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 Okorrana hostii), 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 endemism 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 (Younans et al. 2003). Therefore, this study was conducted in order to provide significant comparative data of amphibian species in Pulau Tinggi.
AMPHIBIAN sampli ng 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. 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.

*Limnonectus 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.
new species were recorded, indicating that the areas 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 that the information on amphibian species in 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 Seribuat 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. dischantus*, *M. heymonsii*, *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

### Table 1. Amphibian species found in Pulau Tinggi in 2019

| Family        | Species                                      | Common name               | IUCN Status |
|---------------|----------------------------------------------|---------------------------|-------------|
| Bufonidae     | *Ingerophrynus parvus* Bioulenger, 1887       | Lesser Malacca Toad       | LC          |
| Dicroglossida | *Fejervarya limnocharis* Gravenhorst, 1829   | Asian grass frog          | LC          |
|               | *Limnonectes deinodon* Dehling, 2014         | Flat-headed corrugated frog | DD          |
| Microhylidae  | *Limnonectes blythii* Boulenger, 1920         | Giant frog                | NT          |
|               | *Microhyla heymonsi* Vogt, 1911               | Banded bullfrog           | LC          |
| Rhacophoridae | *Polypedates leucomystax* Gravenhorst, 1829  | Dark-sided Chorus Frog    | LC          |
|               | *Polypedates discants* 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 |
|---------------|----------------------------------------------|---------------|--------------|--------------|------------|
| Bufo           | *Bufo marinus*                               | +             |              |              |            |
| Dicroglossida  | *Fejervarya limnocharis* Gravenhorst, 1829   | +             | +            |              |            |
| Microhylidae  | *Microhyla heymonsi* Vogt, 1911               | +             |              | +            |            |
| Ranidae       | *Odorrana hostii*                            | +             | +            |              |            |
| Rhacophoridae | *Polypedates leucomystax* Gravenhorst, 1829  | +             |              |              |            |
|               | *Polypedates discants* Rujirawan, Stuart & Aowphol, 2013 |              |              |              |            |

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 Seribuat 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. dischantus*, *M. heymonsii*, *F. limnocharis*, *I. parvus* and *K. pulchra* (Table 2).

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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 Seribuat 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 |
|------------|--------------------------|-------------|---------------------|--------|
| 21-Feb-19  | *Polypedates discantus*  | UTHM 0001A  | 64.6                |        |
| 21-Feb-19  | *Polypedates discantus*  | UTHM 0002A  | 45                  |        |
| 21-Feb-19  | *Polypedates discantus*  | UTHM 0003A  | 48.5                |        |
| 21-Feb-19  | *Polypedates discantus*  | UTHM 0004A  | 46.1                |        |
| 21-Feb-19  | *Polypedates discantus*  | UTHM 0005A  | 41.1                |        |
| 21-Feb-19  | *Polypedates discantus*  | UTHM 0006A  | 47.1                |        |
| 21-Feb-19  | *Polypedates leicomystax* | UTHM 0007A | 51.8                |        |
| 21-Feb-19  | *Polypedates leicomystax* | UTHM 0008A | 50.3                |        |
| 21-Feb-19  | *Polypedates leicomystax* | UTHM 0009A | 51.15               |        |
| 21-Feb-19  | *Polypedates leicomystax* | UTHM 0010A | 51.4                |        |
| 22-Feb-19  | *Polypedates discantus*  | UTHM 0011A  | 51.55               |        |
| 22-Feb-19  | *Kaloula pulchra*        | UTHM 0012A  | 40                  |        |
| 22-Feb-19  | *Limnonectes blythii*    | UTHM 0013A  | 95.3                |        |
| 22-Feb-19  | *Polypedates leicomystax* | UTHM 0014A | 46.1                |        |
| 22-Feb-19  | *Polypedates discantus*  | UTHM 0015A  | 45.5                |        |
| 22-Feb-19  | *Limnonectes deionodon*  | UTHM 0016A  | 38.1                |        |
| 22-Feb-19  | *Polypedates discantus*  | UTHM 0017A  | 40                  |        |
| 23-Feb-19  | *Polypedates discantus*  | UTHM 0018A  | 46.1                |        |
| 23-Feb-19  | *Limnonectes blythii*    | UTHM 0019A  | 46.1                |        |
| 23-Feb-19  | *Limnonectes blythii*    | UTHM 0020A  | 46.1                |        |
| 23-Feb-19  | *Kaloula pulchra*        | UTHM 0021A  | 40                  |        |
| 23-Feb-19  | *Kaloula pulchra*        | UTHM 0022A  | 40                  |        |
| 23-Feb-19  | *Microhyla heymonsi*     | UTHM 0023A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0024A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0025A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0026A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0027A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0028A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0029A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0030A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0031A  | 3.6                 |        |
| 23-Feb-19  | *Ingerophrynus parvus*   | UTHM 0032A  | 3.6                 |        |