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REMARKABLE RECORDS OF MAMMALS AND CONSERVATION STATUS OF *Sundasciurus hippurus* AND *Macaca fascicularis* FROM U MINH HA NATIONAL PARK, SOUTHERN VIETNAM

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Abstract. U Minh Ha is one of the most prominent national parks in southern Vietnam; however, its mammalian fauna remains poorly studied. To address this gap, we conducted a field survey using camera traps and direct transect observations between June and July 2024. The survey yielded photographic records of eight confirmed species (*Tupaia belangeri*, *Macaca fascicularis*, *Rattus tanezumi*, *Sundasciurus hippurus*, *Prionailurus bengalensis*, *Lutra sumatrana*, *Paradoxurus hermaphroditus*, and *Sus scrofa*) representing eight genera, eight families, and five orders. Among these, *M. fascicularis* and *L. sumatrana* are listed as Endangered, and *S. hippurus* as Near Threatened on the IUCN Red List. Notably, *M. fascicularis* and *S. hippurus* were frequently recorded throughout the park, while *L. sumatrana* was documented only twice. Other mammalian taxa, such as bats, were also observed but excluded from the present study pending further taxonomic and conservation assessment. This study provides valuable records supported by verified photographs for all eight documented mammal species, offering robust confirmation of their presence in U Minh Ha National Park. Overall, our findings underscore the park's importance as a potential hotspot for future research on mammalian diversity and broader biodiversity, with particular relevance to ecological patterns, species distribution, and conservation efforts in Vietnam and the wider Southeast Asian region.

Keywords: biodiversity, conservation, distribution, ecology, mammals.

1. Introduction

U Minh Ha National Park, located in southern Vietnam, harbors one of the few remaining extensive lowland peat-swamp forest systems in the Mekong Delta. These wetlands consist of seasonally inundated melaleuca woodlands (*Melaleuca cajuputi*), deep organic peat layers, and a mosaic of grasslands and forest islands, creating a structurally and hydrologically complex environment [1]. Such ecosystems provide a variety of habitats, from permanently wet peat pockets and floating mats to elevated dry tree islands, supporting a diverse and potentially unique assemblage of mammalian species.

Despite being an ideal habitat for a highly diverse fauna, research on the mammals of U Minh Ha National Park remains particularly limited. The park's challenging hydrology, remote terrain, and seasonal accessibility constraints have hindered systematic inventories, leaving much of its mammalian biodiversity undocumented [2]. Given the structural heterogeneity of the peat-swamp ecosystem, the area holds strong potential for the discovery of poorly known or locally endemic species, especially among small carnivores, rodents, and wetland-adapted taxa [3]. Furthermore, recent systematic surveys have increasingly demonstrated that such peat-swamp forests, long overlooked in Southeast Asian mammal research, can serve as biodiversity hotspots not only for wetland-adapted inhabitants but also for forest-edge and other mammalian species.

It is evident that U Minh Ha's complex wetland ecosystem, combined with the scarcity of previous surveys, makes the park a high-priority site for contemporary studies on mammal ecology, species distribution, and conservation. Although several previous publications contained records of mammals from U Minh Ha National Park, almost all of those publications did not include any verified photos of the listed species [4]-[7]. In fact, publications and other official literature containing verified photographs are important for field identification, education, and related purposes. To partially address the existing gap regarding the park's mammal fauna, the present study employed camera trapping and transect surveys conducted between June and July 2024, with the aims of generating baseline data on mammal diversity and highlighting the park's significance for future biodiversity research and conservation initiatives in Vietnam and the broader Southeast Asian region.

2. Content

2.1. Materials and methods

Fieldwork was carried out between June and July 2024, covering both the forest core and the buffer zones. Two complementary survey approaches were employed: (1) passive camera trapping to document medium- and large-sized terrestrial mammals, and (2) diurnal and nocturnal transect observations to detect arboreal and small-sized terrestrial species.

A total of 17 infrared camera traps (Bushnell Trophy Cam HD and Browning Strike Force models) were deployed at selected locations representing major habitat types, including melaleuca forest, peat-grassland edges, canal banks, and mixed-vegetation mosaics (Figures 1, 2). Cameras were mounted 30–50 cm above ground for taking photos from different directions of nine sites and operated continuously for 24 hours per day, with an interval of 1–2 minutes between trigger events, following established field protocols [8], [9]. Each station remained active for 15 days. A major aim of this study

was to confirm the current occurrence of mammal species of conservation concern within the park and to establish an essential baseline database for future research and conservation efforts. Accordingly, all camera traps were deployed within the park's strict protected zone to maximize the likelihood of obtaining target species photographs and relevant scientific data.

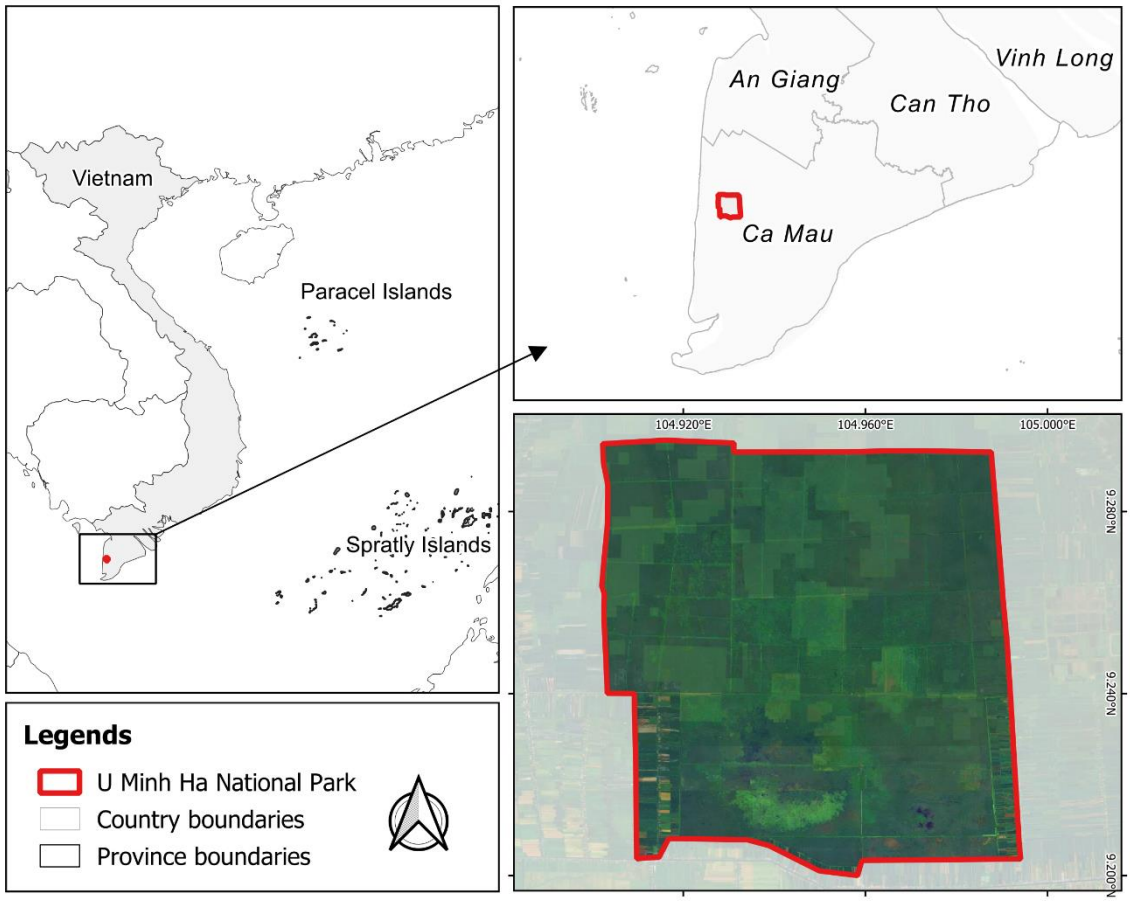

Figure 1. Location of U Minh Ha National Park in southern Vietnam

GPS coordinates, habitat type, and environmental characteristics were recorded for each station. Photographs were examined manually, and mammal species were identified based on morphology following Dang et al. (2007) [10], Francis (2019) [11] and Wilson et al. (2017) [3]. Duplicate photographs within a 30-minute interval were treated as a single independent event [9]. Species conservation status was determined according to the IUCN Red List of Threatened Species [12] and the Red Data Book of Vietnam [13].

Complementary line-transect surveys were conducted along existing forest trails and canal embankments. Each transect was 5.1–8.0 km in length and surveyed both during daylight (06:00–10:00) and at night (18:00–22:00) using headlamps and binoculars. Observers recorded all direct sightings of target mammalian species. Whenever possible, individuals were photographed using two Canon EOS 80D digital cameras equipped with 70–300 mm zoom lenses to aid in species confirmation.

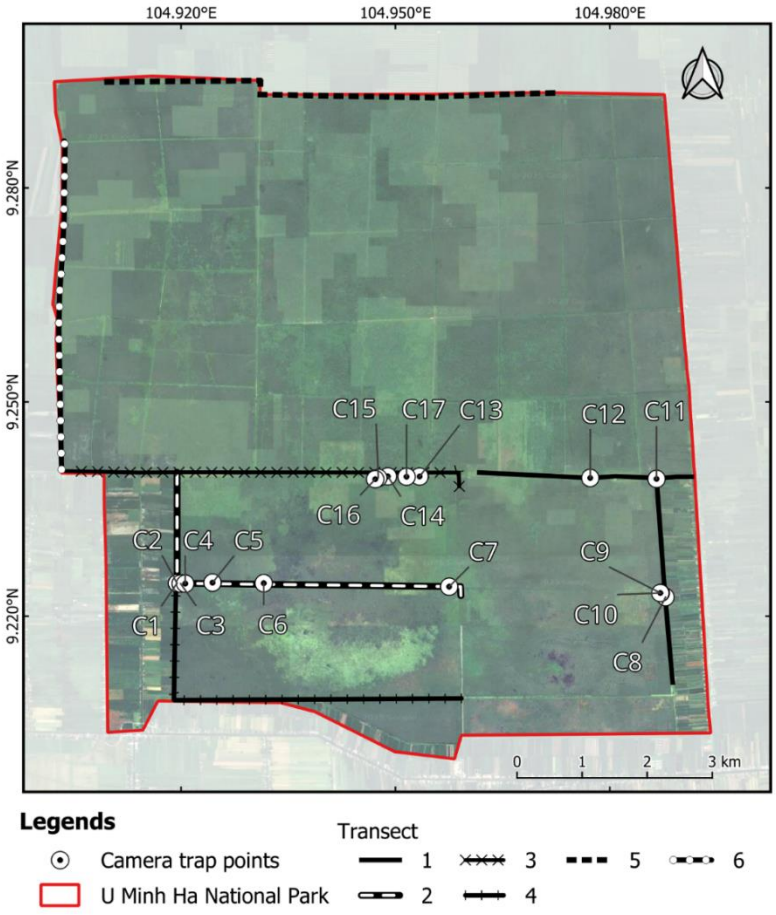

Figure 2. Spatial distribution of transects and camera-trap stations for the mammal survey in U Minh Ha National Park during the present study

2.2. Results and discussion

2.2.1. Recorded mammal species

A total of eight confirmed species (*Tupaia belangeri*, *Macaca fascicularis, Rattus tanezumi*, *Sundasciurus hippurus*, *Prionailurus bengalensis*, *Lutra sumatrana*, *Paradoxurus hermaphroditus*, and *Sus scrofa*) representing eight genera, eight families, and five orders of mammals were recorded during the survey. These species can be reliably distinguished from other species of the respective genus based on their morphological diagnoses. The northern treeshrew (*T. belangeri*) is a small, squirrel-like species characterized by an elongated snout, slender body, and grizzled brownish dorsal fur with a lighter ventral surface (Figure 3). The long-tailed macaque (*M. fascicularis*) is a medium-sized primate with a long, slender tail exceeding the body length, grayish-brown dorsal pelage, pale underparts, and distinct facial whiskers (Figure 4). The Oriental house rat (*R. tanezumi*) is a typical medium-sized species within the genus *Rattus*, characterized by short, sleek, and coarse pelage consisting of pale brown and black-tipped hairs. The dorsum typically exhibits various shades of brown and black, whereas the venter is generally grayish-white, with individual hairs possessing gray bases and buffy-white tips.

The ventral pelage is not sharply demarcated from the dorsal pelage. The feet display a dark grayish-brown dorsal stripe, and the ears are dark and mostly hairless (Figure 4). The horse-tailed squirrel (*S. hippurus*) is identifiable by its robust body, reddish-brown dorsal coloration, creamy ventral pelage, and a long, bushy tail with a distinct black tip (Figure 5). The mainland leopard cat (*P. bengalensis*) is a small wild felid characterized by a slender, elongated body, short legs, a rounded head with prominent whiskers, grayish to yellowish-brown fur marked with distinct dark spots and stripes on the head and body, and a relatively short, ringed tail (Figure 6). The hairy-nosed otter (*L. sumatrana*) is characterized by dark brown dorsal pelage and a paler underside, with the upper lip, sides of the face, chin, and throat appearing white. The tail is distinctly long and rounded in shape (Figure 7). The common palm civet (*P. hermaphroditus*) exhibits a long, slender body, coarse grayish- to brown-coloured fur marked with darker streaks along the back, and a blackish face mask with white markings on the muzzle (Figure 8). The wild boar (*S. scrofa*) is a large-bodied mammal characterized by a robust build, coarse bristly hair ranging from grayish to dark brown, an elongated snout adapted for rooting, small eyes, prominent tusks in males, and a relatively short tail ending in a tuft of hair (Figure 9). These morphological traits were consistent with previously published descriptions and thus facilitated reliable field identification of the species. Among the five confirmed species above, *S. hippurus* and *M. fascicularis* were commonly detected across the park.

Figure 3. The northern treeshrew was recorded at different transects and survey stations

Figure 4. The long-tailed macaque (left) and the Oriental house rat (right)

Figure 5. The horse-tailed squirrel was commonly recorded during the survey

Figure 6. A mainland leopard cat was recorded during the survey

Figure 7. Hairy-nosed otters recorded by camera traps at two sites within U Minh Ha National Park (photos adapted from video footage)

Figure 8. The common palm civet was recorded at one survey station

Figure 9. Wild boar were commonly recorded during the survey

2.2.2. Remark on current diversity and conservation status

Before the present study, at least four publications had reported mammal species from U Minh Ha National Park, including six species: *Herpestes javanicus*, *Paradoxurus hermaphroditus*, *Viverricula indica*, *Prionailurus bengalensis*, *Lutra sumatrana*, and *Aonyx cinereus* [4], [7]. Although these studies employed integrated methods, including camera trapping, direct observation, and local interviews, only a single photograph of the hairy-nosed otter (*L. sumatrana*) was presented by Willcox et al. (2017) [6]. Remarkably, the authors indicated that this species was recorded solely based on observational data. The remaining species were listed without photographic evidence or morphometric measurements necessary for reliable identification. During the present survey, two individuals of the hairy-nosed otter were recorded, both displaying a long, slender tail with a rounded cross-section, a key morphological characteristic of *L. sumatrana*.

Among the eight confirmed species recorded during the survey, five species (*T. belangeri*, *R. tanezumi*, *P. bengalensis, P. hermaphroditus*, and *S. scrofa*) are listed as Least Concern, whereas *M. fascicularis* and *L. sumatrana* are listed as Endangered, and *S. hippurus* is listed as Near Threatened on the IUCN Red List [12]. The five Least Concern species were commonly recorded at multiple transects and stations throughout the park. The long-tailed macaque (*M. fascicularis*) has a broad native distribution in southern Vietnam and is listed as Vulnerable in the 2024 Red Data Book of Vietnam [13]. Recent national data indicate that macaques have been kept as pets in large numbers: one study documented at least 158 *M. fascicularis* out of 1,254 macaques in the pet trade over the period 2015–2019, with at least 423 individuals confiscated or released [14]. Although the species occurs in many protected areas, its wild population size remains uncertain and likely declining due to habitat loss, hunting, and capture for trade [15]. The present survey recorded more than ten colonies, each with over 20 individuals in the core zone of U Minh Ha National Park, suggesting that the park represents a key conservation hotspot of this species in Vietnam.

The horse-tailed squirrel (*S. hippurus*) is globally assessed as Near Threatened due to habitat loss and a restricted range [12]. Although historical records in Vietnam are limited, the present study recorded more than 20 individuals across multiple sites within the park's core zone, providing photographic evidence of their occurrence. Given the species' rarity and the scarcity of data from Vietnam, these observations highlight the conservation importance of U Minh Ha as a potential stronghold for *S. hippurus*.

The hairy-nosed otter (*L. sumatrana*) is globally listed as Endangered due to rapid population declines, habitat loss and degradation, illegal hunting, and human–otter conflict [12]. In Vietnam, the species is listed as Critically Endangered in the 2024 Red Data Book [13]. Historically hunted for food and traded as ornamental animals, hairy-nosed otters now face fragmented and degraded habitats caused by agricultural expansion, aquaculture, and forestry exploitation [13]. In this study, a pair of individuals was recorded in U Minh Ha National Park by camera traps. Previously, Willcox et al. (2017) observed a pair in U Minh Ha in 2008, although no photographic evidence was obtained [6]. These limited observations, along with the lack of recent verified photographic records, underscore the species' rarity and low local population density, consistent with its general status in Vietnam [13].

Prionailurus bengalensis is also considered a valuable species, as it is listed as Vulnerable in the 2024 Red Data Book of Vietnam [13], while globally it is assessed as Least Concern due to its wide distribution across South and Southeast Asia and adaptability to various habitats, including disturbed forests and plantations [12]. In Vietnam, the species faces threats such as habitat loss, persecution, capture for the pet trade, and misidentification with domestic cat hybrids [13]. A single individual was recorded in U Minh Ha National Park, highlighting its continued but uncommon presence in the lowland peat-swamp ecosystem. The observation of only one individual suggests either a very low population density, a recent population decline, or the need for further systematic surveys to clarify its status in this habitat.

3. Conclusions

Among the eight confirmed mammal species from U Minh Ha National Park, the present study provides the first photographic documentation for seven species (*Tupaia belangeri*, *Macaca fascicularis*, *Rattus tanezumi*, *Sundasciurus hippurus*, *Prionailurus bengalensis*, *Paradoxurus hermaphroditus*, and *Sus scrofa*), as *Lutra sumatrana* had already been documented with a photograph in a previous publication. The widespread occurrence of more than 10 colonies of *M. fascicularis* and *S. hippurus*, each with over 20 individuals, represents one of the most substantial population densities recorded for these species in southern Vietnam. The single observation of *P. bengalensis* and a pair of *L. sumatrana* highlight both the rarity of these species in the park. These results underscore the importance of U Minh Ha's unique lowland peat-swamp ecosystem as a key refuge for both common and rare mammal species. The survey not only fills critical baseline data gaps for Vietnamese mammals but also provides scientifically verified records that can guide conservation planning and long-term monitoring efforts. Consequently, U Minh Ha National Park emerges as a priority site for mammal research and conservation at both national and international scales, offering opportunities to better understand species ecology, population dynamics, and habitat requirements within a globally significant wetland landscape.

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