Population status of the François' langur (*Trachypithecus francoisi*) in two karst protected areas in Northern Vietnam

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Hiện trạng quần thể loài Voọc đen má trắng (*Trachypithecus francoisi*) tại hai khu bảo tồn núi đá vôi ở miền Bắc Việt Nam

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ABSTRACT

The François' langur (Trachypithecus francoisi) is an Endangered limestone-dependent primate with a highly fragmented distribution in Northern Vietnam. Updated information on its population status remains limited, hindering effective conservation planning. This study aimed to reassess the status of the species in Than Sa – Phuong Hoang Nature Reserve (NR), Thai Nguyen province and to verify its persistence in Huu Lien NR, Lang Son province. The authors surveyed eight transects in Than Sa – Phuong Hoang NR in 2022 and 11 transects in Huu Lien NR during three survey periods in 2022 and 2024. Interview data suggested the possible presence of two small groups (5–7 individuals/group) in Than Sa – Phuong Hoang NR and one group of 3–5 individuals in Huu Lien NR. However, no direct evidence was recorded in Than Sa – Phuong Hoang NR, while one solitary individual was directly observed in Huu Lien NR. These findings suggest that, if still present, populations in both sites are extremely small and likely fragmented. The absence of recent confirmed records in Than Sa – Phuong Hoang NR further indicates that the population may be close to local extinction. Our results also revealed ongoing threats, particularly illegal logging and hunting, which pose significant risks to any remaining populations. Immediate conservation actions are urgently needed to prevent local extinction and support the long-term survival of the species in Vietnam.

Từ khóa:
Hữu Liên, Khu bảo tồn thiên nhiên, linh trưởng, núi đá vôi, Thần Sa – Phượng Hoàng.

TÓM TẮT

Voọc đen má trắng (Trachypithecus francoisi) là loài linh trưởng nguy cấp, phụ thuộc vào sinh cảnh núi đá vôi, với vùng phân bố bị chia cắt mạnh ở miền Bắc Việt Nam. Tuy nhiên, thông tin cập nhật về hiện trạng quần thể của loài vẫn còn hạn chế, gây khó khăn cho việc xây dựng các chiến lược bảo tồn hiệu quả. Nghiên cứu này nhằm đánh giá hiện trạng quần thể của loài tại Khu bảo tồn thiên nhiên Thần Sa – Phượng Hoàng và xác nhận sự tồn tại của loài tại Khu bảo tồn thiên nhiên Hữu Liên. Nhóm tác giả đã khảo sát tám tuyến điều tra tại Khu bảo tồn thiên nhiên Thần Sa – Phượng Hoàng (năm 2022) và 11 tuyến tại Khu bảo tồn thiên nhiên Hữu Liên trong ba đợt khảo sát vào các năm 2022 và 2024. Dữ liệu phỏng vấn cho thấy khả năng tồn tại của hai đàn nhỏ (5–7 cá thể/đàn) tại Khu bảo tồn Thần Sa – Phượng Hoàng và một đàn gồm 3–5 cá thể tại Khu bảo tồn Hữu Liên. Tuy nhiên, không ghi nhận được bằng chứng trực tiếp nào tại Thần Sa – Phượng Hoàng, trong khi một cá thể đơn lẻ đã được quan sát trực tiếp tại Hữu Liên. Những kết quả này cho thấy, nếu còn tồn tại, các quần thể tại cả hai khu vực đều có quy mô rất nhỏ và bị phân mảnh. Việc thiếu các ghi nhận trực tiếp gần đây tại Thần Sa – Phượng Hoàng cho thấy quần thể tại đây có thể gần bị tuyệt chủng cục bộ. Nghiên cứu cũng ghi nhận các mối đe dọa đang diễn ra, đặc biệt là khai thác gỗ trái phép và săn bắt, gây rủi ro nghiêm trọng đối với các quần thể còn sót lại. Các hành động bảo tồn khẩn cấp là cần thiết nhằm ngăn chặn nguy cơ tuyệt chủng cục bộ và đảm bảo sự tồn tại lâu dài của loài tại Việt Nam.

1. INTRODUCTION

The François' langur (*Trachypithecus francoisi*) is a limestone-dependent, folivorous primate belonging to the family Cercopithecidae, and is restricted to Southern China and Northern Vietnam [1, 2]. In Vietnam, the species was historically distributed across much of the northeastern region, but its current range has been reduced to a few isolated karst areas in Cao Bang, Tuyen Quang, and Thai Nguyen provinces [1]. The species is currently listed as Endangered (EN) on the IUCN Red List of Threatened Species [2] and Critically Endangered (CR) in the Vietnam Red Data Book in 2024 [3] primarily due to severe population declines driven by illegal hunting and habitat loss.

Despite its conservation importance, the population status of François' langur in Vietnam remains poorly understood, with the most recent comprehensive assessments dating back more than a decade [1]. This lack of updated information poses a major challenge for developing effective conservation strategies, particularly given the species' highly fragmented distribution and the increasing pressures on karst ecosystems.

Than Sa – Phuong Hoang Nature Reserve (NR) in Thai Nguyen province was established to protect limestone forest ecosystems, which represent key habitat for the species. The most recent confirmed records of François' langur in this reserve date to 2012, when at least four groups were reported. At that time, the site was considered to support the second largest population of the species in Vietnam and was identified as a priority area for conservation [1]. However, no subsequent population assessments or targeted conservation programs have been conducted in the reserve.

In contrast, the population of François' langur in Lang Son province has previously been considered extirpated [1]. Nevertheless, during fieldwork conducted in early 2021, local reports indicated the possible presence of at least one group, consisting of three to six individuals, within Huu Lien NR. These observations, supported by multiple independent interviews, suggest that a remnant population may still persist in the area. Notably, Huu Lien NR lies approximately 30 km from Than Sa – Phuong Hoang Nature Reserve and is connected by karst forest habitat, potentially forming a natural corridor between the two sites.

Given these uncertainties, updated field surveys are urgently needed to reassess the population status of François' langur in Than Sa – Phuong Hoang NR and to verify its continued existence in Huu Lien NR. This study therefore aims to (1) update the current status of François' langur in Than Sa – Phuong Hoang NR and Huu Lien NR; and (2) assess the main threats to the species and its habitat, and propose conservation recommendations. Specifically, this study aimed to reassess the status of a historically important population in Than Sa – Phuong Hoang NR and to verify the continued existence of François' langur in Huu Lien NR.

2. RESEARCH METHODS

2.1. Study areas

Than Sa – Phuong Hoang NR (21°43′–21°52′ N, 105°53′–106°10′ E) is located in the eastern part of Thai Nguyen province, Northern Vietnam, and covers approximately 18,704.89 ha (Fig. 1). The landscape is characterized by limestone mountains, steep slopes, and highly complex terrain, supporting extensive karst forest ecosystems typical of northeastern Vietnam. Recent biodiversity surveys highlight the high conservation value of the reserve, with 1,234 plant species and 346 vertebrate species recorded, making it an important conservation site in the region [4].

Huu Lien NR (21°37′–21°45′ N, 106°19′–106°26′ E) is located in Lang Son province, Northeastern Vietnam, and covers approximately 8,293.4 ha (Fig. 1). Established in 1986 to conserve limestone biodiversity, the reserve places particular emphasis on protecting the forest musk deer (*Moschus berezovskii*). The terrain is highly rugged, with elevations ranging from 100 to 600 m a.s.l., and is dominated by closed-canopy forest on karst substrates. To date, more than 961 plant species and 402 vertebrate species have been recorded in the reserve [5].

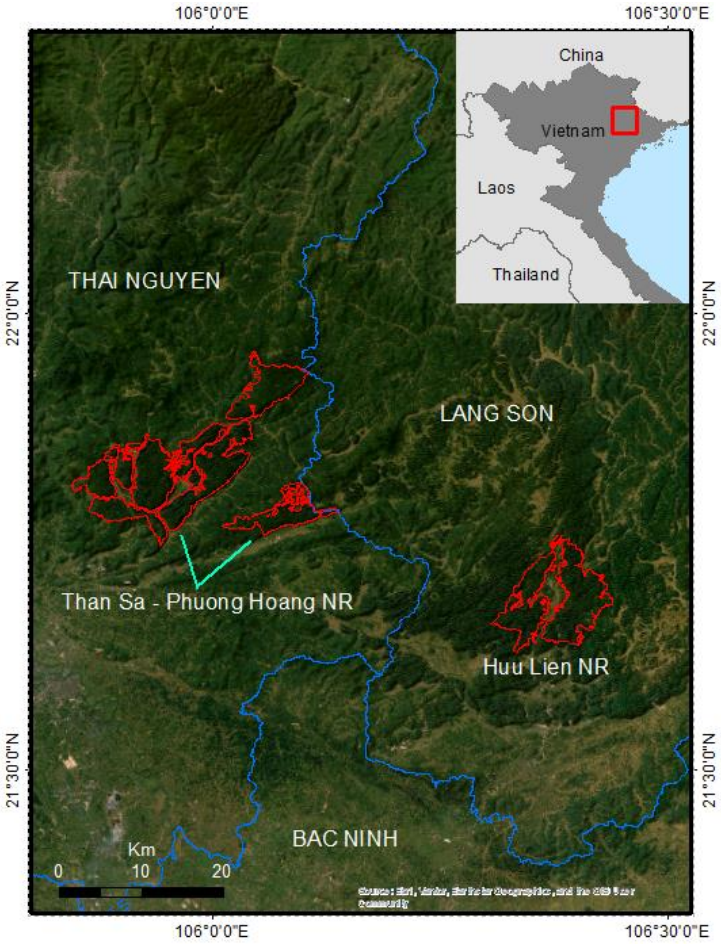


Fig. 1. Location of Than Sa – Phuong Hoang Nature Reserve and Huu Lien Nature Reserve in Northern Vietnam *(created using ArcMap 10.2 with ESRI basemap)*

2.2. Field surveys

Interview surveys

Local people often have an in-depth understanding of species ecology and the major threats facing wildlife. Many previous studies have shown that the use of local knowledge has been applied successfully to obtain data on rare species [6, 7]. Therefore, in the study, we used open questionnaire method to interview local hunters, forest rangers, and nature reserve staff. Interviewees were selected based on their frequent forest activities and long-term familiarity with the study areas. We focused on people who are likely to possess the information on the status, distribution and ecology of our focal species in the reserve. Totally, we interviewed 18 and 16 local people in Than Sa – Phuong Hoang NR, and Huu Lien NR, respectively. The interviewees were asked about the presence, group structure, past and current distribution, location and date of observations as well as main threats to François' langur. Interview information was cross-checked among independent respondents before being used to guide field surveys.

Based on the interview information on the langur groups, our team designed the transects with the length from 500-1500 m that covered forest areas reported to support langur occurrence. Each transect was surveyed repeatedly for 2-3 days with the support from local guides [8]. With the complexity of limestone mountain topography, the systematic surveys using transect-based techniques would not be suitable to survey François' langur. Therefore, survey methods supported by information from local communities were applied successfully in previous studies [8-10] . We surveyed eight transects in Than Sa – Phuong Hoang NR with 18 surveyed days from 16/04/2022 to 09/05/2022 (Fig. 2A). In Huu Lien NR, we conducted surveys along 11 transects over three periods: the first from 17/03/2022 to 04/04/2022 (11 surveyed days); the second

from 31/05/2024 to 01/07/2024 (24 surveyed days), and the third from 01/11/2024 to 20/11/2024 (14 surveyed days, Fig. 2B). Surveys were not conducted during heavy rain or dense fog in order to maximize detectability and ensure surveyor safety. In order to increase the survey coverage and langur detectability, our team split into two survey groups with two members in each group. Surveys were conducted during early morning (05:30–10:00) and late afternoon (15:30–18:00), when langurs are most active. Especially, more survey efforts focus on sleeping sites to increase detection probability of langurs [9]. Once a langur group is found, coordinates of the surveyed posts, compass bearing, and estimated distance to langur groups will be recorded as reference for locating langurs' locations later. We also noted time of record, collected information on group size and age and sex classes in our surveyed forms. The age and sex class can be identified based on fur colour, body size and sexual skin colour at the perineum (white perineum for female, and black one for male; [8]).

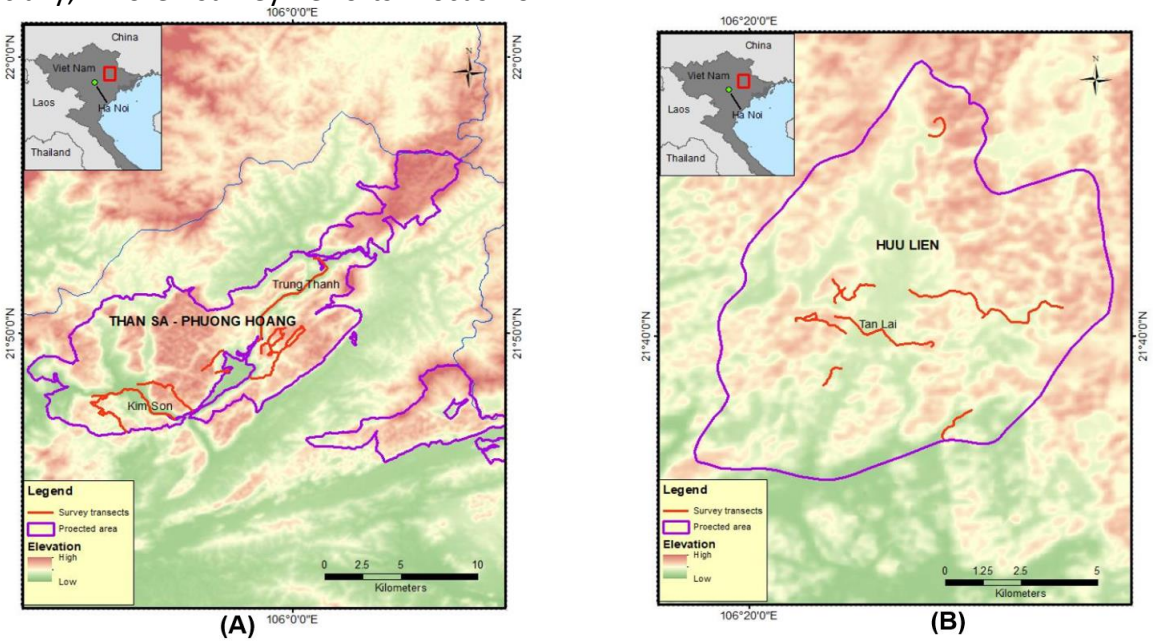


Fig. 2. The surveyed transects in Than Sa – Phuong Hoang NR and Huu Lien NR *(created using ArcMap version 10.2 based on Digital Elevation Model data downloaded from USGS EarthExplorer)*

To locate the langur's sleeping sites, we used both the direct, indirect evidence such as observations of langur, brown deposits of langur excrement below the caves, local reports. Additionally, we also searched the caves on the middle or tops of the cliffs [9]. The coordinate of sleeping sites were recorded and determined on the map.

We collected information of threats and habitat based on direct observation in the field and interview local people such as hunting (traps, snares, guns, camps, hunting dogs), and habitat degradation (logging, non-timber forest product collection, human encroachment, and livestock grazing) to assess major pressure on the langur population and its habitat.

3. RESULTS AND DISCUSSION

3.1. Population status of the François' langur

- ***In Than Sa – Phuong Hoang NR***

Information obtained from interviews with local communities suggested that the François' langur may still occur in Than Sa – Phuong Hoang NR, although likely in extremely small numbers. According to local reports, two possible langur groups were recorded in the reserve. One group of approximately 6–7 individuals was reported from the forest near Trung Thanh village, while another group of 5–6 individuals was reported from the forest near Kim Son village (Table 1).

Local guides also suggested four caves as potential sleeping sites of the langur within the reserve. These sites are located at Bai Da Nguom, Thac Mua Roi, Kim Son forest, and Luc Thanh.

Despite these reports, no direct evidence of the langur, including sightings, vocalizations, or confirmed sleeping sites, was recorded during our field surveys in Than Sa – Phuong Hoang NR.

Table 1. Records of langur from local communities in Than Sa – Phuong Hoang NR

No	Sites	Number of group (individuals)	Evidences	Date of observation
1	Forest in Luc Thanh village	1 (5-6)	Sighting	2010-2011
2	Than Sa protected forest station	(3)	Arresting	2010
3	Forest in Kim Son village	1 (5-6)	Sighting	2011
4	Than Sa protected forest station	(1)	Arresting	2013
5	Forest in Kim Son village	1 (3)	Sighting	2015
6	Forest in Luc Thanh village	1 (6-7)	Sighting	2019
7	Forest in Kim Son village	1 (5-6)	Sighting	2019
8	Forest in Kim Son village	1 (2-4)	Sighting	2019
9	Forest in Kim Son village	1 (3-4)	Sighting	May 2020

- ***In Huu Lien NR***

Our data also indicated that the François' langur may still occur in Huu Lien Nature Reserve, although the population appears to be extremely small. Local people reported the possible presence of a group consisting of approximately 3–5 individuals in the forest area near Tan Lai village (Table 2).

Local guides also identified a potential sleeping site for the langur in forest area of Tan Lai village (Lan Sung). However, despite targeted searches at this location and surrounding areas, no sleeping caves actively used by langurs were detected during the field surveys.

During the surveys, we obtained one direct record of the species. A single individual was observed at Lan Meu at 17:40 on 28 June 2024, representing the only confirmed sighting of the langur during the study period.

Table 2. Records of langur from local communities in Huu Lien NR

No	Sites	Number of group (individuals)	Evidences	Date of observation
1	Forest in Tan Lai village (Lan Sung)	1 (5)	Sighting	2017
2	Forest in Tan Lai village	1 (3)	Sighting	2019
3	Forest in Tan Lai village (Lan Diec)	1 (2)	Sighting	2019
4	Forest in Tan Lai village	1 (3)	Sighting	October 2021
5	Forest in Tan Lai village	1 (1)	Sighting	November 2021
6	Forest in Tan Lai village (Dong Lam)	1 (5)	Sighting	July 2021
7	Forest in Tan Lai village (Lan Sung)	1	Sighting	2021
8	Forest in Tan Lai village	1 (5)	Sighting	2021
9	Forest in Tan Lai village (Lan Ti)	1 (3 + 1 new born)	Sighting	2021
10	Forest in Tan Lai village	1	Sighting	August 2021
11	Forest in Tan Lai village (Lan Ruoi)	(1)	Sighting	May 2021
12	Forest in Tan Lai village (Lan Ti)	1 (2)	Sighting	June 2023
13	Forest in Tan Lai village (Lan Gia)	(1)	Sighting	February 2023
14	Forest in Tan Lai village (Lan Lay)	1 (3)	Sighting	February 2024

The study provides the first updated field assessment of François' langur populations in these two karst protected areas after more than a decade, highlighting evidence of severe population decline and possible near-local extinction in Than Sa – Phuong Hoang NR and the persistence of a remnant population in Huu Lien NR. Our results suggest that the François' langur may still persist in both Than Sa – Phuong Hoang NR and Huu Lien NR, but at extremely low population sizes. While local interviews consistently indicated the presence of small groups, direct field evidence was absent or limited to a single observation, likely reflecting low population density and the cryptic behavior of the species in complex karst habitats. Historically, Than Sa – Phuong Hoang NR was considered one of the most important sites for the species in Vietnam, supporting the second largest population nationwide [1], with at least four groups recorded in 2012. The absence of any direct evidence during our surveys therefore suggests that this population may be close to local extinction. Populations in Lang Son province, including Huu Lien NR, were previously considered extirpated [1]. During surveys in Huu Lien NR, one individual of François' langur was directly observed at Lan Meu. The individual was observed on a limestone cliff within closed-canopy karst forest before moving into dense vegetation. Although only a single individual was recorded,

this observation provides important direct evidence supporting the continued persistence of the species in Huu Lien NR. The limited evidence obtained in this study may therefore indicate the persistence of a remnant population, although at critically low numbers. However, detecting François' langur in rugged karst landscapes remains challenging due to survey accessibility bias and the cryptic behavior of the species, which may reduce detection probability during field surveys [11]. Therefore, further long-term surveys are required for confirmation.

Recent assessments indicate that the global population of François' langur exceeds 2,000 mature individuals, while populations in Vietnam are highly fragmented, with fewer than 200 adults in total. A relatively large population of at least 156 individuals in 16 groups has been documented in Lam Binh District, representing one of the most important remaining strongholds of the species [12]. Compared to this population, the langurs in Than Sa – Phuong Hoang and Huu Lien likely represent small, isolated, and potentially non-viable remnant populations. Similar patterns have been reported in other karst areas such as Ba Be National Park, Vietnam [9], Guangxi province, China [10], Mayanghe National Nature Reserve, China [13]. This consistency suggests a broader regional trend of decline across the species' range. Than Sa – Phuong Hoang NR and Huu Lien NR are connected by limestone forest landscapes, which may potentially function as habitat corridors for the species. However, increasing habitat degradation, illegal logging, and hunting activities may reduce landscape connectivity and further isolate remnant populations. Without immediate conservation actions, including strengthened law enforcement, systematic monitoring, and community-based conservation, the long-term viability of these populations is likely to remain very low.

3.2. Threats to the François' langur and conservation implications

Field surveys conducted in both Than Sa – Phuong Hoang NR and Huu Lien NR revealed that the François' langur and its habitat are under considerable anthropogenic pressure. The most significant threats identified were illegal logging and hunting, both of which were widely detected during fieldwork. In Than Sa – Phuong Hoang NR, at least 13 illegal logging sites were recorded along survey routes. The targeted tree species were typically large and economically valuable, particularly *Burretiodendron hsienmu* (Nghiến). In addition, frequent explosive sounds were heard, associated with the extraction of roots of *Cupressus tonkinensis* (Hoàng đàn hữu liên). Chainsaw activity was also commonly detected in both protected areas, indicating ongoing forest exploitation. Although no direct evidence of langur hunting was recorded during the surveys, indirect evidence suggests that hunting pressure remains high. During fieldwork, four gunshots were also heard within forest areas, further indicating the persistence of hunting activities. Notably, signs of illegal logging and hunting were most frequently detected in remote and rugged areas, which are difficult to access but provide high-quality habitat for langurs. Other human activities, including shifting cultivation, collection of non-timber forest products, and livestock grazing, were also observed. However, these activities were mainly concentrated in buffer zones and are likely to have a more localized impact compared to logging and hunting. Although our threat assessment was primarily based on field observations and local interviews, future studies should apply standardized quantitative approaches, such as camera trapping and systematic threat monitoring, to assess threat intensity and spatial patterns more rigorously.

Given the extremely small population size recorded in both protected areas, these threats pose a critical risk to the persistence of the species. Immediate and targeted conservation actions are therefore required. Firstly, long-term and systematic field surveys are essential to confirm the continued presence of langurs and to obtain more reliable estimates of population size and distribution. Surveys should be conducted across multiple seasons to increase detection probability and should prioritize areas where langurs have been previously reported, such as Kim Son and Trung Thanh villages in Than Sa – Phuong Hoang NR, and the Lan Sung and Lan Meu area in Huu Lien NR. Secondly, strengthening law enforcement capacity is crucial. The current level of forest

protection appears insufficient, partly due to the limited number of rangers and patrol efforts. Enhancing both the number and capacity of rangers, including training in species identification, monitoring techniques, and the use of equipment such as GPS and camera traps, would significantly improve conservation effectiveness. Finally, community engagement and awareness-raising should be prioritized as a key component of conservation strategy. Strengthening collaboration between protected area management and local communities can help reduce illegal activities and promote sustainable resource use. Education and outreach programmes, particularly targeting villages in buffer zones and local schools, could play an important role in fostering long-term support for langur conservation. Materials such as posters, educational campaigns, and interactive activities may help increase awareness of biodiversity conservation laws and the ecological importance of the species.

4. CONCLUSION

This study provides updated evidence on the status of the François' langur (*T. francoisi*) in two karst protected areas in northern Vietnam. Our findings suggest that François' langur populations in Than Sa – Phuong Hoang NR and Huu Lien NR are extremely small and fragmented. Although no direct evidence was recorded in Than Sa – Phuong Hoang NR during field surveys, interview data still suggested the possible persistence of small groups, indicating that the population status requires further confirmation through long-term monitoring. Ongoing threats, particularly illegal hunting and habitat degradation, continue to pose significant challenges to the persistence of the species. Immediate conservation actions, including systematic monitoring, strengthened law enforcement, and enhanced community engagement, are urgently required to prevent further population declines and support the long-term survival of this endangered primate in Vietnam.

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