

Rapid population increase of the Critically Endangered Delacour's langur (*Trachypithecus delacouri*) in Van Long Nature Reserve due to strict protection

Nguyen Van Linh¹, Mai Van Quyen¹ and Tilo Nadler²

¹ Van Long Nature Reserve, Ninh Binh Province, Vietnam

² Wildlife Consultant, Forest Protection Department Ninh Binh Province, Vietnam
Corresponding author: Tilo Nadler <t.nadler@hust.edu.vn>

Key words: Delacour's langur, *Trachypithecus delacouri*, Van Long Nature Reserve

Summary

Van Long Nature Reserve is the sole area with a viable population of the Critically Endangered Delacour's langur (*Trachypithecus delacouri*), which is endemic to Vietnam. A small population was discovered in this area in 1993, and in 2001 the area received protection status as a nature reserve. A Community Protection Unit (CPU) was established in cooperation with Frankfurt Zoological Society to support the protection and the work of the Management Board of the nature reserve. The unit comprised 30 local people and due to its intense protection activities poaching inside the reserve has been eliminated. As a result, the population of the Delacour's langurs which originally comprised about 50 individuals increased rapidly. Repeated surveys document the development of the population over time. In the first half of 2018 a comprehensive survey counted 176 to 184 individuals in 21 groups inside the Nature Reserve, and 31 to 38 individuals in 4 groups in the area adjacent to the reserve. That means over the last 18 years the population has nearly quadruplicated.

Despite good protection of the area further measures are recommended to safeguard the habitat for the expanding population. A part of the habitat is badly affected by limestone quarrying in a neighbouring area through blasting and strepitous transport activities, and by dust formation and smoke from burning car tires to produce road cover material.

About 2000 ha of the Nature Reserve are suitable habitat for the langurs, but 30% of it is in poor condition. These degraded areas should be restored and reforested with a mixture of food tree species for the langurs.

With its successful protection, the excellent community involvement and the continuous growth of the Delacour's langur population, Van Long Nature Reserve hopes to be the first protected area in Vietnam to be included in the newly established IUCN Green List.

Bảo vệ nghiêm ngặt và sự tăng trưởng nhanh chóng của quần thể loài Voọc Mông trắng (*Trachypithecus delacouri*), loài linh trưởng cực kỳ nguy cấp tại khu bảo tồn thiên nhiên Vân Long, Ninh Bình, Việt Nam

Tóm tắt

Khu bảo tồn thiên nhiên Vân Long, nơi duy nhất quần thể Voọc Mông trắng có thể phát triển độc lập, lâu dài. Từ năm 1993 một quần thể nhỏ Voọc Mông trắng được phát hiện ở đây, đến năm 2001 quần thể này được bảo vệ trong lòng khu bảo tồn thiên nhiên Vân Long. Một chương trình bảo tồn loài dựa vào cộng đồng đã được thực thi tại Vân Long. Một nhóm 30 bảo vệ rừng từ cộng đồng đã được thiết lập với sự hỗ trợ của Hội động vật học Frankfurt nhằm triển khai hoạt động tuần rừng và hỗ trợ ban quản lý khu bảo tồn. Hoạt động bảo vệ nghiêm ngặt vùng lõi đã loại bỏ việc săn bắn trộm. Kết quả là từ một quần thể ban đầu khoảng 50 cá thể, số lượng Voọc mông trắng đã tăng nhanh. Kết quả điều tra quần thể trong nửa đầu năm 2018 cho thấy có khoảng 176-184 cá thể thuộc 21 đàn đã được đếm trong vùng lõi của khu bảo tồn. Và có khoảng 31-38 cá thể thuộc 4 đàn được ghi nhận trong vùng rìa của khu bảo tồn. Như vậy, sau 18 năm được bảo vệ số lượng cá thể Voọc mông trắng đã tăng gấp 4

lân. Mặc dù hoạt động bảo vệ được thực hiện tốt đối với quần thể, vẫn cần những nỗ lực bảo vệ an toàn môi trường sống của loài. Hiện tại, hoạt động khai thác đá vôi phục vụ nhà máy xi măng lân cận đã ảnh hưởng đến môi trường sống của loài do đánh mìn, bụi và khói. Có khoảng 2000 héc ta của khu bảo tồn là sinh cảnh sống phù hợp của loài, nhưng khoảng 30% số diện tích này có điều kiện đất và rừng nghèo kiệt. Khu vực này cần được phục hồi sinh thái và trồng bổ sung các loài cây làm thức ăn cho Vọc mòng trắng. Với những thành công trong hoạt động bảo tồn loài và sự tham gia của cộng đồng, khu bảo tồn thiên nhiên Van Long dự kiến là khu bảo tồn đầu tiên của Việt nam được đưa vào danh sách Xanh của tổ chức Liên minh các tổ chức bảo tồn thế giới (IUCN).

Introduction

The Delacour's langur (*Trachypithecus delacouri*) is a Critically Endangered primate species endemic to Vietnam (IUCN Red List of Threatened Species). The species is listed under the World's 25 Most Endangered Primates (Schwitzer et al. 2015), and is included in the Red Data Book of Vietnam (Ministry of Science and Technology & Vietnamese Academy of Science and Technology 2007), resulting in the highest protection status in this country.

The species occurs in a very restricted area of north-central Vietnam covering about 5000 km². In this area, there are 10 isolated sub populations of Delacour's langurs occupying less than 400 km². The population at Van Long is the largest and only viable subpopulation of this species (Nadler 2015).

The Van Long subpopulation was discovered in 1993 during surveys conducted by Frankfurt Zoological Society (FZS) with the aim to provide an overview of the situation for the species. By 2000, the population in Van Long consisted of about 50 individuals (Baker 1999; Nadler 1996), and an increase in the population was recognized during several later surveys (Nadler 2004; 2015; Nadler et al. 2003).

Van Long was established as nature reserve in 2001. Since that time, Frankfurt Zoological Society has provided support for the management of the reserve and the establishment of a Community Protection Unit (CPU) which supports the protection activities of the rangers of the nature reserve. FZS assisted in the recruiting and training of the 30 members of the CPU, equipped them with uniforms and materials for fieldwork and protection activities, and paid their salaries (Fig. 1).



Fig.1. Members of the Community Protection Unit (CPU) at Van Long Nature Reserve. Photo: T. Nadler.

In close cooperation with the surrounding communes, the human impact to the reserve was drastically reduced and primate poaching was completely eliminated. Following these intensive protection activities the population of the Delacour's langurs increased rapidly.

In addition to allow the recovery of the langurs, the reserve has become an eco-tourism site where local people have established eco-tourism by taking visitors around the reserve on bamboo boats. This provides additional income and financial security to formerly very poor local communities.

In 2011 and 2012, the first reintroduction of captive bred Delacour's langurs from the Endangered Primate Rescue Center was carried out to increase the wild population both in number and in genetic diversity (Agmen, 2014; Elser 2014; Elser et al. 2013; Nadler 2012).

In accordance with the 'Urgent Conservation Action Plan for Primates in Vietnam to 2025, Vision to 2030' (Prime Minister of Government 2017) a comprehensive survey was carried out from April to July 2018 in order to assess the development and status of the population.

Objective of the survey

The survey aimed to identify the population status, distribution, and home ranges of Delacour's langur groups at Van Long Nature Reserve. This information will serve as a foundation for estimating the carrying capacity of the nature reserve, which will be used in a government assessment for a possible habitat extension.

General characteristic of the survey area

Van Long Nature Reserve was established under the Decision 2888/QĐ-UB on 18th December 2001 through the Provincial People's Committee of Ninh Binh.

Location of Van Long Nature Reserve

The reserve is located in the North of Ninh Binh Province. In the North Van Long borders Hoa Binh Province, the southern border is formed by a dam running from Xich Tho Commune in the West to Gia Thanh Commune in the East. The eastern border is the Dong Quyen Mountain, and the western border runs along Mot Mountain and Boi River. The area stretches north-south from 20°20'55" to 20°25'45" and west-east from 105°48'20" to 105°54'30" (Fig. 2).

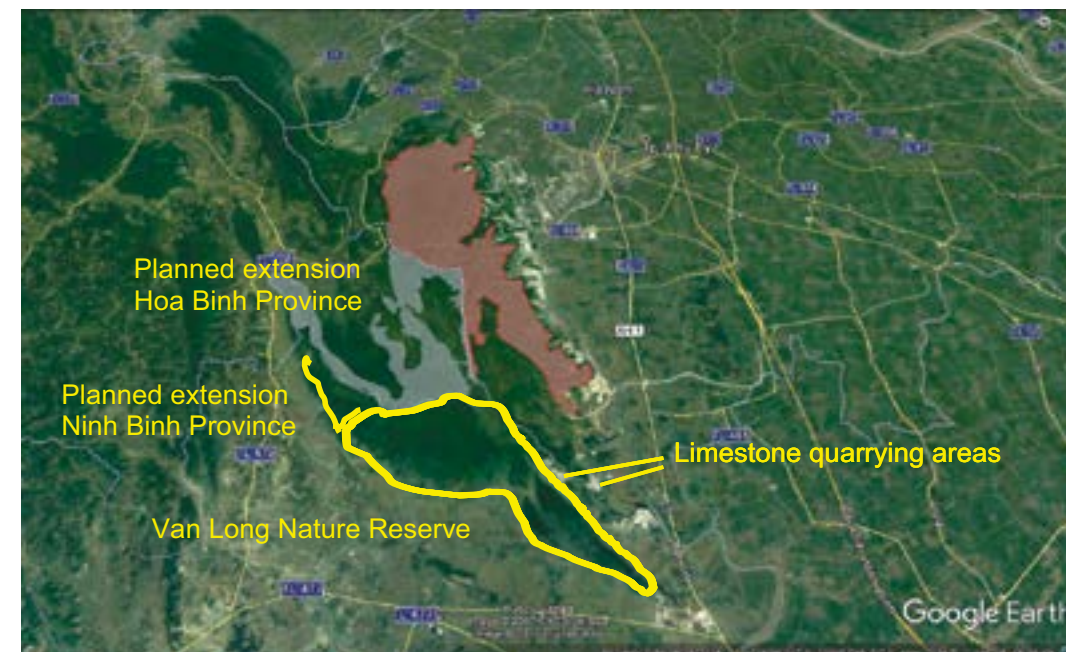


Fig.2. Van Long Nature Reserve with the proposed areas for extension and limestone quarrying areas (white spots).

The adjacent areas in Northwest of the nature reserve is belong to Xich Tho Commune, Nho Quan District, Ninh Binh Province and Dong Tam Commune, Lac Thuy District, Hoa Binh Province with geographical coordination of about 20°24' to 20°31' N and 105°46' to 105°52' E.

Van Long Nature Reserve comprises an area of 2,736 ha and is divided in three zones: a strictly protected area with 1,270.6 ha, a rehabilitation area with 1,463.4 ha and an administrative area with 2 ha.

Forest condition and management

Van Long Nature Reserve consists of natural forest (2,164 ha), plantations (58.5 ha), and water (508 ha). Forested land is divided into three zones: protection forest, special use forest, and production forest. The buffer zone around the reserve comprises 5,990.2 ha (Table 1).

Table 1. Land structure and use of the commune land included into Van Long Nature Reserve. (following Decision 2538/QĐ-UBND - 5/12/2003)

Commune	Total (ha)	Limestone (ha)	Waste land (ha)	Argriculture land (ha)	Water area (ha)	Plantation (ha)
Gia Hung	946	662,90	119,30	103,47	1,93	58,30
Gia Hòa	1.220,63	1.018,15	42,50	159,98		
Liên Sơn	25,25	1,25		24,00		
Gia Vân	320,16	166,50		153,66		
Gia Lập	83,53	31,50		51,90		
Gia Tân	16,58	4,52		12,055		
Gia Thanh	121,36	118,00		3,3950		
Total	2733,51	2.002,82	161,80	508,46	1,93	58,30

Some areas adjacent to the nature reserve (Xich Tho Commune, Nho Quan District, Ninh Binh Province and Dong Tam Commune, Lac Thuy District, Hoa Binh Province) still have natural limestone forests (about 1,000 ha). It is proposed to obtain protection status for these areas, or to include them into the existing nature reserve (Prime Minister of Government 2017).

Van Long Nature Reserve and the forest in the neighbouring Xich Tho Commune are managed through a management board. The protection of the forests in Dong Tam Commune in Hoa Binh Province is contracted through the communes directly to farmers.

Topographical and geographical characteristics

The topography of the survey area consists mainly of forested limestone karst, surrounded by water and wetland. The karst has an abundance of caves, funnels and sinkholes.

Based on geographical characteristics, the nature reserve includes three primary zones:

- high mountain zone about above 300 m, with the highest peak at 436 m
- hilly zone, between 50 and 300 meters
- wetland zone

The high mountain zones in the North and Northwest are divided by a number of large rugged karst formations. Located between these formations are valleys and flat areas, occasionally with ponds (Fig. 3). Some areas have large cave systems below the water level.



Fig.3. The high mountain zone of the nature reserve with the highest mountain 436 m. Photo: T. Nadler.

The hilly zone has gently slopes, some of which are used as agricultural land on a small scale.

The wetland zone partly surrounds the limestone outcrops (Fig. 4). Some areas are seasonally dry; the depth of the water between one and two meters.



Fig.4. The wetland zone is with the limestone outcrops a scenic landscape. Photo: T. Nadler.

The hydrology of the area is characterized by three large river systems which directly supply waters for the wetland; the Day, Boi, and Hoang Long River. These rivers also meander and fill a number of caverns, which helps to maintain water levels stable in the area during dry season.

Climatic conditions

The climate in the area is monsoon tropical climate characterized by profound differences between seasons. The average annual temperature is 23.3°C, and average annual humidity is 84-85%. The winter season lasts from about November to end of March with about 50 to 60 cold days

(below 15°C). The rainfall is 1800 to 1900 mm/year, with significant differences between the seasons (Nguyen Khanh Van et al. 2000).

Human population around Van Long Nature Reserve

The territory of the nature reserve belongs to seven communes with a total population of about 52,000 people (Table 2).

Table 2. Human population in the communes around Van Long Nature Reserve.

Commune	No. people	No. families	No. poor families	People able to work			Population increase (%)
				Total	Man	Women	
Gia Vân	5990	1815	50	2875	1380	1495	1,0
Gia Hung	7200	1882	87	3100	1488	1612	0,7
Gia Hòa	8597	2357	60	5136	2465	2671	0,77
Gia Thanh	6980	2100	45	4563	2190	2373	2,1
Gia Lập	8454	2454	57	3921	2626	1295	1,1
Liên Sơn	5845	1611	64	3120	2097	1023	0,9
Gia Tân	8710	2848	74	4280	2054	2226	0,7
TOTAL	51.776	15.067	437	26.995	14.301	12.694	1

Time of the survey and participants

The survey lasted more than three months, from 10th April to 20th July 2018. A total number of 40 people were involved in the survey including 10 rangers and 30 guards from the CPU.

Methods of the survey

Interview survey

A standard method to gather information before a field survey is to conduct interview surveys with the purpose to more effectively focus field work on areas where primates are often seen. In total, 50 people were interviewed using a standardized form. The locations for conducting interviews were divided into 15 sections (Table 3, Fig. 5).

Table 3. Localities for interview.

Locality	Area	Locality	Area	Locality	Area
1	Kém Châm/ Đôi Sỏi	6	Ba Non	11	Đám Bái
2	Cánh cổng/ Hang bóng	7	Tái Thả	12	Cát Đùn
3	Cánh cổng/ Hang Cá	8	Đầu Voi/ Đồng Rộng	13	Đống Mới
4	Hang Chanh	9	Thung Giếng	14	Suối Tép
5	Mèo Cào	10	Quèn Cá	15	Đôi Bò



Fig.5. For the interview survey the area was divided into 15 sections.

Field survey

Field surveys were carried out using line transects. Most transects followed a patrol path. Areas where langurs had been reported during the interviews, were patrolled more intensively to evaluate the home range of groups. Higher mountains were used as observation points. The field work was carried out normally between 5:30/6:00am to 5:30/6:00pm. On rainy or foggy days with limited view, observation times were more flexible and field work was conducted whenever weather and visibility permitted.

Following the interview results, the trails for the field survey were defined (Table 4). In total, 400 km of trails were surveyed over a total of 500 hours. Data was collected with support from the SMART-Program (Fig. 6).

Table 4. Trails and time for the survey.

Commune	Trail	Survey time
Gia Thanh	Kém Châm	15/4- 29/4
	Vùng Lang - Vùng Vân	
	Trạm Bơm - Cung Sỏi	
Gia Hòa	Hành chanh núi Cò Tiên	4/5 - 30/5
	Hang Chanh - Vùng Đông	
	Hang Chanh- Cửa luồn	
	Hang Cá - Gia Vân	
	Đầu Voi - Thung Ông Quản Nhiếp	
	Hậu Ba Non	
	Ba Non	
Gia Hung	Thung Chuối - Thung Giếng	1/6 - 8/6
	Đồng rộng - Giếng Méo	
Gia Vân	Quèn Cá	9/6 - 30/6
	Đám Bái	
	Hang Bóng	
Khu lân cận	Cánh Cổng	1/7 - 20/7
	Bưng Sóc - Hang Bóng	
	Đôi Bò - Đống Tâm - Hòa Bình	
	Suối Tép - Đống Tâm- Hòa Bình	
	Đại Đống - Đống Tâm- Hòa Bình	
	Đống Mới - Đống Tâm- Hòa Bình	

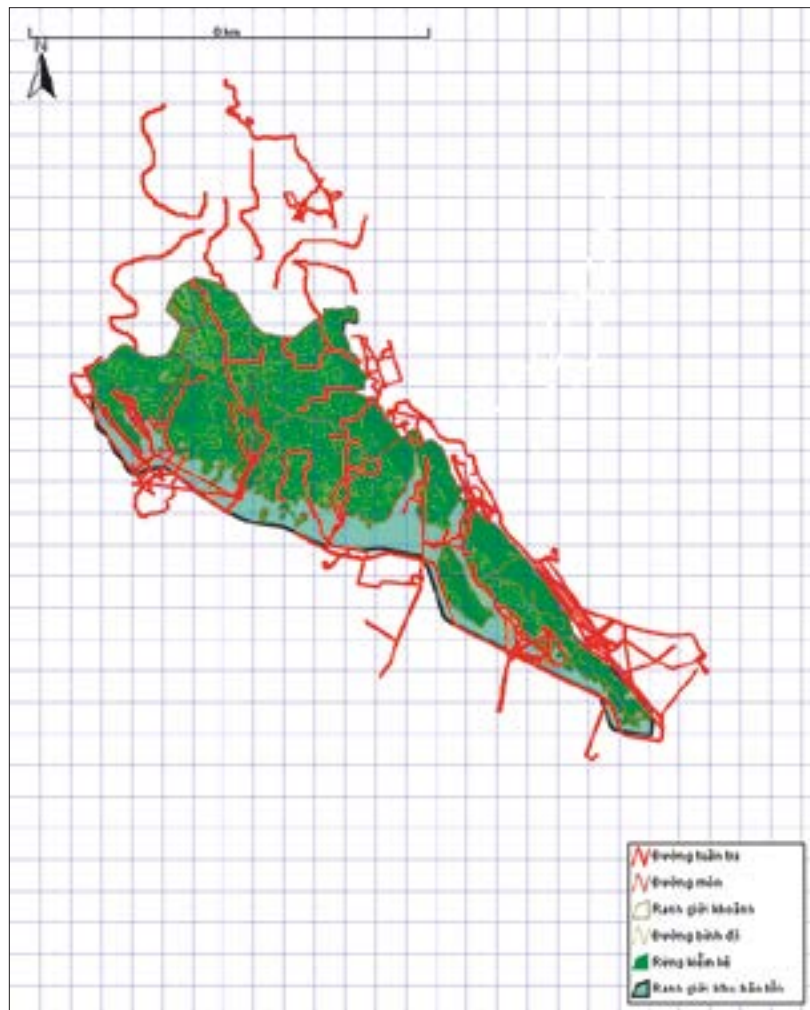


Fig.6. The trails during the field survey are recorded by use of the SMART-Program. The colored part is the area of the nature reserve, the white parts adjacent areas of the nature reserve.

Three teams carried out surveys concurrently with each team consisting of two to three people. Each team was equipped with a GPS, binoculars, and cameras.

If the team spotted langurs they recorded information regarding location, number of individuals as well as age and sex of individuals.

Results of the survey

Result of interview survey

50 people were interviewed. All the interviewees live close to the reserve. All people reported knowing the langurs well, including regularly observing them.

Results of the field survey

Within the nature reserve, 176 to 184 individuals in 21 groups were counted in four primary locations (Dong Quyen Mountain, Hang Chanh, Kem Tram, Ba Non). In the adjacent areas (Dai Dong, Dong Tam), 31 to 38 individuals in 4 groups were counted (Table 5 and 6, Fig.7).

Table 5. Observed and estimated numbers of Delacour's langurs.

Area belongs to commune	Trail	Number of individuals from interview	Observed individuals	Estimated total individuals	Repeated observation	Coordinates Observer	Direction of animals from observer
Gia Hòa	Đầu Voi	8	7 ad.	8	3	20°23'55.91"N 105°51'10.83"E	150 m West
	Hậu Ba Non	6	6 ad.	6	3	20°23'23.54"N 105°51'44.01"E	100 m West
	Thung giếng	5	3 ad.	5	3	20°25'5.05"N 105°51'5.11"E	170 m South
	Khu vực tái thả		4 ad.	4		20°24'27.69"N 105°51'17.32"E	
	Hang Chanh 1		6 ad.	6	4	20°23'5.64"N 105°52'19.78"E	60 m
	Hang Chanh 2		5 ad. 3 subad. 1 immat.	9	3	20°23'33.31"N 105°52'1.97"E	60 m East
	Hang Chanh 3		8 ad. 3 subad.	11	4	20°23'55.04"N 105°52'0.13"E	80 m North
	Hang Chanh 4		6 ad.	6	3	20°23'39.91"N 105°52'24.45"E	120 m West
	Hang Chanh 5		10 ad.	11	3	20°23'9.59"N 105°52'13.73"E	120 m North
	Hang cá	20	14 ad. 1 subad. 2 immat.	20	5	20°22'51.80"N 105°52'32.82"E	60 m North
Gia Hưng	Quèn Cá	0	0	0	0	-	
	Đám Bái	0	0	0	0	-	
Gia Thanh	Thung Lau – khu ông tấn	0	0	0	0	-	
	Kẽm Châm	5	5 ad.	5	5	20°21'56.43"N 105°53'45.90"E	South
	Trạm BV Số 2	9	8 ad.	9	3	20°22'47.26"N 105°53'12.57"E	150 m South
	Vũng Lang – Vũng Vân	10	11 ad.	11	5	20°22'11.62"N 105°53'37.36"E	South
Gia Tân	Kẽm Châm II	7	7 ad.	7	4	20°21'44.42"N 105°53'46.30"E	North
	10	4	4 ad.	4	3	20°21'4.32"N 105°54'16.77"E	150 m South-West

Gia Vân	Cánh Cổng	8	8 ad.	8	5	20°22'9.06"N 105°53'7.73"E	130 m North
	Bưng Sốc – Cánh cổng I (cửa trạm 7)	10	8 ad.	10	5	20°22'42.48"N 105°52'36.38"E	60 m North
	Bưng Sốc – Cánh cổng II (Bưng sóc 1a)	9	6 ad. 1 subad. 1 immat. 1 juv.	9	5	20°22'31.63"N 105°52'40.80"E	90 m North
	Bưng Sốc – Cánh cổng III (Bưng sóc 1b)	8	8 ad.	8	5	20°22'27.70"N 105°52'44.28"E	20 m North
	Bưng Sốc – Cánh cổng IV (Bưng sóc 2)		14 ad.	15		20°22'16.19"N 105°52'55.83"E	80 m North
	Cánh Cổng – Hang Bồng I (Đá An Tái)	8	8 ad.	8	6	20°21'58.65"N 105°53'10.81"E	100 m North
	Hang Bồng	7	7 ad.	7	5	20°21'49.93"N 105°53'43.18"E	40 m West
Giáp Ranh	Đống Mới	12	10 ad.	12	2	20°25'49.61"N 105°50'55.43"E	130 m South-West
	Suối Tép	14	10 ad.	14	2	20°26'34.67"N 105°50'29.17"E	120 m South-West
	Đôi Bò	4	4 ad.	5	2	20°26'20.32"N 105°49'23.55"E	120 m North-East
	Đền Cát Đùn	7	7 ad.	7	2	20°25'31.34"N 105°49'46.19"E	120 m North-East

Table 6. Localities of Delcaour's langur groups.

No. on map	Locality	No. on map	Locality
1	Hang Bồng	E	HC4
2	Kẽm Châm	F	HC 5
3	Vũng lang- Vũng Vân	G	Hậu BN
4	Đá An Tái	H	Thả ĐV
5	Cánh cổng	I	Thung Giếng
6	Trạm 2	J	Đống Mới
7	Bưng sóc 2	K	Suối Tép
8	Bưng Sóc 1b	L	Cát Đùn
9	Bưng sóc 1a	M	Đôi Bò
10	Cửa trạm 7	X	Kẽm II
A	Hang cá	Y	10- Gia Tân
B	HC 1	w	Nhà máy Vissai
C	HC 2	D	HC 3

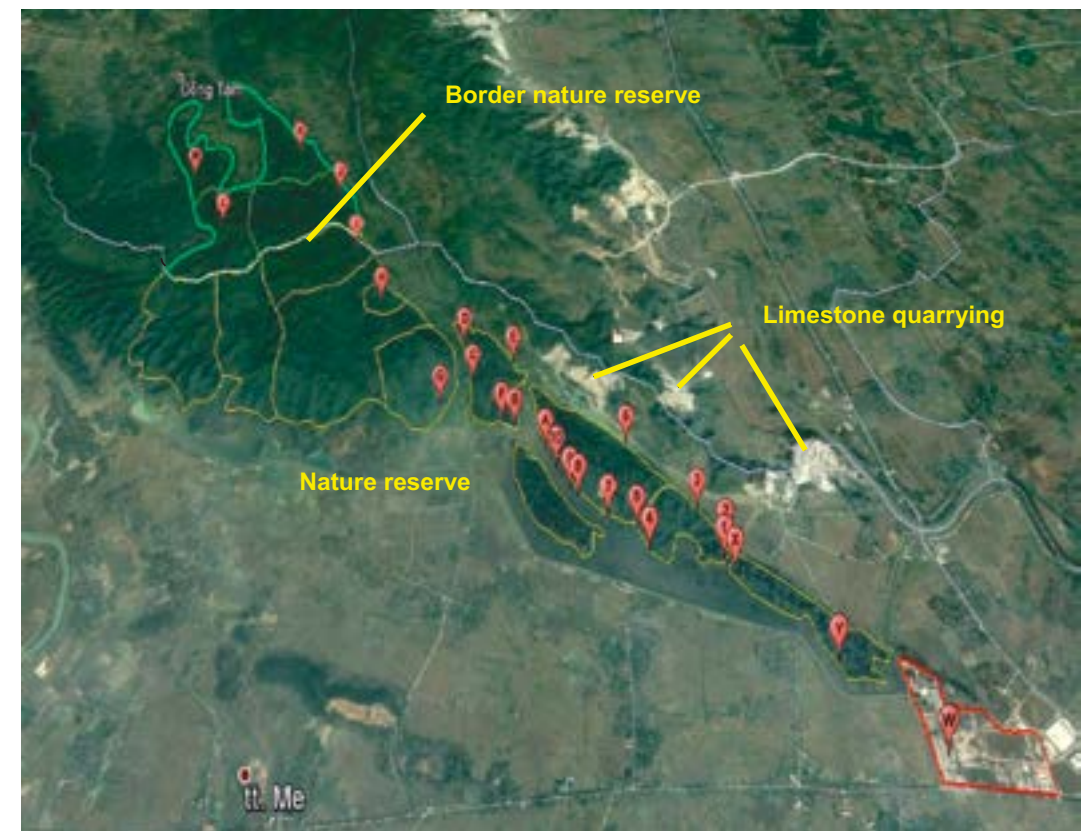


Fig.7. Localities of Delcaour's langur groups inside and outside Van Long Nature Reserve.

Discussion of survey results

According to reports before 2000, Delcaour's langurs were dramatically reduced over their entire area of distribution. With the establishment of Van Long Nature Reserve in 2001 and stricter hunting control, the population has increased significantly in a relatively short period. But the results of this survey suggest a decline in the rate of increase during the last 5 to 6 years (Table 7, Fig. 8). This may be due to the fact that optimal habitat currently is restricted to the south-eastern part of the reserve. Groups are consequently not evenly distributed over the whole nature reserve and are mostly located in the eastern parts (Dong Quyen Mountain and Hang Chanh area).

Table 7. Development of the Delcaour's langur population in Van Long Nature Reserve over the years.

Year	Number of groups	Number of individuals	Organisation carried out the survey
1999	?	45 - 47	Frankfurt Zoological Society
2000	?	51 - 53	Frankfurt Zoological Society
2007	11	55 - 78	Hanoi National University
2010	10 - 14	84 - 100	Frankfurt Zoological Society
2011	14	137 - 147	Frankfurt Zoological Society
2018	21	176 - 184	Van Long Nature Reserve

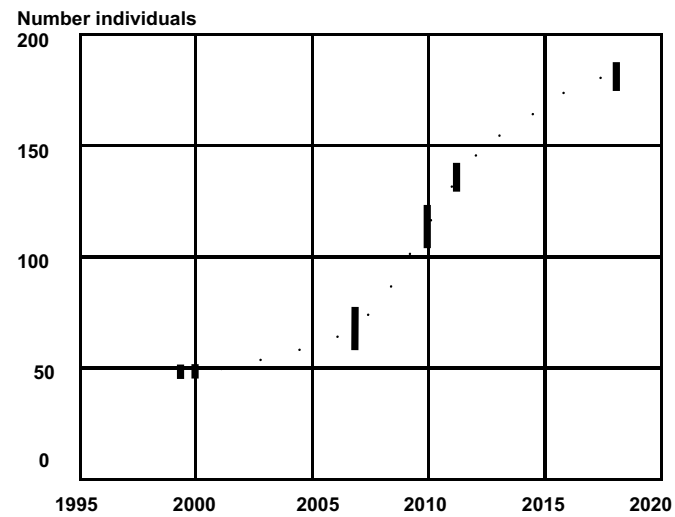


Fig.8. Development of the Delcaour's langur population in Van Long Nature Reserve over the years.

In the large north-western area, consisting of 600 ha belonging to Gia Hung Commune, no animals were observed. Similarly, no langurs were observed in the 77 ha large area Meo Cao; although during the survey a group with three individuals temporarily visited this area. This larger north-western part of the reserve still provides some suitable habitat. It is expected that the population in this area will increase due to dispersal of individuals from the eastern part in search of home ranges to establish new groups. Although movement between the blocks is challenging, movement of single individuals and smaller groups between the eastern and western parts of the reserve has been observed (Fig. 9) and the animals are obviously able to cross the gaps between the limestone blocks.



Fig.9. Moving activities of langur groups between parts of the nature reserve.

There were no observation of langurs in the most eastern part of the nature reserve (Trai Cuon belonging to Gia Thanh Commune). This area is opposite of a large cement quarry belonging to Vissai Cement Company. There is regular blasting and this area is highly polluted with dust (Fig. 2).

Threats and impacts to the Nature Reserve and the Delcaour's langur population

Impact from forest fire

Burning of fields in marginal areas of the Nature Reserve is a common practice by farmers, and can occasionally spark fires which destroy the forest habitat of the langurs. Such forest fires used to

occur four to five times per year, but are now reduced to one or two times due to stricter control by rangers and guards (Management of Van Long Nature Reserve, unpubl. report).

Land conversion into agricultural land

There are some settlements inside the nature reserve. The border of the reserve is not in all areas clearly marked, and about 300 ha within the reserve are used for agriculture. In the past land ownership was not always clear to local communes and they allocated land use rights inside the reserve to families. These localities are also used for grazing domestic animals. Goats are especially problematic as they are food competitors for the langurs.

Impacts from outside

Limestone quarrying which includes blasting and transport activities causes massive dust formation, covering all vegetation in the vicinity. Car tires are burned to produce road cover, leading to the development of thick toxic fumes. The parts of the reserve which are affected by these activities appear to be entirely avoided by the langurs (Fig. 10, 11, 12).



Fig.10. A cement factory in striking distance to the nature reserve. The limestone block on the left is belonging to the reserve. Photo: T. Nadler.



Fig.11. The quarrying area close to the nature reserve is enshrouded in dust. Photo: T. Nadler.



Fig.12. Blasting and heavy traffic along the road close to the nature reserve provoked the langurs to eschew this part of the reserve. Photo: T. Nadler.

Tourism management

The nature reserve has become a tourism hotspot. Tourists are carried in small bamboo boats to enjoy the spectacular landscape and to observe the langurs. However, the management of these tourist activities lacks oversight, regulations and control (Fig. 13).



Fig.13. Tourists can visit the nature reserve only by boat and with a good chance to observe the Delcaour's langurs. To leave the boat and to enter the hills is prohibited. Photo: T. Nadler.

Pollution

Waste from surrounding communes and from tourists is simply dumped in marginal areas of the nature reserve (Fig. 14). Fertilizer and pesticide/herbicide runoff from agricultural areas negatively impacts and kills organisms in the wetlands.



Fig.14. Waste disposal from surrounding communes at the border of the reserve is still a problem. Photo: T. Nadler.

Illegal exploitation of natural resources

A number of plant species growing inside the nature reserve are used for traditional medicine and are illegally extracted from the reserve. The presence of people collecting such plants in the reserve creates additional disturbances such as the creation of trails and the trimming of plants and trees to maintain such trails as well as camping, littering, etc..

Recommendations to secure the long-term existence of the Delcaour's langur

Improvement of protection

The following actions are recommended to improve further protection:

- Setting up more sign boards to inform the public about the exact boundary of the reserve and the regulations about protection
- Abolition of all hunting and trapping activities
- Abolition of collection fuel wood
- Abolition of collection non timber forest product (medicinal plants)
- Abolition of grazing domestic animals
- Reduction of mining outside and adjacent to the nature reserve which impacts the habitat
- Implementation of regulations and strict prosecution of violations

Improvement of the langur habitat, habitat restoration

About 2000 ha is suitable habitat for the langurs, which should be under stricter control and protection. About 30% of the nature reserve's habitat is in poor condition and not an optimal habitat for the langurs. These areas should be restored and planted with a selection of tree species used as food sources by the langurs.

Strengthen Delcaour's langur conservation efforts

It must become an integral part of the protected area management to regularly monitor the Delcaour's langur population and gather information about habitat use and their ecology. The use of the SMART-Patrol program for monitoring activities is recommended to strengthen conservation efforts.

Extension of the protected area

Adjacent areas with suitable habitat and with Delacour's langurs should urgently receive protection status. The groups in these areas are part of the population and it is critical to the survival of this charismatic Vietnamese primate species to preserve their genetic pool.

Safeguarding the livelihood for locals around the nature reserve

The improvement of income from agriculture products through the use of new plant species or technologies and providing alternative sources of income will help to reduce the illegal extraction of forest products and its impacts to the nature reserve. Eco-tourism can be a sustainable safeguard, but needs to be stricter controlled and planned to ensure animals, people, and the environment are protected and remain as a possible ecotourism destination for the future.

Acknowledgements

We would like to thank all the staff of the survey team – rangers, guards and locals - which were involved in this challenging survey work over a long period. We also like to thank the Forest Protection Department of Ninh Binh Province for the initiation and additional financial support of the project, and Frankfurt Zoological Society for collaboration.

Our gratitude goes to Ostrava Zoo for generous financial support.

References

- Agmen F (2014):** Conservation strategies for Delacour's langur (*Trachypithecus delacouri*) in Vietnam: Behavioural comparison and reviewing a release. PhD thesis Australian National University, Canberra.
- Baker LR (1999):** Surveys of the Delacour's langur. Frankfurt Zoological Society and Endangered Primate Rescue Center. (Unpubl. report).
- IUCN Red List of Threatened Species** (www. Red List of Threatened Species).
- Ministry of Science and Technology & Vietnamese Academy of Science and Technology (2007):** Vietnam Red Data Book. Part I. Animals. Scientific Publishing House, Hanoi.
- Nadler T (1996):** Report on the distribution and status of Delacour's langur (*Trachypithecus delacouri*). Asian Primates 6(1-2), 1-4.
- Nadler T (2004):** Distribution and Status of the Delacour's langur (*Trachypithecus delacouri*) and Recommendations for its Long-term Conservation. In: Nadler T, Streicher U & Ha Thang Long (eds.): Conservation of Primates in Vietnam; pp. 63-71. Frankfurt Zoological Society, Hanoi.
- Nadler T (2012):** Reintroduction of the 'Critically Endangered' Delacour's langur (*Trachypithecus delacouri*) – a preliminary report. Vietnamese J. Primatol. Vol 2(1), 67-72.
- Nadler T (2015):** The critical status of the Delacour's langur (*Trachypithecus delacouri*) and the call for a National Action Plan. Vietnamese J. Primatol. 2(4), 1-12.
- Nadler T, Momberg F, Nguyen Xuan Dang & Lormee N (2003):** Vietnam Primate Conservation Status Review Part II: Leaf Monkeys. Frankfurt Zoological Society and Fauna & Flora International-Vietnam Program. Hanoi.
- Nguyen Khanh Van, Nguyen Thi Hien, Phan Ke Loc & Nguyen Tien Hiep (2000):** Bioclimatic Diagrams of Vietnam. Vietnam National University Publishing House, Hanoi.
- Prime Minister of Government (2017):** Decision 628/QĐ-TTg. Approving urgent Conservation Action Plan for Primates in Vietnam to 2015, Vision to 2030.
- Schwitzer C, Mittermeier RA, Rylands AB, Chiozza F, Williamson EA, Wallis J & Cotton A (eds.) (2015):** Primates in Peril. The World's 25 Most Endangered Primates 2014-2016. IUCN SSC Primate Specialist Group, International Primatological Society, Conservation International and Bristol Zoological Society, Arlington.

Discovery of isolated populations of the 'Critically Endangered' grey-shanked douc langur (*Pygathrix cinerea*) in Quang Nam Province, Vietnam

Bui Van Tuan¹, Nguyen Ai Tam^{1,2}, Tran Huu Vy¹, Ha Thang Long^{1,2}, Nguyen Thi Thu Thao³, Tran Kim Phung³, Hoang Quoc Huy¹, Pham Minh Huan⁴ and Tilo Nadler⁵

¹ GreenViet Biodiversity Conservation Centre, K39/21 Thanh Vinh 1 Street, Tho Quang Ward, Son Tra District, Danang City, Vietnam

² Frankfurt Zoological Society, Danang, Vietnam

³ Danang University of Education

⁴ Forest Protection Department of Nui Thanh District

⁵ Wildlife Consultant, Forest Protection Department Ninh Binh, Vietnam
Corresponding author: Bui Van Tuan <buivantuan@greenviet.org>

Key words: Grey-shanked douc langur; *Pygathrix cinerea*

Summary

The grey-shanked douc langur (*Pygathrix cinerea*) is one of the world's rarest primate species. Following up on scarce information about the occurrence of this species in the southern part of Quang Nam Province, we carried out surveys to verify the existence of the species and to estimate the population size. We confirmed four extremely small, isolated populations with a total of 48 to 50 individuals.

The results of the survey induced provincial and local authorities to immediately implement actions to protect the douc langurs and the remaining habitat as well. A "Community Forest Protection Team" was established to patrol the area daily and any deforestation to extent an Acacia plantation is now strictly prohibited. Furthermore the provincial authorities plan to develop a conservation action plan for the remaining douc langur populations and to grant the protection status for the four hills, which they inhabit. To this purpose about 80 ha of Acacia plantation will be repurchased from locals in order to set up a 10 years reforestation project and to create forest corridors between the currently isolated hills.

Phát hiện quần thể chà vá chân xám (*Pygathrix cinerea*) bị cách ly tại tỉnh Quảng Nam, Vietnam

Tóm tắt

Chà vá chân xám (*Pygathrix cinerea*) là một trong những loài linh trưởng quý hiếm nhất trên thế giới. Cùng với những thông tin trong các báo cáo trước đây về sự xuất hiện của loài này ở vùng phía nam của tỉnh Quảng Nam, khảo sát này nhằm xác định lại sự tồn tại của loài và đánh giá cấu trúc quần thể và kích thước quần thể. Kết quả đã xác định được 4 quần thể nhỏ và hoàn toàn cách ly trên 4 ngọn núi nhỏ có rừng đã bị suy giảm chất lượng nghiêm trọng tại địa bàn xã Tam Mỹ Tây, huyện Núi Thành, tỉnh Quảng Nam. Chính quyền địa phương đã có những hành động bảo tồn loài và hệ sinh thái ngay lập tức sau khi nhận được thông tin về sự tồn tại của 4 quần thể loài Chà vá chân xám trong khu vực. "Tổ bảo vệ rừng cộng đồng" đã được thiết lập để thực hiện tuần tra giám sát bảo vệ 4 quần thể Chà vá chân xám và việc phá rừng để mở rộng diện tích trồng cây Keo lai bị nghiêm cấm triệt để. Chính quyền tỉnh Quảng Nam đang xây dựng một kế hoạch hành động bảo tồn loài và sẽ đưa khu này vào vùng được bảo vệ nghiêm ngặt. Khoảng 80 ha đất đang trồng cây Keo lai của người dân địa phương sẽ được chính quyền địa phương mua lại để khởi động chương trình trồng rừng phục hồi hệ sinh thái trong 10 năm với mục tiêu mở rộng và tạo hành lang sinh thái kết nối 4 quần thể tách rời hiện nay.