

Distribution Patterns and Population Status of the Himalayan Grey Langur (*Semnopithecus ajax*) in Machiara National Park, Azad Jammu and Kashmir, Pakistan

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Abstract.- To determine the distribution patterns and population status of Himalayan Grey Langur (*Semnopithecus ajax*) in Machiara National Park (34°-31 N; 73°-37 E), Azad Jammu and Kashmir (Pakistan), surveys were conducted from April, 2006 to April, 2007 using 'All Count Method during transect walks. Langur troops were confined to about 4,890ha area, at 1,790-4,000m above mean sea level. Each langur troop maintained its area of distribution and movement with a little overlapping. Census revealed that the population of langur in the National Park was organized in seven uni-male bisexual troops, two multi-male bisexual troops and three all-male bands with a population density of 0.160 (individuals/ha) (n=783), comprising 10.22% adult males, 22.35% adult females, 7.28% sub-adult males, 15.96% sub-adult females, 7.79% juvenile males, 28.99% juvenile females and 7.41% infants.

Key words: Himalayan grey langur, distribution pattern, population, Machiara National Park, endangered species.

INTRODUCTION

The grey langur (*Semnopithecus entellus*) is the most widely distributed non-human primate species found in the Indian subcontinent (Roonwal and Mohnot, 1977). According to the Orlando C.A.M.P. workshop, ten sub species of grey langur were; i) *S. entellus achatas* (plains langur), ii) *S. e. ajax* (dark-eyed himalayan langur), iii) *S. e. anchises* (Deccan hanuman langur), iv) *S. e. entellus* (Bengal hanuman langur), v) *S. e. hector* (grey langur), vi) *S. e. hypoleucos* (dark-legged Malabar langur), vii) *S. e. schistaceus* (central Himalayan langur), viii) *S. e. dussumieri* (Dussumier's Malabar langur), ix) *S. e. priam* (Madras grey langur) and x) *S. e. thersites* (grey langur) (Walker and Molur, 2004). However, in 2001, it was recommended that several distinctive former subspecies should be given full species status; as such seven species viz., Nepal grey langur (*Semnopithecus schistaceus*), Kashmir grey langur (*Semnopithecus ajax*), Tarai grey langur (*Semnopithecus hector*), northern plains grey langur (*Semnopithecus entellus*), black-footed

grey langur (*Semnopithecus hypoleucos*), southern plains grey langur (*Semnopithecus dussumieri*) and tufted grey langur (*Semnopithecus priam*) were recognized (Groves, 2001, 2005). The grey langur are distributed in Bangladesh, Burma, India, Nepal, Sri Lanka and Pakistan (Walker and Molur, 2004). Dark-eyed Himalayan grey langur (*Semnopithecus ajax*), considered as a sub species of *S. entellus* (Groves and Molur, 2008), can be distinguished from other species of *Semnopithecus* found in the lower altitudinal areas, by its larger size and outer sides of both the fore and hind limbs covered with silvery-dark colored hair (Roberts, 1997; Wilson and Reeder, 1992). The long tail of this langur always forms a broad arc over their back curving towards the head when on the ground (Jay, 1965).

In India, dark-eyed Himalayan grey langur is found in Himachal Pradesh (Great Himalayan National Park, Kallatop-Khajjiar and Manali Wildlife Sanctuaries) and state of Jammu and Kashmir (Kishtwar National Park). In Nepal, the distribution of this species is confined to Lang Tang National Park of Central Province (Walker and Molur, 2004).

Roberts (1997) recorded this species (*S. ajax*) in Pakistan territory and Groves (2001) also reported the same species in Azad Kashmir but

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according to International Union for the Conservation of Nature (IUCN) CAMP report (Walker and Molur, 2004) this species was found only in India and Nepal. The central Himalayan langur (*S. schistaceus*) was another subspecies distributed in Pakistan (Khyber Pakhtunkhwa) and other states in the Himalayan belt including Afghanistan, India (Simla, Himachal Pradesh, Bihar, and the Kargil district of Jammu and Kashmir), China, Tibet, Nepal (central, eastern and mid-western provinces) and Bhutan (Walker and Molur, 2004).

In Pakistan, dark-eyed Himalayan grey langur is confined to Azad Jammu and Kashmir (AJK) and District Mansehra, Palas Kohistan, Bankad, Dubair and Pattan (Roberts, 1997). In AJK, this langur is distributed in Neelum Valley (Machiara National Park and Salkhala Game Reserve), Jehlum Valley (Moji Game Reserve and surroundings) and Hillan and Phalla game reserves in District Bagh (Ahmed *et al.*, 1999; Iftikhar, 2006).

Langurs are endangered because of an encroaching human expansion (Nowak, 1999). The IUCN in 2000 classified the *Semnopithecus entellus ajax* as near threatened. Due to improved information and taxonomic revision, this species was reassessed in 2004 and 2008 as critically endangered and endangered, respectively (IUCN, 2006; Groves and Molur, 2008). According to Roberts (1997), this monkey was very rare in Pakistan and its total population (excluding AJK) was estimated to be less than 200 individuals. In AJK however, its population was better as compared to Pakistan territory, and according to an estimate there were more than 500 individuals in AJK (Iftikhar, 2006).

The true status of the species is unclear throughout its range, including Pakistan and AJK. Therefore, under the available circumstances, a proper study of this endangered species was carried out to assess the existing status of its distribution and population in Machiara National Park.

MATERIALS AND METHODS

Study area

Machiara National Park (MNP), 135.32 km² (13,532 ha-33,437 acres), lies between 34°-31' N

latitude; 73°-37' E longitude, and altitudes 2,000 m to 4,733 m above mean sea level. The national park is located at a distance of about 35 km from Muzaffarabad along the right bank of the River Neelum. On its western side, it is bounded by the Kaghan Valley, Khyber Pakhtunkhwa. Along the southern periphery of the national park, there are 30 main villages comprising 7,635 households inhabited by about 52,792 persons (Fig. 1).

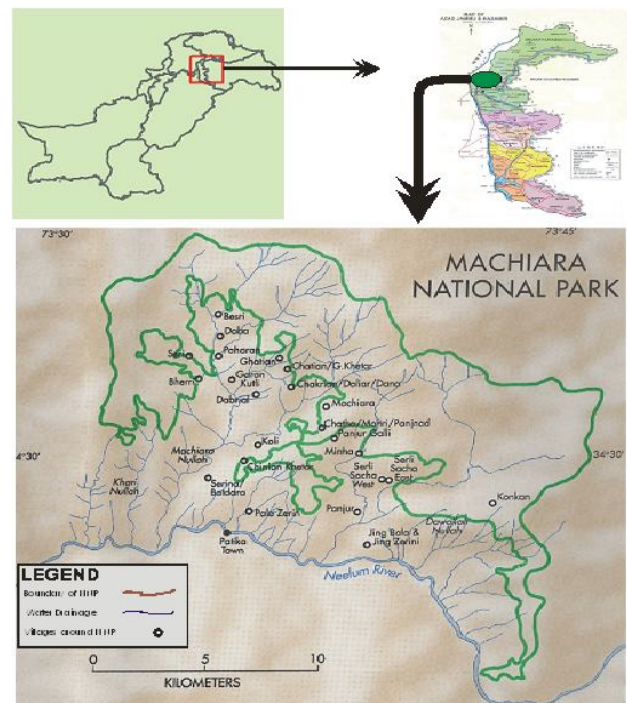


Fig. 1. Location map of Machiara National Park.

The region is influenced by the southwest monsoon and has extra tropical mountain climate. The average annual temperature ranges between 13°C and 27°C with the extremity between -2 to 46°C. Generally the spring (February to April) and monsoon (July to August) are the rainiest seasons of the year.

MNP is a true representative of Himalayan mixed forest-rangeland ecosystem. It comprises of Himalayan moist temperate forests, Himalayan dry coniferous forests, sub-alpine scrub and alpine pastures.

Study methods

The study was organized into 27 field trips of

the study area from April, 2006 to April, 2007. During these surveys, observations were made by moving along transects and scanning the surrounding area thoroughly. Daily ranging or home ranges of the animal groups were assessed by following the group throughout the day regularly from dawn to dusk for six consecutive days in one month each of all four seasons (spring, summer, autumn and winter). The distribution, location and area covered (range) by the langur troops were recorded using global positioning system (GPS) and plotted (see Fig. 2) using Arcview (Version 3.1).

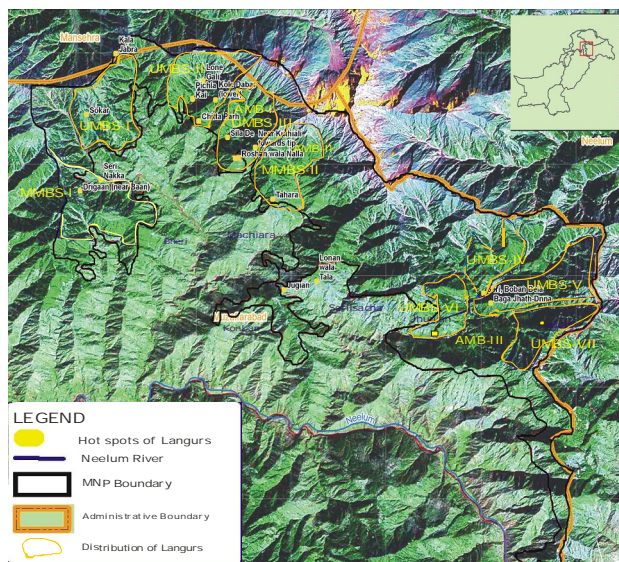


Fig. 2. Satellite map of Machiara National Park showing distribution Ranges and hot spots of Kashmir grey langur.

Population status of Himalayan grey langur was determined by the all count method during transects ($n=10$, average length = 2km) following Mohnot *et al.* (1981) and Struhsaker (1976). Counts were made in the morning (first 4-6 hours) and afternoon (last 3 hours), as these animals are diurnal and these periods are usually coincident with peak activity. To distinguish and overcome double counting, the troops were identified and named using recognizable natural markings (usually morphological variations such as cuts, healed scars, missing or damaged limbs, tail carriage and facial features) and group compositions, respectively. Furthermore, with the help of two more observers,

the counts were made at the same time in all nearby sites. The counts were repeated at least three times in each troop and the maximum numbers of individuals of all the troops were recorded as the total population. The numbers of total individuals observed in a particular area were divided by the areas covered to get the population densities.

With the beginning of each transect, the location, date, starting time, weather condition, slope, aspect and visibility were also recorded. To keep track and avoid mixing, the animal groups were assigned the names MMBS (multi-male bisexual troop), UMBS (uni-male bisexual troop) and AMB (all-male band) on the basis of group composition.

RESULTS

Distribution

The entire langur population in MNP was distributed over 48.9 km² (4,890 ha) area of the mixed coniferous and sub-alpine scrub forests which is about 36% of the total National Park area. They were found distributed in different localities and at elevations during different months of the year (Table I, Fig. 2).

Each langur troop maintained its area of distribution and movement with a little overlap. Home range size varied in different habitats. The same troop differed in its ranging pattern temporarily or permanently during different times of the day or in seasons of the year spatially across different habitats. In bisexual troops (UMBS and MMBS) in the study area, the average home range was from 2.33 km² to 5.47 km² (233-547 hectares) whereas all male bands extensively ranged between 4.0 km² and 6.0 km² area (400-600 hectares) (Table II).

Population

The langur population of 783 individuals in MNP was distributed in seven uni-male bisexual troops, two multi-male bisexual troops and three all male bands with a population density of 0.160 individuals/ha (16.01/km²) (Fig. 3). The mean troop size of 72.77 (range 32-184) and the mean band size of 42.66 (range 25-68) were recorded (Table III). Among bisexual troops the maximum population

Table I.- Distribution of langur troops in different localities encountered during different months of the year 2006-2007.

Sr#	Name of the troop/AMB	Dates of survey	Locality at which the troop seen	GPS location	Elevation (m amsl)
1	UMBS-I	Jun 11, 2006	Kala Jabra (Co. 8b)	N 34°34.980, E 73°32.899	3,208
		Nov 27, 2006	Sokar (Co. 8b)	N 34°33.611, E 73°32.126	2,732
		Mar 28, 2007	Seri Nakka (Co. 8a)	N 34°32.145, E 73°32.500	2,160
2	UMBS-II	Apr 14, 2006	Pichla Kai (Co. 8b)	N 34°33.954, E 73°34.916	2,486
		Nov 28, 2006	Lone Gali (Co. 8b)	N 34°34.361, E 73°35.197	2,731
		Mar 30, 2007	Chitta Parh (Co. 8b)	N 34°33.468, E 73°35.078	2,684
3	UMBS-III	Apr 16, 2006	Kole Dabar (lower) (Co. 9a)	N 34°33.942, E 73°35.521	3,116
		Aug 25, 2006	Roshan wala Nalla (Co. 9a)	N 34°32.640, E 73°36.124	3,134
		Nov 28, 2006	Sila De (Co. 9a)	N 34°33.097, E 73°35.837	2,534
		Mar 30, 2007	Thora Gahatian (Co. 9a)	N 34°32.632, E 73°36.037	2,951
4	UMBS-IV	Aug 31, 2006	Trekana-Pathra (Co.12)	N 34°29. 603 E 73°42. 583	2,201
		Nov 2006	Seri, Boban Bela	N 34°39. 625 E 73°336. 322	2,723
5	UMBS-V	Aug 31, 2006	Baga Jhath-Dnna (Co. 14)	N 34°29. 386 E 73°42. 764	2,515
6	UMBS-VI	Aug 31, 2006	Danna Magri (Co. 11,15a)	N 34°29. 687 E 73°37. 322	1,851
		Dec 2, 2006	Jugian	N34°28.367 E73°41. 148	1,790
7	UMBS-VII	Dec 2, 2006	Nala	N34°26.274 E73°44.522	1,982
8	MMBS-I	Nov 26, 2006	Drigaan (near Baan)	N 34°31. 899 E 73°31. 956	2,660
9	MMBS-II	Apr 16, 2006	Domaillan upper	N 34°31. 719 E 73°37. 026	2,266
		Jun 24, 2006	Near Kuthiali towards thora	N 34°32. 640 E 73°36. 124	3,115
		Aug 27, 2006	Near Kuthiali towards tiper	N 34°32. 875 E 73°36. 567	3,263
		Nov 29, 2006	Domaillan	N 34°31. 719 E 73°37. 026	2,143
10	AMB-I	April 13, 2007	Tahara	N 34°31. 719 E 73°37. 026	2,249
		Aug 25, 2006	Roshan wala Nalla	N 34°32. 640 E 73°36. 124	3,134
		Nov 28, 2006	Sila De	N 34°33. 097 E 73°35. 837	2,534
11	AMB-II	Nov 29, 2006	Domaillan	N 34°31. 719 E 73°37. 026	2,143
12	AMB-III	August	Danna Magri	N34°29.687, E 73°37.322	1,851
		December	Jugian	N34°28.367, E 73°41.148	1,790

MMBS, multi-male bisexual troop; UMBS, uni-male bisexual troop; AMB, all-male band; Co., forest compartment

(number 184) of langur was recorded in focal troop MMBS-II with a population density of 33.58/km² and minimum population (number 32) was found in troop UMBS-I with population density of 6.53/km² during autumn 2006. Among all-male bands the maximum population (number 68) was recorded in AMB-II band during autumn 2006, with a density of 15.18/km² while the minimum population (number 25) was recorded in band AMB-III with population density of 4.10/km² during the same season (Fig. 3, Table II).

Group composition

In MNP three types of langur groups were found. These were uni-male bisexual, multi-male bisexual troops and all male bands. Each troop composed of an adult male (uni-male bisexual) and occasionally of more than one adult male (multi-

male bisexual), several adult females and their immature offsprings. A male band was composed of only males of different age classes excluding the breast feeders (infants, mostly found with adult females) (Tables II, III). Among the total population of langur in the study area, 10.22% (number 80) were adult males (sexually and socially mature males, with well developed secondary sexual characters), 22.35% (number 175) adult females (sexually and socially mature females, with well developed secondary sexual characters), 7.02% (55) were sub adult males (males that are sexually mature, but not socially), 15.96% (125) were sub adult females (females that are sexually mature, but not socially), 7.79% (61) were male juveniles (sexually immature weaned members), 28.86% (266) were female juveniles and 7.79% (61) were infants. The adult male-female sex ratio was 1:25 (Table II, Fig. 4).

HIMALAYAN GREY LANGUR IN AJK

Table III.- Summary of records on census of the langur population in different parts of the National Park during 2006-2007.

Sr#	Main locality/area	Dates of survey	Locality at which the troop seen	GPS location	Elevation (m amsl)	Number & type of group (s) seen	Name of group*	Langur number
1	Jobsar, Lohedandi, Kala Jabra	Apr 23, 2006	Kala Jabra	N 34°34. 980 E 73°32. 899	3208		UMBS-I	44
		Jun 11, 2006	Sokar	N 34°33. 611 E 73°32. 126	2732	1UMBS		32
		Nov 27, 2006	Seri Nakka	N 34°32. 145 E 73°32. 500	2160	1		33
2	Moosa Gali-Biarian Wali Mori	Apr 14, 2006	Pichla Kai	N 34°33. 954 E 73°34. 916	2486	1	UMBS-II	83
		Nov 28, 2006	Lone Gali	N 34°34. 361 E 73°35. 197	2731	1		47
		Mar 30, 2007	Chitla Parh	N 34°33. 468 E 73°35. 078	2684	1		49
3	Sila Da-Prana Chanj-Thora	Apr 16, 2006	Kole Dabar (lower)	N 34°33. 942 E 73°35. 521	3116	1MMBS & 1AMB	UMBS-III	63
		Aug 25, 2006	Roshan wala Nalla	N 34°32. 640 E 73°36. 124	3134	1		65
		Nov 28, 2006	Sila De	N 34°33. 097 E 73°35. 837	2534	1		71
		Mar 30, 2007	Thora gahatian	N 34°32. 632 E 73°36. 037	2951	1		69
4	Pathra-trakana-kachlan-kaila wala Parr-Seri	Aug 31, 2006	Trekana-Pathra Seri, Boban Bela	N 34°29. 603 E 73°42. 583	2201	1	UMBS-IV	53
5	Baga Jhath-Dnna-Jaba-Reveri	Aug 31, 2006	Baga Jhath-Dnna	N 34°29. 386 E 73°42. 764	2515	1	UMBS-V	74
6	Jhugian-Danna Magri	Aug 31, 2006	Danna Magri	N 34°29. 687 E 73°37. 322	1851	1UMBS	UMBS-VI	80
		Dec 2, 2006	Jugian	N34°28.367 E73°41. 148	1790	1UMBS		82
7	Drta Nerian-Nala Jargi	Dec 2, 2006	Nala			1UMBS	UMBS-VII	67
8	Pakhlam, Ban	Nov 26, 2006	Drigaan (near Baan)	N 34°31. 899 E 73°31. 956	2660	1MMBS	MMBS-I	43
9	Thora-Khuthiali-Domallan	Apr 16, 2006	Domallan upper	N 34°31. 719 E 73°37. 026	2266		MMBS-II	171
		Jun 24, 2006	Near Kuthiali towards thora	N 34°32. 640 E 73°36. 124	3115	1MMBS		176
		Aug 27, 2006	Near Kuthiali	N 34°32. 875	3263	1MMBS		182

Sr#	Main locality/area	Dates of survey	Locality at which the troop seen	GPS location	Elevation (m amsl)	Number & type of group (s) seen	Name of group*	Langur number
			towards tiper Domailan	E 73°36.567 N 34°31.719	2143	1 MMBS		184
		Nov 29, 2006	Domailan	E 73°37.026 N 34°31.719	2249	1 MMBS		179
		April 13, 2007	Tahara	E 73°37.026 N 34°32.640	3134	1 AMB	AMB-I	35
10	Thora-Khuthiali-Domailan	Aug 25, 2006	Roshan wala Naalla	E 73°36.124 N 34°33.097	2534	1 AMB		33
		Nov 28, 2006	Sila De	E 73°35.837 N 34°31.719	2143	AMB	AMB-II	68
11	Thora Kuthiali	Nov 29, 2006	Domailan	E 73°37.026 N 34°28.353	1751	1 AMB	AMB-III	25
12	Jhugian	Dec 2, 2006	Jugian	E 73°41.138				

MMBS, multi-male bisexual troop; UMBS, uni-male bisexual troop; AMB, all-male band.

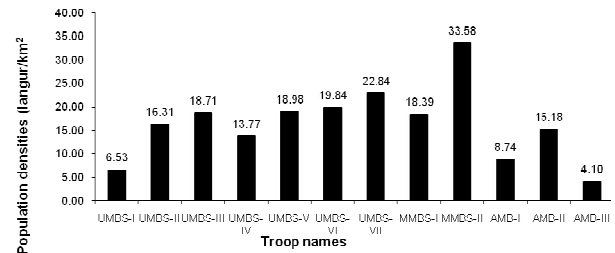


Fig. 3. Population densities of different Langur troops and male bands in MNP during 2006-2007

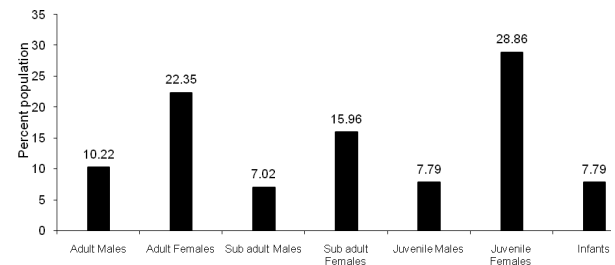


Fig. 4. Percent composition of langur population in MNP during the year 2006-07

Solitary adult males

In the social life of the langur the resident males of troops were found probably on a tenure-ship basis. The ousted resident males might be killed by invading males, might rejoin male bands or might become solitary with their presumed sons from the all-male bands. The last option for the ousted resident male could be leaving the area as solitary or along with few more males and move further as and where they could get suitable place from safety and food availability point of view. During the present study five cases of such solitary and duo males were observed in the study area (Table IV).

All isolated individuals observed were either old adult male or the adult males. One solitary old adult male was sighted in June, 2006 at 'Shah Khori'. Another solitary adult male was observed near Bari Behk on August 23, 2006. Two more such solitary adult males were observed at Chari Tahora in September and at Reveran wala on October 7, 2006. A duo was sighted at 'Roshan Wala Nalla' on November 28, 2006 (Table IV).

Table IV. - Details of the isolated male Langur observed in MNP during 2006-2007.

Observation No.	Date	Locality	Location	Elevation (m amsl)	Solitary/duo isolated male langur
1	June 30, 2006	Shah Khorri (Co. 8a)	N 34°33.402 E 73°33.615	2423	Solitary (1 old adult male)
2	Aug. 23, 2006	Near Bari Behk Co.11)	N 34°29.013 E 73°42.313	1988	Solitary (1 adult male)
3	Sept., 2006	Chari Tahora (Co. 11)	N 34°29.791 E 73°38.542	2414	Solitary (1 adult male)
4	Nov. 28, 2006	Roshan Wala Nala (Co.9 a)	N 34°32.874 E 73°36.564	2801	Duo (2 adult males)
5	Oct. 17, 2006	Reveran Wala (Co. 9 b)	N 34 31.400 E 73 37.164	2585	Solitary (1 adult male)

DISCUSSION AND CONCLUSIONS

Roberts (1997) recorded the Himalayan grey langur (*S. ajax*) in the Pakistan territory but according to IUCN CAMP report by Walker and Molur (2004), this species was found only in India and Nepal. During the present study in MNP, AJK, the presence of Himalayan grey langur (*S. ajax*) has been confirmed as recorded by Roberts (1997). Iftikhar (2006) reported these monkeys in Neelum Valley (MNP and Salkhala Game Reserve), Jehlum Valley (Mojji Game Reserve and surroundings) and Hillan and Phalla game reserves in District Bagh. These animals were also observed in the surroundings of MNP in Jagran and Kutan areas of the District Neelum. Baig (2004) has also reported 1,500-2,000 individuals in MNP in the base-line study report.

All the troops showed very strong attachment to their particular distribution areas. Although, not all the langur troops in Machiara were strictly territorial but definitely they preferred certain areas within their home ranges. In bisexual troops, the average home range varied from 2.33 km² to 5.47 km² (233-547 hectares), while all male bands utilized more extensive space with an average of 4.0 km² and 6.0 km² area (400-600 hectares). The study shows that all male bands usually use larger home ranges than the bisexual troops, which coincides with the findings of Rajpurohit (2005) in Jodhpur India. Chhangani and Mohnot (2006) hold a number of factors responsible for variation in the langur home range size; including availability and

abundance of food, presence of agricultural crops and provisioned food, group size and composition, population density, predator pressure, agricultural activity and human interference. Most of these factors (excluding presence of agricultural crops and provisioned food) were considered to be the causes of variation in langur home range in the study area. Similarly, the troop size and home range are directly linked to each other. The smaller troop size encompasses smaller home range. The home range increases with increase in the group size since the larger troops have to travel long to fulfil their daily food and other requirements as compared to the smaller ones. Similar results were reported by Rajpurohit (1987), Bhaker (2001), Rajpurohit *et al.* (2004) and Rajpurohit (2005). It is inferred from the study that the resource availability and competition among the individuals of the troop results in the variation of home range size. In comparatively rich environments, langur home range, however, may not depend on the troop size (Horwich, 1972) as all the requirements are fulfilled within a smaller area.

The wild population and the geographic range of the *Semnopithecus ajax* is very limited due to which the species is now considered as endangered in the available literature (Groves and Molur, 2008). Nowak (1999) stated that these langur were now endangered because of an encroaching human expansion. The IUCN (2008) classified this species as endangered in its recent assessment (Groves and Molur, 2008). The species is also listed in the Appendix I of Convention on International Trade of Endangered Species (CITES), restricting its

international trade.

Roberts (1997) assessed the langur, very rare in Pakistan; excluding Azad Kashmir he recorded their total population less than 200 individuals. However, GoNWFP (KPK) in wildlife survey report (1997) gave their population as 1,283 individuals.

During the present study the population of the species in MNP was estimated as 783 individuals, which is less than that recorded (1,500-2,000 individuals) by Baig (2004) and exceeds than the estimates (500) of Iftikhar (2006) for the whole territory of AJK. This difference is perhaps due to the seasonal migration to the surrounding areas or may be due to estimation of these authors on the basis of secondary information from the local residents and wildlife staff.

All troops of langur did not permanently stay in the MNP territory throughout the year, resulting in considerable population fluctuations in the study area. Local seasonal migration was observed among the troops MMBS-I, UMBS-I, UMBS-II and UMBS-IV. During winter MMBS-I troop was found usually in Compartment 7 around Pakhlan, Dreg and occasionally around Baan (a pasture). The same troop was observed around Goman Genan in Compartment 6. The troop UMBS-I was also occasionally found in these areas during the winter. Most commonly, they remained confined to adjacent areas of KPK e.g., Reveri, Jaranwala and Burjan. Due to these seasonal movements their population kept fluctuating e.g., population of troop UMBS-I, in June 2006 was recorded as 44 individuals while in November 2006 only 32 individuals were found in this troop. Similarly, the troop UMBS-II was also a winter visitor having population of 83 individuals in April 2006 census, while the same troop was again recorded with 32 individuals only during November 2006 (Table III).

Langur visited the study area in winter when there was no or minimum human interference. During summer when the locals seasonally migrated to the summer residences with their livestock, the langur were found penetrating into the adjacent, comparatively undisturbed areas of KPK. Similar migration pattern was also observed in the langur of troop UMBS-V but this troop penetrated into the adjacent areas of District Neelum e.g., Jagran and surrounding areas. The composition and size of

langur troops in MNP and therefore their population fluctuated throughout the year due to seasonal movements and human disturbances.

During the present study, five cases of solitary and duo males were observed. Six individuals were sighted in different habitats (Table 3.5). Rajpurohit *et al.* (2004) also reported similar cases of existence of solitary langur males at Jodhpur, India. The reasons for this behavior as suggested by Rajpurohit and Mohnot (1988) in their findings are that, after once discarded/ousted from the residency of bisexual troop, there were least chances to get a good rank even in the male bands. Therefore, some (about 20 %) of the ousted resident males isolated themselves from the main population and started living alone nearby. Rajpurohit *et al.* (2004) also reported that in due course of time such males could move even as far as 62-175 km further away in search of more suitable place.

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Table II.- Population density of langur in MNP during the year 2006-2007.

Sr.#	Group Name	Locality	GPS location	Average home range (km ²)	Altitudinal ranges (m amsl)	Group composition										Population	Population density (per km ²)
						Adult		Sub adult		Juvenile		Infants	Total				
						M	Fe	M	Fe	M	F		M	F			
1	UMBS-I	Jobsar, Lohedandi, Kala Jabra	N34°32.498 E73°31.448	4.899	2700-3300	1	14	0	7	0	10	0	1	31	32	6.5319	
2	UMBS-II	Moosa Gali-Biarian Wali Mori	N34°34.361 E73°35.191	3.005	2100-3750	1	17	0	9	0	19	3	1	45	49	16.3062	
3	UMBS-III	Khori-Koledabr-Thora	N34°33.101 E73°35.863	3.687	2250-3800	1	21	0	9	7	22	9	8	52	69	18.7144	
4	UMBS-IV	Pathra-trakana-kachlan-kaila wala Parr-Seri	N34°31.231 E73°44.305	3.993	2132-3130	1	16	0	10	5	17	6	6	43	55	13.7741	
5	UMBS-V	Baga Jhath-Danna-Jaba-Reveri	N34°30.152 E73°43.061	3.898	2320 -3113	1	14	0	22	4	28	5	5	64	74	18.9841	
6	UMBS-VI	Jhugian-Danna magri	N34°28.367 E73°41.148	4.133	1790-3000	1	24	0	11	6	34	6	7	69	82	19.8403	
7	UMBS-VII	Darra Nerian-Nala Jargi	N34°26.274 E73°44.522	2.934	1700-3000	1	15	0	14	0	31	6	1	60	67	22.8357	
8	MMBS-I	Pakhlán, Ban	N34°31.337 E73°32.671	2.338	2600-3400	3	11	7	7	5	7	3	15	25	43	18.3918	
9	MMBS-II	Thora-Khuthiali-Domallan	N34°32.640 E73°36.124	5.479	2041-4000	1	43	8	36	15	58	23	24	137	184	33.5828	
10	AMB-I	Silade, Koledaber	N34°33.101 E73°35.863	4.003	2250-3800	22	0	9	0	4	0	0	35	0	35	8.7434	
11	AMB-II	Thora-Khuthiali-Domallan	N34°32.640 E73°36.124	4.479	2041-4000	33	0	23	0	12	0	0	68	0	68	15.1820	
12	AMB-III	Jhugian-Danna magri	N34°28.367 E73°41.148	6.097	1790-3000	14	0	8	0	3	0	0	25	0	25	4.1004	
Total				48.945		80	175	55	125	61	226	61	196	526	783	16.0122	

(Legend: MMBS, multi-male bisexual troop; UMBS, uni-male bisexual troop; AMB, all-male band), M, Male; F, Female

Table III.- Summary of records on census of the langur population in different parts of the National Park during 2006-2007.

Sr#	Main locality/area	Dates of survey	Locality at which the troop seen	GPS location	Elevation (m amsl)	Number & type of group (s) seen	Name of group*	Langur number
1	Jobsar, Lohedandi, Kala Jabra	Apr 23, 2006					UMBS-I	
		Jun 11, 2006	Kala Jabra	N 34°34. 980 E 73°32. 899	3208			44
		Nov 27, 2006	Sokar	N 34°33. 611 E 73°32. 126	2732	1UMBS		32
		Mar 28, 2007	Seri Nakka	N 34°32. 145 E 73°32. 500	2160	1		33
2	Moosa Gali–Biarian Wali Mori	Apr 14, 2006	Pichla Kai	N 34°33. 954 E 73°34. 916	2486	1	UMBS-II	83
		Nov 28, 2006	Lone Gali	N 34°34. 361 E 73°35. 197	2731	1		47
		Mar 30, 2007	Chitta Parh	N 34°33. 468 E 73°35. 078	2684	1		49
3	Sila Da–Prana Chanj-Thora	Apr 16, 2006	Kole Dabar (lower)	N 34°33. 942 E 73°35. 521	3116	1 MMBS & 1 AMB	UMBS-III	63
		Aug 25, 2006	Roshan wala Nalla	N 34°32. 640 E 73°36. 124	3134	1		65
		Nov 28, 2006	Sila De	N 34°33. 097 E 73°35. 837	2534	1		71
		Mar 30, 2007	Thora gahatian	N 34°32. 632 E 73°36. 037	2951	1		69
4	Pathra-trakana-kachlan-kaila wala Parr-Seri	Aug 31, 2006	Trekana-Pathra			1	UMBS-IV	53
		Nov 2006	Seri, Boban Bela	N 34°29. 603 E 73°42. 583	2201	1		55
5	Baga Jhath-Dnna-Jaba-Reveri	Aug 31, 2006	Baga Jhath-Dnna	N 34°29. 386 E 73°42. 764	2515	1	UMBS-V	74
6	Jhugian-Danna Magri	Aug 31, 2006	Danna Magri	N 34°29. 687 E 73°37. 322	1851	1UMBS	UMBS-VI	80
		Dec 2, 2006	Jugian	N34°28.367 E73°41. 148	1790	1UMBS		82
7	Drra Nerian-Nala Jargi	Dec 2, 2006	Nala			1UMBS	UMBS-VII	67
8	Pakhlan, Ban	Nov 26, 2006	Drigaan (near Baan)	N 34°31. 899 E 73°31. 956	2660	1 MMBS	MMBS-I	43
9	Thora-Khuthiali-Domallan	Apr 16, 2006	Domailan upper	N 34°31. 719 E 73°37. 026	2266		MMBS-II	171
		Jun 24, 2006	Near Kuthiali towards thora	N 34°32. 640 E 73°36. 124	3115	1 MMBS		176

Sr#	Main locality/area	Dates of survey	Locality at which the troop seen	GPS location	Elevation (m amsl)	Number & type of group (s) seen	Name of group*	Langur number
		Aug 27, 2006	Near Kuthiali towards tiper	N 34°32. 875 E 73°36. 567	3263	1 MMBS		182
		Nov 29, 2006	Domailan	N 34°31. 719 E 73°37. 026	2143	1 MMBS		184
		April 13, 2007	Tahara	N 34°31. 719 E 73°37. 026	2249	1 MMBS		179
10	Thora-Khuthiali-Domallan	Aug 25, 2006	Roshan wala Nalla	N 34°32. 640 E 73°36. 124	3134	1 AMB	AMB-I	35
		Nov 28, 2006	Sila De	N 34°33. 097 E 73°35. 837	2534	1 AMB		33
11	Thora Kuthiali	Nov 29, 2006	Domailan	N 34°31. 719 E 73°37. 026	2143	AMB	AMB-II	68
12	Jhugian	Dec 2, 2006	Jugian	N34°28.353 E73°41.138	1751	1AMB	AMB-III	25

MMBS, multi-male bisexual troop; UMBS, uni-male bisexual troop; AMB, all-male band.