

CHECKLIST OF THE INLAND FISH COMMUNITY AT KAMPUNG ASAH AND KAMPUNG MUKUT, TIOMAN ISLAND, PAHANG, PENINSULAR MALAYSIA

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ABSTRACT

Inland fishes of Pulau Tioman have been studied in the past by several researchers. To date, the total number of inland fishes of Pulau Tioman is 62. This study was initiated in order to update the checklist based on the surveys done in the southern part of Pulau Tioman at Kampung Asah and Kampung Mukut in 2016. In this study, we used hand held push net with mesh size 3 mm, plus cast net with the mesh size of 10 mm and hook-and-line to sample fishes from various inland water bodies found in the study area. Twenty-two species of fishes are presently known from the southern drainages in Pulau Tioman, in particular, at Kampung Asah and Kampung Mukut. Seven species were recorded for the first time at Pulau Tioman, namely *Abudefduf bengalensis* (Pomacentridae), *Bathygobius* sp. 1 (Gobiidae), *Bathygobius fuscus* (Gobiidae), *Drombus triangularis* (Gobiidae), *Enneapterygius* sp. 1 (Tripterygiidae), *Omobranchus elongatus* (Blennidae) and *Oreochromis mossambicus* (Chiclididae) bring the total number of inland fishes to 69 species. Most of the newly recorded species were collected in stream channels close to the sea. The presence of the introduced species, *Oreochromis* hybrid and *Oreochromis mossambicus* were restricted to several isolated landscape ponds at Kampung Mukut and none were recorded in the natural drainages there. The increasing number of newly recorded species, although contains mostly brackish fishes in stream closed to the sea showed that this habitat is ichthyodiverse and should be safeguarded to sustain the diversity of inland fish fauna of the island.

Keywords: Pulau Tioman, southern drainages, inland fishes, invasive species, brackish

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INTRODUCTION

Pulau Tioman, one of the biggest islands in Peninsular Malaysia and known for its beautiful and calm environment that has a lot of habitats for flora and fauna to flourish. Most of the streams are covered with forest canopy and riparian vegetation, possess fluvial characteristics; quick flowing water with different size of boulders and a series of mini waterfalls (Ng *et al.*, 1999). Low lying section comprised of more flat area, and the stream's size becomes broader and meandering where swamps are formed (Bullock & Medway, 1966). The rivermouth (area where the stream meets the sea), provided suitable habitat for fresh and saltwater fish to flourish.

The inland fishes recorded so far demonstrated the anadromous characteristic, where most of the species are secondary freshwater fishes and concentrated in the lower parts of the streams and estuaries (Lim, 1993; Alfred, 1966; Ng *et al.*, 1999). Alfred (1966) was the first person to establish the inland ichthyofauna list for Pulau Tioman followed by Lim (1993) but, the sampling were not extensive enough to cover all the drainages in Pulau Tioman. Later, 48 species of fish were recorded by Ng *et al.* (1999) and six of them are the primary freshwater fishes. The number of species increase to 62 through extensive and latest study by Tan *et al.* (2015). The present study updated the checklist based on the surveys done in the southern part of Pulau Tioman at Kampung Asah and Kampung Mukut in 2016.

MATERIALS AND METHODS

Fishes were sampled from streams and water bodies at Kg. Asah and Kg. Mukut, Pulau Tioman, Pahang (Figure 1) using hand held push net with mesh size 3 mm, cast net with the mesh size of 10 mm and hook-and-line. Observations were also made whenever possible by using single lens digital camera Olympus SH-50. These species were then identified using standard references; familial and current names follow Kottelat (2013). Specimens when possible were

collected and fixed in 10% formalin before being transferred into 70% alcohol and deposited at Universiti Malaysia Terengganu under the care of the second author. Abbreviation used include: Sg. = Sungai (meaning river), and Kg. = Kampung (meaning village).

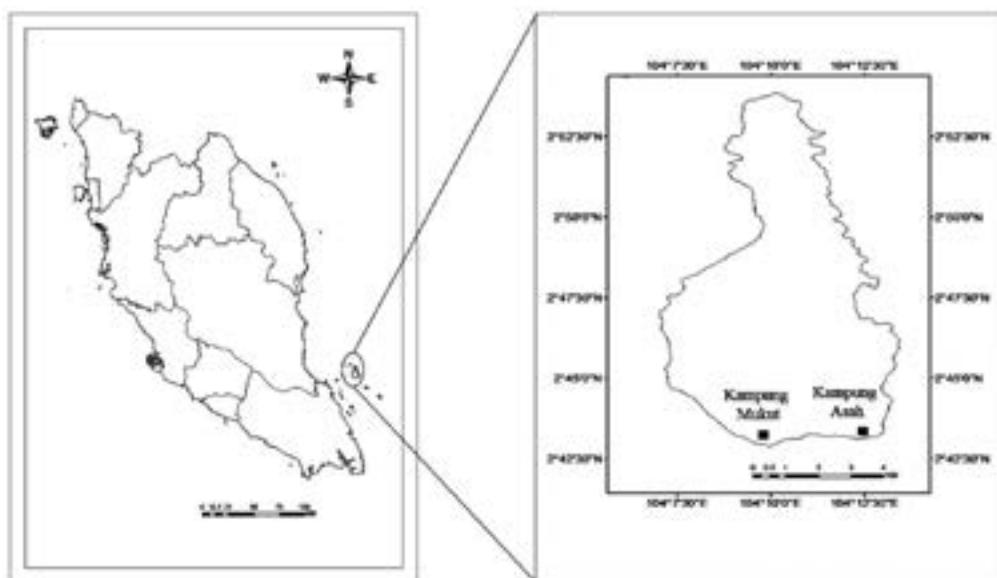


Figure 1 Maps of Pulau Tioman located in Rompin district, Pahang. The magnified map shows the location of Kampung Mukut and Kampung Asah

RESULTS

A total of 22 species from 11 families were recorded in streams and water bodies in the southern parts of Pulau Tioman (Table 1). Most of the species were collected from Kg. Asah (Table 2) with 17 species and nine from Kg. Mukut (Table 3). The total number of fishes known for Kg. Asah and Kg. Mukut were 18 and 12 species, respectively. Most of the fish species recorded at Kg. Asah were marine associated species. Of the 18 species known at Kg. Asah, only four species were considered as the primary freshwater species, namely *Barbodes lateristriga*, *Macrognathus maculatus*, *Clarias batu* and *Stiphodon multisquamus*. *Macrognathus maculatus* was not recorded during the recent survey. From 12 species reported from Kg. Mukut, six species namely *Barbodes lateristriga*, *Clarias batu*, *Dermogenys colletei*, *Oreochromis hybrid*, *Oreochromis mossambicus* and *Trichopodus trichopterus* were freshwater and the rest were marine species. Two species

were introduced species which were *Oreochromis* hybrid (commonly known as Red Tilapia) and *Oreochromis mossambicus*. Seven species were recorded for the first time making the current list of species increase from 62 to 69 species. The seven species are *Abudefduf bengalensis*, *Bathygobius* sp. 1, *Bathygobius fuscus*, *Drombus triangularis*, *Enneapterygius* sp. 1, *Omobranchus elongatus* and *Oreochromis mossambicus*. *Oreochromis mossambicus* was the only one introduced species recorded. Previously, “sepat” *Trichopodus trichopterus* was previously reported in Kg. Mukut and “tilan” *Macrogynathus maculatus* in Kg. Asah by Tan *et al.* (2015) but none was observed or collected during the present study. This study has also provide new distribution record for certain species for both study site (see Table 1).

Table 1 Checklist of fishes collected from Kg. Asah and Kg. Mukut, Pulau Tioman, Pahang

Family	Species	Kg. Asah	Kg. Mukut
Cyprinidae	<i>Barbodes lateristriga</i>	1	1
Clariidae	<i>Clarias batu</i>	1	1
Zenarchopteridae	<i>Dermogenys colletei</i>	0	1
Mugilidae	<i>Crenimugil seheli</i>	1	0
Lutjanidae	<i>Lutjanus argentimaculatus</i>	1	1
Cichlidae	<i>Oreochromis hybrid</i>	0	1
	<i>Oreochromis mossambicus</i>	0	1
Pomacanthidae	<i>Abudefduf sordidus</i>	1	0
	<i>Abudefduf bengalensis</i>	1	0
Blennidae	<i>Istiblennius edentulus</i>	1	0
	<i>Omobranchus elongatus</i>	1	0
Eleotridae	<i>Ophiocara porocephala</i>	0	1
Gobiidae	<i>Bathygobius</i> sp. 1	1	0
	<i>Bathygobius fuscus</i>	1	0
	<i>Drombus triangularis</i>	1	0
	<i>Glossogobius aureus</i>	1	1
	<i>Istiogobius ornatus</i>	1	0
	<i>Pseudogobius javanicus</i>	1	0
	<i>Periophthalmus argentilineatus</i>	0	1
	<i>Redigobius bikolanus</i>	1	0
Tripterygiidae	<i>Stiphodon multisquamus</i>	1	0
	<i>Enneapterygius</i> sp.	1	0

Note: 1= present; 0= absent

Table 2 Fish checklist recorded in this study as compared to Tan *et al.* (2015) in Kg. Asah

Family	Species	Present study	Tan <i>et al.</i> (2015)
Cyprinidae	<i>Barbodes lateristriga</i>	+	+
Clariidae	<i>Clarias batu</i>	+	+
Mastacembelidae	<i>Macrognathus maculatus</i>	-	+
Mugilidae	<i>Crenimugil seheli</i>	+	-
Lutjanidae	<i>Lutjanus argentimaculatus</i>	+	-
Pomacanthridae	<i>Abudefduf sordidus</i>	+	-
	<i>Abudefduf bengalensis</i>	+	-
Blennidae	<i>Istiblennius edentulus</i>	+	-
	<i>Omobranchus elongatus</i>	+	-
Gobiidae	<i>Bathygobius</i> sp. 1	+	-
	<i>Bathygobius fuscus</i>	+	-
	<i>Drombus triangularis</i>	+	-
	<i>Glossogobius aureus</i>	+	-
	<i>Istiogobius ornatus</i>	+	-
	<i>Pseudogobius javanicus</i>	+	-
	<i>Redigobius bikolanus</i>	+	+
	<i>Stiphodon multisquamus</i>	+	-
Tripterygiidae	<i>Enneapterygius</i> sp.	+	-
Total family		8	4
Total species		17	4

Note: + = present; - = absent

Table 3 Fish species recorded in this study as compared to Tan *et al.* (2015) at Kg. Mukut

Family	Species	Present study	Tan <i>et al.</i> (2015)
Cyprinidae	<i>Barbodes lateristriga</i>	+	+
Clariidae	<i>Clarias batu</i>	+	-
Zenarchopteridae	<i>Dermogenys colletei</i>	+	-
Lutjanidae	<i>Lutjanus argentimaculatus</i>	+	+
Cichlidae	<i>Oreochromis</i> hybrid	+	-
	<i>Oreochromis mossambicus</i>	+	-
Eleotridae	<i>Ophiocara porocephala</i>	+	+
Gobiidae	<i>Glossogobius aureus</i>	+	-
	<i>Glossogobius illimis</i>	-	+
	<i>Periophthalmus argentilineatus</i>	+	-
	<i>Redigobius bikolanus</i>	-	+
Osphronemidae	<i>Trichopodus trichopterus</i>	-	+
Total family		7	5
Total species		9	6

Note: + = present; - = absent

DISCUSSION

Fields Note on Selected Species

Pomacentridae – *Abudefduf bengalensis* (Figure 2): a territorial species (Lieske & Myers, 1994) was sighted and collected in the brackish zone where freshwater enters the sea. However, none of the adult was sighted except the juveniles that schooling around the coral reefs for feeding activities.



Figure 2 *Abudefduf bengalensis* (SL 21.0 mm)

Chiclidae – *Oreochromis mossambicus* (Figure 3): a highly invasive species, observed in all artificial tidal and landscape ponds at Kg. Mukut. Most of the individuals are in the adult stage (approximately 30 cm total length). In the same ponds, *Oreochromis* hybrid also can be found but they are outnumbered by the Mozambique tilapia.

Blennidae – *Omobranchus elongatus* (Figure 4): a small and beautiful cloister blenny occurs at the same zone with *A. bengalensis*, hiding under the rock. The adult usually can be found in the estuaries (Allen & Erdmann, 2012). This fish was obtained by using the kick-sampling method.

Gobiidae – *Bathygobius fuscus* (Figure 5): also known as dusky frillgoby occurs in the brackish water at the rocky area during high tidal in lower stream of Kg. Asah. Found in the shallow and rocky bottom near the sea.



Figure 3 *Oreochromis mossambicus* (TL c. 230 mm)



Figure 4 *Omobranchus elongatus* (SL 30.1 mm)



Figure 5 *Bathygobius fuscus* (SL 39.0 mm)

Gobiidae – *Drombus triangularis* (Figure 6): a brown goby that is quite abundant in the lower part of Sg. Asah, in the freshwater ecosystem. They can be differentiated from their black color appearance underwater and often encountered hiding under the substrate or dead leaves.

Tripterygiidae – *Enneapterygius* sp. (Figure 7): a single specimen was collected, also during high tidal at Kg. Asah. Like other gobies, this triple fin fish species prefer to hide in the rocky area. They are small and most of the species have the total length less than 25 mm (Holleman, 2005). A bottom dweller species and some species in the family can occur in the deeper part of the sea until 550 m depth (Nelson, 1994).

Inland fishes in the island are more vulnerable to any changes or habitat alteration compared to the fish on the mainland due to the limited size of their habitat. Hence, understanding what factors that can cause populations to decline are very crucial to protect and preserve the natural fish community (Jelks *et al.*, 2008). Moyle *et al.* (2011) notified that alien species introduction was one of the causes of species declining as well as habitat alteration. This is because, alien species can compete and spread the disease which they may have carried (Moyle & Marchetti, 2006). When the introduction of alien species is common, the extinction of native species is likely to increase and becoming irreversible (Baltz, 1991). Continuous monitoring and biodiversity documenting are important to control and minimize the impact of alien species.



Figure 6 *Drombus triangularis* (SL 24.0 mm)



Figure 7 *Enneapterygius* sp. (SL 21.0 mm)

Possible impacts of the introduced *Oreochromis* sp. in Pulau Tioman

Both *Oreochromis* hybrid and *Oreochromis mossambicus* were sighted in water bodies and landscape ponds in Kg. Mukut but none was observed by Tan *et al.* (2015) except pink Tilapia hybrid, in the artificial ponds of Paya and Juara bays where it might be intentionally introduced (Tan *et al.*, 2015). Due to the high-tolerance of this species, it can dominate other fish populations. *Oreochromis*

sp. can adapt to various types of water condition (Hulsman *et al.*, 2008; Jenkins, 2009) as well as possessing several characteristics; larger size, high fecundity and fast growing species (Hulsman *et al.*, 2008). They also will compete for food and space with native fish in the habitat (McCrary *et al.*, 2007).

The tilapia found in the water bodies within Kg. Mukut however will have a significant effect to the indigenous fish, in particular from family Gobiidae. A study by Jenkins (2009) has shown that Gobiidae and Eleotridae are the most affected species in Fiji after the introduction of *Oreochromis mossambicus* to the island. Fifty five percent of the population of endemic gobies in the island are now being completely destroyed. There are also less numbers of native species in the stream with tilapia. Gobies in Pulau Tioman comprised of 17 species (Tan *et al.*, 2015) and the number keep growing with additional three species recorded in this study. These species may be threatened by the presence of these introduced species. Swift action needs to be taken to control the population of alien species especially tilapia in all parts of Pulau Tioman to ensure native species survival.

CONCLUSION

Southern drainages of Pulau Tioman have a diverse species although many were brackish fishes and have not been recorded for the island ichthyofauna. Isolated microhabitats may harbor more species where additional and interesting species might be recorded through more comprehensive methods such as electrofishing. Despite only a limited area was surveyed, the results are significant and the area should be protected for species survival.

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