

Short Communication: A note on the new record of the amphibian fauna in Pulau Tinggi, Malaysia

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Abstract. Ng YH, Ngadi E, Md-Zain BM, Md-Zairi Z, Abdul-Latiff MAB. 2020. A note on the new record of the amphibian fauna in Pulau Tinggi, Malaysia. *Biodiversitas* 21: 2425-2429. A survey of amphibian species in Pulau Tinggi was conducted from February to October 2019. The study was carried out using the Visual Encounter Survey method and the drift-fenced pitfall trap method. Based on previously published literature and the present survey, an updated checklist of amphibians is presented. In total, nine species were recorded that comprise three previously recorded species (*Limnonectes blythii*, *Polypedates leucomystax* and *Odorrana hosii*), and six new recorded species (*Limnonectes deinodon*, *Polypedates dischantus*, *Microhyla heymonsi*, *Fejervarya limnocharis*, *Ingerophrynus parvus*, and *Kaloula pulchra*).

Keywords: Amphibian, animal, fauna, Pulau Tinggi, Seribuat Archipelago

INTRODUCTION

The Seribuat Archipelago located on the southeast coast of Peninsular Malaysia; it comprises 62 islands in the southern South China Sea. Pulau Tinggi is located in the middle arc of Seribuat Archipelago, which is located 12km away from the inner arc. The island of the middle arc retains large areas of primary dipterocarp forest, lowland tropical forests, riparian vegetation, and mangroves which favor the habitat of amphibians (Grismer 2006). The weather of this island is hot and humid throughout the year (Department of Marine Park Malaysia 2012). The low logging activity preserves the inner part of the island and maintains the primary forest with diverse canopy. This island, with a total area of 17 km², is one of the largest and tallest islands in the East Johor Island Archipelagos (EJIA). The land area in Pulau Tinggi covers approximately 1524.18 hectares (Department of Marine Park Malaysia 2012), and the elevation of the hills is more than 600 meters. The distance along the beach is 6km, and its width is 4km (Fredolin et al. 2004). Pulau Tinggi was gazetted as a marine park in 1994 under the Malaysia Fishery Act (Department of Marine Park Malaysia 2012).

The research of biodiversity in the archipelago is important because of the high endemicity of species in the small area of the island (Fisher 2004). The first report of the herpetofauna in Pulau Tinggi has been done by Escobar et al. (2003a), and then followed by Grismer (2006) and Grismer (2011). The documentation of this unexplored island has generated the baseline data, and continuous

monitoring is important to update the amphibian diversity in Pulau Tinggi. Based on the International Union for Conservation of Nature (IUCN) Red List in 2008, 42.5% of the amphibian species show population decrease, this led to the increasing number of threatened species. Less than 1% of species shows that population increases. Amphibians are diverse in the tropics, and the humid and hot environment of tropical rainforests and freshwater swamp forests in Malaysia are one of the hotspots for amphibians of approximately 300 species. Anurans can be found in the shallowest puddles, resting under leaf litter, making their foam nests in streamside vegetation, or calling continuously from tree holes.

Amphibian is a good biological indicator as they can only survive in a clean environment (Chan et al. 2010). Amphibians fauna are rarely recorded from sandy coastal habitats (Berry 1975; Daicus et al. 2010). Thus, a smaller number of amphibian studies had been conducted in coastal habitat. Therefore, most researchers neglected coastal ecosystems in studying the diversity of amphibians since it has a small number of species. On the other sites, herpetofauna studies also were conducted in the surrounding islands such as Pulau Tioman (Day 1990; Grismer 2011; Hendrickson 1966a,b; Lim and Lim 1999), Pulau Tulai (Hendrickson 1966a; Grismer et al. 2001b), Pulau Aur (Grismer et al. 2001a; Escobar et al. 2003b), and Pulau Pemanggil (Youmans et al. 2003). Therefore, this study was conducted in order to provide significant comparative data of amphibian species in Pulau Tinggi.

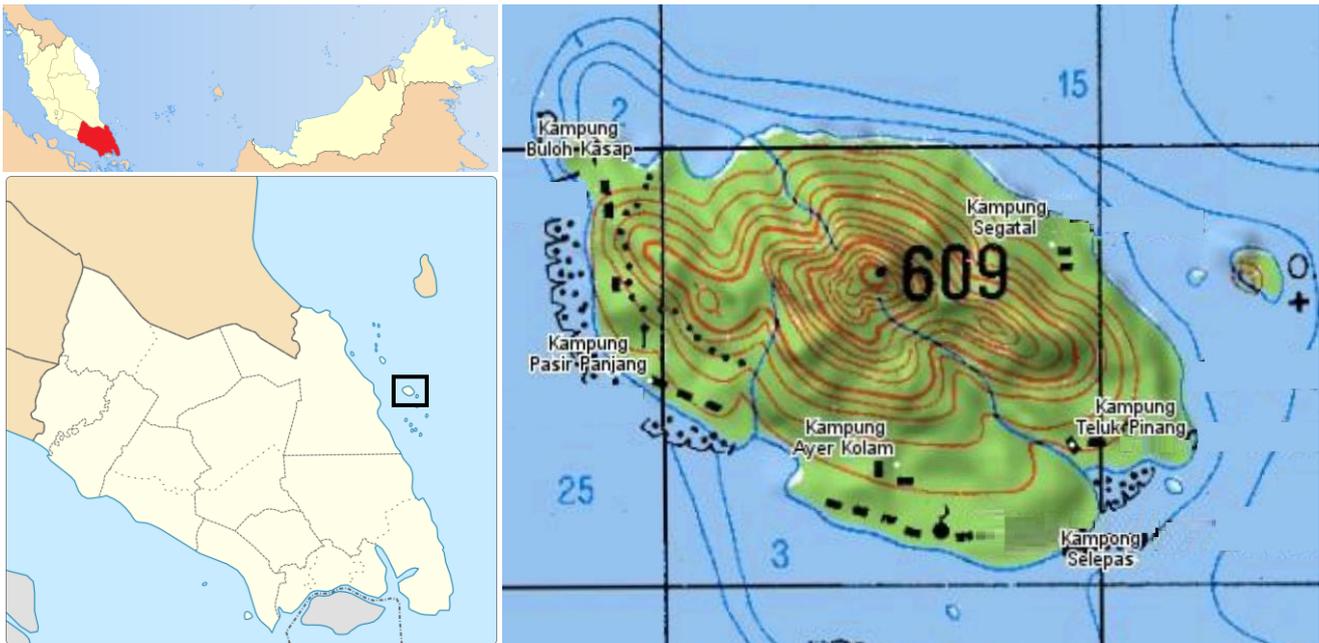


Figure 1. Map of Pulau Tinggi, Johor, Malaysia (modified using ATLOGIS Geoinformatics GmbH & Co. KG application)

MATERIALS AND METHODS

Amphibian sampling was conducted at Pulau Tinggi, Malaysia from February until October 2019. It was carried out for ten days every month (Table S1). The samplings were majorly focused on the riverine area at Gunung Semudu and Kampung Sebirah. Two types of sampling were used; visual encounter survey (VES) and drift-fenced pitfall traps. The VES method is carried out by four to eight persons starting from 18.30 until 22.30 o'clock. The samples were collected bare-handed. The searching areas are focused on riverbanks, boulders, and forest trails. In order to maximize the data collection, the drift-fenced pitfall traps method was used. Figure 1 shows the island dissected by three main rivers up to the peak. These main rivers were expected to be the main hotspot for anurans. This method is comprised of orchid nets that act as a fence with 50cm height and arranged in "Y" shape with 10m long of each wing. At the center of the trap design, a 20L plastic bucket was buried with its mouth exposed, used to traps the anurans. Twenty traps were set up at four different sites along Gunung Semudu trails from Kampung Penaga.

Species encountered were photographed and collected, and their live colors and patterns were recorded directly. The specimens were euthanized using Tricaine solution (Ethyl 3-aminobenzoate methanesulfonate salt). The snout-vent length (SVL) and tibia length (TL) were measured and recorded. The muscle tissue was extracted and preserved in absolute alcohol for DNA analysis. The specimens are fixed in 10% formalin solution and soaked in 70% alcohol for long term preservation. All species were identified up to species level using keys following Frost et al. (2016). All specimens were deposited at the Wildlife Repository, Universiti Tun Hussein Onn Malaysia.

RESULTS AND DISCUSSION

Table 1 shows the amphibian species recorded in this study. A total of eight species of anurans were collected. One species belongs to the Bufonidae family which is *Ingerophrynus parvus*. Three species are of the Dicroglossidae family, which are *Fejervarya limnocharis*, *Limnonectes blythii*, and *Limnonectes deinodon*; two species are of Microhylidae, which are *Kaloula pulchra* and *Microhyla heymonsi*. Rhacophoridae family was presented by two species, which are *Polypedates leucomystax* and *Polypedates discantus*.

Species notes

Ingerophrynus parvus Boulenger, 1887

Lesser Malacca Toad

This species was collected from the sandy soil around the Shaz Resort. This species was resting during the capture.

Fejervarya limnocharis Gravenhorst, 1829

Asian grass frog

One sample of this species was collected on the grass near the Shaz Resort. The distance between this species and the shoreline is approximately 20m.

Limnonectes deinodon Dehling, 2014

Flat-headed corrugated frog

The species was found congregated abundantly at the riverbank in the forest area; N 02°17'31.1", E 104°07'36.0" (142 m); February 23, 2019, UTHM 0016A: an adult female.

Table 1. Amphibian species found in Pulau Tinggi in 2019

Family	Species	Common name	IUCN Status
Bufonidae	<i>Ingerophrynus parvus</i> Bioulenger, 1887	Lesser Malacca Toad	LC
Dicroglossidae	<i>Fejervarya limnocharis</i> Gravenhorst, 1829	Asian grass frog	LC
	<i>Limnonectes deinodon</i> Dehling, 2014	Flat-headed corrugated frog	DD
	<i>Limnonectes blythii</i> Boulenger, 1920	Giant frog	NT
Microhylidae	<i>Kaloula pulchra</i> Gray, 1831	Banded bullfrog	LC
	<i>Microhyla heymonsi</i> Vogt, 1911	Dark-sided Chorus Frog	LC
Rhacophoridae	<i>Polypedates leucomystax</i> Gravenhorst, 1829	Four-lined tree frog	LC
	<i>Polypedates discantus</i> Rujirawan, Stuart & Aowphol, 2013	Malayan slender tree frog	NA

Note: NA: not available, DD: data deficient, LC: least concern, NT: near threatened

Table 2. List of amphibian species found in Pulau Tinggi

Family	Species	Escobar 2003b	Grismer 2006	Grismer 2011	This study
Bufonidae	<i>Ingerophrynus parvus</i>				+
Dicroglossidae	<i>Fejervarya limnocharis</i>				+
	<i>Limnonectes deinodon</i>				+
	<i>Limnonectes blythii</i>	+	+	+	+
Microhylidae	<i>Kaloula pulchra</i>				+
	<i>Microhyla heymonsi</i>				+
Ranidae	<i>Odorranas hosii</i>	+	+	+	
Rhacophoridae	<i>Polypedates leucomystax</i>	+		+	+
	<i>Polypedates discantus</i>				+

Note: +: present

***Limnonectes blythii* Boulenger, 1920**

Asian giant frog

In the forest area; N 02°17'29.1", E 104°07'25.7" (82m); August 31, 2019, PT0022A: an adult male.

***Kaloula pulchra* Gray, 1831**

Malaysian bullfrog/painted burrowing frog

On dry sandy soil; N 02°17'12.1", E 104°07'16.8" (7 m); July 16, 2019; PT0010A: an adult female found resting on weeds. We frequently heard the advertisement call and have a high chance to be seen around Shaz resort.

***Microhyla heymonsi* Vogt, 1911**

This species was observed near the puddle. It's clear calling sound indicates the presence of the species. However, its tiny size makes it difficult for the observant to find the individuals.

***Polypedates leucomystax* Gravenhorst, 1829**

Four-lined treefrog/common treefrog

On dry sandy shore; N 02°17'27.0", E 104°07'18.7" (85 m); August 30, 2019, PT0021A: an adult female, four-lined stripes on dorsum.

***Polypedates discantus* Rujirawan, Stuart & Aowphol, 2013**

Malayan slender tree frog

On the forest floor around resort area; N 02°17'25.7", E 104°07'17.3" (82 m); August 31, 2019, PT0024A: an adult female, small black dot present on dorsum.

The latest study has recorded the additional number of amphibian species at Pulau Tinggi, whereas the previous report has not. Escobar et al. (2003b) reported three species, namely *L. blythii*, *P. leucomystax* and *O. hosii*, and the following field survey by Grismer (2006) found two species, which are *L. blythii* and *O. hosii*. In the book "Amphibians and Reptiles of the Seribu Archipelago Peninsula Malaysia", Grismer (2011) recorded three species of amphibians namely *L. blythii*, *P. leucomystax* and *O. hosii*. The six new recorded species in this study comprise *L. deinodon*, *P. discantus*, *M. heymonsi*, *F. limnocharis*, *I. parvus*, and *K. pulchra* (Table 2).

In the present study, six new species were recorded, adding the species number, thus totaling to nine. It shows that the area of Pulau Tinggi is still harboring a number of species that had not been discovered yet. It also indicates that the information on amphibian species in Pulau Tinggi is still not enough. It might be due to several limitations such as landscape and topography. The hilly area and steep slope limit the researcher to explore the area. Furthermore, the forest landscape also limits the exploration of the species that complicates the researcher to conduct sampling. The island ecosystems that had a smaller number of permanent water body (rivers, cascades, waterfall and small streams) (Escobar et al. 2003b), makes the exploration becomes more difficult because of the few habitats. Amphibian species tend to become very dependent on the water body, thus, the searching areas should be focusing on the water body (Grismer 2006). However, a low number of amphibian species reflect that

the island ecosystems are harboring few numbers of amphibian species. This is because, this isolated ecosystem inhibits the dispersion of amphibian species since the island is surrounded by sea-water, which restricted their movements to the other islands (Grismer 2006).

In conclusion, the new record of species shows an extensive study needed to be conducted on this island. The study of amphibian diversity on the surrounding island is also needed to fill the knowledge gap of biodiversity in the Seribu Archipelago. More new species are expected to be found in future studies. Increasing awareness in conservation of amphibians is important as it is one of the most threatened classes of vertebrates, especially in the insular ecosystem.

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Table S1. List of amphibians recorded in Pulau Tinggi, Johor, Malaysia (February-October 2019)

Date	Species	Tag No.	Measurement		Gender
			Snouth-vent length	Tibia	
21-Feb-19	<i>Polypedates discantus</i>	UTHM 0001A	64.6	32.6	F
21-Feb-19	<i>Polypedates discantus</i>	UTHM 0002A	45	24.4	M
21-Feb-19	<i>Polypedates discantus</i>	UTHM 0003A	48.5	26.6	M
21-Feb-19	<i>Polypedates discantus</i>	UTHM 0004A	46.1	26.1	M
21-Feb-19	<i>Polypedates leucomystax</i>	UTHM 0005A	41.1	23	M
21-Feb-19	<i>Polypedates discantus</i>	UTHM 0006A	47.1	27.7	M
21-Feb-19	<i>Polypedates leucomystax</i>	UTHM 0007A	51.8	28.4	M
21-Feb-19	<i>Polypedates leucomystax</i>	UTHM 0008A	50.3	30.4	M
21-Feb-19	<i>Polypedates leucomystax</i>	UTHM 0009A	51.15	28.5	M
21-Feb-19	<i>Polypedates leucomystax</i>	UTHM 0010A	51.4	29	M
22-Feb-19	<i>Polypedates discantus</i>	UTHM 0011A	51.55	28.5	M
22-Feb-19	<i>Kaloula pulchra</i>	UTHM 0012A	40	15.95	F
22-Feb-19	<i>Limnonectes blythii</i>	UTHM 0013A	95.3	56	F
22-Feb-19	<i>Polypedates discantus</i>	UTHM 0014A	46.1	25.5	F
22-Feb-19	<i>Polypedates discantus</i>	UTHM 0015A	45.5	23.5	M
22-Feb-19	<i>Limnonectes deionodon</i>	UTHM 0016A	38.1	20	F
22-Feb-19	<i>Polypedates discantus</i>	UTHM 0017A			
23-Feb-19	<i>Polypedates discantus</i>	UTHM 0018A			
23-Feb-19	<i>Limnonectes blythii</i>	UTHM 0019A			
23-Feb-19	<i>Limnonectes blythii</i>	UTHM 0020A			
23-Feb-19	<i>Kaloula pulchra</i>	UTHM 0021A			
23-Feb-19	<i>Kaloula pulchra</i>	UTHM 0022A			
23-Feb-19	<i>Microhyla heymonsi</i>				
23-Feb-19	<i>Ingerophrynus parvus</i>				
23-Apr-19	<i>Polypedates leucomystax</i>	UTHM 0023A	3.6	1.8	F
20-Apr-19	<i>Kaloula pulchra</i>	PT 0001A	6	2	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0002A	7.5	2	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0003A	7	2.3	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0004A	7	2	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0005A	7.5	2.2	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0006A	7	1.5	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0007A	7	1.8	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0008A	7	1.5	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0009A	6.8	1.8	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0010A	7	2	
16-Jul-19	<i>Kaloula pulchra</i>	PT 0011A	6.5	1.2	
29-Aug-19	<i>Polypedates discantus</i>	PT 0012A	6.5	3.5	F
29-Aug-19	<i>Polypedates discantus</i>	PT 0013A	5.3	3	M
29-Aug-19	<i>Polypedates discantus</i>	PT 0014A	7	3.5	F
29-Aug-19	<i>Polypedates discantus</i>	PT 0015A	4.8	2.5	M
29-Aug-19	<i>Polypedates discantus</i>	PT 0016A	5.5	2.8	M
29-Aug-19	<i>Polypedates discantus</i>	PT 0017A	5	2.2	F
30-Aug-19	<i>Limnonectes blythii</i>	PT 0018A	7.8	4	F
30-Aug-19	<i>Limnonectes blythii</i>	PT 0019A	6.8	3.5	M
30-Aug-19	<i>Polypedates discantus</i>	PT 0020A	6.8	3.5	F
30-Aug-19	<i>Polypedates leucomystax</i>	PT 0021A	7.2	3.6	F
31-Aug-19	<i>Limnonectes blythii</i>	PT 0022A	8.7	4.4	M
31-Aug-19	<i>Polypedates discantus</i>	PT 0023A	4.7	2.5	F
31-Aug-19	<i>Polypedates discantus</i>	PT 0024A	7	3.3	F
31-Aug-19	<i>Limnonectes blythii</i>	PT 0025A	3	2	M
31-Aug-19	<i>Limnonectes blythii</i>	PT 0026A	8.6	3.9	F
31-Aug-19	<i>Limnonectes blythii</i>	PT 0027A	5.7	2.8	
5-Oct-19	<i>Limnonectes blythii</i>	PT 0028A	4.3	2	
5-Oct-19	<i>Limnonectes blythii</i>	PT 0029A	7.2	3.5	
5-Oct-19	<i>Polypedates leucomystax</i>	PT 0030A	4.7	2.8	
5-Oct-19	<i>Limnonectes blythii</i>	PT 0031A	3.2	1.5	
5-Oct-19	<i>Polypedates discantus</i>	PT 0032A	4.7	2.2	