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An updated checklist of the herpetofauna of the Belum-Temengor forest reserves, Hulu Perak, Peninsular Malaysia

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Abstract. A herpetofaunal survey was carried out in Temengor Forest Reserve, Peninsular Malaysia during the second Temengor Scientific Expedition conducted from 1st to 10th October 2012. This study represents the first records of amphibians and reptiles of Sungai Enam Basin and an updated record of Belum-Temengor Forest Reserve. In this survey, a total of 27 species of herpetofauna was recorded comprising 12 species of amphibians from four families and 15 species of reptiles from six families. No new records of frog or lizard species are reported in this study. However, three new records of snakes are reported from the area.

Key words: Herpetofauna, Malaysia, Temengor Forest Reserve.

Introduction

The 2nd Temengor Scientific Expedition to Belum running from 1st to 10th October 2012 was based at Sungai Enam, a small, 4 km long tributary of the Singor River, which flows into the Temengor Reservoir. The vegetation of this area is characteristic of Lowland Dipterocarp Forest. The first herpetofauna survey of Belum-Temengor Forest Reserves was conducted by Kiew et al. (1995) during the Malaysian Nature Society's Heritage and Scientific Expedition to Belum. They found 24 species of amphibians, representing 26% of the amphibian fauna of Peninsular Malaysia. In the same expedition, Diong et al. (1995) reported on the lizards while Lim et al. (1995a, b) reported on the snakes and turtles, respectively.

The second survey conducted opportunistically during a mammal survey of the northern part of the Belum Forest Reserve by Norsham et al. (2000) recorded the presence of 26 species of amphibians and reptiles (nine species of frogs, 10 species of lizards and geckos, one species of varanid and skink, four species of snakes and one species of turtle). Sukumaran (2002) documented 26 species of frogs and seven species of reptiles from five and four families respectively within the Perak Integrated Timber Complex (PITC) located in Temengor Forest Reserve. Two years later, a comprehensive survey by Grismer et al. (2004) was conducted at the PITC. They discovered 32 species of amphibians and 25 species of reptiles representing five and seven families, respectively. In their survey, they added five new records of frogs including an undescribed species of flying frog (*Rhacoporus*), one caecilian, 15 species of lizards and four species of snakes. In this study, we added three new records of snakes; *Typhlopsmuelleri*, *Calamariaschlegeli* and *Rhabdophischrysargos* from two families.

Materials and Methods

Study area

The Sungai Enam base camp (5°30.65'N 101°27.79'E), with an elevation of 450m a.s.l., is located at Sungai Enam, a small, 4 km long tributary of the Singor River, which then flows into Temengor Reservoir (Fig. 1). The base camp is about 500 m from the river mouth; about 200 m of the lower part of the river, the riverbed is made up of sandy and silty soil, whereas about 3.8 km upstream is of rocky terrain with gravel, cobblestones, boulders and occasional large boulders (Fig. 2). Bedrock is also present, forming some rock pools and some small riffles. The banks of the river were somewhat overgrown with lowland dipterocarp vegetation with trees, shrubs, saplings, ferns and lianas overhanging the river.

Herpetofaunal survey

The survey was conducted over a period of four days from 2-5 October 2013, accumulating to 24 active survey hours (hours surveyed actively by 4 to 7 number of people). Areas around the base camp, the surrounding forest, established trails, river banks and streams were actively searched for herpetofauna. Amphibians were captured mainly at night by hand or with fishnets by field parties working from 2000 hrs to 2300 hrs with the help of handheld battery powered torchlights. Surveys for reptiles were a combination of active searches and chance observations. Lizards were captured by hand or by sweep nets, while smaller snakes and turtles were caught by hand, nets and poles. The specimens collected were placed in separate plastic bags and labeled for subsequent processing at the base camp. All captured specimen were photographed and identified by referring to Berry (1975), Ibrahim et al. (2008), Cox et al. (1998) and Das (2010), and the amphibians names were updated according to Frost et al. (2011). All amphibian specimens were injected with benzocaine solution into its dorsal lymph sac to humanely kill them before dissection (Norhayati Ahmad, pers. comm).

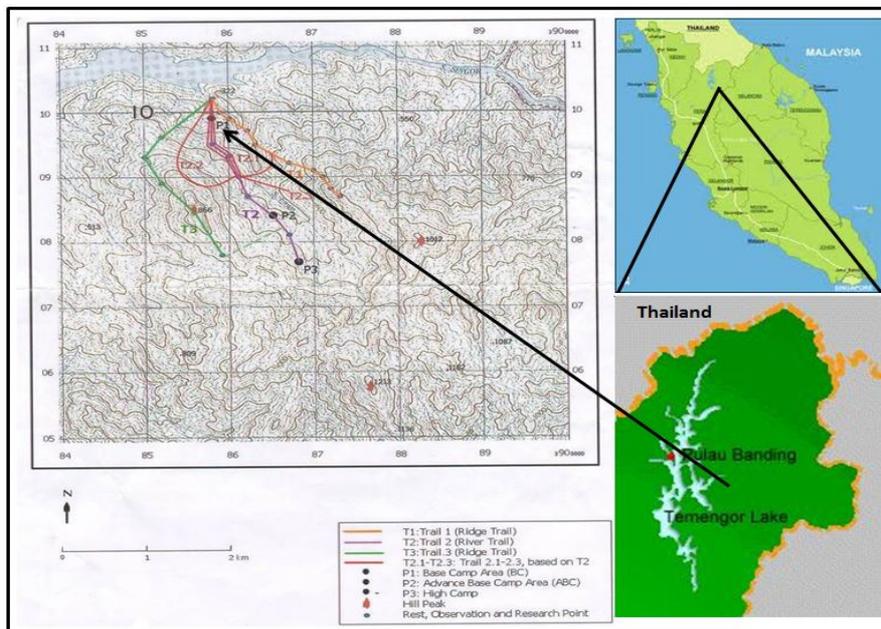


Figure 1: Map showing the location of study area (modified from Rainwalker Ecosystems,2012).

Specimens were then weighed to the nearest 0.1g using an AND Electronic Precision Model EK- 1200A (1200g capacity). Basic morphometric data; snout- vent length (SVL), mouth width (MW), tibia length (TL) and tympanum diameter (TD) were measured to the nearest 0.01mm using dial calipers (\pm 0.05mm). Voucher specimens of species collected were preserved in 10% formalin and later stored in 70% alcohol and housed at The Amphibian and Reptile Collections University Sains Malaysia (ARC, USM). For the reptiles, the voucher specimens were housed at the Faculty of Veterinary Medicine, Universiti Putra Malaysia for future reference.

Results and Discussion

A total of 27 species of amphibians and reptiles were identified. These comprised twelve species of frogs and toads, belonging to four families; eight species of lizards and geckos from two families; six species of snakes from four families; and a species of softshell turtle of one family. The updated checklists of amphibians (Table 1) and reptiles (Table 2) are presented below with annotations for each species recorded.

Table 1: Amphibians of Belum-Temengor Forest Reserves.

Species	Kiew et al. 1995	Norsham et al. 2000	Sukumaran 2002	Grismer et al. 2004	This study 2012
AMPHIBIANS (ANURANS)					
Bufonidae					
1 <i>Phrynoideasaspera</i>	X	X	X	X	X
2 <i>Ingerophrynusparvus</i>	X	X	X	X	X
3 <i>Leptophryneborbonica</i>			X	X	X
4 <i>Pedostibesoshii</i>		X	X	X	
Dicroglossidae					
5 <i>Fejervaryaaff. Limnocharis</i>	X	X	X	X	X
6 <i>Limnonectesblythii</i>	X	X	X	X	X
7 <i>Limnonecteskuhlii</i>	X		X	X	
8 <i>Limnonecteslaticeps</i>	X		X	X	X
9 <i>Limnonectesparamacrodon</i>		X			
10 <i>Limnonectesplicatellus</i>			X	X	
11 <i>Occidozygalaevlis</i>	X				
12 <i>Limnonecteshascheanus</i>				X	
Megophryidae					
13 <i>Leptobrachiumhendricksoni</i>	X				
14 <i>Leptolalaxheteropus</i>	X		X	X	X
15 <i>Megophrysnasuta</i>			X	X	X
16 <i>Megophrysaceras</i>			X	X	
Microhylidae					
17 <i>Kalophrynuspleurostigma</i>	X				

18	<i>Microhylaberdmorei</i>						X
19	<i>Microhylabutleri</i>				X		X
20	<i>Microhylaheymonsi</i>	X			X		X
Ranidae							
21	<i>Amolopslarutensis</i>	X	X		X		X
22	<i>Hylaranalaterimaculata</i>				X		
23	<i>Hylaranaerythraea</i>	X	X				X
24	<i>Hylaranaglandulosa</i>	X			X		X
25	<i>Hylaranahosii</i>	X	X		X		X
26	<i>Hylarananicobariensis</i>						X
27	<i>Hylarananigrovittata</i>	X			X		X
28	<i>Hylaranalabialis (raniceps)</i>	X			X		X
29	<i>Hylaranasignata</i>	X			X		X
Rhacoporidae							
30	<i>Nyctixalus pictus</i>				X		X
31	<i>Philautus parvulus</i>				X		X
32	<i>Philautus petersi</i>	X					
33	<i>Polypedates leucomystax</i>				X		X
34	<i>Polypedates macrotis</i>	X					
35	<i>Rhacoporus nigropalmatus</i>				X		
36	<i>Rhacoporus prominanus</i>	X			X		X
37	<i>Rhacoporus sp.</i>						X
38	<i>Thelodermahorridum</i>						X
AMPHIBIANS (CAECILIANS)							
Ichthyophidae							
39	<i>Ichthyophis sp.</i>						X

Table 2: Reptiles of Belum- Temengor Forest Reserves.

Species	Diong et al. 1995	Lim et al. 1995a	Lim et al. 1995b	Norsham et al. 2000	Sukumaran 2002	Grismer et al. 2004	This study 2012
REPTILES (LIZARDS)							
Agamidae							
40	<i>Aphanotis fusca</i>	X					X
41	<i>Acanthasaura armata</i>	X				X	
42	<i>Bronchoelacristatella</i>	X				X	
43	<i>Calotes emma</i>	X					
44	<i>Draco cristatellus</i>					X	
45	<i>Draco fimbriatus</i>					X	

46	<i>Draco formosus</i>				X	
47	<i>Draco maximus</i>	X			X	X
48	<i>Draco melanopogon</i>	X		X	X	X
49	<i>Draco quinquefasciatus</i>	X			X	
50	<i>Draco sumatranus</i>	X		X		
51	<i>Gonocephalusabbotti</i>	X		X	X	X
52	<i>Gonocephalusbellii</i>	X				
53	<i>Gonocephalusgrandis</i>	X		X	X	X
Eublepharidae						
54	<i>Aeluroscalabotesfelinus</i>				X	
Gekkonidae						
55	<i>Cosymbotescraspedotus</i>				X	
56	<i>Cyrtodactylusconsobrinus</i>	X				X
57	<i>Cyrtodactylusquadrivirgatus</i>	X			X	X
58	<i>Gekkosmithii</i>	X				X
59	<i>Gehyramutilata</i>				X	
60	<i>Ptychozoonhorsfieldi</i>	X				
61	<i>Ptychozoonkuhlii</i>				X	
Scincidae						
62	<i>Dasiaolivacea</i>	X			X	
63	<i>Eutropismultifasciatus</i>	X			X	
64	<i>Sphenomorphus maculates</i>	X				
65	<i>Sphenomorphus cf. butleri</i>				X	
Varanidae						
66	<i>Varanusdumerilii</i>				X	
67	<i>Varanusrudicollis</i>	X				
68	<i>Varanussalvator</i>	X				
REPTILES (SNAKES)						
Typhlopidae						
69	<i>Ramphotyphlopslineatus</i>		X			
70	<i>Typhlopsmuelleri</i>					X
Pythonidae						
71	<i>Python brongersmai</i>		X			
72	<i>Python reticulatus</i>		X			
Colubridae						
73	<i>Ahaetullaprasina</i>		X			
74	<i>Aplopeltura boa</i>			X		
75	<i>Boigacynodon</i>		X			
76	<i>Boigadendrophila</i>		X		X	X
77	<i>Calamariaschlegelii</i>					X
78	<i>Dendrelaphisformosus</i>		X			

79	<i>Elapheflavolineata</i>	X		
80	<i>Elapheprasina</i>	X		
81	<i>Enhydrisindica</i>	X		
82	<i>Gongylosoma cf. longicauda</i>		X	
83	<i>Gonyosomaoxycephalum</i>	X		
84	<i>Lepturophisalbofuscus</i>	X		
85	<i>Lycodonsubcintus</i>		X	X
86	<i>Oligodonpurpurescens</i>	X		
87	<i>Oreocalamushanitschi</i>	X		
88	<i>Psammodynastespulvurulentus</i>	X		
89	<i>Pseudorhabdionlongiceps</i>	X		
90	<i>Rhabdophischrysargos</i>			X
91	<i>Xenochrophistrianguligerus</i>		X	
Elapidae				
92	<i>Bungaruscandidus</i>	X		
93	<i>Calliophisbivirgata</i>	X		
94	<i>Najasumatrana</i>	X		
Viperidae				
95	<i>Pariashageni</i>	X		
96	<i>Pariassumatranus</i>		X	
97	<i>Popeiapopeiorum</i>	X		
98	<i>Tropidolaemuswagleri</i>	X		X
REPTILES (TURTLES)				
Emydidae				
99	<i>Batagurborneoensis</i>	X		
100	<i>Cuoraamboinensis</i>	X		
101	<i>Cyclemysdentata</i>	X		
102	<i>Heosemysspinosa</i>	X		
103	<i>Notochelysplatynota</i>	X		
Trionychidae				
104	<i>Amydacartilaginea</i>	X		
105	<i>Doganiasubplana</i>	X		X

The present effort represents the fifth herpetological survey of the Belum- Temengor Forest Reserves, but constitutes the first survey of the Sungai Enam Basin, Temengor. In this study, we added three new records of snakes namely *Typhlopsmuelleri*, *Calamariaschlegelii* and *Rhabdophischrysargos*. This brings the total number of herpetofauna documented in the Belum-Temengor area to 105. This low herpetofaunal diversity may be largely attributed to the limited sampling period (four search days) and restricted to three main trails (Trail 1, Trail 2 and Waterfall 4) of the area. In addition, herpetological surveys in general require longer periods of time due to the elusive and secretive nature of many species of snakes and lizards which they tend to slip away

unnoticed at the approach of man (Ibrahim et al., 2013). Hence, cross sectional surveys normally tend to under- represent the actual herpetofaunal diversity, especially so in the dense tropical forest. According to Inger (2003), numerous factors such as duration of sampling period, area of coverage, sampling technique, topography, weather, types of microhabitat and activity pattern are known to influence the number of species recorded in each area. Besides, continuous surveys are also necessary to increase the chances of detection and increase the total number of herpetofauna recorded (Shahriza et al., 2012). For example, an early record of amphibian's diversities of Peninsular Malaysia by Berry (1975) found 83 species. Thirty years later, this number increased to 100 species (Inger, 2005) and seven more were identified in the following five years (Chan et al. 2010). This scenario clearly reveals that Malaysian forests are very rich in herpetofaunal assemblage. Similarly, in this study, the number of herpetofauna of the Belum- Temengor Forest Reserves is still increasing and additional new records can be expected with continuous intensive surveys. Most reptiles caught especially snakes are juveniles which indicated that the area is still viable to the snakes although the base camp site is already disturbed and slowly been developed into an ecotourism site.

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