

ASSAMESE MONKEYS IN NAGARJUN FOREST OF SHIVAPURI NAGARJUN NATIONAL PARK, NEPAL

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ABSTRACT

*The population distribution of Assamese monkey *Macaca assamensis* were studied in Nagarjun forest of Shivapuri Nagarjun National Park, Nepal and data collected during Dec. 2013 and January 2014, by scan sampling methods along with transect walk through forest trails and ring-road of forest.. Seven bisexual troops were observed in subtropical/lower temperate forest of Nagarjun forest especially around Raniban forest area. The observed smallest troop was with 9 individuals while the largest troop had 37 (41) individuals of different age. The average troop size is 20.57. Out of three broad age groups adults were 56.31% and immature 43.06% while infant alone were 18.06%. The sex ratio between male and female was 1:1.34. Plant usage for feeding and resting were also enumerated. Nagarjun forest troops use mostly tall trees for the night halts and resting in day time.*

Key words: Assamese monkey, population, floral usage, Nagarjun, Nepal.

INTRODUCTION

Macaca assamensis is explored patchily in Nepal. Its status and distribution within the Makalu-Barun area is documented partially and some information is available from Langtang area. The legally protected animal Assamese monkey (*Macaca assamensis*) was first recorded in 1985 in Shivapuri Nagarjun National Park and thereafter remained unknown longtime (Wada, 2005; Chalise *et al.*, 2005).

It is perhaps one of the less common primate species in Nepal belonging to the genus *Macaca*. It belongs to the sinica-troop together with *Macaca sinica*, *Macaca radiata*, and *Macaca thibetana*. *Macaca assamensis* inhabits the foothills of the Himalayas and adjoining mountain ranges from west-central Nepal eastward through Sikkim, northern West Bengal, Bhutan, Arunachal Pradesh, Nagaland and in northern and eastern Burma, southern China, and the northern part of the south-east Asia. An estimated 20,300 of these animals inhabit Indochinese protected areas. They are killed for crop pest control measures and have been included on the list of endangered species in this region and protected species of Nepal. (Chalise, 1999, 2003).

The local vernacular names of the Assamese monkeys are Kalo Bandar, Pahare Bandar, Pupa, Timnyau, and KalaGanda. Considered distinct and likely endemic to Nepal, they are referred to as the "Nepal Population" by CAMP

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(2003), as they are awaiting taxonomic revision (Sanjay *et al.* 2003; Chalise, 2008). It is also possible that within Nepal two forms may occur with a distinct difference found between the higher elevation and lower elevation populations between 380 and 2,350 m (Chalise, 2003a, 2008a). At present they are trooped within the larger Assamese metapopulation and are classified as Near Threatened by the IUCN. Assamese monkeys are similar to rhesus in a generalized “macaque” way, but locals describe them as “missal” or mixed for their color variation within troops (Chalise, 2013a, b).

Assamese monkeys tend to be larger and heavier than rhesus, with males and females weighing more than 12 kg on average, and having a head and body length greater than 60 cm. This population is different from Assamese monkeys described so far from this region Asia (Roonwal and Mohnot, 1977; Fooden, 1989, Kawamoto *et al.*, 2006, Zhao *et al.*, 2011; Timmins *et al.*, 2013) in respect to the head-body length, tail length, T/HB ratio, body weight and fur coloration and its distribution in Nepal.

Therefore, Socio-ecology and population distribution of this endangered and protected monkey species of Nepal could be of great importance for the purpose of species conservation and its management (Chalise, 2000, 2003, 2005).

ECOLOGY AND BEHAVIOR

Assamese monkeys live primarily in subtropical broadleaf-evergreen forests, and to a lesser extent, mixed deciduous and bamboo forest utilizing many types of forest vegetation from semi-deciduous mixed wet to tropical dry deciduous forest, from monsoon to tropical evergreen Montana forest. They spend a great deal of time in the high canopy and are rarely seen on the ground. Adult males tolerate to young males and infants even hug sometime and groom briefly. Estrus female has sexual swellings on the base of tail. Such cases are not recorded in rhesus. The swelling looks like a blackish-brown protruded moist organ. Some people mistook it as a septic. The infants are born during spring mostly but in late winter too. Infants are much darker in fur coloration (Chalise, 2010).

Assamese monkeys inhabit in the mountains and hills along the Himalayas. Like rhesus, they are flexible in habitat types in Nepal from river basins to subtropical hills of Sal forests, mixed deciduous forest, temperate broadleaved forest with rocky outcrops, and along the steep sloped forests along rivers above altitude. Assamese monkeys of Nepal are diurnal animal found along the hills, valleys and upland river basin along the east-west mountainous range with diversified ecological zones. They are found in riverside hill-Sal forest area to mixed deciduous and evergreen forest of Schima-Castanopsis, Elaeocarpus-Macaranga forests in mid-hills and Quercus-Pine-Rhododendron forest of high mountains. They are easily located in the remote mountain villages along the marginal plots of agricultural lands. They are not recorded from Tarai plain and high snowy mountains and in human settlements (Chalise, 2013a, b).

Assamese monkeys are shy, timid and less aggressive to human beings in comparison to rhesus monkey. They are arboreal, terrestrial and omnivorous animals with multi-male and multi-female social troops. They come to the ground for easier and safe movement in the dense undergrowth from the tree middle

canopy. They are mostly seen doing their social and other activities in the ground with sluggish movement. They predominantly leaf eater but will feed on petiole, gum, shoot, flower, fruits, seeds, bark and caterpillar while they do long foraging activities to find young sprout of grass, aquatic herbs and their pith, aquatic insects and larva, climb hanging greenish rocks to lick and eat a special type of ground soil. They raid crops in hills of Nepal mainly for maize, rice, wheat, millets and fruits. Astonishingly, they dig out potatoes, yam and sweet potatoes from the ground and uproot the new maize seedling to eat the seed. They raid not only banana but also rhizome of cardamom in the orchard farm of east Nepal. In the off-season, they come to nearby tree grooves of village and hide until human activities and when they feel secure, skillfully raid dry maize comb from courtyard storage (Chalise, 1997, 1999, 2003).

They have sub-troops of close kith and kin and stay closely during foraging, grooming and in night-rest in a troop. It is observed that adult females, their infants and even male stay in body contact. In winter morning, to get warmth they stay in sub-troops for longer period near night halt site and start daily activities after sunshine in their part. During summer, they start their daily activities earlier. The night halt sites are in rocky outcrops inaccessible by other animals, which is visible blackish leakage by their night toileting. They reach their by a slow and creeping walk through the bare rocks, sometime using only hands. The species seems less quarrelsome than rhesus monkey. The recorded troop size is 5 to 36 individuals in Langtang area while 7 to 50 individuals in Makalu area. The total counted population revealed that there are more than 200 Assamese in Tamku sector of Makalu-Barun and same amount in Dhunche–Sebru area of Langtang. Scattered population along the Melamchi River Helambu, Tamor River around Mulghat, Ramdi area of KaliGandaki River and Kimni of Acham are recorded, (Chalise, 2000; Chalise *et al.*, 2001, 2005).

Recently it was confirmed that there are a number of troops around Nepal and a total of 1,099 individuals Assamese in 51 troops recorded that were scattered in Mid-hills along the Warm Temperate Monsoon and Cool Temperate Monsoon area ranging from 1,000 to 3,000 m asl (Chalise, 2013a). In reference to the Shivapuri Nagarjun National Park, it was published that the assamese troop size in the park was 23.71 in average with the standard deviation of 9.92 (Chalise *et al* 2013). In this study, we further explored and found the adding in the population and habitat of *M. assamensis* in Nagarjun forest especially in Raniban area.

METHODS

Study Area: Shivapuri Nagarjun National Park (SNNP) covers 159 square kilometers area and is located between 27°45' to 27°52'N and 85°15' to 85°30' E with two isolated islands forest Shivapuri and Nagarjun. Nagarjun lies adjacent to Kathmandu city while Shivapuri is of 4 km distance to North. The government of Nepal has declared the Shivapuri Watershed and Wildlife Reserve as a national park in 2002 and the Nagarjun forest area has been annexed in 2009 AD (SNNP, 2010). The Shivapuri Nagarjun (1000-2732 masl) is the true representation of the mid-hills in the protected area system of Nepal. The park lies in the transition zone between sub-tropical to temperate regions with 1250 species of flowering plants. The floral composition park has been categorized into

four types viz. i) Lower mixed hardwood forests, ii) Chirpine forests, iii) Oak forests, and iv) Upper mixed hardwood forests. The major plant species found are *Schima wallichii*, *Castanopsis indica*, *Pinus roxburghii*, *Myrica esculenta*, *Pyrus pasia*, *Rhododendron arboreum*, *Juglans regia* and *Quercus* sp. (SNNP, 2010).

Park record shows that it is supporting a number of animals of ecological significance. SNNP provides shelter to 21 species of mammals (excluding rodents and bats); clouded leopard *Neofelis nebulosa*, common leopard *Panthera pardus*, leopard cat *Felis bengalensis*, jungle cat *Felis chaus*, pangolin *Manis* sp, rhesus monkey *Macaca mulata*, barking deer *Muntiacus muntjack*, wild boar *Sus scrofa* as well as assamese monkey *Macaca assamensis*, Himalayan black bear *Ursus thibetanus* and other prey species. The park is important bird areas (IBAs) with over 311 species of birds have been recorded. There are more than 102 species of butterflies (Pandey, 2010; SNNP, 2010). It is estimated that more than 200 Rhesus monkeys inhabit around SNNP and with a maximum number of 64 individuals in a troop of Sundarijal (Chalise 2013a; Chalise *et al.*, 2013).

OBSERVATION

The study areas were surveyed walking along Jamacho Road and also the forest trail taken it as the transect line. After several visits to different spots, areas with primate availability were selected as "focal areas". Such focal areas were frequently visited on foot and the troop was studied. The focal troop members were classified according to age and sex (Chalise, 1997). The duration of any behavior and activities were also recorded on the protocol papers with the help of binocular and watch. The individual counting and identification of troops were repeated several times in one observation session. The data obtained from this procedure gave insight for the determination of average troop size, composition and social structure of species. For the behavioral observations, continuous recording (or all occurrences recording) technique was used (Altman 1974; Martin and Bateson 1993). Diurnal activities and population census were carried out 7:30 AM to 4:30:00 PM covering more than 80 hours by three observers simultaneously.

RESULTS

POPULATION

The troops from Nagarjun forest were observed on south-Eastern slope of mountain range while Sanagaun-Mudkhu troop was found on North-Western slopes. Fulbari Gate troop was found Eastern slope and the Raniban troop was found on Southern slopes (Fig. 1).

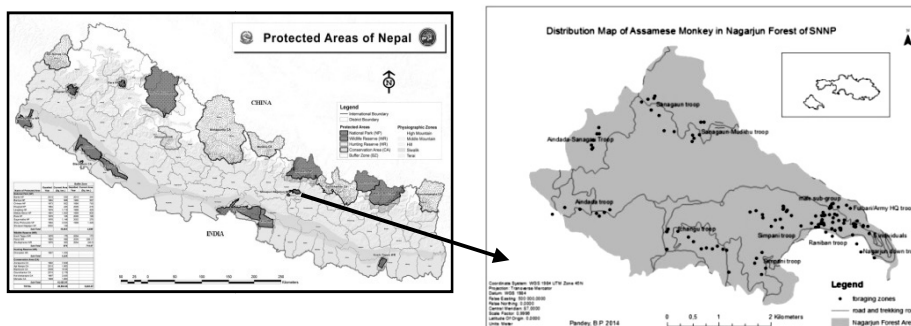


Fig. 1: Nagarjun forest site and assamese locations in SNNP, Kathmandu Nepal, 2013/14.

All the troops are found confined around the park boundary and frequently interacting with crop-field of nearby villages. In Nagarjun forest area habitat sharing with rhesus was common and frequent conflict was observed. Interview with local park staff and security personnel revealed the possibilities of Assamese monkeys in the forests around Jamacho Gompa-Aindanda area too.

Table 1: Composition of assamese monkeys in Raniban periphery of Nagarjun forest, SNNP.

Area Lat/Long	Mature		Immature				Total	Possibility
	Male	Female	Juvenile		Infant			
			Male	Female	Male	Female		
Army barrack N27°44'29.0" E85°17'44.1"; 1419 m;	8	13	3	5	3	5	37	41
Cross road of army gate N27°44'27.6"E85°17'5 1.8"1355 m;	2	5		3		4	14	23
Small subtroop N27°44'45.5" E85°17'47.4"; 1345 m;	4	4		1			9	
Raniban Post around 27°44.548N 85°17.347E	3	6		6		4	19	22
Helipad All male troop 27°44.508N 85°17.600E	5						5	5
Simpane Raniban 27°44.535N 85°16.789E	8	10	1	8		4	31	31
Ichangu 27°73284N85°27087E	2	4		3		3	12	12
Sanagaun 27°76300N85°25329E	3	5		6		3	17	17
Total	35	47	36	26			144	151
Age wise total and average	82	9.11	62	8.85			20.57	151/6=25.16

The recent census (December/Jan, 2013/14) revealed that there were more than 176 assamese monkey individuals in the study area (Table 1). Among them 144 individuals were age-wise categorized while immature were not fully identified to sex-wise. The mature individuals counted were 82 (56.9%) while immature were 62 (43.1%) individuals. Along Aindanda Sikaripost (27°74369N 85°24733E) area, we could figure out the total individual (20 to 25) only in a troop. There were no single male but a troop of all male was identified in Raniban area.

Two troops of rhesus were found with the habitat of assamese. They were found in the periphery of army barrack and water pool area. During both species interaction assamese seemed reluctant to conflict with rhesus troop even not with a single male. However, rhesus male tried several time to encroach assamese foraging area.

Out of 51 plant species recorded during the 10 meter scan sampling of assamese observation, 11 plant species are identified as the food plants during this short study for winter season (Table 2). However there are more than 47 species that are known to be the food plants in other season. These food plant species are also use as resting and night halt trees. There are no any rocky outcrops or sloppy terrain in the area which can be the night halt site for them as indicated in other habitat of assamese monkeys in Nepal, they rely on the tall tree tops or middle canopy for night rest. In this area also they utilized the cattle's poisonous plant such as Bhalayo and Siundi, which secrete the alkaloids and at least causing allergy to the harvesters.

Table 2:Plants and their usage by assamese around Raniban area, SNNP, 2013/14.

Nepali Name	Scientific Name	Use for the Winter 2013/14	Plant used in other season
1. Aijeru	Loranthus sp.	Unknown	Food
2. Amala	Phyllanthus emblica	Rest	Food
3. Angeri	Lyonia ovalifolia	Unknown	Food
4. Arkhaulo	Lithocarpus sp.	Unknown	Food
5. Bakhre ghas	Reinwardtia indica	Food	Food
6. Banjh	Quercus lanuginosa	Unknown	Food and rest
7. Bhalayo	Semecarpus anacardium	Unknown	Food
8. Bilaune	Maesa chisia	Food	Food
9. Chilaune	Schima wallichii	Food and Rest	Food and rest
10. Chutro	Berberies aristata	Unknown	Food
11. Dhairo	Woodfordia fruticosa	Unknown	Food
12. Dhale katus	Castonopsis indica	Rest	Food and rest
13. Firfire	Acer oblongum	Unknown	Food and rest
14. Gayo	Budleja asiatica	Unknown	Food
15. Gogan	Saurauia napaulensis	Unknown	Food
16. Hade bayer	Zizyphus mauritiana	Food	Food

17. Hakulal	<i>Symplocos sumuntia</i>	Rest	Food
18. Jamun	<i>Syzygium cumini</i>	Unknown	Food and rest
19. Jhinganu	<i>Eurya acuminata</i>	Unknown	Food
20. Kafal	<i>Myrica esculanta</i>	Unknown	Food and rest
21. Kalikath	<i>Myrsine semiserrata</i>	Unknown	Food and rest
22. Kalo siris	<i>Albizia bellek</i>	Food and Rest	Food and rest
23. Kalo tindu	<i>Diospyros malabarica</i>	Unknown	Food and rest
24. Kavro	<i>Ficus lacor</i>	Rest	Food and rest
25. Khanyu	<i>Ficus chordata</i>	Unknown	Food
26. Koiralo	<i>Bauhinia variegata</i>	Unknown	Food and rest
27. Kutmero	<i>Litsea monopetala</i>	Unknown	Food
28. Laliguras	<i>Rhododendron arboretum</i>	Unknown	Food and rest
29. Lankuri	<i>Fraxinus floribunda</i>	Rest	Food
30. Lapsi	<i>Choerospondias axillaris</i>	Food and Rest	Food and rest
31. Mahuwa	<i>Englehardtia spicata</i>	Unknown	Food and rest
32. Mallato	<i>Macaranga indica</i>	Rest	Food and rest
33. Musure katus	<i>Castanopsis tribuloides</i>	Rest	Food and rest
34. Okhar	<i>Juglans regia</i>	Rest	Food and rest
35. Paheli	<i>Litsea oblonga</i>	Rest	Food
36. Paiyun	<i>Prunus cerasoides</i>	Food	Food and rest
37. Pangra	<i>Entada phaseoloides</i>	Food	Food
38. Patle katus	<i>Castanopsis hystrix</i>	Rest	Food
39. Pipal	<i>Ficus religiosa</i>	Rest	Food and rest
40. Ranisalla	<i>Pinus roxburghii</i>	Food and Rest	Food and rest
41. Saur	<i>Betula alnoides</i>	Food and Rest	Food and rest
42. Setikath	<i>Myrsine capitellata</i>	Unknown	Food and rest
43. Seto siris	<i>Albizia procera</i>	Rest	Food and rest
44. Simal	<i>Bombax ceiba</i>	Rest	Food and rest
45. Siundi	<i>Euphorbia sp</i>	Food	Food
46. Tejpat	<i>Cinnamomum tamala</i>	Unknown	Food
47. Tree fern	<i>Cythea spinolusa</i>	Unknown	Food
48. Uttis	<i>Betula nepalensis</i>	Rest	Rest
49. Unknown 2		Food	
50. Kukhure		Unknown	
51. Gajali		Unknown	
52. Paniyor		Unknown	

CONCLUSION

The protected species are the great wealth of any country. The protected species assamese monkey found in this location is significant for wildlife study. It is further important that the assamese are residing very close to capital city and University and colleges of the valley. It provides a high opportunity to study them in their natural setting and could be an easy access to formulate their management planning for countrywide.

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WORKS CITED

- Altman, J. (1974). Observational studies of behavior: sampling methods. *Behavior*, **49**:227-265.
- Chalise, M.K. (1997). "Monkeys from Makalu-Barun Conservation Area (MBCA)." *Natural History Society Nepal*. Bull: **7** (1-4): 30-34.
- (1999). "Some behavioral and ecological Aspects of Assamese Monkeys (Macaca assamensis) in Makalu-Barun Area." *Nepal. Nepal Journal of Science & Tech.*, RONAST, **1**: 85-90.
- (2000). "Report on the Assamese monkeys (Macaca assamensis) of Nepal." *Asian Primates*, Vol. **7** (1-2), p. 7-11.
- (2003). "Assamese Monkeys (Macaca assamensis) in Nepal. Primate Conservation." No. 19: 99-107. *The Journal of the IUCN/SSC Primate Specialist Troop*, Conservation International, USA.
- (2003a). Initiative for primate resources, biomedical research, and conservation in Nepal. International perspectives the future of nonhuman primate resources. National Research Council, National Academy of Sciences Washington, USA. Proc of the Workshop April 17-19, 2002, pp 29-35
- (2005). "Characteristics of the Assamese monkey (Macaca assamensis) of Nepal." ASP Congress August 17-20, *American Journal of Primatology*. Vol. 66, supp 1: 195p.
- (2008). *Nepalka Samrakshit Banyajantu, (Nepal's Protected Wildlife) in Nepali*. Shajha Prakashan, Lalitpur Kathmandu Nepal, page 116+12.
- (2008a). "Primate Census in Kathmandu and West Parts of Nepal." *Journal of Natural History Museum*, TU, Kathmandu, Vol. **23**: 60-64pp.
- (2010). "A Study of Assamese Monkey in Sebrubeshi of Langtang National Park." *Nepal. Journal of Natural History Museum*, Vol. 25, pp. 54-61.

- (2013b). *Biodiversity: Nonhuman Primates*. In: *Biological diversity and conservation*. (eds.) P.K. Jha, F.P. Neupane, M.L. Shrestha and I.P. Khanal, Publ. Nepal Academy of Science and Tech, Lalitpur, pp. 93-96.
- (2013a). Fragmented Primate Population of Nepal. In: L.K. Marsh and C.A. Chapman (eds.), *Primates in Fragments: Complexity and Resilience, Developments in Primatology: Progress and Prospects*, 329-356pp. DOI 10.1007/978-1-4614-8839-2_22, © Springer Science+Business Media New York 2013 Library of Congress C No: 2013945872.
- Chalise MK, Bhattarai, GP and Pandey, B (2013). "Ecology and Behaviour of Assamese Monkeys in Shivapuri-Nagarjun National Park, Nepal." *Journal of Natural History Museum*. Nepal. Vol. 27: 12-24p.
- Chalise, M.K., Karki, J.B. and Ghimire, M. (2001). "Survey of Assamese Monkey in Langtang National Park, Nepal." *American Society of Primatologists*, USA, ASP Bulletin, Vol. 25 (4): 4-5.
- Chalise M.K; Karki, J.B. and Ghimire, M.K. (2005). "Status in Nepal: Non-human Primate." Special issue published on the occasion of 10th Wildlife Week, 2062. DNPWC/ HMG Nepal, p. 19-26.
- Fooden, J. (1989). *Classification, distribution and ecology of Indian macaques. Perspective in primate biology*." Vol. 2 (Seth, P. K. and Seth, S. ed.), New Delhi. p. 33-46.
- Kawamoto, Y., M. Aimi, T. Wangchuk and Sherub. (2006). Distribution of Assamese macaques (*Macaca assamensis*) in the inner Himalayan region of Bhutan and their mtDNA diversity. *Primates* 47, (4): 388-392.
- Martin P. and Bateson, P. (1993). *Measuring behaviour*. Cambridge University Press, NY, USA.
- Pandey, B.P., (2010). A Report on Presence/Absence Survey of Clouded Leopard (*Neofelis nebulosa*) in Shivapuri Nagarjun National Park, Nepal, DNPWC, Kathmandu, Nepal.
- Roonwal ML, Mohnot SM (1977). *Primates of South Asia: ecology, sociobiology and behaviour*. Harvard University Press, Cambridge, p 421+XVIII ISBN 0-674-70485-1
- Sanjay M., Douglas B-J, Wolfgang, D, Ardith E., Ajith K., Mewa, S., M.M. Feeroz, Mukesh Chalise, Padma P., Sally W (2003). Status of South Asian Primates: Conservation assessment and Management Plan (CAMP) Workshop Report, Zoo Outreach Organization/CBSG-south Asia, Coimbatore, India, viii+432pp.
- SNNP (2010). *Shivapuri Nagarjun National Park*, Brochure. Kathmandu: Shivapuri Nagarjun National Park, Panimuhan, Budhanilkantha, Kathmandu, Nepal.

- Timmins R.J. and J.W. Duckworth (2013). Distribution and Habitat of Assamese Macaque *Macaca assamensis* in Lao PDR, Including its Use of Low-altitude Karsts. *Primate Conservation* (26): 103–114
- Wada, K., (2005). The distribution pattern of rhesus and Assamese monkeys in Nepal. *Primates*, pp. 46:115-119 DOI 10.1007/s10329-004--0112-x.
- Zhou, Q., Wei, H., Huang, Z. & Huang, C., (2011). Diet of the Assamese macaque *Macaca assamensis* in lime-stone habitats of nonggang, China. *Current Zoology*, 57(1), pp. 18-25.