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DIVERSITY OF MAMMALS IN DONG PHOUVIENG NATIONAL PROTECTED AREA, SAVANNAKHET PROVINCE, LAO PDR

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Abstract – *The study of the diversity of mammals in the Dong Phouvieng National Protected Area (Savannakhet Province, Lao PDR) was conducted in 2023, focused on three administrative districts Phin, Sepon, and Nong covering ten village sectors. Standardized methods included deployment of camera-traps, systematic corridor transects, acoustic monitoring, opportunistic photography, and semi-structured interviews with residents concerning historical wildlife use. This survey found 10 families and 20 species. Sciuridae accounted for the greatest number of species, followed sequentially by Cercopithecidae, Viverridae, and Tupaiidae. The remaining six families, such as Cervidae, Craseonycteridae, Hystricidae, Leporidae, Muridae, and Spalacidae, were each represented by a single species. Overall, the results of this study indicate that the species diversity index for both the dry and rainy seasons was low, suggesting that the studied area has low biodiversity. Conservation assessments placed Pygathrix nemaeus and Trachypithecus germaini in the Critically Endangered category of the International Union for Conservation of Natures Red List; the remaining eighteen species are currently assessed as Least Concern. Under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, Viverricula indica is listed in Appendix I, Pygathrix nemaeus and Trachypithecus germaini in Appendix II, and Paradoxurus hermaphroditus in Appendix III; while sixteen species have yet to be evaluated. Nationally, Viverricula indica, Pygathrix nemaeus, and Trachypithecus germaini are within Lao Category I (Prohibited); Muntiacus muntjac, Atherurus macrourus, Paradoxurus hermaphroditus, and Melogale personata are within Category II (Regulated), and ten species are within Category III (Common); three species remain unevaluated at the national level.*

Keywords: diversity, Dong Phouvieng National Protected Area, mammals, Savannakhet.

I. INTRODUCTION

Systematic investigations of the Lao PDR's fauna were negligible until the late 1980s, when coordinated surveys began to underpin development of the national protected-area network. Joint initiatives led by the Lao Government, with technical support from the International Union for Conservation of Nature (IUCN) and the Wildlife Conservation Society, deployed multidisciplinary field teams to assess candidate protected areas and to establish baseline data on priority wildlife populations. These efforts rapidly yielded remarkable discoveries, including several new taxa to science during the 1990s, for example, the saola (*Pseudoryx nghetinhensis*), the Annamite striped rabbit (*Nesolagus timminsi*), and the large-antlered muntjac (*Muntiacus vuquangensis*) recorded along the Truong Son (Annamite) range as referred by Duckworth et al. [1]. A landmark review subsequently synthesised available information on the conservation status of mammals in Lao PDR. Continued exploration has extended the nation's species list still further, most notably with the description of the Laotian rock rat (*Laonastes aenigmamus*) from the Phou Hin Poun National Biodiversity Conservation Area in Khammouan Province, alongside additional novel taxa documented from other remote landscapes.

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The assessment is used to inform the upcoming environmental and social impact assessment process and guide planning, management, and monitoring decisions for the proposed Stora Enso Eucalypt Plantation. This includes increasing pressure on forest and wildlife resources, degradation of aquatic habitat, and the establishment and spread of invasive alien species. Minimizing adverse impacts on biodiversity requires a transparent and inclusive process that recognizes the interdependence between different components of the mosaic landscape and the diversity of local peoples. To bring significant benefits to local people, the project should be planned, implemented, and monitored within the mosaic framework as well. Together, it provides a forum for multi-stakeholder engagement to explore ways of strengthening governance in the plantation sector and demonstrate how a multi-stakeholder approach leads to equitable and sustainable growth within this rapidly expanding sector in Lao PDR [2].

Dong Phouvieng National Protected Area in Savannakhet Province comprises largely undisturbed montane evergreen forest whose lower slopes still support an intricate network of creeks, Luthans, and perennial streams. Acting simultaneously as a key watershed and a reservoir of taxonomic, functional, and landscape diversity, the park possesses exceptional ecological and aesthetic value. Rigorous scientific investigation encompassing species inventories, analyses of biotic interactions within this distinctive habitat mosaic, and assessments of trophic roles is essential to guide evidence-based zoning, management, and long-term protection of both forest and water resources [3]. The overarching objective is to strengthen governance of protected and defence forests, bolster enforcement of forestry, fisheries, and wildlife legislation, and facilitate the broader application of national environmental and social policies, thereby ensuring the parks biological wealth is conserved in perpetuity.

The dry dipterocarp forest ecosystems located in Savannakhet Province are recognized as globally and nationally important for their provision of numerous ecosystems that benefit the people of Lao PDR. In recent decades, dry dipterocarp ecosystems and the species within them have faced increasing threats from large-scale forest conversion, degradation of forest ecosystems, unsustainable logging, habitat loss, and species loss. The objective is to demonstrate the role of sustainable land and forest management in the forested landscape of Savannakhet Province to conserve critical wildlife habitats, biodiversity, and the continuous flow of multiple services, including the provision of quality water and flood prevention [4].

Given the recognised conservation significance of several mammal taxa within Dong Phouvieng National Protected Area and the parks role as the headwaters of the Xe Banghieng river this survey set out to establish a baseline inventory of mammalian diversity for use by district- and provincial-level authorities. Species records, abundance estimates, and threat assessments will inform future biodiversity management and environmental protection plans. Notably, several species detected are already listed under the IUCN Red List, categories of wildlife I–III by Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the national lists of endangered wildlife, underscoring the parks importance as a refuge for rare and range-restricted fauna and taxa newly documented in Lao PDR.

This research aims to classify and assess the diversity of mammalian species and compare the diversity of species found in the dry and the rainy season at Dong Phouvieng National Protected Area in Savannakhet Province. The study focuses on species richness, occurrence, and conservation status of mammals within Dong Phouvieng National Protected Area (Savannakhet Province). Fieldwork and data analysis were conducted in 2023, with an emphasis on monitoring and evaluating population trends of recorded species.

II. LITERATURE REVIEW

Aroon et al. [5] surveyed animals four times between November 2011 and August 2012. Several standard methods for surveying vertebrate

groups were used, both direct and indirect observations, including line transect, point count, funnel trap, live trapping, mist netting, and interviews. A total of 172 vertebrate species were recorded: 7 mammals, 93 birds, 10 amphibians, 22 reptiles, and 40 fish. Of these, only 100 are protected species in Thailand; seven species are in the IUCN Red List 2012. Big animals were not found since humans, cows, buffaloes, dogs, and cats roam the area freely. The area is close to the dam office and an urban area; it is under high pressure from local poachers. Therefore, raising conservation awareness for local people and restricted areas is urgently needed.

Timmins et al. [6] revealed that the Indochinese silvered leaf monkey *Trachypithecus germaini* (perhaps comprising two species, *T. germaini [sensu lato]* and *T. margarita*) is probably the rarest and most threatened monkey in Lao PDR. It has received less conservation-related attention in the country, however, than have the endemic primates of East Indochina of the Mekong because until recently it was generally considered conspecific with the widespread *T. cristatus* of Southeast Asia. All Lao records with firm locality details are from south of 16^{o}23'N (in Dong Phou Vieng National Protected Area) and in lowland forests (up to 550 m above sea level), with many from near waterbodies. The predominant habitat seems to be semi-evergreen forest as patches and strips within a mosaic of more deciduous forest types, especially in riparian and other waterside situations.

Efforts to conserve the Indochinese silvered langur (*Trachypithecus germaini*) in Lao PDR have focused on raising awareness among local communities, improving knowledge of population and habitat conditions around Dong Phouvieng National Protected Area, and enhancing cooperation between residents and the staff [7].

In 2007, Nattawut [8] studied small mammal communities over 12 months, from January to December, in three dry tropical habitats: dry dipterocarp, ecotone, and dry evergreen forest in Sakaerat Environmental Research Station. Traps were established on 0.81-ha trapping grids with 15-m trap spacing. Traps were set for three nights each month, and trapped animals were marked and released. Data were collected on species, age, body mass, and trap location, allowing determination of population age structure through time, minimum home range sizes, biomass, and community diversity indices. Six species of Rodentia and one each of Scandentia, Lagomorpha, and Canivora were recorded in 1,047 captures of 371 individuals over 3,528 trap nights. The four most common species caught in all sizes were *Maxomys surifer, Tupia glis, Rattus rattus*, and *Leopoldamys sabanus*, with *M. surifer* being the most common species in all forest types. There was significant variation across forest types and seasons in the age of animals caught, their density, and their mass, but not in community structure or sex ratios. Minimum home range sizes were larger in the cold and hot seasons than in the rainy season in all forest types. The dry dipterocarp forest supported the highest diversity of small mammals. The diversity was positively correlated with forest heterogeneity and their characteristics in each season.

Hoffmann et al. [9] introduced inventory methods for mammals in terrestrial habitats, with a focus on trapping methods for terrestrial small mammals, bats, and medium-sized (meso-) mammals. The authors suggested guidelines for designing a study, introduced selected trapping and handling procedures, and made recommendations for field equipment and data recording. Practical notes and hints based on the authors field experience were integrated into all sections of the chapter. Additionally, the authors reviewed safety precautions and covered practical aspects of what to do before launching an expedition.

A study conducted in the Elds Deer Sanctuary by Phiapalath et al. [10] recorded a total of 1,233 species (408 fauna and 825 flora), comprising 62 mammals, 277 birds, 44 reptiles, 25 amphibians, 126 plants (trees), and almost 700 non-tree species. More than half of the wildlife species were confirmed in the field during the survey, and approximately 226 wildlife species were photographed, with a particular focus on birds (135

species). Still, this wildlife figure did not include fish (89 species). For the plants, including non-trees and the species counted from outside the plant plots, there were over 825 species from 155 families. This was not only in the dry dipterocarp forest, but also in other forest types located within the Elds Deer Sanctuary. There were 21 threatened species, mostly from plants (15 species). There would be more threatened species, but they were not confirmed yet in the field.

Sungkawung [11] found a total of 16 mammalian species from 10 families. The most common is the squirrel family Sciuridae, with four species found, followed by the Old-World monkey family. Cercopithecidae found three species, fruit bat family Pteropodidae, with two species, chipmunk family Tupaiidae, civet and civet Viverridae, wind monkey family Lorisidae, weasel family Mustelidae, mouse Muroidea, tiger and cat family Feliformia, and Mongoose family Herpestidae, with one species.

A study surveying the Indochinese silvered langur, currently classified as endangered by the IUCN, conducted by Duc et al. [12] revealed major threats to this species, including habitat loss due to land use and hunting for bushmeat, the pet trade, and use in traditional medicine. Deforestation and habitat degradation are major threats in Cambodia and Vietnam, with land converted for projects such as rubber plantations. Much of the population is split into small, isolated populations, which exacerbates the already severe threats to this species. Many individuals currently held in zoos in Vietnam are believed to have been captured from wild populations.

Wildlife Conservation Association [13] improved conservation of the Indochinese silvered langur (*Trachypithecus germaini*) in Lao PDR through awareness-raising initiatives among local communities, improving understanding of the langur population and habitat status in and around Dong Phouvieng National Protected Area, and strengthening coordination and cooperation between locals and national protected area staff.

The Ministry of Agriculture and Forestry [14] has established the principles and is responsible for regulating and monitoring all activities to ensure that all operations are effective and efficient. This is achieved by taking into consideration quality, safety, waste management, and animal welfare. It must also recognize the importance of honesty, generosity, kindness, and collaboration in the regulation, monitoring, protection, development, and bringing of all animals, as well as protecting the environment based on international standards. Furthermore, the Ministry takes responsibility for and benefits from risk management to ensure quality, which is a key part of developing its quality management system. In the act established to manage wildlife and aquatic animals, the Ministry of Agriculture and Forestry [15] divided them into three categories, with the following details:

1) Category Ⅰ – Prohibited wildlife consists of 152 species. Among these, there are 72 mammal species, 22 reptile species, 56 bird species, and 2 amphibian species.

2) Category Ⅱ – Regulated wildlife consists of 61 species. Among these, there are 21 mammal species, 7 reptile species, 24 bird species, 1 amphibian species, and 8 insect species.

3) Category Ⅲ – Common wildlife consists of 21 species. Among these, there are 4 mammal species, 4 reptile species, 3 bird species, 3 amphibian species, and 7 insect species.

III. RESEARCH METHODS

This data collection and sampling effort selected villages located near and dependent on the Dong Phou Vieng National Protected Area for their livelihoods. People who are experienced in hunting mammals in the area were interviewed to gather information about these wildlife species. Subsequently, the study conducted a field survey of the wildlife and forest ecology together with the village authorities and residents skilled in jungle trekking and installed camera traps to record the movement of the wild animals.

A. Field component

Surveys were conducted across three administrative districts Phin, Sepon, and Nong encompassing ten focal localities (Alao Kao, Alao Mai,

Vong Si Keo, Kang Ki, Meuang Sane, Meuang Chan, Sa Weu, Kang Lin, Ban Phin, and Labao Nam). Field teams deployed passive infrared camera traps at pre-selected micro-habitats, photographed opportunistically encountered mammals, and recorded geospatial coordinates with handheld GPS units.

B. Laboratory component

Captured imagery was curated and taxonomically verified by the laboratory using authoritative references, including a field guide to the mammals of Laos and the Lao wildlife status [1]. Comparative identification also drew on specialist websites, interviews with local hunters and guides, and consultations with zoologists familiar with the regional fauna. Each confirmed record was assigned a conservation status following the IUCN Red List, CITES Appendices, and Lao national listings for prohibited or managed wildlife and aquatic species.

C. Data analysis

The diversity index of species was analysed using the Shannon-Weaver diversity index for comparing diversity between various habitats [16]. It assumes that individuals are randomly sampled from an independent large population [17]. In this research, the diversity index of species found seasonally popular in ecology and biology was calculated as Formula (1).

$$H' = \sum_{i=1}^{n}(p_i)(log\ p_i) \quad (1)$$

pi: The proportion of individuals of species (i) relative to the total number of individuals (pi = ni/N)

ni: Number of individuals of species (i)

N: Total number of individuals of all species found in the sample

H' : Shannon Weaver diversity index

(H' has a minimum value of 0, meaning the sampled area contains only one species studied. The value of H' increases with the number of species, but it will not exceed 5.)

The experimental results were analyzed by using statistical methods. Each experiment was replicated three times. Excel software was used to calculate the mean and standard deviation of the statistical data analysis of the experimental results. The standard deviation was used as the uncertainty of the obtained experimental/analysis results. Additionally, Excel software were used to generate various graphical representations as appropriate for each type of result.

IV. RESULTS AND DISCUSSION

A. Classification and assessment of the diversity of mammalian species

The results showed that a total of 20 species in 10 mammalian families were recorded. Species richness was highest in the squirrels (Sciuridae) exhibited the highest species diversity with six species, such as *Petaurista petaurista* (Pallas, 1766), *Petinomys setosus* (Temminck, 1844), *Hylopetes spadiceus* (Brandt, 1855), *Ratufa bicolor* (Sparrman, 1778), *Callosciurus finlaysonii* (Horsfield, 1823), and *Callosciurus erythraeus* (Pallas, 1779). This was followed by monkeys (Cercopithecidae) with three species, such as *Trachypithecus germaini* (A. Milne-Edwards, 1876), *Pygathrix nemaeus* (Linnaeus, 1771), and *Macaca mulatta* (Zimmermann, 1780); civets (Viverridae) with three species, such as *Viverricula indica* (Geoffroy Saint-Hilaire, 1803), *Paradoxurus hermaphroditus* (Pallas, 1777), and *Melogale personata* I. Saint-Hilaire, 1831. Tree shrews (Tupaiidae) accounted for two species, such as *Tupaia* ssp Raffles, 1821, and *Tupaia belangeri* ssp (Wagner, 1841). The remaining six families consist of a single species for each, such as deer (Cervidae) such as *Muntiacus muntjac* (Zimmermann, 1780); bumblebee bats (Craseonycteridae) such as *Craseonycteris thonglongyai* Hill, 1974; porcupines (Hystricidae) such as *Atherurus macrourus* (Linnaeus, 1758); wild rabbits (Leporidae) such as *Lepus peguensis* Blyth, 1855; rats and mice (Muridae) such as *Leopoldamys sabanus* (Thomas, 1887); and bamboo rats (Spalacidae) such as *Cannomys badius* (Hodgson, 1841) (shown in Table 1).

Conservation assessments classified *Pygathrix nemaeus* (Linnaeus, 1771) and *Trachypithecus germaini* (A. Milne-Edwards, 1876) in the Critically Endangered (CR) category of the IUCN Red List [18]; the remaining 18 species are currently assessed as Least Concern (LC). Under CITES [19], *Viverricula indica* (Geoffroy Saint-Hilaire, 1803) is listed in Appendix I, *Pygathrix nemaeus* (Linnaeus, 1771), and *Trachypithecus germaini* (A. Milne-Edwards, 1876) in Appendix II, and *Paradoxurus hermaphroditus* (Pallas, 1777) in Appendix III; while 16 species have yet to be evaluated. Nationally, *Viverricula indica* (Geoffroy Saint-Hilaire, 1803), *Pygathrix nemaeus* (Linnaeus, 1771), and *Trachypithecus germaini* (A. Milne-Edwards, 1876) are within Lao Category I (prohibited); *Muntiacus muntjac* (Zimmermann, 1780), *Atherurus macrourus* (Linnaeus, 1758), *Paradoxurus hermaphroditus* (Pallas, 1777), and *Melogale personata* I. Saint-Hilaire, 1831, within Category II (Regulated) and 10 species within Category III (Common); three species remain unevaluated at the national level.

From Table 1, it is observed that a total of 10 families and 20 species of mammals were found. Sciuridae was found most frequently, followed by Cercopithecidae, Viverridae, Tupaiidae, and the least common family was Cervidae, Craseonycteridae, Hystricidae, Leporidae, Muridae, and Spalacidae. Two primate taxa detected in both studies, *Pygathrix nemaeus* (Linnaeus, 1771) and *Trachypithecus germaini* (A. Milne-Edwards, 1876), are classified as Critically Endangered on the IUCN Red List, underscoring their high conservation priority. The research result is consistent with the research of Coudrat et al. [20]. It was found that there are 21 species of small carnivores (Viverridae, Prionodontidae, Mustelidae, and Herpestidae). These are globally important for the conservation of many of these. In addition, there are similarities with the research of Alexiou et al. [21]. It was found that 18 species of mammals from the community were listed as Near Threatened or above according to the IUCN [18]. There are five of these species that are Annamite Endemics (Annamite dark muntjac, Annamite striped rabbit, Large antlered muntjac, Owstons civet, and Red-shanked douc *Pygathrix nemaeus*).

B. Comparison of mammalian species diversity found in the dry and rainy seasons

Based on a study of mammals in the Dong Phouvieng National Protected Area, specifically in Phin, Sepon, and Nong districts of Savannakhet Province, a total of four surveys were conducted from January to December 2023, covering both the rainy and dry seasons.

First time (March 2023): 10 families and 20 species were recorded.

Second time (June 2023): 9 families and 19 species were recorded.

Third time (September 2023): 9 families and 19 species were recorded.

Fourth time (November 2023): 10 families and 20 species were recorded.

Figure 1 illustrates the diversity of mammalian species across seasons at each sampling point varied with each data collection period. The highest number of species, 20 species, was found during the dry season (post-rainy season), specifically in November. The lowest number, 19 species, was observed during the transition from the dry to the rainy season (March, June, and September), as presented in Table 2.

However, many mammalian species were not discovered during this research. This could be due to several limitations, including the vast study area, restricted sampling periods, challenging conditions (such as heavy rainfall and flooding), difficult terrain during fieldwork, and prohibitions from villages against surveying their sacred forests. These factors significantly impacted data collection in the designated areas. Furthermore, the research was also limited by the availability of modern equipment and tools, which prevented more detailed identification.

When comparing diversity indices, it was found that the diversity index may or may not depend on the number of species and the abundance of each species observed seasonally at specific

Table 1: Species diversity of mammals
in Dong Phouvieng National Protected Area, Savannakhet Province

No.	Family	Scientific's name	Local's name	IUCN Red List	CITES	Categories of wildlife
1	**Cervidae**	*Muntiacus muntjac* (Zimmermann, 1780)	Red Muntjac	LC	EN	Regulated Wildlife (II)
2	**Cercopithecidae**	*Trachypithecus germaini* (A. Milne-Edwards, 1876)	Indochinese Silvered Langur	CR	II	Prohibited Wildlife (I)
3	**Cercopithecidae**	*Pygathrix nemaeus* (Linnaeus, 1771)	Red-Shanked Douc Langur	CR	II	Prohibited Wildlife (I)
4	**Cercopithecidae**	*Macaca mulatta* (Zimmermann, 1780)	Rhesus Macaque	LC	NE	Common Wildlife (III)
5	**Craseonycteridae**	*Craseonycteris thonglongyai* Hill, 1974	Kitti's hog-nosed bat	LC	NE	Common Wildlife (III)
6	**Hystricidae**	*Atherurus macrourus* (Linnaeus, 1758)	Asiatic Brush-Tailed Porcupine	LC	NE	Regulated Wildlife (II)
7	**Leporidae**	*Lepus peguensis* Blyth, 1855	Siamese Hare / Burmese Hare	LC	NE	Common Wildlife (III)
8	**Muridae**	*Leopoldamys sabanus* (Thomas, 1887)	Noisy Rat	LC	NE	NE
9	**Sciuridae**	*Petaurista petaurista* (Pallas, 1766)	Red Giant Flying Squirrel	LC	NE	NE
10	**Sciuridae**	*Petinomys setosus* (Temminck, 1844)	Temminck's Flying Squirrel	LC	NE	Common Wildlife (III)
11	**Sciuridae**	*Hylopetes spadiceus* (Brandt, 1855)	Flying Squirrels	LC	NE	Common Wildlife (III)
12	**Sciuridae**	*Ratufa bicolor* (Sparrman, 1778)	Black Giant Squirrel	LC	NE	Common Wildlife (III)
13	**Sciuridae**	*Callosciurus finlaysonii* (Horsfield, 1823)	Finlayson's squirrel	LC	NE	Common Wildlife (III)
14	**Sciuridae**	*Callosciurus erythraeus* (Pallas, 1779)	Red-bellied squirrel	LC	NE	Common Wildlife (III)
15	**Spalacidae**	*Cannomys badius* (Hodgson, 1841)	Lesser Bamboo Rat	LC	NE	NE
16	**Tupaiidae**	*Tupaia* ssp *Raffles,* 1821	Treeshrew	LC	NE	Common Wildlife (III)
17	**Tupaiidae**	*Tupaia belangeri* ssp (Wagner, 1841)	Northern Treeshrew	LC	NE	Common Wildlife (III)
18	**Viverridae**	*Viverricula indica* (Geoffroy Saint-Hilaire, 1803)	Small Indian Civet	LC	I	Prohibited Wildlife (I)
19	**Viverridae**	*Paradoxurus hermaphroditus* (Pallas, 1777)	Asian Palm Civet	LC	III	Regulated Wildlife (II)
20	**Viverridae**	*Melogale personata* I. Saint-Hilaire, 1831	Ferret Badger	LC	NE	Regulated Wildlife (II)

locations. The diversity index is related to the distribution of each species, indicating whether they are widespread or confined to only certain parts of the sampling points. Overall, this study found that the average diversity index for both the dry season (H' = 0.3809) and the rainy season (H' = 0.3566), as illustrated in Table 3, indicating a low degree of diversity. It can be concluded that the studied area has low biodiversity, which aligns with the criteria set by Guajardo [22].

It is observed that more mammalian species were sampled during the dry season than in the rainy season. This could be attributed to differences in the sampling season and landscape conditions. The dry season (post-rainy season, around November) offers abundant food and favourable environmental conditions for mammalian reproduction. In contrast, the rainy season is characterized by high water levels, with some areas experiencing flooding and intermittent road closures, making it difficult to access the habitats of these animals and resulting in fewer species being found. Additionally, during sampling, 10 families and 20 species of mammals were found during the dry season (November to March), including Cervidae such

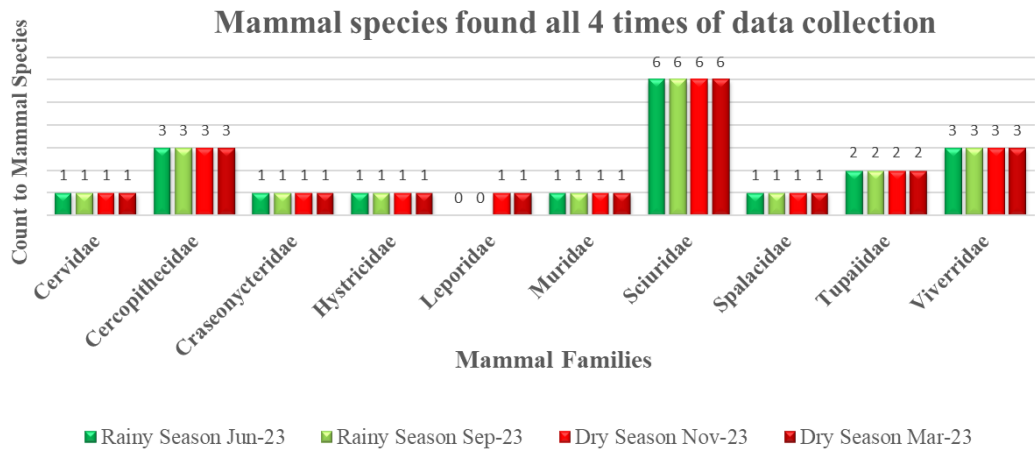


Fig. 1: Mammal species found all four times

Table 2: Number of species and diversity index (H) of mammals found by season in Dong Phouvieng National Protected Area in 2023

Season	Code	Number of species	Diversity index (H')
Rainy season	RS	19	0.3566
Dry season	DS	20	0.3809

as *Muntiacus muntjac* (Zimmermann, 1780);Cercopithecidae with *Trachypithecus germaini* (A. Milne-Edwards, 1876), *Pygathrix nemaeus* (Linnaeus, 1771), and *Macaca mulatta* (Zimmermann, 1780); Craseonycteridae with *Craseonycteris thonglongyai* Hill, 1974; Hystricidae with *Atherurus macrourus* (Linnaeus, 1758); Leporidae with *Lepus peguensis* Blyth, 1855; Muridae with *Leopoldamys sabanus* (Thomas, 1887); Sciuridae with *Petaurista petaurista* (Pallas, 1766), *Petinomys setosus* (Temminck, 1844), *Hylopetes spadiceus* (Brandt, 1855), *Ratufa bicolor* (Sparrman, 1778), *Callosciurus finlaysonii* (Horsfield, 1823), and *Callosciurus erythraeus* (Pallas, 1779); Spalacidae with *Cannomys badius* (Hodgson, 1841); Tupaiidae with *Tupaia* ssp Raffles, 1821, and *Tupaia belangeri* ssp (Wagner, 1841); Viverridae with *Viverricula indica* (Geoffroy Saint-Hilaire, 1803), *Paradoxurus hermaphroditus* (Pallas, 1777), and *Melogale personata* I. Saint-Hilaire, 1831 (shown in the Appendix).

During the rainy season (June to September), only nine families and 19 species were found. These were largely the same species as those found in the dry season, except for the Leporidae family (wild rabbits), such as *Lepus peguensis* Blyth, 1855, which were not observed.

The slight differences in mammalian families found across the various seasons might be due to variations in landscape and sampling points, the timing of data collection (covering morning, afternoon, and night), and the suitability of the surrounding environment and habitats for the growth and survival of species within each family at different sampling locations and during seasons.

The research result found that the number of mammalian species was higher during the dry season (51.28%) than in the rainy season (48.72%) (see Figure 2). Among the families, squirrels (Sciuridae) exhibited the highest species diversity with six species. This was followed by monkeys (Cercopithecidae) and civets (Viverridae), each with three species; tree shrews (Tupaiidae) accounted for two species. The remaining six families, such as deer (Cervidae), bumblebee bats (Craseonycteridae), porcupines (Hystricidae), wild rabbits (Leporidae), rats and mice (Muridae), and bamboo rats (Spalacidae), were

Table 3: Diversity of mammals in Dongphouvieng National Protected Area, Savannakhet Province

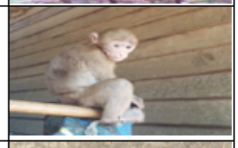
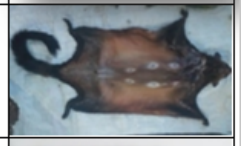
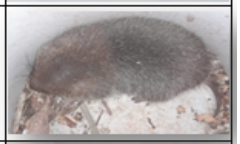
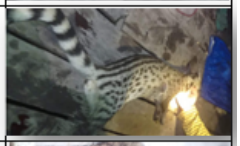
No.	Family	Scientific's Name	Local's Name	Picture of Wildlife (Mammals)
1	**Cervidae**	*Muntiacus muntjac* (Zimmermann, 1780)	Red Muntjac	
2	**Cercopithecidae**	*Trachypithecus germaini* (A. Milne-Edwards, 1876)	Indochinese Silvered Langur	
3	**Cercopithecidae**	*Pygathrix nemaeus* (Linnaeus, 1771)	Red-Shanked Douc Langur	
4	**Cercopithecidae**	*Macaca mulatta* (Zimmermann, 1780)	Rhesus Macaque	
5	**Craseonycteridae**	*Craseonycteris thonglongyai* Hill, 1974	Kitti's hog-nosed bat	
6	**Hystricidae**	*Atherurus macrourus* (Linnaeus, 1758)	Asiatic Brush-Tailed Porcupine	
7	**Leporidae**	*Lepus peguensis* Blyth, 1855	Siamese Hare / Burmese Hare	
8	**Muridae**	*Leopoldamys sabanus* (Thomas, 1887)	Noisy Rat	
9	**Sciuridae**	*Petaurista petaurista* (Pallas, 1766)	Red Giant Flying Squirrel	
10	**Sciuridae**	*Petinomys setosus* (Temminck, 1844)	Temminck's Flying Squirrel	
11	**Sciuridae**	*Hylopetes spadiceus* (Brandt, 1855)	Flying Squirrels	
12	**Sciuridae**	*Ratufa bicolor* (Sparrman, 1778)	Black Giant Squirrel	

Table 3: Diversity of mammals in Dongphouvieng National Protected Area, Savannakhet Province (cont.)

13	**Sciuridae**	*Callosciurus finlaysonii* (Horsfield, 1823)	Finlayson's squirrel	
14	**Sciuridae**	*Callosciurus erythraeus* (Pallas, 1779)	Red-bellied squirrel	
15	**Spalacidae**	*Cannomys badius* (Hodgson, 1841)	Lesser Bamboo Rat	
16	**Tupaiidae**	*Tupaia* ssp. *Raffles,* 1821	Tree shrew	
17	**Tupaiidae**	*Tupaia belangeri* ssp. (Wagner, 1841)	Northern Treeshrew	
18	**Viverridae**	*Viverricula indica* (Geoffroy Saint-Hilaire, 1803)	Small Indian Civet	
19	**Viverridae**	*Paradoxurus hermaphroditus* (Pallas, 1777)	Asian Palm Civet	
20	**Viverridae**	*Melogale personata* I. Saint-Hilaire, 1831	Ferret Badger	

Source: All photos taken by the Authors in March 2024

represented by just one species each.

V. CONCLUSION AND RECOMMENDATIONS

A total of 20 species across 10 mammalian families were recorded. Species richness was highest in the squirrels (Sciuridae), which exhibited the highest species diversity with six species, such as *Petaurista petaurista* (Pallas, 1766), *Petinomys setosus* (Temminck, 1844), *Hylopetes spadiceus* (Brandt, 1855), *Ratufa bicolor* (Sparrman, 1778), *Callosciurus finlaysonii* (Horsfield, 1823), and *Callosciurus erythraeus* (Pallas, 1779). This was followed by monkeys (Cercopithecidae) with three species, such as *Trachypithecus germaini* (A. Milne-Edwards, 1876), *Pygathrix nemaeus* (Linnaeus, 1771), and *Macaca mulatta* (Zimmermann, 1780); civets (Viverridae) with three species, such as *Viverricula indica* (Geoffroy Saint-Hilaire, 1803), *Paradoxurus hermaphroditus* (Pallas, 1777), and *Melogale personata* I. Saint-Hilaire, 1831. Tree shrews

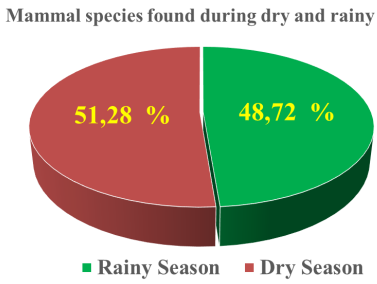


Fig. 2: Percentage of mammalian species by family found in rainy and dry seasons

(Tupaiidae) accounted for two species, such as *Tupaia* ssp Raffles, 1821, and *Tupaia belangeri* ssp (Wagner, 1841). The remaining six families found one species per family, including deer (Cervidae) such as *Muntiacus muntjac* (Zimmermann, 1780); bumblebee bats (Craseonycteridae): *Craseonycteris thonglongyai* Hill, 1974; porcupines (Hystricidae): *Atherurus macrourus* (Linnaeus, 1758); wild rabbits (Leporidae): *Lepus peguensis* Blyth, 1855; rats and mice (Muridae): *Leopoldamys sabanus* (Thomas, 1887); and bamboo rats (Spalacidae): *Cannomys badius* (Hodgson, 1841).

The mammalian species found were higher during the dry season (51.28%) than in the rainy season (48.72%). Among the identified families, squirrels (Sciuridae) exhibited the highest species diversity, with six species. This was followed by monkeys (Cercopithecidae) and civets (Viverridae), each with three species; tree shrews (Tupaiidae) accounted for two species. The remaining six families, such as deer (Cervidae), bumblebee bats (Craseonycteridae), porcupines (Hystricidae), wild rabbits (Leporidae), rats and mice (Muridae), and bamboo rats (Spalacidae), each had only one species per family. Overall, the results indicate a low species diversity index in both the dry and rainy seasons, suggesting limited biodiversity in the study area.

Conservation assessments revealed two species Critically Endangered (CR) taxa on the IUCN Red List, while the remaining eighteen species are currently classified as Least Concern (LC). Under CITES, one species is listed in Appendix I, two species in Appendix II, and one species in Appendix III; while sixteen species have yet to be evaluated. National legislation places three species in Lao Category I (prohibited), three species in Lao Category II (Regulated), and ten species in Lao Category III (general management), with three species still lacking national assessment.

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