

CHECKLIST ON SMALL VERTEBRATES AT BUKIT TAREK FOREST RESERVE, SELANGOR

***Faradiana N.M. Fauzi, Shahfiz M. Azman, Kaviarasu Munian, Nor Hazwani A. Ruzman & Alwani N. Zakaria**

Zoology Branch, Fauna Biodiversity Program, Forest Biodiversity Division, Forest Research Institute Malaysia (FRIM), 52109 Kepong, Selangor.

*Corresponding author's email: noorfaradiana@frim.gov.my

ABSTRACT

Bukit Tarek Forest Reserve (BTFR) is one of the four forest reserves identified in Central Forest Spine (CFS) Selangor known as Secondary Linkage-3 (SL3). Not much information on small vertebrates is documented from this forest reserve. The main objective of this paper is to provide a preliminary checklist on small vertebrates from BTFR. Three surveys were carried out in April, May and July 2017. Forty collapsible cage traps, 40 Sherman traps, ten mist nets and two harp traps were used to capture non-volant small mammals, bats, and birds. Active searches were carried out to record nocturnal species, especially amphibians. The surveys were carried out with a minimum of four sampling trap-nights. Based on these surveys, ten species of small mammals from five families, 17 species of birds from 10 families, and 13 species of herpetofauna from eight families were recorded. BTFR plays its role in providing habitats and resources for vertebrates to survive. Therefore, conservation efforts must be taken immediately to ensure this reserve is preserved and conserved.

Keywords: Checklist, small vertebrates, Bukit Tarek Forest Reserve, Selangor

Received (28-February-2018); Accepted (02-May-2019); Available online (11-October-2019)

Citation: Faradiana, N.M.F., Shahfiz, M.A., Kaviarasu, M., Nor Hazwani, A.R. & Alwani, N.Z. (2019). Checklist on small vertebrates at Bukit Tarek Forest Reserve, Selangor. *Journal of Wildlife and Parks*, **34**: In press.

INTRODUCTION

Vertebrates are organisms belonging to Phylum Chordata, which are described as animals that possess a rod of flexible tissue which protected in higher forms by vertebral column known as spinal cords (Allaby, 2009). This phylum includes mammals, birds, amphibians, reptiles and fishes. Small vertebrates are defined based on their body weight which is less than 5 kg at the adult stage (Hayward & Phillipson, 1979).

In Malaysia, the complex and rich tropical rainforest holds a large number of small vertebrates (Ibrahim *et al.*, 2012). In Peninsular Malaysia, a total of 229 species of mammals were recorded in which at least 60% of the total number of species are small mammals (Davison & Zubaid, 2007; Shahfiz *et al.*, 2011). In addition, approximately 670 birds species (MNS Bird Conservation Council, 2005), 256 species of reptiles (Das & Norsham, 2007) and 107 amphibians (Chan *et al.*, 2010) are recorded in Peninsular Malaysia. Vertebrates play essential

roles such as bioindicator for ecological change, decomposers, and seed dispersal to ensure the balance of ecosystem especially the smaller sized vertebrates such as bats, rodents, civets, bulbuls and frogs (Hodgkison *et al.*, 2003; Mansor & Sah, 2012).

Bukit Tarek Forest Reserve (BTFR) is one of the forest reserves identified as Secondary Linkage-3 (SL3) under the Central Forest Spine (CFS) initiative (Department of Town and Country Planning Peninsular Malaysia, 2009). BTFR is gazetted as a permanent reserve with a total area of 7,946 ha. This forest reserve is a combination of lowland forest with hill forest. The main activities surrounding BTFR are the cultivation of rubber trees, vegetable farms, fruits orchards and fish farming.

To date, information on small vertebrates from this forest reserve is scarce and lacking. These surveys were conducted to document baseline information of small vertebrates from this reserve in order to provide preliminary insight of the reserve as habitat for a variety of small vertebrates. Later, effective conservation measures can be strategised to conserve biodiversity in this area.

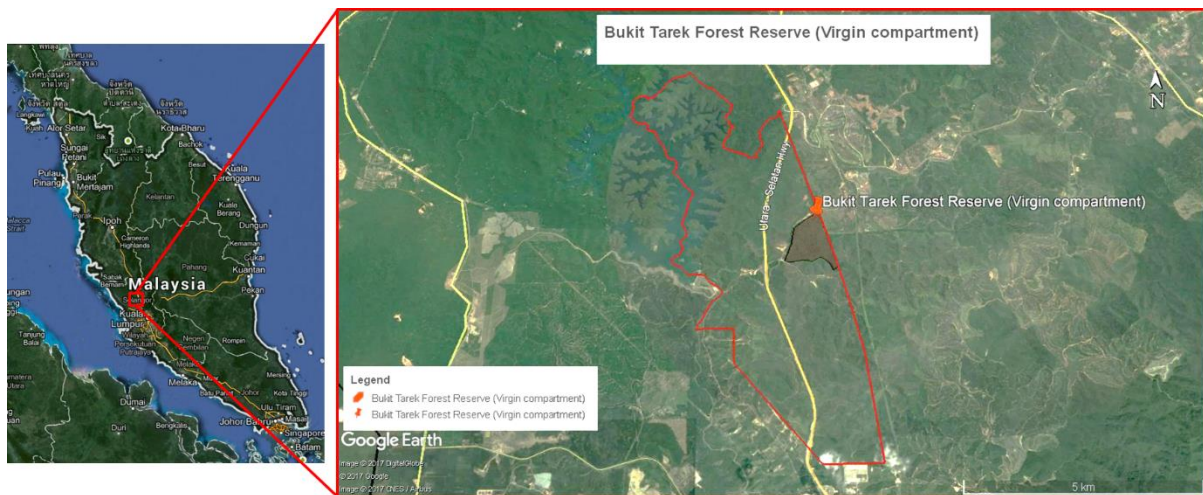


Figure 1 Location of the surveyed site at Bukit Tarek Forest Reserve, Selangor

MATERIALS AND METHODS

The surveys were carried out at BTFR which lies at $3^{\circ} 33'9.12''$ N; $101^{\circ} 31' 4328''$ E (Figure 1). The surveys were conducted in April, May and July 2017. A transect line of 800 m in length was prepared for the surveys. A total of 40 collapsible cage traps and 40 Sherman traps were set up baited with oil palm fruits to capture non-volant small mammals. Cage traps (42 x 17 x 17 cm) and Sherman traps (24 x 8 x 9 cm) were deployed alternately on the ground with a distance of approximately 10 m intervals. Trappings were conducted for four consecutive nights for each survey. Traps were checked twice a day at 0900 hours and 1500 hours. The cumulative trapping efforts for non-volant small mammals were 960 trap nights. At least five important measurements were recorded, namely total length (TL), head body (HB), hindfoot (HF), ear (E) and weight. Night observations were carried out to document any nocturnal species such as civets and cats.

For Chiroptera, a total of 10 mist nets (12 m x 2 m with 36 mm mesh) and two harp traps (four banks) were set up for four consecutive nights in each sampling session. Nets and harp traps were set randomly along the line transect and nearby streams within the surveyed site. Both nets and traps were left open throughout each sampling session. The cumulative trapping efforts were 120 net nights and 24 trap nights for the mist nets and harp traps, respectively. Measurements were taken namely forearms (FA), ear (E), tail (T), and weight for each captured animal. Small mammal identification was done following Kingston *et al.* (2009), Francis (2008), and Phillipps & Phillipps (2016).

The same mist nets used to capture Chiroptera were also being used to capture the understorey birds. Captured individuals were measured for bill depth (BD), bill width (BW), bill length (BL), head-bill length (HB), wingspan (WS), wing length (WL), tail (T), tarsus (TR) and total length (TL). Identification keys by Robson (2014) and Myers (2016) were used for identification. Apart from mist-netting activities, observations using binoculars were carried out. Night observations were also conducted to document nocturnal species such as owls and nightjars.

Active searches were conducted to survey amphibians and reptiles species with the aid of headlamps and snake tongs at nearby streams and the suitable watery area along the transect line. A minimum of two hours was spent for two consecutive nights in each respective sampling session. Each captured animal was measured for snout-vent length (SVL), total length (TL) and tail (T). References by Norhayati *et al.* (2005), Cox *et al.* (1998), Das (2015), and Norhayati (2017) were used for identifications.

RESULTS

A total of 122 individuals comprising ten species of small mammals, 17 species of birds and 13 species of herpetofauna were documented in BTFR. Herpetofauna recorded the highest number of individuals with a total of 64 individuals followed by birds and mammals with 30 and 28 individuals, respectively.

Among 28 individuals of small mammals recorded, 20 of them comprised of six species of non-volant small mammals. Of these, two species of forest rat, namely Long-tailed Giant Rat (*Leopoldamys sabanus*) and Muller's Rat (*Sundamys muelleri*) were found abundantly in this area with six individuals respectively. As for the rodents, all identified species were from Family Muridae and only a single species of treeshrew, Common Treeshrew (*Tupaia glis*) from Family Tupaiidae was captured (Table 1).

Eight individuals from four species of bats were recorded comprising of three families namely Pteropodidae (2 species), Rhinolophidae (1 species) and Vespertilionidae (1 species) (Table 1). Of these, the most abundant species recorded was the Common Short-nosed Fruit Bat, *Cynopterus cf. brachyotis* Forest with five individuals. Besides *C. cf. brachyotis* Forest, one individual of Dusky Fruit Bat (*Penthetor lucasi*) was also recorded. Two species of insectivorous bats were recorded namely Trefoil Horseshoe Bat (*Rhinolophus trifolius*) and Papillose Woolly Bat (*Kerivoula papillosa*).

Thirty individuals from 17 species of birds comprising of ten families were recorded (Table 2). Birds from the Family Timaliidae recorded the highest number of species (29.41%) followed by Nectariniidae and Pycnonotidae with 17.65% and 11.76%, respectively. Hairy-backed

Bulbul (*Tricholestes criniger*) from the Family Pycnonotidae was the most common species captured with eight individuals followed by Little Spiderhunter (*Arachnothera longirostra*) and Cream-vented Bulbul (*Pycnonotus simplex*) with four and three individuals, respectively.

Herpetofauna recorded a total of 64 individuals with 13 species and comprising of eight families. Of these, 60 individuals belong to nine species of amphibians (Table 3). White-lipped Frog (*Chalcorana labialis*) was the most abundant species recorded (35%) followed by Asia Grass Frog (*Fejervarya limnocharis*) and Giant Asian River Frog (*Limnonectes blythii*) accounting 20% and 15% of species abundance, respectively. As for reptiles, only four individuals from four species were recorded (Table 3) which included Reticulated Python (*Python reticulatus*), Brown Whip Snake (*Dryophiops rubescens*), Dusky Earless Agamid (*Aphanotis fusca*) and Peter's Bent-toed Gecko (*Cyrtodactylus consobrinus*).

Table 1 Small Mammals of Bukit Tarek Forest Reserve, Selangor. IUCN= International Union for Conservation of Nature; LC= Least Concern; VU= Vulnerable

No.	Family	Common Name	Scientific Name	N	IUCN Status
1.	Muridae	Whitehead's Spiny Rat	<i>Maxomys whiteheadi</i>	4	VU
2	Muridae	Rajah Spiny Rat	<i>Maxomys rajah</i>	6	VU
3	Muridae	Long-tailed Giant Rat	<i>Leopoldamys sabanus</i>	6	LC
4	Muridae	Muller's Rat	<i>Sundamys muelleri</i>	2	LC
5	Muridae	Dark-tailed Tree Rat	<i>Nivivinter cremoriventer</i>	1	LC
6	Tupaiaidae	Common Treeshrew	<i>Tupaia glis</i>	1	LC
7	Pteropodidae	Dusky Fruit Bat	<i>Penthetor lucasi</i>	1	LC
8	Pteropodidae	Common Short-nosed Fruit Bat	<i>Cynopterus cf. brachyotis</i> Forest	5	LC
9	Rhinolophidae	Trefoil Horseshoe Bat	<i>Rhinolophus trifoliatus</i>	1	LC
10	Vespertilionidae	Papillose Woolly Bat	<i>Kerivoula papillosa</i>	1	LC
No. Families				5	
No. Species				10	
No. Individuals				28	

Table 2 Birds of Bukit Tarek Forest Reserve, Selangor. LC= Least Concern; NT= Near Threatened

No.	Family	Common Name	Scientific Name	N	IUCN Status
1	Aegithinidae	Green Iora	<i>Aegithina viridissima</i>	1	NT
2	Alcedinidae	Blue-eared Kingfisher	<i>Alcedo meninting</i>	1	LC
3	Caprimulgidae	Malay Eared Nightjar	<i>Lyncornis temminckii</i>	1	LC
4	Dicaeidae	Crimson-breasted Flowerpecker	<i>Prionochilus percussus</i>	1	LC
5	Dicruridae	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	1	LC
6	Muscicapidae	White-rumped Shama	<i>Kittacincla malabarica</i>	1	LC
7	Nectariniidae	Little Spiderhunter	<i>Arachnothera longirostra</i>	4	LC
8	Nectariniidae	Long-billed Spiderhunter	<i>Arachnothera robusta</i>	1	LC
9	Nectariniidae	Purple-naped Sunbird	<i>Arachnothera hypogrammica</i>	1	LC
10	Pellorneidae	White-chested Babbler	<i>Trichastoma rostratum</i>	1	NT
11	Pycnonotidae	Hairy-backed Bulbul	<i>Tricholestes criniger</i>	8	LC
12	Pycnonotidae	Cream-vented Bulbul	<i>Pycnonotus simplex</i>	3	LC

No.	Family	Common Name	Scientific Name	N	IUCN Status
13	Timaliidae	Fluffy-backed-Tit Babbler	<i>Macronus ptilosus</i>	1	NT
14	Timaliidae	Black-Throated Babbler	<i>Stachyris nigricollis</i>	1	NT
15	Timaliidae	Chesnut-winged Babbler	<i>Cyanoderma erythropterum</i>	2	LC
16	Timaliidae	Grey-headed Babbler	<i>Stachyris poliocephala</i>	1	LC
17	Timaliidae	Pin-striped Tit Babbler	<i>Mixornis gularis</i>	1	LC
No. Families				10	
No. Species				17	
No. Individuals				30	

Table 3 Herpetofauna of Bukit Tarek Forest Reserve, Selangor. LC= Least Concern; NT= Near Threatened; NE= Not Evaluated

No	Family	Common Name	Scientific Name	N	IUCN Status
1	Dicroglossidae	Asian Brackish Frog	<i>Fejervarya cancrivora</i>	3	LC
2	Dicroglossidae	Asian Grass Frog	<i>Fejervarya limnocharis</i>	12	LC
3	Dicroglossidae	Giant Asian River Frog	<i>Limnonectes blythii</i>	9	NT
4	Dicroglossidae	Peat Swamp Frog	<i>Limnonectes malesianus</i>	8	NT
5	Microhylidae	Butler's Ricefrog	<i>Microhyla butleri</i>	2	LC
6	Raniidae	White- Lipped Frog	<i>Chalcorana labialis</i>	21	LC
7	Raniidae	Rough-sided Frog	<i>Pulcharana gladulosa</i>	1	LC
8	Raniidae	White-lipped Frog	<i>Chalcorana hosii</i>	2	LC
9	Rhacophoridae	Common Tree Frog	<i>Polypedates leucomystax</i>	2	LC
10	Agamidae	Dusky Earless Agama	<i>Aphaniotis fusca</i>	1	LC
11	Gekkonidae	Peter's bent-toed gecko	<i>Cyrtodactylus consobrinus</i>	1	LC
12	Colubridae	Brown Whip Snake	<i>Dryophiops rubescens</i>	1	LC
13	Pythonidae	Reticulated python	<i>Malayopython reticulatus</i>	1	NE
No. Families				8	
No. Species				13	
No. Individuals				64	

DISCUSSION

Leopoldamys sabanus (Long-tailed Giant Rat) and *Maxomys rajah* (Rajah Spiny Rat) were the common species recorded in this study. According to Francis (2008), *L. sabanus* are large-bodied and long-tailed arboreal rat, which mainly inhabits in tall and secondary forest. The Rajah Spiny rat is considered as forest species that commonly found in all types of forest with a well-drained ground of ridges and higher slopes (Medway, 1983; Payne *et al.*, 1985). Francis, (2008) stated that species such as *Maxomys whiteheadi*, *Sundamys muelleri*, *Niviventer cremoriventer* and *Tupaia glis* are a common species of mainland forest.

As for volant small mammals, more individuals of fruit bats were recorded than insectivorous bats in these surveys. *Cynopterus cf. brachyotis* Forest was the most abundant fruit bat recorded. There are at least two different forms of *C. brachyotis* distributed in Peninsular Malaysia and Borneo recognised as *C. cf. brachyotis* Forest and *C. cf. brachyotis* Sunda (Jayaraj *et al.*, 2012; Fong *et al.*, 2013). These species are broadly sympatric but appear to be ecologically and morphologically distinct. The *C. cf. brachyotis* Forest are generally confined to the primary and mature secondary forest while *C. cf. brachyotis* Sunda inhabit open area

(Campbell *et al.*, 2006; Jayaraj *et al.*, 2012; Fong *et al.*, 2013). According to Kingston *et al.* (2009), the adult forearm length for the Forest type is less than 63 mm while for the Sunda type, the adult forearm length is more than 64 mm. Therefore, all of the individuals recorded were believed as *C. cf. brachyotis* Forest as the measurements of the forearms were less than 63 mm and all the individuals were recorded in the forest interior. However, Jayaraj *et al.* (2012) state that high reliance on forearm length to differentiate the two species is problematic as various authors reported different measurements for identification. Therefore, further study such as the predictive model using multivariate analysis (Jayaraj *et al.*, 2012) and microsatellite analysis (Fong *et al.*, 2013) could be better identification tools for *C. brachyotis*.

Meanwhile, birds were dominated by Hairy-backed Bulbul (*Tricholestes criniger*) followed by Little Spiderhunter (*Arachnothera longirostra*). Robson (2014) state that Hairy-backed Bulbul inhabits lowland forest while the Little Spiderhunter possesses a broader range where it can be found in lowland forest, gardens, parks and lower montane forest.

The herpetofauna, on the other hand, was dominated by White-Lipped Frog (*Chalcorana labialis*) from family Ranidae. According to Norhayati *et al.* (2005), this frog is non-habitat specific. It can be found ranging from primary forest, degraded secondary forest, cultivated or plantation and common along forest stream, on vegetation by the river and swampy areas in the forest.

According to the conservation status assigned under the International Union for Conservation of Nature (IUCN) Red List, two species are classified as Vulnerable (VU) namely the Whitehead's rat Spiny Rats (*M. whiteheadi*) and Brown Spiny Rat (*M. rajah*), and six species are classified as Near Threatened (NT) such as the Black-throated Babbler (*S. nigricollis*), Green Iora (*A. viridissima*) and Peat Swamp Frog (*L. malesianus*). While the rest of 31 species recorded in these surveys are classified as Least Concern (LC) such as Common Tree Frog (*P. leucomystax*) and Common Tree Shrew (*T. glis*) while only Reticulated python (*M. reticulatus*) was classified as Not Evaluated (NE). Several species such as *Tupaia glis*, *Chalcorana labialis*, *Limnonectes blythii*, *Limnonectes malesianus*, *Macronus ptilosus*, *Alcedo meninting* and *Mixornis gularis* are protected under the Wildlife Conservation Act 2010 (Act 716). Therefore, these habitats must be protected and conserved to ensure the survival of small vertebrate populations.

CONCLUSION

From the checklist generated, BTFR provides an important habitat for small vertebrates. Although the species recorded is considered low, this baseline information can be improved with more sampling efforts carried out such as increased number of traps per session, variety of trap placement such as on a tree branch and using multiple approaches such as point count, quadrat, pitfall trap and setting mist net at higher strata.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the Selangor Forestry Department for their permission to conduct surveys in this area. We are grateful to the Forest Research Institute Malaysia (FRIM) for logistic and supports. We thank the Department of Wildlife and National Park (PERHILITAN) for allowing us to participate in the 8th Biodiversity Seminar. The surveys

were funded by the federal government in the project titled “Monitoring of Selected Flora, Fauna and Insect at SL3 CFS Selangor” (51310904004).

REFERENCES

- Allaby, M. (2009). *Oxford Dictionary of Zoology*. New York: Oxford University Press. Inc.
- Campbell, P., Schneider, C.J., Adnan, A.M., Zubaid, A. & Kunz, T.H. (2006). Comparative population structure of *Cynopterus* fruit bats in peninsular Malaysia and southern Thailand. *Molecular Ecology*, **15**(1): 29-47.
- Chan, K.O., Daicus, B. & Norhayati, A. (2010). A revised checklist of the amphibians of Peninsular Malaysia. *Russian Journal of Herpetology*, **17**(3): 202-206.
- Cox, M.J., Van Dijk, P.P., Nabhitabhata, J. & Thirakhupt, K. (1998). *A photographic guide to snakes and other reptiles of Peninsula Malaysia, Singapore and Thailand*. London: New Holland Publisher (UK) Ltd.
- Das, I. & Norsham, Y. (2007). Status of knowledge of the Malaysian herpetofauna. In *Status of biological diversity in Malaysia and threat assessment of plant species in Malaysia* (Chua, L.S.L., Kirton, L.G. & Saw, L.G., eds), pp. 31-81, Kepong: Forest Research Institute Malaysia.
- Das, I. (2015). *A field guide to the reptiles of South-East Asia*. London: Bloomsbury Publishing PLC.
- Davison, G.W.H. & Zubaid, A. (2007). The status of mammalian biodiversity in Malaysia. In *Status of biological diversity in Malaysia and threat assessment of plant species in Malaysia*. Kuala Lumpur: Forest Research Institute Malaysia.
- Department of Town and Country Planning Peninsular Malaysia. (2009). *Final report CFS I: Master Plan for Ecological Linkages*. Malaysia: Regional Planning Division.
- Fong, P.H., Yuzine, E. & Abdullah, M. (2013). Genetic variations and population structure of the genus *Cynopterus* in Malaysia. *Pertanika Journal of Tropical Agricultural Science*, **36**(3): 225-248.
- Francis, C.M. (2008). *A field guide to the mammals of South-East Asia*. New Holland Publishers (UK) Ltd., London, United Kingdom.
- Hayward, G.F. & Phillipson, J. (1979). Community structure and functional role of small mammals in ecosystems. *Ecology of Small Mammals*, **4**: 135.
- Ibrahim, J., Zalina, A., Shahriza, S., Shahrul Anuar, M.S., Nur Hafizah, I., Amirah, H., Nurul Dalila, A.K., Mohd Abdul, M. & Amirudin, I. (2012). Checklist of the herpetofauna of Bukit Perangin Forest Reserve, Kedah, Malaysia. *Sains Malaysiana*, **41**(6): 691-696.
- Jayaraj, V.K., Laman, C.J. & Abdullah, M. T. (2012). A predictive model to differentiate the fruit bats *Cynopterus brachyotis* and *C. cf. brachyotis* Forest (Chiroptera: Pteropodidae) from Malaysia using multivariate analysis. *Zoological Studies*, **51**(2): 259-271.

Medway, L. (1983). *The wild mammals of Malaya (Peninsular Malaysia) and Singapore*. Kuala Lumpur: Oxford University Press.

MNS Bird Conservation Council. (2005). *A checklist of the birds of Malaysia*. Kuala Lumpur: Malaysia Nature Society.

Myers, S. (2016). *Birds of Borneo*. London: Christopher Helm.

Norhayati A., Juliana S. & Lim B.L. (2005). *Amphibians of Ulu Muda Forest Reserve, Kedah*. Kuala Lumpur: The Forestry Department of Peninsular Malaysia.

Norhayati, A. (2017). *Frogs and toads of Malaysia*. Bangi: Penerbit UKM, Malaysia.

Payne, J., Francis, C.M. & Philipps, K. (1985). *A field guide to the mammals of Borneo*. Kota Kinabalu: The Sabah Society.

Phillipps, Q. & Phillipps, K. (2016). *Phillipps' field guide to the mammals of Borneo and their ecology: Sabah, Sarawak, Brunei, and Kalimantan*. Princeton, New Jersey: Princeton University Press.

Hodgkison, R., Sharon, T., Balding, S.T., Zubaid, A. & Kunz, T.H. (2003). Fruit bats (Chiroptera: Pteropodidae) as seed dispensers and pollinator in lowland Malaysian rain forest. *Biotropica*, **35**(4): 491-502.

Robson, C. (2014). *A field guide to the birds of South-East Asia*. London: Bloomsbury Natural History.

Mansor, M.S. & Sah, S.A.M. (2012). The Influence of habitat structure on bird species composition in lowland Malaysian rain forests. *Tropical Life Sciences Research*, **23**(1): 1–14.

Shahfiz, M.A., Shahrul Anuar, M.S., Nor Zalipah, M., Nurul Ain, E., Pan, K.A., Muin, M.A., Yusof, M.O., Khairul, N.A.M., Edzham, S.M.S.H., Ganesan, M., Nordin, A., Juliana, S., Yusuf, A., Rashid, A. & Fadhil, A. (2011). Survey of small mammals at selected sites in Royal Belum State Park. In *Taman Negara Diraja Belum, Perak: Pengurusan Hutan, Pesekitaran Fizikal dan Kepelbagaian Biologi dan Sosioekonomi* (Abd Rahman H.A.R., Koh, H.L., Abdullah, M. & Latiff, A., eds), pp. 299-308. Kuala Lumpur: Jabatan Perhutanan Semenanjung Malaysia

Kingston, T., Lim, B.L. & Zubaid, A. (2009). *Bats of Krau Wildlife Reserve*. Bangi: Penerbit Universiti Kebangsaan Malaysia.