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AMPHIBIAN ASEMBLAGE OF BUBU PERMANENT FOREST RESERVE, PERAK, PENINSULAR MALAYSIA

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ABSTRACT

A brief study of the amphibian fauna of Bubu Permanent Forest Reserve, Perak, which constitutes the southernmost part of the Bintang Hijau Forest Reserve, was carried out from 18 to 21 December 2006 to determine the diversity and density estimate of amphibian species in the area. Field parties comprising seven persons searched and collected amphibians from a small stream, the Dal River, in Compartments 6 and 7 of the Bubu Permanent Forest Reserve, from 2000 hrs to 2300 hrs for three consecutive nights. A total of 79 individual frogs from 13 species in five families were recorded. The five most abundant species were *Hyalarana nicobariensis*, *H. labialis, Pedostibes hosii*, *Phrynoides aspera* and *Amolops larutensis*. Six other species were considered rare, namely, *Limnonectes doriae, H. picturata, Odorrana hosii, Polypedates leucomystax* and *Rhacophorus bimaculatus*. Preliminary analysis of the data showed that the estimated populations of *H. nicobariensis, H. labialis* and *P. hosii* are 23, 13 and 10 individuals per 100 meters of river length, respectively. Due to the brief nature of the study, and the small area covered, the number of species is considered relatively moderate. More than 95% of frogs collected are forest species that require clean and pollution-free habitats to survive. This shows that the Dal River is a pristine river flowing from the Gunung Bubu range. It originated from a virgin jungle, hence it has clear waters with a minimum amount of pollution and disturbance. We hope that the relevant authorities will preserve it as it is for the benefit of future generations and more importantly, for the continued survival of the amphibian fauna.

ABSTRAK

Satu kajian ringkas tentang fauna amfibia di Hutan Simpan Kekal Bubu, Perak, iaitu bahagian yang paling selatan daripada Hutan Simpan Bintang Hijau, telah dijalankan dari 18 hingga 21 Disember 2006, untuk menentukan kepelbagaian dan anggaran populasi spesies amfibia di situ. Kumpulan pencari yang terdiri daripada tujuh orang telah mencari dan memungut haiwan amfibia daripada sebuah sungai kecil, Sungai Dal, di dalam Kompartmen 6 dan 7 Hutan Simpan Kekal Bubu, dari jam 2000 hingga jam 2300 untuk selama tiga malam berturut-turut. Sejumlah 79 individu katak dari 13 spesies dalam lima famili telah direkodkan. Lima spesies katak yang paling limpah ialah *Hyalrana nicobariensis, H. labialis, Pedostibes hosii, Phrynoides aspera* dan *Amolops larutensis*. Enam spesies lain adalah dianggap jarang ditemui iaitu *Limnonectes doriae, H. picturata, Odorrana hosii, Polypedates leucomystax* dan *Rhacophorus bimaculatus*. Analisis awal data menunjukkan bahawa anggaran kepadatan untuk *H. nicobariensis, H. labialis* dan *P. hosii* adalah masing-masing 23, 13 dan 10 individu per 100 meter panjang sungai. Disebabkan oleh kajian ini ringkas dan kawasan kajian yang kecil, bilangan spesies adalah sederhana. Lebih daripada 95% katak yang ditangkap adalah spesies hutan yang memerlukan habitat tidak tercemar untuk hidup. Ini membuktikan bahawa Sungai Dal adalah sungai yang berpunca dari hutan dara Gunung Bubu, di mana airnya tidak tercemar atau terganggu. Diharapkan agar pihak berwajib dapat memeliharakan kawasan ini untuk kepentingan genarasi akan datang dan lebih lagi untuk kemandirian fauna amfibia di situ.

Key words: Amphibians, Gunung Bubu Forest Reserve, Perak.

INTRODUCTION

The equatorial climate of Peninsular Malaysia supports a diverse array of amphibian species and this country is one of the top three countries in South-east Asia harbouring a high number of amphibians with 206 species listed to date (Norhayati *et al*., 2009). Among the reasons for the high diversity of amphibians in Peninsular Malaysia and South-east Asia are: the geologically and climatically diverse conditions that support various ecosystems and microecosystems; the presence of

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large tracts of primary forests on mountains that act as refugia and barriers to dispersion; complex geological history of high and low sea levels that joined and severed islands to the main land mass during the Pleistocene period (Ibrahim, 2010).

Amphibians often concealed in the leaf litter of a tropical forest, unexplored canopy or underwater in streams, springs, pools, and seepages, and play a major role in the web of cryptic ecological interactions (Wikramanayake *et al* 1994). Despite the tremendous diversity of Peninsular Malaysian frogs and their importance in the ecological processes of our ecosystems, virtually no data exist on their biology or ecology other than reports on inventories, checklists, diversities, guides and assemblages such as Shahriza *et al*. (2011), Grismer *et al*., (2010), Chan *et al*., (2010), Chan *et al*., (2009), Ibrahim *et al*., (2008), Wood *et al.*, (2008), Ibrahim *et al*., (2006), Grismer (2006) and Norhayati *et al.*, (2005), to name a recent few. At the same time, most Malaysian frogs are under threat of population decline due to loss of natural habitats, environmental degradation and pollution (Kiew, 1984). Therefore, it is imperative that the relevant authorities embark on a holistic approach to determine the current status of the diversity and richness of our native flora and fauna. Hence, this study, which aims to inventorise and estimate the density of amphibians in a lowland forest, is part of a larger research study executed by the Forestry Department Peninsular Malaysia, Perak State Forestry Department and Universiti Kebangsaan Malaysia on the biological diversity of the Bintang Hijau Forest Reserve, Perak. We hope that the results from this study can be used to better understand and manage the ecological diversity of the amphibian fauna in the Bintang Hijau Forest Reserve.

MATERIALS AND METHODS

The site of the study was a 100 m stretch of the Dal River (4º 45.00' N and 100º 51.80' E, elevation *ca*. 200 m above sea level), a small, 8-km tributary of the Kangsar River which eventually flows into Perak River (Figure 1). It is situated in Compartments 6 and 7 of the Bubu Permanent Forest Reserve (18,213 ha.) which is in the southern part of the Bintang Hijau range with Gunung (=Mount) Bubu (1,657 m) as the highest point. Further description of the general area is found in Grismer *et al*. (2010). The river is about 2 to 3 m wide, partly sandy-bottomed and partly rocky, with a few pools, riffles and small cascades. Average depth of the river channel was about 0.5 m. Both banks were overgrown with lowland dipterocarp vegetation where trees, plants and lianas overhang the river making it shady by day.

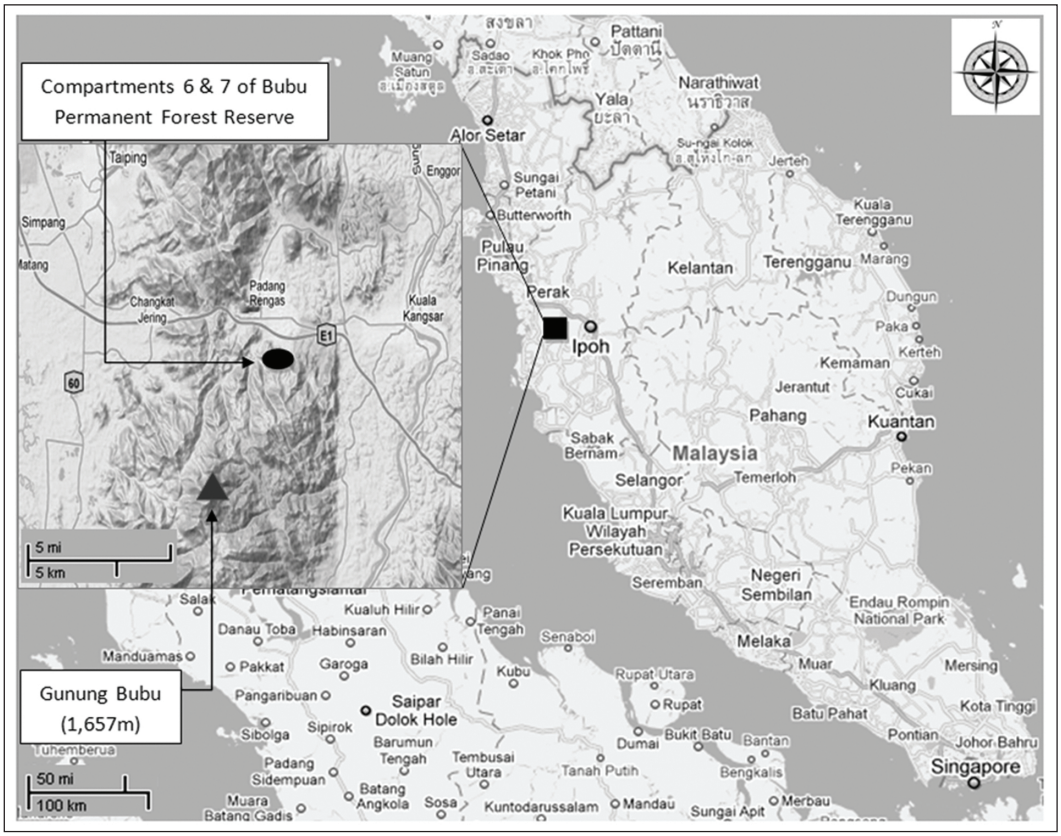

Fig. 1. Map of Peninsular Malaysia showing the study site (Source; Google maps)

The collections were done on three consecutive nights on 18, 19 and 20 December 2006. Seven-person parties searched and scoured a 100 m length of Dal River, and 5 m on both banks to look for amphibians from 2000 hrs to 2300 hrs. The search was also extended to vegetation and fallen tree trunks up to 3 m vertical height. Each night the samples were brought back to the field laboratory, identified, weighed, sex was determined and morphometric data were recorded. Positive identification of the samples was made by referring to Berry (1975), Inger and Stuebing (1997) and Norhayati *et a*l. (2009). Samples were then stored temporarily in holding plastic aquaria (25 cm width, 43 cm length and 30 cm height) according to species. Minimum density estimates for each species was then calculated for the 100 m length of the river at the end of the three day period. Voucher specimens of each species collected was fixed and stored at the Universiti Sains Malaysia's Zoology Museum (Amphibian Section) for future reference. All captured amphibians (minus the voucher specimens) were later released near the point of collection at the end of the brief study.

RESULTS

The survey with a work effort of 63 man-hours resulted in the collection of 79 individual frogs and toads from five families, namely Megophryidae, Bufonidae, Dicroglossidae, Ranidae and Rhacophoridae. The most abundant species was *Hylarana nicobariensis*, followed by *H. labialis, Pedostibes hosii*, *Phrynoides aspera* and *Amolops larutensis*. These five species made up almost 83% of the total catch. Another five species were considered rare as only one individual for each species was captured. They were *Limnonectes doriae, H. picturata, Odorrana hosii, Polypedates leucomystax* and *Rhacophorus bimaculatus*. We also managed to collect two individuals each of *L. blythii* and *Rhacophorus prominanus*. The list of species, number of individual captured and their relative abundances (RA) are shown in Table 1 below.

Preliminary analysis of the data showed that the lowest estimated density of the five most abundant species, namely, *H. nicobariensis, H. labialis* and *P. hosii* are 23, 13, 10, 9 and 9 individuals per 100 meters of river length, respectively.

DISCUSSION

The total number of species recorded here is 13 and is comparable to other studies of amphibian species in lowland forests in Peninsular Malaysia. For example Assalam (2000) listed 17 species in Pondok Tanjung Forest Reserve, Perak; Norsham *et al* (2000) reported 17 species in Endau-Rompin State Park, Pahang; Ibrahim *et al* (2006) reported 15 species around Gunung Jerai, Kedah and Ibrahim *et al* (2008) listed 15 species in Bukit Bauk Urban Forest, Trengganu. However, we truly believe that this area holds more species of amphibians than the 13 species we recorded in this study, because we only covered a small patch of forest and only the riparian zone of the Dal River. There are other habitats that we did not canvas, such as the forest floor, undergrowth and tree canopy. A more thorough study and on longer time scale would surely uncover more species than recorded from this

Table 1. Family, species, number of individual (n) and Relative Abundance (RA) of frogs from compartments 6 and 7 of the Gunung Bubu Virgin Forest Reserve, Bintang-Hijau Range, Perak.

Family	Species (common name)	n	RA (%)
Megophryidae	*Leptobrachium hendricksonii* (Spotted Litter Frog)	6	7.6
Bufonidae	*Phrynoides aspera* (Giant River Toad)	9	11.4
	Pedostibes hosii (Brown Tree Toad)	10	14.3
Dicroglossidae	*Limnonectes blythii* (Blyth's Giant Frog)	2	2.5
	L. doriae (Doria's Frog)	1	1.3
Ranidae	*Amolops larutensis* (Larut Torrent Frog)	9	11.4
	H. picturata (Spotted Stream Frog)	1	1.3
	H. nicobariensis (Cricket Frog)	23	29.1
	H. labialis (White-lipped Frog)	13	16.5
	Odorrana hosii (Hose's Poisonous Rock Frog)	1	1.3
Rhacophoridae	*Polypedates leucomystax* (Commom Tree Frog)	1	1.3
	Rhacophorus bimaculatus (Spotted Tree Frog)	1	1.3
	R. promnianus (Malayan Flying Frog)	2	2.5
	Total	**79**	**100**

brief survey. This is especially true since Grismer *et al* (2010) recorded 20 species from the Ulu Kenas area, which is approximately 7 km south from our study site, at around the same dates as our excursion. Out of the13 species, six were also recorded by Grismer *et al*. (2010) whereas seven other species, namely *Pedostibes hosii, Limnonectes doriae, H. picturata, H. nicobariensis, Polypedates leucomystax, Rhacophorus bimaculatus* and *R. prominanus* were not found (Table 2).

The higher number of samples obtained by Grismer *et al* (2010) can be attributed to the fact that their team canvassed a wider area and extended their search to higher elevations, whereas our study was limited to a 100 m length of a small river. Nonetheless, our study revealed new records of *Pedostibes hosii, L. doriae, H. nicobariensis, P. leucomystax, R. bimaculatus and R. prominanus* for this area. Interestingly enough, both Grismer *et al* (2010) and our studies did not record one of the most common toads in Malaysia, namely *Duttaphrynus melanostictus* and no explanation can be given for this phenomenon currently, especially since another commensal species, *P. leucomystax* is present in the area.

The densities of the five most abundant species, namely *H. nicobariensis, H. labialis, P. hosii*, *P aspera* and *A. larutensis* are comparable those reported in other studies, for instance, Inger and Greenberg (1966) reported densities of 7-8.5 and 0.6-1.1 frogs per 33 meters of stream length for *L. blythii* and *L. macrodon* respectively, in Borneo, while Tessier *et al* (1991) found 32 frogs of the species *Leiopelma hochstetteri* in a 120 meter length of a mountain stream in New Zealand. However, due to the brief nature of our study, the data collected is considered preliminary. We found that more frogs keep turning up at the study site even though we captured all frogs present on the three consecutive nights. This shows that some frog species tend to live in the forest and only turn up at the river's edge either to forage or mate (Voris and Inger, 1995). Since this is only a brief survey, we expect that the site harbours more amphibians, and repeated surveys over a longer time frame would produce better and more comprehensive results as in the studies by Inger and Greenberg (1966) and Voris and Inger (1995) in Sarawak. Again we concur that our data and estimate of the frogs' density to be only

Table 2. Composite list of Amphibians of Bubu Permanent Forest Reserve.

Species	Grismer *et al* (2010)	This study
Ansonia malayana	x	
Phrynoides aspera	x	x
Ingerophrynus parvus	x	
Leptophryne barbonica	x	
Pedostibes hosii		x
Leptobrachium hendricksonii	x	x
Leptolalax heteropus	x	
Megophrys nasuta	x	
Amolops larutensis	x	x
Fejervarya limnocharis	x	
Limnonectes blythii	x	x
L. doriae		x
L. kuhlii	x	
L. laticeps	x	
L. malesianus	x	
Occidozyga laevis	x	
Odorrana hosii	x	x
Hylarana banjarana	x	
H. erythraea	x	
H. labialis	x	x
H. nicobariensis		x
H. nigrovittata	x	
H. picturata		x
Philautus petersi	x	
Polypedates leucomystax		x
Rhacophorus bimaculatus		x
R. prominanus		x

preliminary. Further studies are needed to confirm these findings.

More than 95% of frogs collected are forest species that require pollution free habitats to live and survive. The only disturbed habitat species found was *P. leucomystax* and it was collected at the edge of the Bubu Permanent Forest Reserve. This shows that the Dal River is a pristine river flowing from the Gunung Bubu range. It originated from a virgin jungle, hence it has clean, clear waters with a minimum amount of pollution and disturbance. We hope that the relevant authorities will keep and preserve it as it is for the benefit of future generations and more importantly for the continued existence and survival of the amphibian fauna there.

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