Ichthyofauna Checklist in Tributaries of Muda Reservoir, Kedah, Peninsular Malaysia

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Received 28 May 2021 Accepted 23 June 2021 Published 30 June 2021
DOI: https://doi.org/10.51264/inajl.v2i1.13

Abstract

Ichthyofauna checklist was scrutinized in tributaries of Muda Reservoir. A total of 5998 specimens were caught using a cast net of 2.5 cm mesh size. Amongst these specimen, 30 fish species from 12 families were recorded. The most dominant fish family in this lotic ecosystem was Cyprinidae. *Rasbora dusonensis*, *Cyclocheilichthys apogon* and *Mystacoleucus marginatus* recorded the uppermost distribution compared to other fish species found in this tributaries. Six fish species were the newly recorded species found in tributaries of Muda Reservoir; *Barbonymus gonionotus*, *Luciosoma setigerum*, *Toxabramis houdemeri*, *Mystus singaringan*, *Anabas testudineus* and *Trichopodus pectoralis*. In accordance with the previous combination of recorded fish species in tributaries of Muda Reservoir, a total of 57 updated total numbers of fish species were recorded. The information obtained in present study will update the latest ichthyofauna checklist in tributaries of Muda Reservoir, as well as for the future comparison in other geographical locations.

Keywords: checklist, distribution, fish species

INTRODUCTION

Malaysia is one of the well-known countries of high fish diversity of fishes in Southeast Asia with at least 1951 species of freshwater and marine fish species (Chong *et al*., 2010). Muda Reservoir and its tributaries are ecologically and economically important for the livelihood of local people by providing sources of employment, cheap protein sources, and ornamental fish resources.

Several studies on freshwater fish distribution in various tributaries of Muda Reservoir had been previously reported by Samat and Mazlan (2003), Samat *et al*. (2005), Shah *et al*. (2012), and Lee *et al*. (2013). They revealed that fish species diversity in tributaries of Muda Reservoir was moderate and could be increased by more intensive sampling. Samat and Mazlan (2003) studied the fish distribution in Weng River, Samat *et al*. (2005) in Lasor River, Shah *et al*. (2012) in Sira Batu River, Surat River, Air Hangat River, Bahui River, and Jawa River, and Lee *et al*. (2013) in riverine (Muda River, Teliang River, and Charok Tera River) and lacustrine environment.

The continuous assessment of ichthyofauna checklist distribution is required for better conservation planning in the future. Hence, this study was conducted to promulgate and update the latest ichthyofauna checklist distribution in tributaries of Muda Reservoir.

METHODS

This study was conducted for 18 months from March 2014 to August 2015 in the lotic

environment at tributaries of Muda Reservoir; Labua River (ST 1), Sira Jawa River (ST 2), Nyeh River (ST 3), Debu River (ST 4) and Teliang River (ST 5). The map of the sampling stations is illustrated in Figure 1. Location and the description of the sampling stations are presented in Table 1.

Fish samples were caught using a cast net of mesh size of 2.5 cm by randomly cast-netting for about 10 to 15 times covering a distance of 20 to 30 meters at each sampling station. All captured fish were temporarily placed in a cooling box filled with ice and transported to the research laboratory for species identification. Fish species were identified and systematically arranged according to Kottelat (2013) and Van der Laan *et al*. (2014).

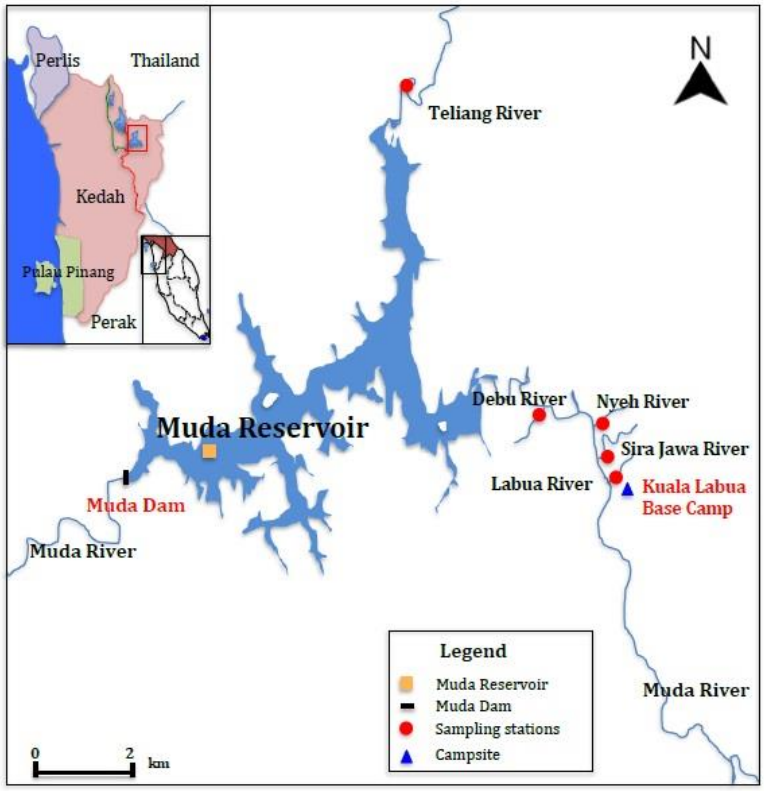

Figure 1. Location of sampling (ST 1: Labua River, ST 2: Sira Jawa River, ST 3: Nyeh River, ST 4: Debu River, and ST 5: Teliang River).

Table 1. Location and description of sampling stations.

Sampling Station	GPS Location	Description of Sampling Station
ST 1 Labua River	06º 06' 56.2" N 100º 57' 43.3" E	This station is surrounded by riparian vegetation consists of grass, bushes, and trees. Kelumpang trees (*Sterculia foetida*) of more than 30m in height shaded the river and shed their leaves during the dry season (Suksuwan, 2008). Substrate sandy and rocky and in some areas of slow flow silty with leaf accumulation. Water is clear to slightly turbid. Moderate to fast-flowing waters. Occasionally, the footprint and droppings of elephants and wild boars could be observed at the upper part of this river. Kuala Labua Base Camp is located nearby to this river.
ST 2 Sira Jawa River	06º 07' 38.7" N 100º 57' 20.3" E	This station is surrounded by riparian vegetation consists of grass, bushes, and trees. Surrounding area forested with more than 30m trees in height. The grass is the main emergent vegetation. Substrate sandy and muddy. Water is clear to slightly turbid. Moderate to fast-flowing waters. Wallow port for wild boar and elephants. The footprints and droppings of elephant were frequently observed.
ST 3 Nyeh River	06º 07' 45.9" N 100º 56' 36.6" E	This river is exposed directly to sunlight and inundated all the time. Substrate muddy and water is slightly brownish. Slow to moderate flow waters. The main vegetation is floating vegetation and emergent vegetation (riparian grass).
ST 4 Debu River	06º 07' 28.3" N 100º 55' 35.7" E	This river is surrounded by a forested area. Occasionally, floating logs were observed in some areas in this river. Moderate to slow flow waters. Substrate muddy. Water is murky.
ST 5 Teliang River	06º 09' 35.5" N 100º 55' 12.5" E	This river is surrounded by a forested area. Water is brownish, peaty to slightly turbid. Slow to moderate flow waters. Substrate sandy, silty, and rocky with leaf accumulation in areas of slow flow. This river has been gazetted as a fish reserve under the Kedah State Enactment (K.P.U. 19.) *Fisheries (Riverine) Rules*, 1990.

RESULTS AND DISCUSSION

A total of 5998 fishes were caught during this study. 30 fish species from 12 families were recorded in this study. The highest percentage of family composition was Cyprinidae (90.25%) followed by Ambassidae (3.65%), Osphronemidae (3.07%), Bagridae (1.32%), Pristolepididae (0.55%), Cichlidae (0.28%), Cobitidae (0.28%), Anabantidae (0.22%), Notopteridae (0.20%), Zenarchopteridae (0.08%), Channidae (0.07 %) and Gobiidae (0.03%).

Cyprinidae was the most abundant fish family in this study, represented by 17 species while the other families were only represented by one or two species. Shah *et al*. (2012) and Lee *et al*. (2013) found that Cyprinidae was the dominant fish family in their studies. On the other hand, Salam and Gopinath (2006) also found that Cyprinidae was the dominant fish family particularly in Peninsular Malaysia and Borneo. Cyprinidae

family was also discovered as a dominant group of fishes in the various freshwater habitats by Zarul-Hazrin *et al*. (2012) and Ahmad *et al*. (2013).

Rasbora dusonensis, *Cyclocheilichthys apogon* and *Mystacoleucus marginatus* were the three species that dominated the catches during this study, representing percentage composition 23.96%, 20.96% and 19.46% respectively, followed by *Systomus binotatus* (7.82%), *Osteochilus vittatus* (7.02%), *Osteochilus waandersii* (3.72%), *Parambassis siamensis* (3.65%), *Trichogaster trichopterus* (2.65%), *Oxygaster anomalura* (1.98%), *Rasbora paviana* (1.53%), *Labiobarbus leptocheilus* (1.40%), *Hemibagrus capitulum* (0.70%), *Barbonymus schwanenfeldii* (0.70%), *Mystus singaringan* (0.62%), *Pristolepis fasciata* (0.55%), *Hampala macrolepidota* (0.47%), *Barbonymus gonionotus* (0.42%), *Trichogaster pectoralis* (0.42%), *Devario regina* (0.30%), *Oreochromis niloticus* (0.28%), *Acantopsis dialuzona* (0.28%), *Toxabramis houdemeri* (0.25%), *Anabas testudineus* (0.22%), *Notopterus notopterus* (0.20%), *Barbodes lateristriga* (0.17%), *Hemirhamphodon pogonognathus* (0.08%), *Luciosoma setigerum* (0.08%), *Channa striata* (0.07%), *Pseudogobiopsis oligactis* (0.03%) and *Lobocheilos rhabdoura* (0.01%). In this study, the percentage composition of *Rasbora dusonensis* and *Cyclocheilichthys apogon* has been increased and *Mystacoleucus marginatus* has been decreased compared to the previous study by Lee *et al*. (2013) with the recorded percentage composition of *Rasbora dusonensis* (15.81%), *Cyclocheilichthys apogon* (6.99%) and *Mystacoleucus marginatus* (26.75%) from the total catch of 329 fishes in the riverine environment.

The total number of 30 fish species from this study was higher than the previous study from various tributaries in Muda Reservoir by Samat and Mazlan (2003), Samat *et al*. (2005), Shah *et al*. (2012), and Lee *et al*. (2013) which recorded 11, 17, 25 and 18 fish species respectively (Table 2). Within this study and existing records by the previous study, the updated total number of fish species from various tributaries of Muda Reservoir was 57 species from 19 families. There were six newly recorded fish species as compared to the previous study by Samat and Mazlan (2003), Samat *et al*. (2005), Shah *et al*. (2012), and Lee *et al*. (2013) which were *Barbonymus gonionotus*, *Luciosoma setigerum*, *Toxabramis houdemeri*, *Trichopodus pectoralis*, *Anabas testudineus*, and *Mystus singaringan*. *Barbonymus gonionotus*, *Mystus singaringan*, and *Trichopodus pectoralis* were found in all sampling stations. *Luciosoma setigerum* was found in ST1 (Labua River) and ST2 (Sira Jawa River). *Toxabramis houdemeri* was found in ST2 (Sira Jawa River) and ST3 (Nyeh River). *Anabas testudineus* was found in all sampling stations except ST2 (Sira Jawa River).

According to Agostinho *et al*. (1999), the most important factors in determining fish diversity, distribution and composition were the habitat of fish and its environment. The discrepancy in the total number of species between the previous study and this study was probably influenced by some factors such as sampling areas, sampling efforts, and type of sampling gears. The main sampling method used in the riverine environment in Muda Reservoir was cast-netting, where the water was shallow and the flow was fast (Lee *et al*., 2013), which was used in this sampling. Previously, Shah *et al*. (2012) used two cast nets and a backpack LR-24 Smith-Root electro-fisher. Cast-netting was deployed for about 30 minutes, whereas electro-shocking was carried out for 30 to 45 minutes, covering a distance of 30 to 50 meters on each sampling site. Lee *et al*. (2013) used two cast nets and cast-netting was deployed for 30 minutes per site, covered as many microhabitats as possible, such as pools, glides, riffles, and the channel itself within the sampling area. Therefore, it is suggested that the catch potential of fish for future study will be increased by maximizing all aforementioned factors.

Table 2. Ichthyofauna checklist studies from various tributaries in Muda Reservoir

Family	Species	Previous studies				Recent study *				
		Samat & Mazlan (2003) [w]	Samat *et al.* (2005) [#]	Shah *et al.* (2012) [&]	Lee *et al.* (2013) [@]	ST 1	ST 2	ST 3	ST 4	ST 5
Notopteridae	*Notopterus notopterus*	-	-	-	+	-	-	-	+	+
Cyprinidae	*Barbodes binotatus*	-	-	+	+	+	+	+	+	+
Cyprinidae	*Barbodes lateristriga*	-	-	+	-	+	+	-	-	+
Cyprinidae	*Barbonymus gonionotus* [R]	-	-	-	-	+	+	+	+	+
Cyprinidae	*Barbonymus schwanenfeldii*	-	-	-	+	+	+	+	+	+
Cyprinidae	*Crossocheilus cobitis*	+	+	-	-	-	-	-	-	-
Cyprinidae	*Crossocheilus oblongus*	-	+	+	-	-	-	-	-	-
Cyprinidae	*Cyclocheilichthys apogon*	-	-	+	+	+	+	+	+	+
Cyprinidae	*Devario regina*	-	+	+	-	+	+	-	-	-
Cyprinidae	*Garra cambodgiensis*	-	+	+	-	-	-	-	-	-
Cyprinidae	*Hampala macrolepidota*	-	+	+	+	+	+	+	+	+
Cyprinidae	*Labiobarbus leptocheilus*	-	-	-	+	+	+	+	+	+
Cyprinidae	*Lobocheilos rhabdoura*	-	+	+	-	-	+	-	-	-
Cyprinidae	*Luciosoma setigerum* [R]	-	-	-	-	+	+	-	-	-
Cyprinidae	*Mystacoleucus obtusirostris*	-	+	+	+	+	+	+	+	+
Cyprinidae	*Neolissochilus hexagonolepis*	+	+	-	-	-	-	-	-	-
Cyprinidae	*Osteochilus vittatus*	-	-	+	+	+	+	+	+	+
Cyprinidae	*Osteochilus waandersii*	-	+	+	-	+	+	+	+	+
Cyprinidae	*Oxygaster anomalura*	-	-	+	+	+	+	+	+	+
Cyprinidae	*Toxabramis houdemeri* [R]	-	-	-	-	-	+	+	-	-
Cyprinidae	*Poropuntius deauratus*	-	+	+	-	-	-	-	-	-
Cyprinidae	*Rasbora cephalotaenia*	+	-	-	-	-	-	-	-	-
Cyprinidae	*Rasbora dusonensis*	-	-	-	+	+	+	+	+	+
Cyprinidae	*Rasbora paviana*	-	-	-	+	+	+	+	+	+
Cyprinidae	*Rasbora sumatrana*	-	-	+	-	-	-	-	-	-

Notes: + = present, − = absent, [R] = new record, [w] = Weng River, [#] = Lasor River, [&] = Sira Batu River, Surat River, Air Hangat River, Bahui River and Jawa River, [@] = Muda River, Teliang River and Charok Tera River, * = Labua River (ST 1), Sira Jawa River (ST 2), Nyeh River (ST 3), Debu River (ST 4) and Teliang River (ST 5)

Table 2. Continued. Ichthyofauna checklist studies from various tributaries in Muda Reservoir

Family	Species	Previous studies				Recent study *				
		Samat & Mazlan (2003) [w]	Samat *et al.* (2005) [#]	Shah *et al.* (2012) [&]	Lee *et al.* (2013) [@]	ST 1	ST 2	ST 3	ST 4	ST 5
Cyprinidae	*Rasbora vulgaris*	-	-	-	+	-	-	-	-	-
Cobitidae	*Acantopsis choirorhynchos*	-	-	+	-	-	-	-	-	-
Cobitidae	*Acantopsis dialuzona*	-	+	-	+	+	+	+	+	+
Balitoridae	*Homalopteroides stephensoni*	+	-	-	-	-	-	-	-	-
Balitoridae	*Homalopteroides cf. wassinkii*	+	-	-	-	-	-	-	-	-
Balitoridae	*Homalopteroides sp.*	+	-	-	-	-	-	-	-	-
Amblycipitidae	*Amblyceps foratum*	-	+	-	-	-	-	-	-	-
Amblycipitidae	*Amblyceps mangois*	+	-	-	-	-	-	-	-	-
Sisoridae	*Glyptothorax major*	-	+	-	-	-	-	-	-	-
Sisoridae	*Glyptothorax platypogonides*	+	-	-	-	-	-	-	-	-
Siluridae	*Silurichthys hasseltii*	-	+	-	-	-	-	-	-	-
Clariidae	*Clarias teijsmanni*	+	-	-	-	-	-	-	-	-
Bagridae	*Hemibagrus capitulum*	-	+	+	-	-	-	-	+	+
Bagridae	*Leiocassis micropogon*	-	-	+	-	-	-	-	-	-
Bagridae	*Mystus castaneus*	-	-	+	-	-	-	-	-	-
Bagridae	*Mystus singaringan* [R]	-	-	-	-	+	+	+	+	+
Zenarchopteridae	*Hemirhamphodon pogonognathus*	-	-	+	-	+	+	-	-	+
Synbranchidae	*Monopterus albus*	-	+	-	-	-	-	-	-	-
Mastacembelidae	*Mastacembelus cf. erythrotaenia*	-	+	-	-	-	-	-	-	-
Ambassidae	*Ambassis kopsii*	-	-	+	-	-	-	-	-	-
Ambassidae	*Parambassis siamensis*	-	-	-	+	+	+	+	+	+
Pristolepididae	*Pristolepis fasciata*	-	-	+	-	+	+	-	+	+
Cichlidae	*Oreochromis niloticus*	-	-	-	+	-	-	+	+	+

Notes: + = present, − = absent, [R] = new record, [w] = Weng River, [#] = Lasor River, [&] = Sira Batu River, Surat River, Air Hangat River, Bahui River and Jawa River, [@] = Muda River, Teliang River and Charok Tera River, * = Labua River (ST 1), Sira Jawa River (ST 2), Nyeh River (ST 3), Debu River (ST 4) and Teliang River (ST 5)

Table 2. Continued. Ichthyofauna checklist studies from various tributaries in Muda Reservoir

Family	Species	Previous studies				Recent study *				
		Samat & Mazlan (2003) [w]	Samat *et al.* (2005) [#]	Shah *et al.* (2012) [&]	Lee *et al.* (2013) [@]	ST 1	ST 2	ST 3	ST 4	ST 5
Gobiidae	*Glossogobius spp.*	-	-	+	-	-	-	-	-	-
Gobiidae	*Pseudogobiopsis oligactis*	-	-	-	+	-	-	-	-	+
Anabantidae	*Anabas testudineus* [R]	-	-	-	-	+	-	+	+	+
Osphronemidae	*Betta pugnax*	-	-	+	-	-	-	-	-	-
Osphronemidae	*Betta splenden*	+	-	-	-	-	-	-	-	-
Osphronemidae	*Trichopodus pectoralis* [R]	-	-	-	-	+	+	+	+	+
Osphronemidae	*Trichopodus trichopterus*	-	-	-	+	+	+	+	+	+
Channidae	*Channa gachua*	+	-	+	-	-	-	-	-	-
Channidae	*Channa striata*	-	-	+	+	-	-	-	+	+
Total species		11	17	25	18	23	24	20	23	26
Total species - recent study (all sampling stations)										30
Updated total species - previous and recent studies										57

Notes: + = present, − = absent, [R] = new record, [w] = Weng River, [#] = Lasor River, [&] = Sira Batu River, Surat River, Air Hangat River, Bahui River and Jawa River, [@] = Muda River, Teliang River and Charok Tera River, * = Labua River (ST 1), Sira Jawa River (ST 2), Nyeh River (ST 3), Debu River (ST 4) and Teliang River (ST 5)

CONCLUSION

The information obtained from this study will give the latest ichthyofauna checklist in tributaries of Muda Reservoir which will be useful for the management of fishery resources in the future.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the School of Biological Sciences, Universiti Sains Malaysia for providing all the facilities to conduct this research. Grateful appreciation is extended to the Universiti Sains Malaysia through the Research Grants Scheme 203.PBIOLOGI.6711522. Very heartfelt gratitude goes to all people involved in this study directly or indirectly.

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