DIVERSITY SMALL MAMMALS FAUNA IN CHU MOM RAY NATIONAL PARK, CENTRAL HIGHLAND OF VIETNAM

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***Abstract**: We recorded species diversity in small mammals of Chu Mom Ray National Park (CMRNP), Kon Tum province, of the Central Highlands of Vietnam. Based on the specimens in field survey combined with data from previous publications, 64 small mammal species in 14 families and 5 orders documented in this area. Of which, Sphaerias blanfordi, Cynopterus sphinx, Hipposideros larvatus, Hipposideros pomona, Rhinolophus affinis are the most common species in bat fauna, Callosciurus erythraeus, Maxomys moi are the most species in rodent fauna. However, illegal exploitation, hunting and human activities effect negative to the biodiversity values. Therefore, the conservation of biodiversity is required.*

***Keywords**: Small mammals, checklist, Chu Mom Ray National Park, Vietnam.*

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1. INTRODUCTION

Chu Mom Ray National Park is located in the North Central Highlands, at a road of Indochina, shares the border with the Laos and Cambodia. Chu Mom Ray NP has formed from Chu Mom Ray Nature Reserve since 2002 with the total forest area of this area is about 56.621 hectares, on the territory of Sa Thay and Ngoc Hoi district, Kon Tum (Prime Minister, 2002). It is one of the highest biodiversity in Vietnam. Chu Mom Ray NP has been recognized as ASEAN Heritage Park by the ASEAN Secretariat since 2004 (ASEAN Centre for Biodiversity, 2010). The national park contains three main types of topography in mountain ranges such as low and mid – elevations with steep and pointed peak, hills are steeper and usually surround high foothills and tributaries of Dak Hodrai and Krong Po Ko rivers (ASEAN Centre for Biodiversity, 2010; Birdlife, 2001). The major forest types

include evergreen forest, lower montane evergreen forest, lowland semi-evergreen forest, bamboo and grasslands, in which lowland evergreen forest and lower montane evergreen forest are major forest of Chu Mom Ray NP (ASEAN Centre for Biodiversity, 2010; Birdlife, 2001). It is known for the largest grassland ares in Vietnam up to 15,750 hectares, the home of 115 species of mammals, in which there are some ungulates such as: Gaur *Bos gaurus*, the annamite muntjac *Muntiacus truongsonensis*, the wild boar *Sus scrofa*,... and especially the kouprey *Bos sauveli*, endemic to Southeast Asia, however, since 1995 until now, information about this species has not been recorded (ASEAN Centre for Biodiversity, 2010). Besides, this is distributed somes large mammals and especially primate species such as the yellow-cheeked gibbon *Nomascus gabriellae*, the grey-shanked douc langur *Pygathrix cinerea*, The red-shanked douc *Pygathrix nemaeus*, and *Macaca sp*.. (ASEAN Centre for Biodiversity, 2010). However, the exploitation of forest resources, habitat fragmentation affects the species population and biodiversity of national park (Fahrig, 2003).

Le et al., Nguyen et al. recorded the recent bat surveys and mammals in Chu Mom Ray NP in 2011 (Le et al., 2011; Nguyen et al., 2011). However, human activities currently have greatly affected to biodiversity in area. Therefore, the investigation and review to evaluate the biodiversity status to management and conservation of animal resources in Chu Mom Ray National Park is very necessary.

2. CONTENT

Methodology

Given the diversity of small mammal fauna in the study site, different methods were used to collect specimens. During the survey, we conducted day and night time excursions and using specialized trap methods for small mammals. A few types of traps were used:

– Three kinds of Sherman live-traps (3×3×10 cm; 5 × 5 × 18cm; 7 × 7 × 30cm) were used to catch medium-sized rodents and shrews. Tomahawk cage traps (20 × 20 × 60cm) and local cage traps (15 × 15 × 25cm) were used to large-sized rodents and squirrels. Baits for trapping must be odiferous enough to draw rodents into the traps from some distance, sticky enough to as here to the trap, and stable enough to keep from rotting. Baits were changed every day after checking the traps.

– Two types of mole-traps - Japanese hand-made traps and Talpex traps. Mole traps were set on the trails along small trails where mole tunnels were observed.

– Different types of mist nets (2 × 3m, 5 × 3m and 12 × 4m), two-handle hand net (‘flap-trap’), and harp trap (1.5 × 1.5m) were used to live capture bats. The nets and traps were set to cross trails in the forest, over small ponds and streams in the forest or near forest edges,

at openings at the forest edges and the entrances of caves. Flap-trap was used for active bat capture on the open places (roads and riverbeds).

The external body measurements: head and body length (HB), tail length (TL), hind foot length (HF), ear length (E) and weight (Wt) were taken by tapeline and digital caliper. For bats, forearm (FA) and tibia (Tib) lengths also were measured (Kruskop, 2013).

Detailed identification followed Csorba et al., 2003; Francis, 2019; Wilson & Reeder, 2005, Lunde & Nguyen, 2001.

The nomenclature of mammals follows Csorba et al., 2003, Wilson & Reeder, 2005; Lunde & Nguyen, 2001; Dang et al., 2008 unless otherwise stated.

Time and efforts survey

Fieldworks were conducted in Chu Mom Ray NP during 10 - 27 September, 2019 by the Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology and Ha Noi Metropolitan University. This national park is located in Sa Thay and Ngoc Hoi districts in the western part of Kon Tum Province, Central Highland, Vietnam stretching from 14°18’00” to 14°38’45” N and from 107°29’45” to 107°47’08” E (Do et al., 2006; Nguyen et al., 2006a). The survey areas in 2019 was campsite to Monkey waterfall (trap line A), and peaks of Chu Mom Ray (trap line B). Total survey efforts are shown in Table 1.

Table 1. *Total survey efforts in Chu Mom Ray National Park*

Trapline	Coordinates	Elevation	D.O	MN	H	M	S	C	N.O
Trapline 1A Monkey waterfall	$14^0$26’25.6” N $107^0$43’25.5” E	806	4			576	160	80	4
Trapline 2A Rescue center	$14^0$25’56.7” N $107^0$43’15.8” E	709	4	1296					4
Trapline 3A Monkey waterfall	$14^0$26’25.4” N $107^0$43’26.5” E	994	4	1296					4
Trapline 4A Monkey waterfall	$14^0$26’31.60” N $107^0$43’27.2” E	1124	4	672					4
Trapline 5A Monkey	$14^0$25’56.7” N $107^0$43’15.8” E	1142	4		72				4

waterfall									
Trapline 1B Peak of Chu Mom Ray	$14^0$27’28.7” N $107^0$43’8.99” E	1350	4	240					4
Trapline 2B Peak of Chu Mom Ray	$14^0$27’28.3” N $107^0$43’8.95” E	1305	2	672					2
Trapline 3B Peak of Chu Mom Ray	$14^0$27’31,76” N $107^0$44’4.34” E	1420	2		36	288	80	40	2
Trapline 4B Peak of Chu Mom Ray	14°26'46.94"N 107°43'56.65"E	1240	1.5	672					1.5
Total			31.5	4.848	108	864	240	120	31.5

D.O. - Daytime observation (hours); MN – Mist nets (m2 / n / h); H - Harp trap (m^2/n/h); M - Mole-traps (trap nights); S - Sherman traps; C - Cage traps (trap nights); N.O. - Nighttime observations (hours); n - Number of captured specimens.

3. CONCLUSION

In total, 45 species were captured in 2019. Collected specimens, direct observation in the field, the materials retrieved from local households, and combination of previously published records shows that there are 64 species belonging to 14 families and 5 orders. (Table 2).

Table 2. *Small mammals recorded in Chu Mom Ray National Park*

	Scientific name	**2011[5,6]**	**2019**
	I.SCANDENTIA Wagner, 1855		
	1.Tupaiidae Gray, 1825		
1	*Tupaia belangeri* (Wagner, 1841)	+	S
2	*Dendrogale murina* (Schlegel, Müller, 1843)		
	II.DERMOPTERA Illiger, 1811		
	2.Cynocephalidae Simpson, 1945		
3	*Galeopterus variegatus* (Audebert, 1799)	+	S
	III.EULIPOTYPHIA Gregory, 1910		
	3.Erinaceidae G. Fischer, 1814		

4	*Hylomys suillus* Müller, 1840		
	4.Soricidae G. Fischer, 1814		
5	*Chimarrogale varennei* (Temminck, 1842)		
6	*Crocidura attenuata* Milne-Edwards, 1872	+	S
7	*Crocidura dracula* Thomas, 1912		S
8	*Crocidura phanluongi* Jenkins, Abramov, Rozhnov, Olsson, 2010		
9	*Crocidura tanakae* Kuroda, 1938		S
10	*Suncus murinus* (Linnaeus, 1766)	+	S
	5.Talpidae G. Fischer, 1814		
11	*Euroscaptor parvidens* (Miller, 1940)	+	S
	IV.CHIROPTERA Blumbach, 1779		
	6.Pteropodidae Gray, 1821		
12	*Cynopterus brachyotis* (Müller, 1838)	+	S
13	*Cynopterus sphinx* (Vahl, 1797)	+	S
14	*Megaerops niphanae* Yenbutra and Felten, 1983	+	
15	*Sphaerias blanfordi* (Thomas, 1891)		S
	7.Rhinolophidae Gray, 1825		
16	*Rhinolophus affinis* Horsfield, 1823	+	S
17	*Rhinolophus chaseli* (Sanborn, 1939)	+	S
18	*Rhinolophus macrotis* Blyth,1844	+	S
19	*Rhinolophus malayanus* Bonhote,1903	+	S
20	*Rhinolophus pearsonii* Blyth, 1844	+	S
21	*Rhinolophus pusillus* Temminck, 1834	+	S
22	*Rhinolophus shameli* Tate, 1943	+	
	8.Hipposideridae Lydekker, 1891		
23	*Hipposideros ater* Templeton,1848	+	
24	*Hipposideros galeritus* Canter,1846	+	S
25	*Hipposideros larvatus* (Horsfield, 1823)	+	S
26	*Hipposideros pomona* K. Andersen, 1918	+	S
	9.Vespertilionidae Gray, 1821		
27	*Kerivoula hardwickii* (Horsfield, 1824)	+	S
28	*Kerivoula titania* Bates, Struebig, Hayes, Furey, Mya, Thong, Son, Harrison, Csorba, Francis, 2007	+	S
29	*Murina cyclotis* Dobson, 1872	+	

30	*Murina tubinaris* (Scully, 18810)	+	
31	*Myotis horsfielddi* (Temminck,1840)	+	S
32	*Myotis siligorensis* (Horsfield, 1855)	+	
33	*Pipistrellus javanicus* (Gray, 1838)		S
34	*Pipistrellus paterculus* Thomas, 1915		S
35	*Tylonycteris fulvida* (Peter,1872)		S
36	*Tylonycteris pachypus* (Temminck, 1840)	+	
37	*Tylonycteris robusta* Thomas,1915	+	
	10.Megadermatidae H. Allen, 1864		
38	*Megaderma spasma* (Linnaeus, 1758)		S
	V.RODENTIA Bowdich, 1821		
	11.Sciuridae Fischer de Waldheim, 1817		
39	*Ratufa bicolor* (Sparrman, 1778)	+	O
40	*Hylopetes alboniger* (Hodgson, 1836)	+	O
41	*Petaurista philippensis (*Elliot, 1839)	+	
42	*Callosciurus erythraeus* (Pallas, 1779)	+	S
43	*Dremomys rufigenis* (Blanford, 1878)	+	S
44	*Menetes berdmorei* (Blyth, 1849)	+	S
45	*Tamiops rodolphii* (Milne-Edwards, 1867)	+	
	12.Spalacidae Gray, 1821		
46	*Rhizomys pruinosus* Blyth, 1851	+	S
47	*Rhizomys sumatrensis* (Raffles, 1821)		S
	13.Muridae Illiger, 1811		
48	*Bandicota indica* (Bechstein, 1800)	+	
49	*Chiropodomys gliroides* (Blyth, 1856)	+	
50	*Berylmys bowersi* (Anderson,1879)		S
51	*Maxomys moi* (Robinson, Kloss, 1922)		S
52	*Mus caroli* Bonhote, 1902		S
53	*Mus pahari* Thomas, 1916		S
54	*Mus musculus* Linnaeus, 1758		S
55	*Niviventer fulvescens* (Gray, 1847)	+	
56	*Niviventer langbianis* (Robinson & Kloss,1922)		S
57	*Niviventer niviventer* (Hodgson,1836)		S
58	*Rattus tanezumi* Temminck, 1844	+	

59	*Rattus exulans* (Peale, 1848)		S
60	*Rattus nitidus* (Hodgson, 1845)		S
61	*Rattus andamanensis* (Blyth, 1860)	+	
62	*Rattus cremoriventer* (Miller,1900)	+	
	14.Hystricidae G. Fischer, 1817		
63	*Atherurus macrourus* (Linnaeus, 1758)	+	O
64	*Hystrix brachyura* Linnaeus, 1758		O

S: specimens; O: observation; +: Recorded

In the species composition, the Chiroptera and Rodentia orders are recorded the most species richness with 27 species (42.19%) and 26 species (40.63%), respectively. In bat fauna, Vespertilionidae family is the most species diverse with 11 species (17.19%), next to Rhinolophidae family with 7 species (25.93%). Based on survey effort time, *Hipposideros larvatus, Hipposideros pomona, Rhinolophus affinis, Sphaerias blanfordi* and *Cynopterus sphinx* were the most common species with the highest catch frequency.

15 specimens *Cynopterus sphinx* were captured and released including 7 males and 8 females lowland semi-evergreen forest, only one male and female kept as voucher specimens. Besides, the *Sphaerias blanford* species is also typical of lower montane evergreen forest from 1000-1700m, with high frequency trapping.

Fig 1. *Common species recorded in Chu Mom Ray NP*

During the survey, 12 specimens including 8 females and 4 males were obtained. We have kept 1 male and 1 female sample as voucher specimens. In addition, some dominant species were also found such as *Rhinolophus chaseni*, *Rhinolophus malayanus*, *Rhinolophus pusillus*. Some vespertilionidae bat were least common, mainly at average elevations between 1000-1300 m lower montane evergreen forest and along streams.

In the rodent fauna, the Muridae family is most richness with 15 species (23.44%). *Maxomys moi* species is trapped with the highest catch frequency. In the field survey, 5 specimens of Maxomys moi species were collected in lower montane evergreen forest and lowland semi-evergreen forest otherwise other rodents trapped 1-2 specimens. Besides, we recorded 7 specimens of 5 species belong Eulipotyphia order, collected along streams and evergreen forest.

Compared with the previous study on the bat fauna of Nguyen et al, and mammal fauna of Le et al, the survey showed that the result is similar in species composition and abundant, in which *Hipposideros larvatus, Hipposideros pomona, Rhinolophus affinis* are the most common in bat fauna. Besides, we added *Cynopterus sphinx* in the checklist of bat fauna in Chu Mom Ray National Park.

- Threats to the small mammal fauna in Chu Mom Ray

Impact of illegal poaching

Fig 2. *An individual Black Giant Squirrel Ratufa bicolor was taken photo in nature in Chu Mom Ray NP*

It is a direct threat to the biodiversity. Hunting occurs almost any time during the year, especially during the dry season, most strongly around November and December. It is conducted by local ethnic people and neighborhoods nearby as well as professional hunters and trappers coming from the other provinces (Do et al., 2006). The rangers also collaborated with local authorities confiscated guns and traps. However, hunting still takes place in many difficult management areas in the NP. Among small mammals, some species in Sciuridae family such as *Callosciurus erythraeus, Dremomys rufigenis, Menetes berdmorei* are subjects are regularly hunted for food and trade value. Besides, some squirrels, considered Mom Ray NP*Petaurista philippensis*, are also frequently hunted (Vietnam Red Data Book, 2007).

The secondly, iIllegal logging on a small scale, mainly selective logging still occurs in Chu Mom Ray National Park. Timber is harvested mainly for local use to build houses, build household appliances, and build livestock barns. This is not an easy problem to solve, as it is an essential need of the people in the area. In addition, firewood is an essential daily need of households living in the buffer zone of the NP.

Impact of illegal logging and non-timber forest products (NTFPs) extraction.

Illegal logging caused another threat to small mammal fauna in Chu Mom Ray. It causes the extraction of biomass, damages the stand structure then affect species living in the underground such as moles, well as habitat fragmentation, affect to especially small animals living in high canopy such as flying squirrels.

The NTFPs are collected by local communities, mainly orchids, honey and some valuable medicinal herbs in NP. The extraction of non-timber forest products has had a great impact on the National Park, causing disturbances in the forest, directly affecting wildlife. Especially, firemaking to wild honey extraction contributed to forest fires in the park causing forest fire, another threat to biodiversity decreases and habitat loss (Nguyen et al., 2006a; Wode, 2000).

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ĐA DẠNG KHU HỆ THÚ NHỎ TẠI VƯỜN QUỐC GIA CHƯ MOM RAY, TÂY NGUYÊN, VIỆT NAM.

Tóm tắt: *Chúng tôi đã ghi nhận sự đa dạng về thành phần các loài thú nhỏ ở Vườn Quốc gia Chư Mom Ray (CMRNP), Kon Tum, Tây Nguyên Việt Nam. Dựa trên các mẫu vật thu được trong quá trình khảo sát thực địa kết hợp với các công bố trước đây, 64 loài thú nhỏ thuộc 14 họ, 5 bộ đã được ghi nhận ở khu vực này. Trong đó, Sphaerias blanfordi, Cynopterus sphinx, Hipposideros larvatus, Hipposideros pomona, Rhinolophus affinis là những loài phổ biến nhất trong khu hệ dơi, Callosciurus erythraeus, Maxomys moi là những loài có phổ biến trong khu hệ gặm nhấm. Tuy nhiên, hoạt động khai thác, săn bắn trái phép và các hoạt động của con người đang ảnh hưởng tiêu cực đến các giá trị đa dạng sinh học ở khu vực này. Vì vậy, việc bảo tồn đa dạng sinh học là bắt buộc.*

Từ khóa: *Các loài thú nhỏ, danh sách thành phần loài, Vườn quốc gia Chư Mom Ray, Việt Nam.*