

A Brief Survey of Mammals in Imbak Canyon Conservation Area, Sabah

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Brief Review on Mammals Research in Sabah

- Well-conducted base on numerous publications
 - Chasen and Kloss (1931), Davis (1962), Lim and Heyneman (1968), Duff *et al.* (1984), Stuebing and Gasis (1989), Ghazally *et al.* (1995) and Payne and Francis (1985)
- The latter study presented the first updated checklist of mammals from Borneo.
- Shukor (2008) presented species richness of small mammals along the Mt. Kinabalu gradient.

Brief Review on Mammals Research in Sabah

- Anwarali *et. al* (2009) documented the species composition and abundance of mammals found in Mount Silam, Sabah.
- Shukor (2006) in Maliau Basin Conservation Area demonstrated that Sabah is well recognised of its small mammal diversity.
- Following the expedition in Maliau Basin Conservation Area, the Academy Sciences of Malaysia and Sabah Foundation jointly organised an expedition to ICCA (3rd expedition).

MATERIALS AND METHOD

- **Study Area**
 - Imbak Canyon Conservation Area (N 05° 01'. 643' E 117° 02'. 514; Protection For. Reserve Class I ; District: Tongod/Kinabatangan; Locality: Mt. Kuli Research Centre



Figure 1: Map showing study area

• Three sampling sites

- Slope Trail (1 k.m transect), Summit Trail (200 m transect) and Riverine Trail (200 m transect)
- Mixed dipterocap forest (MDF).
- The sampling sites were at an altitude about 391 m a.s.l to 459 m a.s.l.

• Trapping

– Direct

- Cage trap (82), harp trap (5), mist-net (15) and Sherman trap (18).
- Cage traps and Sherman traps were set up along the trail approximately 10 meters apart.
- Cage trap were set up either on the ground or on tree branch.
- 82 cage traps were placed at Slope Trail (1 km transect-baited with bananas and salted fish
- Sherman traps were baited with salted fish and peanut butter mix, and were check twice daily, in the morning and evening (Lim, 1973).

– Indirect

- Vocalisation, defecation, feeding signs and foot print
- Observation of mammals was conducted from during the period of traps checking.

• Bats

- captured using mist nets measuring 12 m × 2 m with mesh size of 36 mm.
- bat fly-ways, nets were placed randomly; 10 were in the Slope Trail, three in the Summit Trail and two were in Waterfall Trail.
- Nets in all the study sites were left opened from dusk to dawn and checked every one hour or two hours between 1830 hrs to 2030 hrs.
- Three harp traps were placed at Slope Trail while one was in the Summit Trail & Riverine Trail. Bats captured were placed in cloth bags before being measured and processed



Sample Collection and Processing

- Identification of mammals was done following Payne and Francis (1985).
- Selected or targeted specimens were euthanised using chloroform and preserved as wet specimen in 75% ethanol.
- Sample including blood spot or blood strip were air dried and kept in a Ziplock bags while the muscle and liver tissue were preserved in 75 % ethanol for DNA analysis.
- Any ectoparasites found on the body of the specimen were collected and preserve in the 70 % ethanol. All representatives of preserved specimens were deposited into the reference collection facilities at UNIMAS and Universiti Malaysia Sabah (UMS).

RESULTS AND DISCUSSION

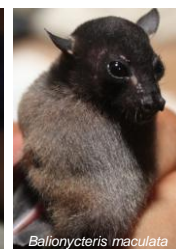
- 36 species of mammals
 - Nine orders and 20 families were recorded.
 - Twenty species of small mammals were captured by using traps (mist nets, harp traps and cage traps)
 - 10 species of large mammals and six species small mammals were indirectly identified through footprints, droppings and vocalization methods.
 - The most frequently captured small mammals species were the Fawn Roundleaf Bat (*Hipposideros cervinus*) and Spotted-winged Fruit Bat, *Balionycteris maculata*.

Table 1. List of mammals species recorded by trapping in Imbak Canyon Conservation Area (ICCA), Sabah.

Order	Family	Species	Common Name	Trail
Insectivora	Soricidae	<i>Suncus etruscus</i>	Sav's Pigmy Shrew	Riverine
Scandentia	Tupaidae	<i>Tupaia montana</i>	Mountain Treshrew	Slope
		<i>T. dorsalis</i>	Striped Treshrew	Slope
Rodentia	Muridae	<i>Maxomys rajah</i>	Brown Spiny Rat	Slope
		<i>Leopoldamys sabanus</i>	Long Tailed Giant Rat	Slope
		<i>Niviventer cremeriventer</i>	Dark Tailed Rat	Slope
		<i>Chirotopomys major</i>	Large-Pencil Eailed Tree Mouse	Slope
		<i>Sundasciurus lowii</i>	Low's Squirrel	Riverine
		<i>Sundamys muelleri</i>	Muller's Rat	Slope
Chiroptera	Nycteridae	<i>Nycteris javanica</i>	Hollow-Faced Bat	Slope
		<i>Hipposideros cervinus</i>	Fawn Roundleaf Bat	Summit, Slope
	Hipposideridae	<i>H. ater</i>	Dusky Roundleaf Bat	Summit
		<i>H. diadema</i>	Diadem Roundleaf Bat	Summit
		<i>H. diacorum</i>	Dayak Roundleaf Bat	Summit
		<i>Rhinolophus trifolius</i>	Trefol Horshoe Bat	Slope, Summit, Riverine
	Rhinolophidae	<i>R. sedulus</i>	Lesser Wolly Horshoe Bat	Slope, Summit, Riverine
		<i>R. accuminatus</i>	Accuminate Horshoe Bat	Slope, Summit, Riverine
	Pteropodidae	<i>Cynopterus brachyotis</i>	Greater Short-Nose Fruit Bat	Slope, Summit, Riverine
		<i>Balionycteris maculata</i>	Spotted Wing Fruit Bat	Slope, Summit, Riverine
Vesperilionidae	<i>Kerivoula papillosa</i>	Papillose Woolly Bat	Riverine	



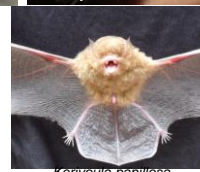
Hipposideros diadema



Balionycteris maculata



Rhinolophus trifolius



Kerivoula papillosa



Table 2. List of mammals species recorded by observation in Imbak Canyon

Conservation Area (ICCA), Sabah.						
Order	Family	Species	Common Name	Trail	Method	
Insectivora	Erinacidae	<i>Echinoreax gymnurus</i>	Moonrat	Riverine	Sighted	
Scandentia	Tupaidae	<i>T. gracilis</i>	Slender Treeshrew	Riverine	Sighted	
		<i>Excilisciurus exilis</i>	Plain Pypmy Squirrel	Riverine	Sighted	
Chiroptera	Pteropodidae	<i>Pteropus vampyrus</i>	Large Flying Fox	Riverine	Sighted	
Primates	Hylobatidae	<i>Hylobates muelleri</i>	Bornean Gibbon	Riverine	Sighted	
		<i>Pongo pygmaeus</i>	Orangutan	Riverine	Nests sighted	
	Cercopithecidae	<i>Presbytis rubicunda</i>	Maroon Langur	Riverine	Sighted	
Pholidota	Manidae	<i>Manis javanica</i>	Pangolin	Riverine	Sighted	
Rodentia	Sciuridae	<i>Ratufa affinis</i>	Giant Squirrel	Slope	Sighted	
	Hystricidae	<i>Hystrix brachyura</i>	Common Porcupine	Slope	Sighted, spike found in Slope Trail	
Carnivora	Viverridae	<i>Prionodon linsang</i>	Banded Linsang	Slope	Sighted	
Proboscidea	Elephantidae	<i>Elephas maximus borneensis</i>	Borneo Elephant	Riverine	Track, dung	
Artiodactyla	Suidae	<i>Sus barbatus</i>	Bearded Pig	Slope	Wallow, track	
	Tragulidae	<i>Tragulus javanicus</i>	Pelanduk	Slope	Sighted	
		<i>T. napu</i>	Napuh	Riverine	Sighted	
Cervidae		<i>Muntiacus muntjak</i>	Red Muntjac	Riverine	Sighted	

General Diversity and Distribution

- Diversity of mammals is relatively high
- Further study should be conducted in the future in the higher elevation because Shukor (2008) found that diversity of small mammal is reported high at higher middle slope elevation at Mount Kinabalu.
- Mammal diversity from this study is higher than study done by Shukor *et. al* (2010) in Maliau Basin where only five large mammal species and 11 small mammals species (three species of rodents and eight species of bats).
- The differences might be because of altitude -study done by Shukor *et. al* (2006) was at 900 – 1000 m a.s.l.

- Both methods, indirect and direct method provided good results
- Most of the large mammals were spotted in the Riverine Trail as this trail is less visited by researchers during the study and thus minimise the disturbance.
- Slope Trail is much higher in small mammals diversity compared to others trail where it captured 14 species compared to eight species in both Summit Trail and Riverine Trail.

Ectoparasites Collection

- Ectoparasites such as ticks, mites and chiggers were collected from tree-shrews, rats, and squirrels as shown in Table 3.
- The host was then euthanised and then combed to dislodge ectoparasites from the body.
- A thorough examination was made on various body parts of the animal such as head, ear, neck (dorsal and ventral regions), dorsum, lateral regions, belly, hind feet (internal and external regions), forefeet (internal and external regions), tail base (tail insertion on body), tail and the ears and eyelids (Williams, 1944; and Bittencourt & Rocha, 2002).
- Ectoparasites collected were then preserved in 70% ethanol in a labelled vial. Each vial was designated for ectoparasites of an animal. However, due to time constraints, the samples are yet to be processed.

Table 3. Ectoparasites collected from small mammal in Imbak Canyon Conservation Area (ICCA), Sabah 2010.

Study site	Host of ectoparasites (Order, Family, Species)			Ectoparasites collected (infestation area)
	Insectivora (1)Soricidae	Scandentia (2)Tupaidae	Rodentia (4)Sciuridae (5)Muridae	
Imbak Canyon	<i>Suncus estruscus</i>			No collection-found dead
		<i>Tupaia montana</i>		Ears, genital area
		<i>Tupaia dorsalis</i>		Ear, genital area, body
			<i>Sundasciurus lowi</i> (4)	No ectoparasites infestation
			<i>Sundamys muelleri</i> (5)	Ear lobes, body
			<i>Maxomys rajah</i> (5)	Body, neck
			<i>Niviventer cremoriventer</i> (5)	Ear
			<i>Leopoldamys sabanus</i> (5)	Foot, hand
			<i>Chitropodomys major?</i> (5)	Body
			<i>Maxomys ochraceiventer</i> (5)	No collection-found dead

CONCLUSIONS

The survey found that Imbak Canyon Conservation Area harbors a relatively high mammalian species.

Indirect & direct method were efficient in recording mammals in this survey.

However, further study is needed to record the actual diversity of the mammalian species in ICCA.

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