p-ISSN. 2579-4752
e-ISSN. 2620-7397

Akuakultura, 9:1 (2025): 7 - 11

AKUAKULTURA

Characteristics and Utilization of Long Wishkered Catfish (*Mystus gulio*) in Indonesia

Karakteristik dan Pemanfaatan Ikan Keting (*Mystus gulio*) di Indonesia

Received: January 22, 2025, Revised: February 05, 2025, Accepted: March 22, 2025
DOI: 10.35308/ja.v9i1.11401

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Abstract

Long-wishkered catfish is an Indonesian native species that can be found in the regions of Sumatra, Java and Kalimantan in rivers and estuaries. This study is based on a literature review containing the characteristics and uses of the Mystus genus of long wishkers catfish in Indonesia which was published in 2013-2023. There are 11 species of Indonesia`s native species which are included in the Mystus genus, one of which is the long wishkers catfish. This fish has barbels, a smooth body without scales and has a patil on the back. This fish is a micro carnivorous fish or crustacivores. There are partial spawners with fecundity ranging from 3100-24459 eggs. Currently, long wishkes catfish is widely used to make shrimp paste, salted fish and fish meal.

Keywords: Characteristics, Genus Mystus, Indonesia's native Species, Long Wishkers Catfish

Abstrak

Ikan keting adalah spesies native Indonesia yang dapat ditemukan di wilayah Sumatera, Jawa dan Kalimantan pada aliran sungai hingga muara. Studi ini menggunakan kajian literatur tentang karakteristik dan pemanfaatan ikan keting genus Mystus di Indonesia yang dipublikasikan pada tahun 2013-2024. Ada 11 spesies ikan asli Indonesia yang termasuk dalam genus Mystus salah satunya adalah ikan keting. Ikan keting memiliki sungut, tubuh licin tidak bersisik dan memiliki patil di bagian sirip punggung. Ikan keting termasuk ikan karnivora mikro atau crustacivora. Ikan keting bersifat *partial spawner* dengan fekunditas berkisar antara 3.100-24.459 butir telur. Pemanfaatan ikan keting saat ini banyak digunakan untuk pembuatan terasi, ikan asin dan tepung ikan.

Keywords: *Genus Mystus, Karakteristik, Ikan Asli Indonesia*

1. Introduction

Indonesia is a megabiodiversity country that has a very high biodiversity. The overall diversity of fish species is estimated to reach 4,899 species. Based on Fishbase data (2019) there are 11 species of fish from the genus Mystus which are native to Indonesia, one of which is keting fish which belongs to the Bagridae family, order Siluriformes, genus Mystus. Keting fish (*Mystus gulio*) in Indonesia is distributed in Sumatra, Java and Kalimantan with various local names including keting fish, kating, getting, lundu and sengkiran. In addition, keting fish are also found in Asian regions such as India, Bangladesh, Sri Lanka, Vietnam, Pakistan, Nepal, Thailand, Malaysia and Myanmar. There have been quite a lot of studies on the bioecology and cultivation of catfish in these countries such as exploitation rates and MSY (*Maximum Sustainable Yield*) (Rahman *et al.,* 2024), bioaccumulation of heavy metals (Ray and Rahul, 2024), hormone induction and sex ratio in spawning (Kumar *et al.,* 2021), and the development of catfish embryos and larvae (Kumar *et al.,* 2018). Meanwhile, data on keting fish farming in Indonesia is still very minimal, so it needs to be studied further

Catfish is a popular fish for consumption in Indonesia and Asia, but its utilization relies heavily on catches from the wild. The conservation status of catfish in the IUCN *Red List* is categorized as Low Risk or *Least Concern* (LC) and the population trend is stable (Ng, 2019). The threat of fish population decline can occur due to several factors such as *overfishing*, habitat destruction and the introduction of foreign species. Therefore, efforts are needed to preserve keting fish as one of Indonesia's native species. In addition, iktiofauna studies need to be carried out as a basis for fish resource management by identifying fish diversity and investigating the presence of native and foreign fish species (Sukmono *et al.,* 2013) so that they can apply fish domestication in a water area and conservation activities.

This study aims to present information related to catfish in Indonesia which includes characteristics, distribution, nutritional content and utilization so that it can find out existing conditions, opportunities, and steps to support the preservation of local resources.

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2. Materials and Methods

This literature review is compiled based on a literature study using reference data sourced from *Fishbase, Sciencedirect* and *Google Scholar* with a limitation of case study coverage in Indonesia and published from 2013 to 2024. The article search used the keywords keting, kating, lundu, getting, sengkiran or *Mystus gulio.* The focus of this study includes the characteristics, distribution, nutritional content and utilization of catfish in Indonesia. The criteria for selecting articles were reviewed based on the year published, articles can be accessed thoroughly and the subject matter of catfish according to the focus of the study. The type of data studied includes quantitative and qualitative data to produce scientific information in descriptive form and compare it with the results of studies in other countries.

3. Results and Discussion

3.1. Characteristics of Keting Fish

Based on data from Fishbase (2019) there are 11 species of fish from the genus Mystus reported as native to Indonesia, details can be seen in Table 1.

Table 1.
List of Indonesian native fish species of the genus Mystus

No.	Species	Common Name/Fishbase Name
1.	*M. abbreviatus*	-
2.	*M. alasensis*	-
3.	*M. bimaculatus*	-
4.	*M. bleekeri*	Day's mystus
5.	*M. castaneus*	Rik
6.	*M. gulio*	Lundu, Getting, Keting, Sengkiran/ *Long Whiskers Catfish*
7.	*M. impluviatus*	-
8.	*M. nigriceps*	*Twospot Catfish*
9.	*M. punctifer*	-
10.	*M. singaringan*	Lelandin, Landin
11.	*M. wolffii*	-

Source: Fishbase (2019)

Morphologically, fish species of the genus Mystus have different maximum lengths. The species with the smallest maximum length is *M. bimaculatus* (6.7 cm) and the largest is *M. gulio* (46 cm), while *M. abbreviatus* and *M. punctifer* have no information regarding their maximum length. In general, fish of the genus Mystus are found in Sumatra, Java and Kalimantan. These fish generally live in fresh waters except for *M. gulio* and *M. wolffii* which are also found in brackish waters. Fish of the genus Mystus are demersal, meaning they live at the bottom of the water. The downstream part of the river tends to have surface areas to the bottom of the water in the form of sand deposits, mud, organic deposits and other types of deposits that can change with changes in water quality (Herawati *et al.,* 2020).

The biological aspect of keting fish is studied through its growth pattern, according to Herawati *et al.* (2021) that this fish is found in the lower reaches of the Cimanuk river and is negative allometric (b<3) which ranges from 1.96 to 2.95, namely weight gain is slower than length gain. The condition factor shows an average of 1.05, which means the fish is not flat. The results of these measurements are important to know as an early stage of sustainable fisheries utilization.

Based on Table 1, it is known that keting fish with other names lundu, getting, sengkiran or *Long Whiskers Catfish* has the scientific name *M. gulio.* This fish is anadromous, has a snout (*catfish*), a slippery body and has a patil on the dorsal fin. A detailed picture of *M. gulio* can be seen in Figure 1.

Figure 1. *M. gulio* (Fishbase, 2019)

Catfish are micro carnivores or crustacivores (Suryandari & Didik, 2015). The growth pattern of keting fish found in the Cimanuk River, West Java is negative allometric. A negative allometric growth pattern was also reported by Suryandari and Didik (2015) on keting fish found in Segara Anakan, Cilacap and in estuaries in West Java (Paujiah *et al.,* 2023) with a condition factor of 0.904-1.042 for males and 0.993-1.029 for females. A negative allometric growth pattern was also reported by Rahman *et al.* (2024) from catfish living in coastal areas of Bangladesh.

Keting fish *spawning is partial spawner*, which is the release of eggs little by little in two spawning seasons. Female fish mature gonads earlier than male fish and the sex ratio of male and female fish is 1: 1.1. Based on research reported by Johansen and Sulistiono (2022), the maximum IKG (Gonad Maturity Index) value of keting fish occurred in January, namely male fish by 11.21% and female fish by 16.9%. Egg diameter ranges from 0.2-0.45 mm, in TKG III and IV. TKG III has two modes of egg diameter, namely the range of 0.3-0.31 mm and 0.34-0.35 mm. TKG IV also has two modes of egg diameter in the range of 0.3-0.31 mm and 0.36-0.37 mm. The fecundity of keting fish is 3,100-24,459 eggs with a two-peak distribution mode indicating a partial spawning type. Meanwhile, the fecundity of catfish from India reported by Kumar *et al.* (2021) was 169 eggs/g broodstock with fertilization rate (77.33%), hatchability (71.00%), larval survival (31.67%) and the effective male:female sex ratio for spawning was 2:1. The size of the first maturing gonads in catfish in Bangladesh for females is 12.95 cm and for males is 10.89 cm (Rahman *et al.,* 2024).

3.2. Distribution of Keting Fish in Indonesia

Mackerel are found in the public waters of Indonesia in Sumatra, Java and Kalimantan. The existence of keting fish populations in several regions can be seen in Table 2 below

Table 2.
Distribution of catfish in Indonesia

No.	Name of Waters	Location	Island	Source
1.	Way Seputih	Lampung	Sumatra	Apriyanti *et al.* (2021)
2.	Nitap River	South Sumatra	Sumatra	Sulastri *et al.* (2023)
3.	Cimanuk River	West Java	Java	Herawati *et al.,* (2020)
4.	Cilutung River	West Java	Java	Yustiati *et al.,* (2023)
5.	Cikawung River	Central Java	Java	Nuryanto *et al.,* (2015)
6.	Bogowonto River Estuary	Special Region of Yogyakarta	Java	Djumanto *et al.* (2019)
7.	Paciran Village, Lamongan	East Java	Java	Ma'rufi *et al.,* (2023)
8.	Barito River		Kalimantan	Ariyanti *et al.* (2022)
9.	Nagara River		Kalimantan	Herman *et al.,* (2021)
10.	Sungai Bakar Village		Kalimantan	Ulimaz, (2020)
11.	Marang Lake		Kalimantan	Sweking *et al.,* (2019)

The habitat of keting fish is fresh to brackish waters such as river and estuary waters so that it is classified as a group of euryhaline fish. According to Sulastri *et al.* (2023) keting fish with

the local name stinging fish is found in the Nitap River with brownish water conditions. Differences in the location of the keting fish habitat affect its genetic structure and morphometric size. Stingray found in Percut Sei Tuan and Pantai Cermin waters have a very strong relationship between morphometrics and fish weight. However, it did not show a significant difference in the average weight of fish from the two locations at the same growth (Triana, 2023). Based on research that has been reported, keting fish are found in public waters with details of water quality as can be seen in Table 3.

Table 3.
Water quality of catfish habitat

No.	Parameters	Value	Source
1.	Water temperature (°C)	25-30	Sulastri *et al.,* 2023
2.	Dissolved oxygen (mg.L^{-1})	3,9-4,6	Ariyanti *et al.,* 2022
3.	pH	6,92-10,20	Paujiah *et al.,* 2023
4.	Current speed (m.s^{-1})	0,38-0,61	Herman *et al.,* 2021
5.	Brightness (cm)	24-38	Herman *et al.,* 2021
6.	Suspended solids (mg.L^{-1})	4,13-44,87	Ariyanti *et al.,* 2022
7.	Salinity (ppt)	0-32,2	Suryandari & Didik, 2015

Catfish are able to survive in environments with poor water quality such as low *dissolved oxygen* content, turbid water and polluted water conditions without dying. Furthermore, Sofian *et al.* (2024) stated that the tidal irrigation area of the Musi River is utilized for agricultural and fishery activities. The availability of food sources in this area is able to provide optimal growth. It can be seen from the highest abundance of keting fish species from other fish species. Temperature affects the metabolic activity of fish; the higher the temperature to the optimal limit, the faster the metabolism runs. Fish can adapt to changes in environmental temperature (Muslih, 2013). The high abundance of fish is influenced by the rate of water flow that carries food sources and the amount of oxygen from upstream to the middle to downstream of the river (Zamzami *et al*., 2023). High river water volume makes small fish, plankton, and nutrients available to fish and other biota (Eddy, 2013).

M. gulio as an adult is an omnivorous fish with carnivorous tendencies, feeding on 79% animal food among others, nauplius larvae and *Brachionus* sp. have been reported as the main food with higher frequency. For this fish species, there are also reports that they usually feed on bottom fish (Gupta, 2014). Thus, important factors in fish survival include shape, size and food availability in their habitat.

3.3. Nutritional Content and Utilization of Catfish in Indonesia

Ikan keting is a useful source of protein and nutrients. The protein content of ikan keting ranges from 17-20g in 100g of fish meat, 3-5g fat in 100g, vitamin A, vitamin D, vitamin E and vitamin B12 and mineral content such as calcium, phosphorus, iron and zinc. According to Jannah *et al.* (2023) keting fish oil has a high content of omega-6 and omega-3 PUFAs such as linoleic acid (27.55%) and docosahexaenoic (3.26%). Omega-3 DHA plays an important role in brain development, especially in children. Based on these data, it shows that keting fish has the potential to be utilized as a source of animal protein to overcome the problem of *stunting* in Indonesia.

On the other hand, keting fish caught from public waters are found to contain heavy metals that can have adverse health effects. Herring is one of the top predators in the food web so it has the potential to accumulate heavy metals. As reported by Aina *et al.* (2016) who conducted a study related to biomonitoring of pollution in the Silugonggo River found that the heavy metal Pb content in water ranged from 0.026-0.056 ppm, while the Pb content in lundu fish was higher, ranging from 0.497-0.725 ppm. These results exceed the maximum limit of Pb heavy metal contamination in food based on SNI 7387:2009 which is 0.3 mg/kg. Lestari *et al.* (2021) have also studied the heavy metal content in the coastal waters of Bojanegara Teluk Banten, found that the heavy metal content in keting fish meat is <0.001 mg/kg (Hg), <0.005 mg/kg (Cd), <0.030 mg/kg (Pb) and 0.699-10.920 mg/kg (Cu). The Cu content is categorized as moderate to high levels. The safe consumption level of catfish is 6.03 kg/week for adults and 4.81 kg/week for children.

Heavy metal content in fish affects the reproductive system, sense of smell, neurology and musculature so that it can interfere with the metabolic system, food and predator detection and fish health. Even fish that accumulate contaminants biologically can then cause exposure to other animals including humans and can be harmful to health (Ray and Rahul, 2024).

Efforts to reduce heavy metal content in keting fish to keep it safe for consumption can be done by soaking siamese orange filtrate. Sabila and Intan (2019) reported that the soaking time of chayote filtrate for 90 minutes was able to reduce Cu levels by 72.14% and reduce Zn levels by 84.94%.

The utilization of keting fish is currently widely used for processed food ingredients such as oseng, krispi keting fish, making shrimp paste, salted fish and fish flour (Sarasati *et al.,* 2023). In addition, in the aquatic environment keting fish can be used for biomonitoring, namely the use of organisms to detect the condition of an environment. Dewi *et al.* (2024) reported that keting fish included a species that was tolerant of mud from the exploration of polluted rivers using environmental DNA (eDNA) metabarcode in the Porong area, East Java.

3.4. Opportunities for Keting Fish Development in Indonesia

Data on catfish in Indonesia is still very minimal, even the specific production of catches from public waters does not exist. Meanwhile, other countries such as Bangladesh have found actual exploitation rates (E = 0.63) higher than the maximum allowable exploitation (Emax = 0.421). The overexploitation rate of keting fish is 16% for males and 14% for females (Rahman *et al.,* 2024). This overfishing is a threat to the sustainability of keting fish stocks in nature, so in the country studies of keting fish farming are carried out to provide fish seeds from aquaculture. Kumar *et al.,* (2018) reported that some areas in Sundarban, Bangladesh use *Mystus gulio* species as biota in aquaculture activities and become popular consumption fish and potential species for aquaculture.

The price of catfish in each region varies greatly. Data from the East Java Maritime and Fisheries Service, the average price of keting fish is quite varied in the period January 3 to December 25, 2024 ranging from Rp 18,000-80,000 / kg. Based on this data, the price of keting fish tends to be high and has a great opportunity to develop cultivation activities. Because if you only rely on catches from nature, it can threaten the existence of keting fish in Indonesia

The study of keting fish farming is expected to provide long-term benefits. Cultivated keting fish are expected to be more guaranteed in quality and not contaminated with heavy metals that can have a negative impact on health. In addition, the presence of farmed keting fish can be further studied related to nutritional content and product diversification to provide an affordable source of animal protein for the community.

4. Conclusion

Based on the results obtained, native Indonesian fishes of the genus *Mystus* consist of 11 species, although the systematics of group kinship is still incomplete. Keting fish are found in Sumatra, Java and Kalimantan. Keting fish has a snout, a slippery body, and has a patil on the dorsal fin. Keting fish are micro

carnivores or crustacivores. Hooked fish are *partial spawners* with fecundity ranging from 3100-24459 eggs. The utilization of keting fish is currently widely used for making shrimp paste, salted fish and fishmeal.

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