STATUS AND SOCIAL ORGANIZATION OF HATINH LANGUR (*Trachypithecus hatinhensis* Dao, 1970) IN DONG HOA AND THACH HOA COMMUNES FOREST, QUANG BINH PROVINCE

Dong Thanh Hai[1], Thao A Tung[2]
[1,2]*Vietnam National University of Forestry*

SUMMARY

Hatinh Langur *(Trachypithecus hatinhensis* Dao, 1970) is endemic to Central Vietnam and Laos. In Vietnam, this species is restricted to two provinces of Quang Binh and Quang Tri. The species is nationally and globally threatened. Previous studies have shown that the social structure of leaf-eating monkeys is one-male or multimales and multifemales units. Group size ranges from 7 to 20 individuals. Studies on the social structure of *T. hatinhensis* are mostly carried out in Phong Nha - Ke Bang National Park, while other sites only investigate the status and distribution of species. The objective of this study was to determine the population status and social organization of the Hatinh langur in Dong Hoa and Thach Hoa Forest as a basis for proposing conservation measures. Linetransects and direct count methods was used to collect data. The results showed that there were 9 groups with the total number of 81 individuals. Social organization of groups of *T. hatinhensis* is similar to those patterns of species in subfamily colobinae that comprise of one-male and multimales and mutifemale units. Average group size is 9 ± 3 individuals. The ratio of adult males to females (AM/AF) is 1:2.5; infants to females (IF/AF) is 1:3; adults to immature individuals is 1:0.84.

Keywords: Hatinh langur, population size, social structure.

I. INTRODUCTION

Hatinh Langur (*Trachypithecus hatinhensis*) is an endangered and endemic to Central Vietnam and Laos. In Viet Nam, the distribution of the species is restricted to two provinces of Quang Binh (Tuyen Hoa, Minh Hoa, Bo Trach and Quang Ninh) and Quang Tri (Ministry of Science and Technology, 2007; Nguyen Xuan Dang and Le Xuan Canh, 2009; Christian Roos et al., 2014; Christian Roos et al., 2013). It has been listed as Critically Endangered in the Vietnam Red Data Book (Ministry of Science and Technology, 2007) and Endangered in the IUCN Red List (IUCN, 2018).

The social structure of the leaf-eating monkeys belonging to subfamily (Colobinae) consists of uni-male, multi-males, multi-females. Group sizes of the members of colobines vary between species, ranging from several individuals in Mentawai Leaf Monkey (fewer than 4 individuals) to several hundred individuals for Golden Snub-nosed monkeys (more than 400 individuals). Most species group size range from 7 to 20 individuals (Newton and Dunbar, 1994). The social structure of the primates is generally influenced by the distribution of food; predators (Chapman et al., 2009; Newton and Dunbar, 1994).

Studies on the social structure of *T. hatinhensis* are mostly carried out in Phong Nha - Ke Bang National Park (Nguyen Hai Ha, 2011; Pham Nhat, 2002; Nguyen Van Truong, 2011; Tilo Nadler, 2010), while other sites only investigate the status and distribution of species.

A forest associated with limestone hills with a total of 174 ha falls into 3 communes Thach Hoa, Dong Hoa and Tuyen Hoa district. It has been reported that this is a home of 7 - 9 groups of *T. hatinhensis* with a total of more or less than 100 individuals (Quang Binh Nature Conservation Department, 2015). However, little information on population and group size is available. The objectives of this study, therefore, are to identify the population status and social organization of *T. hatinhensis* in Thach Hoa and Dong Hoa forest and to give appropriate recommendations for conservation of the species.

II. RESEARCH METHODOLOGY

2.1. Study area

The study area is located in Dong Hoa and Thach Hoa communes, Tuyen Hoa district in the Northwest of Quang Binh province (Figure 1). The forest borders the Ha Tinh province to the North, Phong Hoa commune to the East, Nam Hoa and Duc Hoa communes to the South, Thuan Hoa commune to the West. The topography of entire area is limestone. The main vegetation type is tropical evergreen forest, moist on limestone mountains. Elevation range from 10 to 224 m above sea level. It falls into tropical monsoon climate, divided into two distinct seasons: rainy season from September to March next year. The rainy season is concentrated in September, October and November. The dry season is from April to August. The highest temperature is June, July and August.

2.2. Method

2.2.1. Line transect surveys

Fieldwork was carried out between September 2017 and February 2018. Linetrasects were used to determine the number of groups, individuals and group structure of Hatinh langur in the study area. Due to the high slope of the study area, it is difficult to establish linetransects cutting through the mountains; In addition, Hatinh langurs' activities are mainly on the stiff cliffs, it is easier to observe the species on linetransect along the bottle of the mountains and contour lines (Figure 1).

Six (6) linetransects with a length of 1.0 - 2.2 km were established in Dong Hoa and Thach Hoa communes (Figure 1). Investigators moved at a speed of 0.8 to 1.0 km/h on linetransects and carefully scanned from the bottom to the peaks of the mountains to detect the presence of the species. The surveys started at 5 am and ended at 6 pm. Upon detection of the subjects, the following information is collected in the prepared datasheet including time, number of individuals, age/sex classes, locations (GPS), habitats. Age/sex classes were categorised as follow: adult male (AM), adult female (AF), Sub-adults (SBA), Juvenile (J), Infant (IF). Detailed description of age/sex categories is presented in section 3.2.

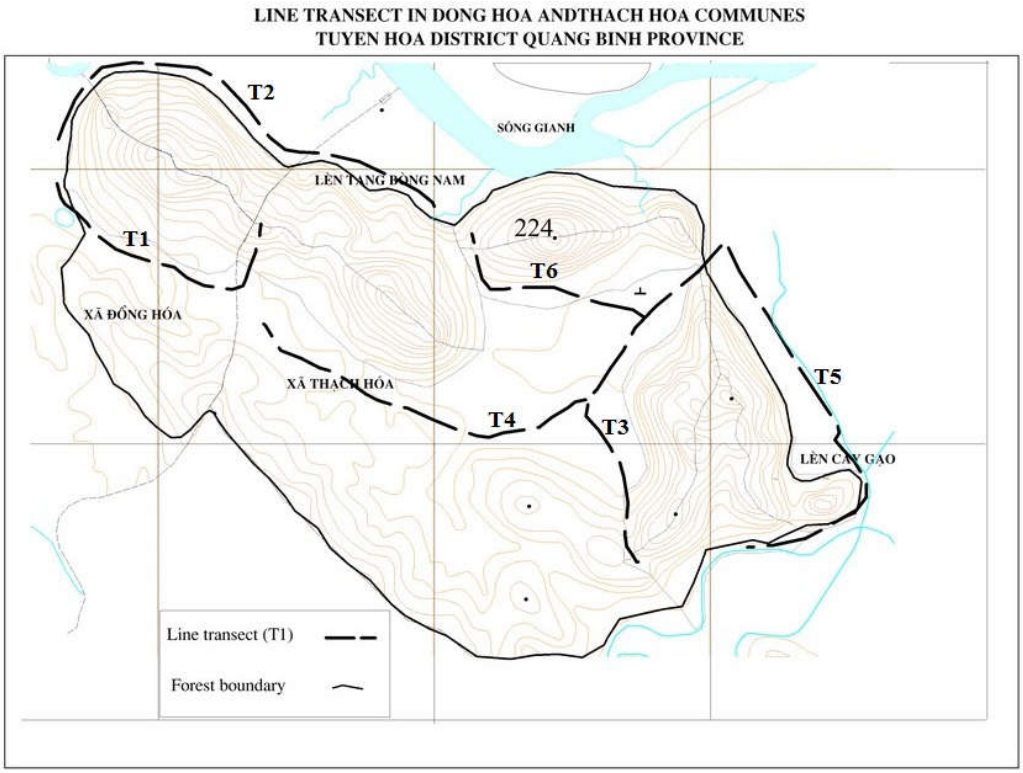

Figure 1. Study area and line transects

2.3. Direct count method

Direct count is used to determine the number of individuals at vantage points along the linetransects. Observers spent about 30 minutes at each points. Upon detection of the species, we count the the number of visible or estimated individuals of the groups based on the sound produced by the langurs and the area of the shaking branches of trees. Other information also recorded during observations of the species including locations (GPS), age/sex classes, habitats. In addition, pictures and video footages of groups of *T. hatinhensis* were taken during observations.

III. RESULTS AND DISCUSSION

3.1. Population status

A total of 9 groups with 81 individuals of Hatinh langurs were recorded at the study site (Table 1). Of which, 5 groups with 52 individuals were found in Thach Hoa commune. These groups are distributed in Cua Hung (group 1), Eo Len (group 2), Eo Len and Len Cay Gao (group 3), Hung Tru (group 4), Hung Su and Len Tang Bong Nam (group 5). In Dong Hoa commune, there were 4 groups with 29 individuals in Len Tang Bong Nam and Trung Doan 18 (group 6), Mieu Tam Quan (group 7), Trung Doan 18 (group 8). Group 9 was recorded at the boundary between Dong Hoa and Thach Hoa communes (Figure 2).

Table 1. Observations of *T. hatinhensis* in study area

Groups	Locations		GPS Locations (VN2000)	Group size (IDs)
	Communes	Areas		
1	Thach Hoa	Cua Hung	511290/1974578 511290/1974578 511290/1974578	9
2		Eo Len	510728/1974139 511371/1974250	8
3		Eo Len and Len Cay Gao	510735/1974294 510735/1974294	11
4		Hung Tru	510722/1974986	9
5		Hung Su and Len Tang Bong Nam	510290/1974654 510198/1974970 510198/1974970	15
6	Dong Hoa	Len Tang Bong Nam and Trung Doan 18	509300/1975368 509742/1975293	10
7		Mieu Tam Quan	508665/1975272 508665/1975272 508906/1975632	7
8		Trung Doan 18	509300/1975368 509149/1974943 509292/1974901	8
9	Dong Hoa and Thach Hoa	Boundary between Dong Hoa and Thach Hoa communes	509292/1974901	4

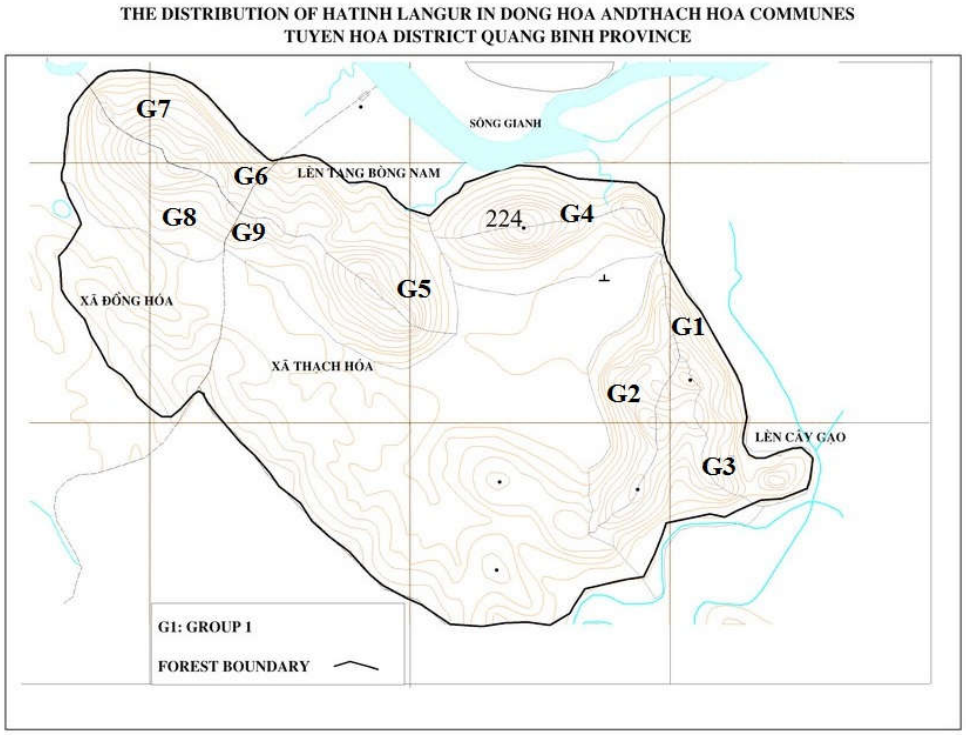

Figure 2. Distribution of *T. hatinhensis* groups in study area

3.2. Social organization

The social organization of Ha Tinh langur in the study area is uni-male, multi-males and multi-females and their offsprings (Group 2 and 6). The average group size is 9 (4 - 15) individuals. Group 5 has highest number of individuals (15 IDs), while the least number of individuals were recorded in group 9 (4 IDs). Only group 2 and group 6 were identified to age/sex classes, we used these two groups to calculate age/sex ratio. The ratio of adult males to females (AM/AF) is 1:2.5; infants to females (IF/AF) is 1:3; adults to immature individuals is 1:0.84. Two infants were observed in group 2 and 5. Based on the pelage colour, we assumed the infants to be two to three months old (figure 5).

Table 2. Social organization of two groups of *T. hatinhensis* at Dong Hoa and Thach Hoa forest

Groups	AM	AF	SUA	J	IF	AM:AF	IF:AF	A: IM	Group size
1									9
2	1	3	1	2	1	1:3	1:3	1:1	8
3									11
4									9
5					1				15
6	2	4	2	2		1:2	0	1:0.67	10
7									7
8									8
9									4
Mean ± SD	**1,5 ± 0,71**	**3,5 ± 0,71**	**1,5 ± 0,71**	**2 ±0**	**0,5 ±0**	**1:2.5**	**1:3**	**1:0.84**	**9 ± 3**

Note: AM: Adult male; AF: Adult femals: SA: Sub-adult; J: Juvenile; IF: Infant.

Age/sex categories

Adult male

Adult males have the maximum body size. The fur has turned completely black, except for two small white cheek-stripes that grow up from the corners of the cheeks to the ears and extend to the behind the ears onto the nape. The groin and grooves are milky (figure 3). Adult males often emit warning vocalizations and choose a good observation position while moving or feeding. They often seat on peak of rock or big trees to emit vocalizations in the morning and when the threat is detected.

Adult female

Adult females are similar in size to adult males. The fur is completely black, except for two small white cheek-stripes that grow up from the corners of the cheeks to the ears and extend to the behind the ears onto the nape. Threre are two black nipples when viewed from the front. Adult females often hug and take care of their infants (figure 3).

Figure 3. Adult male and adult female *T. hatinhensis*

Sub-adults

Sub-adults comprise of sub- adult males and sub-adult females. The body is about the same size as the adults. The fur is completely black, except for two small white cheek-stripes that grow up from the corners of the cheeks to the ears and extend to the behind the ears onto the nape (figure 4).

Juvenile

Body size is smaller than sub-adults. They are able to move independently without adult support, except difficult terrain requiring parental support. The pelage turned black except for the orange head (figure 4).

Figure 4. A sub-adult and juvenile of *T. hatinhensis*

Infant

Body size is small and still sucking mothers. They are not able to move independently although sometimes they can separate themselves from the mothers. The tail, back and limbs began to turn black (Figure 5).

Figure 5. Infant of *T. hatinhensis*

3.3. Discussion

Social organization of *T. hatinhensis* in Dong Hoa and Thach Hoa forest is similar to those pattern in colobinae that comprise of one-male unit and multimales and multifemales units and their offsrings (Newton and Dunbar, 1994). Similaritily, average group size of *T. hatinhensis* follow the pattern of species in genus *Trachypithecus* (Nguyen Hai Ha, 2011; Ta Tuyet Nga, 2014; Nguyen Vinh Thanh, 2008) (Table 3).

Table 3. Social organization of species in genus *Trachypithecus*

Species	AM:AF	IF:AF	A:IM	Average group size	References
T. hatinhensis	1:2.5	1:3	1:0.84	9	This study
T. hatinhensis				12	Nguyen Hai Ha, 2011
T. poliocephalus	1:3.5	1:2	1:0.83	9	Ta Tuyet Nga, 2014
T. delacouri	1:3.96	1:2.32	1:0.81	8	Nguyen Vinh Thanh, 2008

Average group size (9 individuals) of *T. hatinhensis* in the current study is smaller than that in previous study by Nguyen Hai Ha (2011) (12 individuals). This may be explained that Phong Nha - Ke Bang National Park is lager in size, therefore it may support larger group size.

The current findings of the ratio of adult males to females and immature (1:2.5:0.84) are similar to those studies by Ta Tuyet Nga (2014) in *T. policephalus*, and Nguyen Vinh Thanh (2008) in *T. delacouri* (table 3). Ta Tuyet Nga (2014) reported that the ratio of adult males to females of two groups of Cat Ba langur in Cua Dong was

1:3.5:0.83. The social organization consist one single male, several adult females and their offsprings. Study by Nguyen Vinh Thanh (2007) indicates that the ratio of adult males to females of 11 groups of Delacour's Langur in Van Long Nature reserve was 1:3.96:0.81. In this structure, the proportion of juveniles is relatively low compared to those of females.

IV. CONCLUSION

Nine (9) groups with 81 individuals of *T. hatinhensis* were recorded in Dong Hoa and Thach Hoa forest. The social organization of *T. hatinhensis* in study area is similar to those in other species of subfamily colobinae. It comprise of one-male unit and multimales and multifemales unit with their offsprings. Average group size is 9 ± 3. The ratio of adult males to adult females and immature is 1:2.5:0.84.

This study only reveal the population status and social organization of 2 groups out of 9 groups. Futher research may study into details social organization of 9 group and look at the relationships between groups in the study area.

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TÌNH TRẠNG VÀ TỔ CHỨC XÃ HỘI QUẦN THỂ VOỌC HÀ TĨNH (*Trachypithecus hatinhensis* Dao, 1970) TẠI KHU RỪNG XÃ ĐỒNG HÓA VÀ THẠCH HÓA, HUYỆN TUYÊN HÓA, TỈNH QUẢNG BÌNH

Đồng Thanh Hải[1], Thào A Tung[2]
[1,2]Trường Đại học Lâm nghiệp

TÓM TẮT

Voọc hà tĩnh (*Trachypithecus hatinhensis* Dao, 1970) là loài đặc hữu của khu vực miền Trung Việt Nam và Lào. Ở Việt Nam loài này chỉ phân bố giới hạn tại 2 tỉnh Quảng Bình và tỉnh Quảng Trị. Quần thể này đang bị đe dọa tuyệt chủng ở Việt Nam và trên thế giới. Các nghiên cứu đã chỉ ra rằng cấu trúc xã hội của các loài khỉ ăn lá gồm: một hoặc nhiều đực và nhiều cái, kích thước đàn dao động từ 7 - 20 cá thể. Các nghiên cứu về cấu trúc xã hội chủ yếu thực hiện tại Vườn Quốc gia Phong Nha - Kẻ Bàng, trong khi các khu khác chỉ khảo sát sự phân bố của loài. Mục tiêu của nghiên cứu này nhằm xác định kích thước đàn và tổ chức xã hội của quần thể Voọc hà tĩnh tại khu rừng xã Đồng Hóa và Thạch Hóa để làm cơ sở đề xuất các giải pháp bảo tồn loài. Phương pháp điều tra theo tuyến và phương pháp đếm đàn đã được sử dụng để thu thập số liệu. Kết quả đã ghi nhận được 9 đàn Voọc hà tĩnh với tổng số 81 cá thể. Tổ chức xã hội của quần thể Voọc hà tĩnh giống như mô hình của các loài khỉ ăn lá bao gồm: 1 hoặc nhiều đực với nhiều cá thể cái và cá thể chưa trưởng thành. Tỷ lệ đực trưởng thành trên cái trưởng thành (AM/AF) là 1:2.5, tỷ lệ con non trên cái trưởng thành (IF/AF) là 1:3 và tỷ lệ đực trưởng thành trên con trưởng thành là 1:0.84.

Từ khóa: Cấu trúc xã hội, kích thước đàn, Voọc hà tĩnh.

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