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ICHTHYOFAUNAL DIVERSITY OF TASEK BERA RAMSAR SITE, PAHANG, PENINSULAR MALAYSIA

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ABSTRACT

Tasek Bera Ramsar Site is an alluvial swamp with small area of open water and is an important and unique freshwater ecosystem in Peninsular Malaysia. Research on fish fauna of Tasek Bera began more than 60 years ago. A recent survey has collected a total of 52 species belonging to 20 families of freshwater fishes bringing the total number of fish species known to date to 127 species from 30 families. Thirteen species are newly recorded for the ecosystem, comprising of mainly small, cryptic and bottom dwelling species that can be found among riparian vegetation or root system of riparian plants. The remaining species are common and can be found widely distributed throughout Peninsular Malaysia. The ichthyofaunas of Tasek Bera are dominated by Cyprinidae (51 species), Siluridae (12 species), followed by Bagridae (nine species) and Osphronemidae (nine species). The available data showed that fish diversity of Tasek Bera ecosystem is highly diverse. Future research needs to consider the peripheral habitat in order to obtain a complete picture of the ichthyofauna diversity of Tasek Bera Ramsar Site for sound conservation and management.

Keywords: inland freshwater fishes, lacustrine habitat, blackwater, Ramsar Site, checklist

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INTRODUCTION

Tasek Bera is the largest freshwater swamp-lake system in Peninsular Malaysia (Benstead *et al*., 1993). It represents one of the most unique and important freshwater ecosystem in Peninsular Malaysia. Tasek Bera has a dendritic shape

of drainage system that was formed from the combination of the components of swamp that extend through a wide area of water bodies and reeds in between patches of raised ground (Khan *et al*., 1996). The dominant habitats are open water bodies, river, streams, *Pandanus-Lepironia* swamp, freshwater swamp forest, peat swamp forest and secondary swamp forest (Syakirah *et al*., 2000). Tasek Bera is also home for more than 200 bird species, 50 mammals and 94 fish species (Chong, 2007). Because of its importance, Tasek Bera has been protected under the Ramsar Convention since November 1994.

Given its unique and diverse aquatic habitats, several ecological studies had been conducted on the freshwater fishes in Tasek Bera. The most comprehensive study on fish ecology at Tasek Bera was done by Furtado and Mori (1982) but many studies on species composition of freshwater fish of Tasek Bera were conducted more than 60 years ago (see Tweedie, 1952, 1956; Brittan, 1954; Menon, 1954; Alfred, 1964a, b, c). In the 1970s, Shiraishi and Nishiyama (1972) conducted a study resulting in the collection of 70 fish species. Mizuno *et al*. (1982) combined their data and data from various studies up to the 1980s and listed a total of 95 species. Khan *et al*. (1996) added another 14 species to the checklist making the overall number of species totaling to 109. Later, Zakaria-Ismail (1997) recorded 80 species while the two most recent surveys by Sim (2002) and Mustafa and Abd Ghani (2010) documented 94 and 30 species, respectively. However, the total species count remains at 109 species.

There are indications showing that Tasek Bera ecosystem are facing threats from large scale deforestation of wetland and pollution of rivers from the nearby oil palm plantation (Sharip & Zakaria, 2008; Gharibreza *et al*., 2013) that might reduce its aquatic diversity. Overexploitation of freshwater fishes in Tasek Bera for food, sport fishing, and aquarium trade without proper sustainable management could also affect the fish composition and abundance (Khan *et al*., 1996; Sim, 2002). Of the 109 species of freshwater fishes listed to date, many small, cryptic and bottom-dwelling species that frequented soft, muddy bottom and the roots of riparian plants are missing. This study is conducted in order to revise and updated the checklist of freshwater fishes in Tasek Bera and to fill the gap in fish checklist in order to have a better understanding of the dynamic of fish species composition in the area. We believe there are many more species yet to be recorded at Tasek Bera as we notice that the fringing ecosystem has not been surveyed intensively.

METHODOLOGY

Study Area

Tasek Bera Ramsar Site is located in the southwest of Pahang, Malaysia (3°49′00″N 102°25′00″E), extending 35 km long and 20 km wide and drains into Sungai (Sg.) Pahang (Figure 1). It is an alluvial blackwater swamp lake with a catchment area covering approximately 600 km^2. Tasek Bera can be divided into three major habitat types; (1) limnetic zone which is fringed by *Utricullaria* in the surface water, (2) littoral zone that comprise of *Lepironia* reeds and *Pandanus* clumps, and (3) littoral zone which is dominated by *Eugenia* swamp forest stands. These habitats had been sampled many times in the past.

Water from Tasek Bera flow to the north-east into Sungai (Sg.) Bera. From Sg. Bera, the water flow northwards into Sg. Pahang which heads eastwards into the South China Sea. Sg. Bera is an important area to study the intermigration of fish between lacustrine and riverine habitat. The stream has soft and clay substrate with leaves, branches, and tree logs on the bottom surface. The water current is mostly slow flowing but fast flowing water exist at certain area because of the different topographic gradient. This area is dominated by *Pandanus* and has well developed riparian vegetation.

Sg. Tembangau located in the south-west of Tasek Bera flows from the peat swamp forest in the area. There is little water current and the substrate is comprised of leaf litter, dead wood, with deep peat. The landscape is mostly shaded and covered with riparian vegetation.

Data Collection

Two types of sampling gears were used in this study. The selection of gear is based on target species, habitat characteristic and human resources. The gears that were used are hand held push net and seine net with stretch mesh of 3 mm. Since our target species are small size fish that mostly preferred shallow habitat with densely vegetated or large amount of snags and woody debris, it is not suitable to use a cast net and gill nets. Electrofishing is not feasible in these environment and water conditions. These two gears are easily manoeuvred and have high flexibility in swampy areas. Night surveys were also conducted using torchlight and scoop nets to catch the fishes that inhabit the main water body at the resort jetty area.

Checklist of freshwater fishes in Tasek Bera by Mizuno *et al*. (1982), Khan *et al*. (1996), Sim (2002), and Mustafa and Abd Ghani (2010) were revised and compared to the recent study. The revised checklist follows the latest nomenclature and familial arrangement of Kottelat (2013).

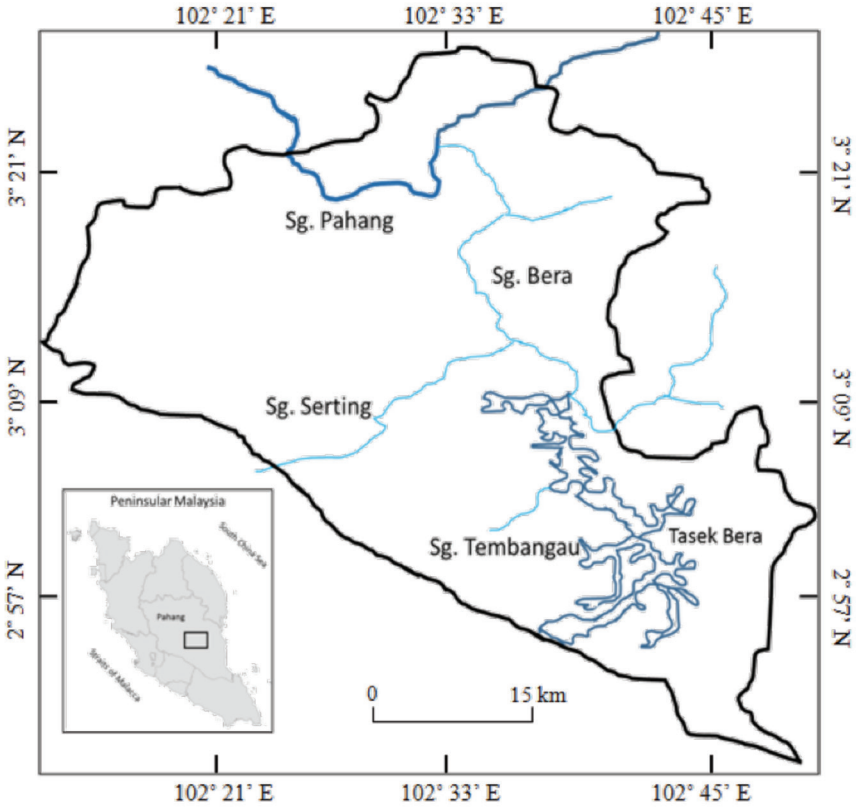

Figure 1 Map of the district of Bera, Pahang, showing streams and rivers around Tasek Bera. Sg. Bera flows northwards into Sg. Pahang which flows eastward into the South China Sea. Inset is the map of Peninsular Malaysia showing the study location.

RESULTS AND DISCUSSIONS

Revised Checklist of Fishes of Tasek Bera Ramsar Site

The first established checklist of freshwater fishes of Tasek Bera was prepared by Mizuno *et al*. (1982) whom reported a total of 95 species. After this revision and following the recent taxonomic nomenclature, the overall number of fish fauna had decreased to 88 species. Seven species were reclassified from the

original checklist were either a synonym to the already listed species or an invalid name. Fish from the genus *Chela* sp. were removed from the checklist, while the others were synonymised; *Puntius fasciatus* (synonym to *Desmopuntius johorensis*), *Rasbora retrodorsalis* (synonym to *Rasbora dusonensis*), *Belone canala* (synonym to *Xenentodon canciloides*), *Osteochilus hasseltii* (synonym to *Osteochilus vittatus*), and *Puntius tetrazona tetrazona* (synonym to *Puntigrus partipentazona*). The other three checklists of fishes from Tasek Bera (i.e., Khan *et al*., 1996; Sim, 2002; Mustafa & Abd Ghani, 2010) have no changes made on the number of species recorded except for a few nomenclature changes (see Table 1).

Taxonomy is a rather fluid and dynamic field. From time to time, naming of species may change due to taxonomic revision with the advancement of available tools. Since the first study of fish in Tasek Bera dated approximately some 60 years ago, most of the fish identification were made using old taxonomic references and classification systems which was current during that period of time. Some of the species in Mizuno *et al*. (1982) checklist that were recently revised following the current classification (i.e., Kottelat, 2013) were *Monopterus javanensis* (previously as *Fluta alba*), *Chitala lopis* (previously as *Notopterus chitala*), *Belontia hasselti* (previously as *Polyacanthus hasseltii*), *Chaca bankanensis* (previously as *Chaca chaca*), *Pangio semicincta* (previously as *Acanthophthalmus kuhli*) and *Clarias nieuhofii* (previously as *Prophagorous niewhofi*). There were also five families that were revised which include Synbranchidae (previously Flutidae), Channidae (previously Ophicephalidae), Ambassidae (previously Centropomidae), Zenarchopteridae (previously Hemiramphidae), and Soleidae (previously Synapturidae). All species that were previously placed under family Anabantidae except *Anabas testudineus*, are now placed in family Osphronemidae. *Luciocephalus pulcher* which was under family Luciocephalidae is also now placed under Family Osphronemidae. Family Luciocephalidae has been removed from the checklist because it is now considered as a single family together with Belontiidae and Osphronemidae with the precedence given to Osphronemidae (Britz, 1994; Kottelat, 2013). Three species from Family Cobitidae in Mizuno *et al*. (1982) are each now under new family; *Syncorssus hymenophysa* (Family Botiidae), *Nemacheilus selangoricus* (Family Nemacheilidae) and *Vaillantella maassi* (Family Vaillantellidae). *Pristolepis fasciatus* which previously was placed under Family Nandidae is now reverting back into Family Pristolepididae.

One species listed as *Tor clouremis* cannot be placed into any families because of its invalid species name. We had searched through the Catalog of Fishes (Eschmeyer, 2014) but failed to find any synonym or valid name for the species.

Table 1 Updated checklist of ichthyofauna of Tasek Bera, Pahang, Malaysia. The symbol asterisk (*) designates species collected in the recent survey and the pound (#) symbol denote a newly recorded species for the area.

No.	Species	Remarks
	Family Osteoglossidae	
1.	*Scleropages formosus*	
	Family Notopteridae	
2.	*Chitala lopis*	Reported as *Notopteru chitala* in Mizuno *et al*. (1982)
3.	*Notopterus notopterus*[*]	
	Family Cyprinidae	
4.	*Balantiocheilos melanopterus*	
5.	*Barbichthys laevis*	
6.	*Barbodes banksi*[*#]	Reported as *Puntius binotatus* in Mizuno *et al*. (1982)
7.	*Barbodes binotatus*	
8.	*Barbodes lateristriga*	Reported as *Puntius lateristriga* by Mizuno *et al*. (1982)
9.	*Barbonymus schwanefeldii*[*]	Reported as *Puntius schwanefeldii* in Mizuno *et al*. (1982), and Sim (2002)
10.	*Boraras maculatus*[*#]	
11.	*Brevibora dorsiocellata*[*]	Previously listed under genus *Rasbora*
12.	*Clupeichthys aesarnensis*	
13.	*Crossocheilus oblongus*	
14.	*Cyclocheilichthys apogon*[*]	
15.	*Cyclocheilichthys armatus*	
16.	*Cyclocheilichthys heteronema*	
17.	*Cyclocheilichthys repasson*	
18.	*Desmopuntius johorensis*[*]	Synonym of *Puntius eugrammus* and *Puntius fasciatus* as listed by Mizuno *et al*. (1982). While Sim (2002) reported as *Puntius johorensis*
19.	*Hampala macrolepidota*[*]	
20.	*Labiobarbus fasciatus*	
21.	*Labiobarbus festivus*	Listed as *Labiobarbus faestiva* by Mizuno *et al*. (1982)
22.	*Labiobarbus leptocheilus*	
23.	*Labiobarbus ocellatus*	

Continued

Table 1 *Continued*

24.	*Leptobarbus hoevenii*	
25.	*Luciosoma setigerum*	
26.	*Luciosoma trinema*	
27.	*Osteochilus melanopleura*	
28.	*Osteochilus spilurus*[*]	
29.	*Osteochilus vittatus*[*]	Reported as *Osteochilus hasselti* in Mizuno *et al*. (1982), Sim (2002), and Mustafa and Abd Ghani (2010)
30.	*Osteochilus* cf. *microcephalus*[*]	Reported as *Osteochilus waandersii* in Sim (2002)
31.	*Oxygaster anomalura*	Misspelled as *Oxygaster anomalua* in Mizuno *et al*. (1982)
32.	*Parachela hypophthalmus*	Listed as *Oxygaster hypophthalmus* by Mizuno *et al*. (1982)
33.	*Malayochela maassi*[*]	Listed as *Oxygaster oxygastroides* by Mizuno *et al*. (1982)
34.	*Puntigrus partipentazona*[*]	Identified as *Puntius tetrazona partipentazona* by Mizuno *et al*. (1982) and *Puntius partipentazona* by Sim (2002) and Mustafa and Abd Ghani (2010)
35.	*Puntioplites bulu*	
36.	*Rasbora bankanensis*[*]	
37.	*Rasbora caudimaculata*	
38.	*Rasbora cephalotaenia*[*]	
39.	*Rasbora* cf. *paucisqualis*[*#]	
40.	*Rasbora argyrotaenia*	
41.	*Rasbora dusonensis*	Previously reported as *Rasbora retrodorsalis*
42.	*Rasbora einthovenii*	
43.	*Rasbora elegans*[*]	
44.	*Rasbora leptosoma*	Could be a misidentified species; *R. leptosoma* is not found in Peninsular Malaysia
45.	*Rasbora* spp.[*#]	Unidentified fish that belong to a small size *Rasbora* spp. group
46.	*Rasbora myersi*[*]	
47.	*Rasbora notura*	Identified as *Rasbora* cf. *paviei* by Mustafa and Abd Ghani (2010)

Continued

Table 1 *Continued*

48.	*Rasbora trilineata*	
49.	*Rasbora vulgaris*	Misidentified as *Rasbora sumatrana* by Mizuno *et al*. (1982)
50.	*Striuntius lineatus*	Previously reported under genus *Puntius* in Sim (2002)
51.	*Thynnichthys thynnoides*	
	Tor clouremis	Probably invalid or misspelled species name
52.	*Trigonopoma gracile*[*]	Listed as *Rasbora taeniata* in Mizuno *et al*. (1982)
53.	*Trigonopoma pauciperforatum*	Previously under genus *Rasbora*
54.	*Trigonostigma heteromorpha*[*]	Reported as *Rasbora heteromorpha* by Mizuno *et al*. (1982)
	Family Botiidae	
55.	*Syncorssus hymenophysa*	Reported as *Botia hymenophysa* in Mizuno *et al*.(1982)
	Family Vaillentellidae	
56.	*Vaillantella euepiptera*[*]	
57.	*Vaillantella maassi*[*]	Reported as *Vaillantella flavofasciata* in Mizuno *et al*. (1982)
	Family Cobitidae	
58.	*Acanthopsoides molobrion*[*#]	
59.	*Lepidocephalichthys hasselti*[*#]	
60.	*Pangio malayana*[*#]	
61.	*Pangio muraeniformis*[*]	Identified as *Pangio shelfordii* by Sim (2002)
62.	*Pangio piperata*[*#]	
63.	*Pangio semicincta*[*]	Reported as *Acanthopthalmus kuhlii* by Mizuno *et al*. (1982) and as *Pangio kuhlii* by Sim (2002)
	Family Barbuccidae	
64.	*Barbucca diabolica*[*#]	
	Family Balitoridae	
65.	*Homaloptera ogilviei*	
66.	*Homalopteroides smithi*[*#]	
	Family Nemacheilidae	
67.	*Nemacheilus selangoricus*[*]	Listed as *Noemacheilus selangoricus* in Mizuno *et al*. (1982)

Continued

Table 1 *Continued*

	Family Akysidae	
68.	*Parakysis verrucosus*[*]	Recorded as *Parakysis verrucosa* in Mizuno *et al*. (1982)
	Family Sisoridae	
69.	*Glyptothorax callopterus*	Previously known as *Glyptothorax major, G. fuscus*
	Family Siluridae	
70.	*Kryptopterus bicirrhis*	
71.	*Kryptopterus cryptopterus*	
72.	*Kryptopterus limpok*	
73.	*Kryptopterus macrocephalus*[*]	
74.	*Kryptopterus* spp.	
75.	*Ompok eugeneiatus*	
76.	*Ompok fumidus*	Previously known as *Ompok leiacanthus*
77.	*Ompok rhadinurus*	Reported as *Ompok hypophthalmus* by Mizuno *et al*. (1982) and Sim (2002)
78.	*Phalacronotus apogon*	Previously under genus *Kryptopterus*
79.	*Silurichthys hasseltii*	
80.	*Silurichthys indragiriensis*[*#]	
81.	*Wallago leerii*	Identified as *Wallagonia miostoma* by Mizuno *et al*. (1982)
	Family Chacidae	
82.	*Chaca bankanensis*	
	Family Clariidae	
83.	*Clarias* cf. *batrachus*	
84.	*Clarias meladerma*	
85.	*Clarias nieuhofii*	Recorded as *Prophagorus niewhofi* in Mizuno *et al*. (1982)
	Family Bagridae	
86.	*Bagrichthys macracanthus*	
87.	*Hemibagrus capitulum*[*]	Previously known as *Mystus*/ *Hemibagrus nemurus*
88.	*Hemibagrus hoevenii*	Reported as *Hemibagrus* spp. by Mustafa and Abd Ghani (2010)
89.	*Leiocassis micropogon*	
90.	*Leiocassis poeciloptera*	Reported as *Leiocassis poecilopterus* in Mizuno *et al*. (1982), Sim (2002), and Mustafa and Abd Ghani (2010)

Continued

Table 1 *Continued*

91.	*Mystus castaneus*[*]	Reported as *Mystus nigriceps* in Mizuno *et al*. (1982) and as *M. macronemus* in Sim (2002)
92.	*Mystus singaringan*[*]	Identified as *Mystus cavacius* in Mizuno *et al*. (1982)
93.	*Nanobagrus stellatus*[*#]	
94.	*Pseudomystus leiacanthus*[*]	
	Family Zenarchopteridae	
95.	*Hemirhamphodon pogonognathus*[*]	
	Family Belonidae	
96.	*Xenentodon canciloides*[*]	Reported previously as *Belone canala*
	Family Syngnathidae	
97.	*Doryichthys deokhatoides*[*]	
	Family Synbranchidae	
98.	*Monopterus javanensis*[*]	Reported as *Fluvia alba* by Mizuno *et al*. (1982) and as *Monopterus albus* by Sim (2002)
	Family Mastacembelidae	
99.	*Mastacembelus favus*	
100.	*Macrognathus maculatus*[*#]	
101.	*Macrognathus tapirus*	Identified as *Macrognathus aculeatus* by Mizuno *et al*. (1982) and Sim (2002)
	Family Ambassidae	
102.	*Gymnochanda filamentosa*	Listed as *Gynochanda filamentosa* by Mizuno *et al*. (1982)
103.	*Parambassis apogonoides*	Reported as *Chanda* sp. by Mizuno *et al*. (1982)
104.	*Parambassis siamensis*	Identified as *Chanda ranga* by Mizuno *et al*. (1982)
	Family Nandidae	
105.	*Nandus nebolusus*[*]	
	Family Pristolepididae	
106.	*Pristolepis fasciata*	Reported as *Pristolepis fasciatus* by Mizuno *et al*. (1982), Sim (2002), and Mustafa and Abd Ghani (2010)
107.	*Pristolepis grootii*[*]	
	Family Eleotridae	

Continued

Table 1 *Continued*

108.	*Oxyeleotris marmoratus*	
	Family Anabantidae	
109.	*Anabas testudineus*[*]	
	Family Helostomatidae	
110.	*Helostoma temminckii*	
	Family Osphronemidae	
111.	*Belontia hasselti*	Reported as *Polyacanthus hasseltii* in Mizuno *et al*. (1982)
112	*Betta imbelis*	Previously reported as *Betta splendens*
113.	*Betta* cf. *pugnax*[*]	
114.	*Luciocephalus pulcher*	
115.	*Osphronemus goramy*	
116.	*Sphaerichthys osphromenoides*	
117.	*Trichopodus leerii*[*]	Previously under genus *Trichogaster*
118.	*Trichopodus pectoralis*	Previously under genus *Trichogaster.*
119.	*Trichopodus trichopterus*	Previously under genus *Trichogaster*
120.	*Trichopsis vittata*[*]	Listed as *Trichopsis vittatus* in Mizuno *et al*. (1982) and Sim (2002)
	Family Channidae	
121.	*Channa lucius*	
122.	*Channa marulioides*	
123.	*Channa melasoma*	
124.	*Channa micropeltes*	
125.	*Channa striata*[*]	
	Family Soleidae	
126.	*Achiroides leucorhynchos*	Identified as *Synaptura harmandi* by Mizuno *et al*. (1982)
	Family Tetraodontidae	
127.	*Pao palembangensis*	Previously reported under genus *Tetraodon*

However, the genus *Tor* is valid and thus we retain the species in the revised checklist. We believed it was due to misread and misspell error of the word 'clouremis' by Mizuno *et al*. (1982) from the original author.

Future research should consult the checklist of Sim (2002) for the most updated checklist. Several revisions of species names were needed due to misidentification or changes in the recent taxonomic classification. Some species were classified as misidentified as these species might not occur in Peninsular Malaysia, e.g., *Ompok leiacanthus* and *O. hypophthalmus* in which we assumed to be as *O. fumidus* and *O. rhadinurus* (both native to Peninsular Malaysia). According to the recent freshwater fish database, fish species such as *Leiocassis leiacanthus* could be either *Leiocassis poecilopterus* or *Pseudomystus leiacanthus* of which both natively occurred in Peninsular Malaysia and *Tetraodon palembangensis* was changed into *Pao palembangensis*.

On a whole, a total of 127 species representing 30 families of freshwater fish was recorded in the Tasek Bera system (Table 1). This figure showed that Tasek Bera has approximately 43 % of the total freshwater fish in Peninsular Malaysia (298 species; see Lim & Tan, 2002). The most dominant family is Cyprinidae (52 species), Siluridae (12 species), Bagridae (nine species), Osphronemidae (nine species), and Cobitidae (six species). From the four ichthyological studies that were conducted in the Tasek Bera system, Mizuno *et al*. (1982) collected 88 species from 27 families, Khan *et al*. (1996) listed 38 species from 15 families, Sim (2002) reported 94 species from 27 families, Mustafa and Abd Ghani (2010) with 30 species from 10 families, and the current study collected 52 species representing 20 families.

Sim (2002) and Mizuno *et al*. (1982) listed the highest number of species (94 and 88, respectively) compared to other studies. The fish collection method used in these studies varied from gill nets of mixed mesh sizes, cast nets, and scoop nets to visual observation to identification through snorkelling. The used of various methods were the reason why they managed to collect the high number of fish species in Tasek Bera; with the use of mix size of gill nets alone could catch a wide range of sizes of fishes. Besides, their studies were continuous compared to the two most recent studies which were rapid sampling in nature. Mustafa and Abd Ghani (2010) conducted a survey within four days (from 12th to 15th April 2010) and used small range of fish collection methods which were gill nets (one to five inch mesh size), cast net, and fish traps. These three methods were specialised to collect open water and large fishes such as *Scleropages formosus*, *Puntioplites bulu*, *Thynnichthys thynnoides*, and *Channa micropeltes*. While in

recent study, the fish survey was conducted in two days. The fishing gears that were used (i.e., seine net and hand held push net) was based on our target species which is small size fishes that are usually found at the river bottom or muddy banks under riparian roots or among snags and leave piles. Passive methods such as gill nets or fish traps were not suitable to be used here.

From the total number of species collected in the current survey, 13 species were newly recorded in the area which came from several fish families, namely Cyprinidae (four species), Cobitidae (four species), Barbuccidae (one species), Balitoridae (one species), Siluridae (one species), Bagridae (one species), and Mastacembelidae (one species). The area that we covered in this study is the marginal area adjacent to the main water bodies of Tasek Bera. Most of the newly recorded species were found in Sg. Bera with the exception of two species, i.e., *Barbodes banksi* and *Boraras maculatus* that were found in Sg. Tembangau.

Pangio malayana, Pangio piperata, Acanthopsoides molobrion, Lepidocephalichthys hasselti, Barbucca diabolica, and *Homalopteroides smithi* are technically small and slender fish species that attained a maximum width less than 10mm. Proper gear such as hand held push net with small mesh size are crucial in order to collect these small fishes. The absence of these species in the previous studies was also probably due to selective habitat sampling which overlook certain habitat types. Certain species prefer slow-moving and shallow water compared to deep water. Muddy substrates, thick leaf litters, and exposed tree roots are a refuge for species like *Lepidocephalichthys hasselti*, *Pangio malayana, P. piperata*, and *Homalopteroides smithi* (Froese & Pauly, 2014). Habitat plays a major role in determining the diversity of fishes, i.e. habitat with submerged log and leaf litter have a higher fish count and contains the highest number of rare species (Wright & Flecker, 2004).

Interestingly, a single specimen of *Nanobagrus stellatus* was successfully collected in this study. This was the second records of its occurrence in Peninsular Malaysia; the first one being found in Sg. Kahang, Johor (Ng, 2010). Similarly, this was the second reports on the occurrence of *Vaillantella euepiptera* in Peninsular Malaysia which was found during this current survey. The first record of *V. euepiptera* in Peninsular Malaysia was from Sg. Bera (Lim, 1993). These species were not captured during the previous three studies since these studies did not cover the fringing areas of the main lake.

Seven species were recorded in all the previous studies conducted which were *Notopterus notopterus*, *Barbonymus schwanefeldii*, *Cyclocheilichthys apogon*,

Hampala macrolepidota, *Osteochilus vittatus*, *Puntigrus partipentazona*, and *Hemibagrus capitulum*. These species are common and have a wide distribution in riverine swamp of Peninsular Malaysia. Thus, we classified these fishes as the core species to the area. Core species is the resident of the area or habitat. It is characterised by highly adapted, locally abundant, and biologically associated with the habitat (Magurran & Henderson, 2003; Belmaker, 2009; Coyle *et al*., 2013). Because of its high affinity with the habitat, it is sensitive to changes in the ecosystem, e.g., habitat loss, overexploitation, and introduction of invasive species. The impact of these changes on core species could lead to the loss of other species and disruption of natural cycle in ecosystem (Gaston, 2010). Unique species which are defined as species that occurred only once, ironically, were far richer than that of the core species (38 species compared to seven species) for each study conducted in Tasek Bera. We classified these species as rare species. Ecologists regarded this as 'universal' in many assemblages and across taxa where a small number of the core species present against a higher number of rare members (Supp, 2013). Mizuno *et al*. (1982) had listed nine species; *Rasbora* cf. *argyrotaenia*, *R. einthovenii*, *R. leptosoma*, *R. vulgaris*, *Tor 'clouremis'*, *Syncorssus hymenophysa*, *Gymnochanda filamentosa*, *Channa marulioides,* and *Achiroides leucorhynchos* which did not re-occur in the later studies. The most recent study added 13 species in which many were small and cryptic caught only from specific habitat-type and with selective gear. However, not all but a few of them are 'geographically' or 'methodologically' rare species (Longino *et al*., 2002).

The high diversity of ichthyofauna in Tasek Bera is a result of the existence of various type of habitats, i.e., lotic, lentic, limnetic, littoral and vegetated zones (Furtado & Mori, 1982; Khan *et al*., 1996). Thus it is important to study Sg. Bera and other adjacent areas of Tasek Bera in order to fully understand the fish diversity in this area since fish is a high-mobility organisms. Additionally, the dynamic of freshwater fish species in Tasek Bera need to be closely monitored. Fish species in this area are facing danger of being overexploited for food, sport fishing and the aquarium trade. One of the species that is being targeted is *Sceloropages formosus* which had been listed as endangered in IUCN Red List of Threatened Species (IUCN, 2014). However, the other common and least concern species that had been heavily harvested should not be taken for granted since it can lead to another bad chain of reaction in the ecosystem. The study on fish species composition in Tasek Bera is important to provide information for the long term conservation and sustainable management planning. Future research need to consider the peripheral habitat in order to obtain a complete picture of ichthyofauna diversity of Tasek Bera Ramsar Site for sound conservation and management.

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