 2):

Figure 2:
The average value of the condition factor of male and female *Glossogobius matanensis* fish based on sampling time at Station 2 (T. lengkobutanga)

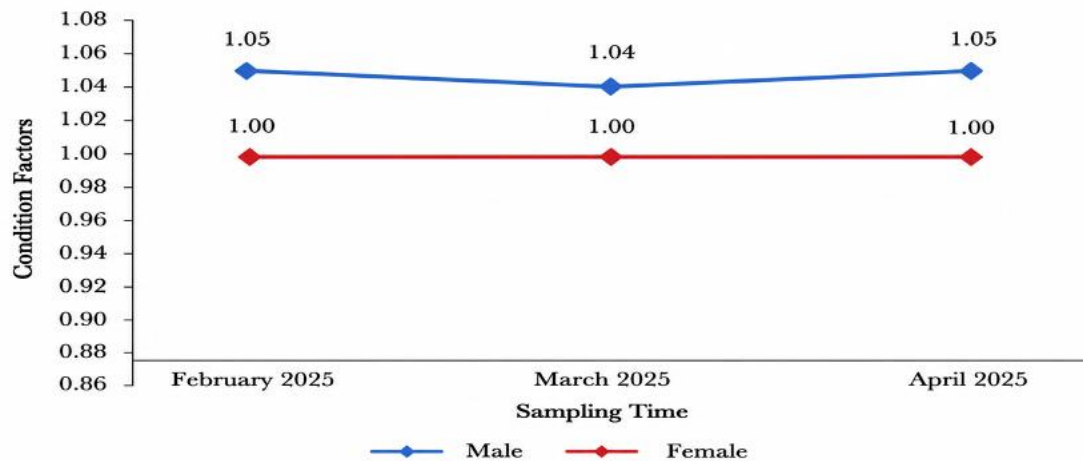


Source: research results



The results of the analysis of the average condition factor of male *Glossogobius matanensis* fish at station 3 of Tanjung Bakara were lowest in February (1.04 ± 0.30) and highest in February and April (1.05 ± 0.29), the average condition factor of female fish was the same in February, March and April (1.00 ± 0.09) (Figure 3):

Figure 3:
The average value of the condition factor of male and female *Glossogobius matanensis* fish based on sampling time at Station 3 (T. Bakara)



Source: research results

Condition factors are important indicators in assessing the health, level of physiological balance, and nutritional adequacy of fish in a habitat (Froese, 2006). This value describes the relationship between weight and body length of fish, where a high K value indicates that the fish is in good condition, while a low value can indicate environmental stress, lack of feed, or physiological disorders.

Based on the results of the study, the value of the condition index (K) of *Glossogobius matanensis* fish in Lake Towuti ranged from 1.00-1.05. This value is still within the normal range for tropical freshwater fish (1.0–2.0), which indicates that the population of *G. matanensis* is generally in a proportionate and healthy body condition (Le Cren, 1951). The distribution of K -values between observation stations showed variations influenced by local environmental characteristics. Fish found in areas near riparian vegetation and sandy substrates tend to have higher K -values compared to fish from open or rocky water areas. This can be attributed to the availability of more abundant natural feed as well as better habitat protection in vegetation areas (Barletta et al., 2010).

Correlation analysis showed a positive relationship between the K value and the concentration of dissolved oxygen (DO), as well as a negative relationship with the concentration of ammonia in the waters. This means that fish that live in waters with high DO levels and low ammonia levels tend to have better body conditions. These findings reinforce the assumption that habitat quality plays a direct role in supporting the physiological fitness of fish (Rashed, 2001; Liu et al., 2019). In addition, variations in K -values between individuals may also be influenced by gender factors and reproductive seasons. In some species of gobiidae, females undergoing gonadal maturation show an increase in K values due to significant increased body weight (Miller, 1986). If the data show the dominance of females or individuals who are maturing gonads, then the



fluctuations in the K value should be analyzed more carefully so as not to cause interpretive bias.

In the context of domestication, a *stable K-value* that is in the optimal range is a positive indication that *G. matanensis* has the potential to adapt to the cultivation environment if the environmental parameters are kept close to their natural conditions. Therefore, the selection of a parent for the domestication program should consider *the highest K* value as an early indicator of good body performance.

CONCLUSION

The endemic fish *Glossogobius matanensis* found in Lake Towuti showed a condition factor (K) value in the range of [content with the actual value of the research results], with the average value falling into the optimal category (1.08–1.15), which indicates that the fish population is generally in a healthy and proportionate body condition. The K-value shows variation between sampling locations, where individuals found in areas with better riparian vegetation and more supportive water quality tend to have higher condition indexes, thus confirming the important role of local habitat quality on the physiological status of fish. In addition, aquatic environmental factors such as dissolved oxygen (DO), temperature, and ammonia content were shown to influence the K-value, with DO showing a positive correlation to the condition of the fish's body, while ammonia was negatively correlated. These findings suggest that optimal environmental conditions contribute directly to fish fitness, while strengthening the potential of *G. matanensis* to be domesticated, especially if the adaptation process is carried out in a cultivation system that mimics its natural habitat parameters, as well as by prioritizing individuals with high condition factor values as potential parents in the domestication program.

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