Status and distribution of least known primate species: Slow Loris and Capped langur in the Protected Areas of Assam, India and its Feeding Ecology

Final Report

(Margot Marsh Biodiversity Foundation sponsored project)

By: Jihosuo Biswas

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Margot Marsh
Biodiversity Foundation

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(Jihosuo Biswas)

CONTENTS

HIGHLIGTHS OF THE PROJECT

- We recorded 25 numbers of Bengal Slow loris – highest ever count from 8 different Protected Areas and two Reserved Forests out of which two were new record and confirmed the presence of the species in another four PAs by secondary information and from the body parts confiscated. We also recorded loris from Namdapha NP out side our proposed study site.

- We recorded Bengal Slow loris out side the westernmost boundary of its distribution range as per IUCN *Nycticebus bengalensis* range map (2008).

- A long term study on habituated Bengal Slow loris covering behaviour, feeding ecology and home range utilization pattern has been initiated based on the present study.

- We recorded 721 individuals of Capped langur in 77 groups from 9 different PAs of Assam and recorded the sub specific distributional pattern of the species.

- A long tern study of the habituated groups of Capped langur covering its behaviour, feeding ecology and habitat utilization pattern has also been initiated based on this study.

- We recorded 715 individuals of endemic Golden langur from two PAs viz. Manas NP and Chakrashilla WLS – a thorough count after 10 years of the species.

- A total 3111 primate biomass from 13 different PAs was recorded.

- Greatest out come of the project is the capacity development as two long term eco-behavioural study for both the species leading to doctoral dissertation has been started by the project personnel's which will help to develop a Conservation Action Plan for the species which will eventually through light on site specific conservation of both the species. The staffs of all the 13 PAs also learn about the night survey protocol for nocturnal animals.

CHAPTER – I

Assam – a rich diversity of life forms

Being the core component part of North East India, the state of Assam represents bio-geographic gateway at the junction of the Indian Sub-continent and the Indo - China Bio-geographic Regions. The state has the important feature of Indo-Malayan, Indo-Chinese characteristics and represents the transition zone between the Himalayan and Indo-Burmese Biodiversity Hot Spot contributing to its total biodiversity. The altitudinal variations and climatic individuality of the state offer diverse ecosystem ranging from different forest types like wet evergreen forests, ever green and semi ever green forest, moist deciduous forests, savannah grassland, wetlands and river systems that can maintain the rich gene pool of wide variety of fauna and flora. Assam also harbors part of the world's northern most tropical rain forests and estimated to have nearly 50% of the total flowering plant species of India (Procter *et. al*., 1998; Whitmore, 1998). The state is also recognized one of globally important eco-regions (Olson & Dinerstein, 1998) and as endemic bird area (Stattersfield *et. al*., 1998).

Besides the state of Assam serves as the faunal gateway through which the oriental as well as palaearctic fauna could spread and colonize in the country. It is the westernmost boundary of the range of many Indo-Chinese mammals like some primates and the eastern most limits of many peninsular mammalian species. The range of distribution of many Indian species such as clawless otter, the stone martin, the hispid hare, the great Indian rhinoceros, the swamp deer, the spotted deer, the pigmy hog have terminated in the state while that of Malayan/Chinese species such as clouded leopard, the marbled cat, the golden cat, the spotted linsang, the large Indian civet, the binturong, the crab eating mongoose, the ferret badge, the hog badger, the bay bamboo rat, the hoary bamboo rat and almost all the north eastern primate species like Hoolock gibbon, Capped leaf monkey, Stump tailed macaque, Pig tailed macaque have their range of distribution sustain from this region. Many of the relict mammalian species of southern peninsular India, mostly confined to Western Ghat, are also closely related to Assam Pradesh and Northeast India. Thus Assam holds a

key place in the evolutionary process of divergence of the present day mammalian fauna of India, serving as an effective gateway of floristic and faunal influx.

The ethnic diversity also reflected by many tribes and clans each with distinct geographical distribution and linguistic individuality - are socio-economically, culturally dependent on the forests. This diversity of lifestyle of different tribes has made the conservation related to any wildlife a dynamic, unpredictable and challenging task. During the last couple of decades, the forests and wilderness areas are being severely degraded and even fragmented making many species endangered and locally extirpated from many forest areas.

Assam also occupies a unique position within the environment and development debate has huge potentialities and pressure from mainland as well as from neighboring countries which bring the state a cascade position. The tae, oil and other industries have prompted destruction of forests with added pace, the benefit of which goes only to the rich industrialist. These along with population growth and influx from neighboring countries brings in the local people in to direct conflict over the ownership of natural resources that often ended with social unrest which now pose great threat to the fascinating biodiversity of the state.

Primates are particularly at risk in the states due to excessive deforestation and traditional hunting. Excluding few patches, most of the forest, which represents the primary habitat of primates' in Assam, is under continuous process of degradation and destruction causing threat to the future existence of the populations. Thus a detail status and distributional study of both the taxa viz. Capped langur and Slow Loris is a prerequisite to initiate any conservation activities under such scenario.

Scope

Wildlife research and conservation in Assam has largely remained restricted to one or two charismatic species like Rhino, Tiger, Elephant and their habitats, with much of its important taxa like primates and their habitats are being virtually unexplored and unprotected. Although some

research project has been initiated in recent years by some individuals and organization that yielded new informations, but there is absolute paucity of research addressing the systematic study of the status and distribution of Capped langur and Slow Loris in the entire Assam. In recent years, few sporadic report based on preliminary observations have been published, but unfortunately the actual population and distributional status of both the primate taxa and its threats have never been evaluated. Thus a comprehensive study covering all of the Protected areas of the state is urgently required to document the status, distribution and conservation perspectives of these two primate taxa along with other non-human primates for a number of reasons: 1) there is a lack of information of its distribution and status, 2) it is threatened by habitat loss and hunting, 3) there is weak capacity for protection, 4) there is no awareness education in the communities where it resides.

The present study has been initiated to evaluate the detail status and distribution of two least studied primate species viz. Capped langur and Slow Loris in protected areas of Assam.

Objectives

Goal: *To collect data on the present population and habitat status and demography as well as feeding ecology of Slow Loris and Capped langur to support long-term conservation of both the species in Assam.*

Objectives:

(i) Survey: -

I. To know the present distribution and population status as well as demography of Slow Loris and Capped langur in the PAs of Assam.

II. To survey the habitat status of Slow loris and Capped langur in the PAs of Assam.

(ii) Feeding ecology:-

III. To find out the food plants used by Slow loris and Capped langur and its feeding ecology

(iii) Conservation: -

IV. To evaluate the threats from various angle viz., (a) population, (b) demography.

V. To provide data for the preparation of a Slow Loris Conservation Action Plan and for contributions to protected area management plans.

VI. To provide training and valuable work experience on Slow Loris and Capped langur research to members of the survey team as well as the forest staffs, as an emerging Biological Resources Unit.

VII. To encourage further detailed research on habituated Slow Loris and Capped langur, further strengthening the national commitment towards the long-term preservation of the species.

VIII. To evaluate the scope of working with the communities. To initiate a long-term population monitoring and community participatory program.

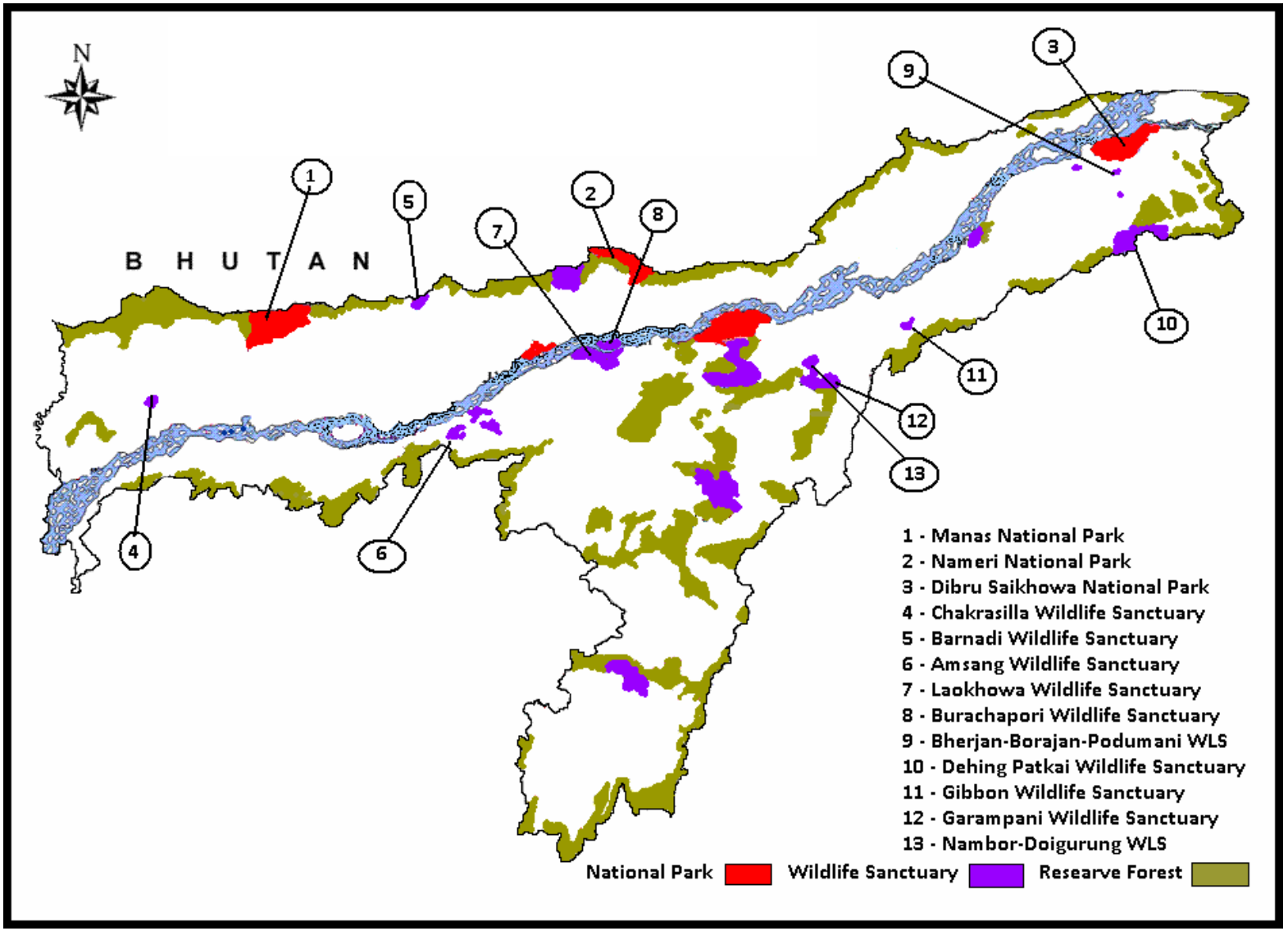
Study Area

This study supposed to cover the following 13 Protected Areas of Assam.

Manas NP (500 km^2); Nameri NP (200 km^2); Dibru Saikhowa NP (340 km^2); Garampani WLS (6.05 km^2); Gibbon WLS (20.98 km^2); Padumani -Bherjan -Borajan WLS (7.21 km^2); Nambar-Doigrung WLS (97.15 km^2); Dhing Patkai WLS (111.00 km^2); Amchang WLS (79.00 km^2); Chakrasila WLS (45.56 km^2); Laokhowa WLS (6.0 km^2); Burhachapori WLS (70 km^2); Bornodi WLS (45.57 km^2). Moreover, we cover two Reserved Forests of Assam (Chirrang RF and Joypur RF) adjacent to two major PAs and one PA of Arunachal Pradesh viz. Namdapha NP for slow loris survey and

Due to certain logistic problem the authority did not allow us to survey inside some protected areas like Kaziranga NP, Sonai Rupai WLS, Orang NP, Marat Longpi WLS etc.

Figure- I-1: Study Areas under the project



CHAPTER – II

Status and Distribution of Non-human Primates in PAs of Assam

Constitute in the highest order in the mammalian hierarchy, primate always attracts man's interest. Luxuriant in the tropical forest, primates are also seen in the diverse ecosystem due to its excellent adaptive capacity next to human beings. They are notable consumer of plants and to a much lesser extent of animal parts. At the ecosystem level they exerts a very important feedback control on the vegetation itself and also essential to maintain homeostasis of the forest ecosystem, especially critical for forest regeneration and survival.

Primate could also be projected as 'flagship' or 'umbrella' species in tropical and sub tropical woodland forest ecosystem and by projecting 'primates', a large number of species including its habitat could be protected. On the other hand primate often performs ecological services that are important to maintain tropical habitat as seed disperser, pollinator, seed predator as well as food for top predator.

Like other species, the state of Assam is also rich in primate diversity, and represented by nine species, some of these are exclusively found in the state and adjacent region. But unfortunately, the wild populations of all primates are in trouble and almost all of them are considered to be conservation concerned.

Method

I. For Day Survey:

Presence of primate was confirmed from direct sightings and song records for diurnal primate species particularly Capped langur. Depending up on the forest condition, survey was

carried out either by random sampling using *modified line transect* method to cover all the representative area of primary forest habitat or by direct method for secondary and open scrub habitat to document the distributional and population status, demography, habitat status and conservation threat of primates in Assam.

a) (Modified)Line transect method: Since the general topography of most of the study areas were varies from low lying plain areas to hilly terrain, the *modified line transect* method was applied (Burnham *et al*, 1980; Chetry *et. al.*, 2002; Indo-US primate project, 1995; NRC, 1981; Srivastava *et. al*, 1999; Struhsaker, 1997) to evaluate distribution, population and habitat status and demography of the diurnal primate species particularly Capped langur. In modified line transect method, instead of following fixed and marked transect of certain length, observers followed non-fixed transect, which they have randomly visited once or twice. The transect was laid in the existing forest trails and occasionally off forest tracts and extra care have been taken to cover at least 10-15% of the total areas of each forest and all the representative areas of the forest in stratified random manner (Mueller-Dombois and Ellenberg 1974).

Three groups of observer consisting of one researcher and one local field guide in each group followed on an average 10 -15 km. transects per day on foot. Walking transects generally started in the morning and the typical starting time was 6.00 to 6.30 AM and terminated in the evening. The survey transects were walked at a slow speed of approximately 1.5 km/hr (depending on weather conditions and habitat type) and as quietly as possible, stopping every 500 metre to take the reading on visibility, lat-long and altitudinal information as well as other habitat parameters and spend 2 – 3 minutes to listen any sound or movement or song. When a primate group was encountered during the transect walk, individuals were monitored for a while to confirm their taxonomic status. The individuals of the group was counted as per their age-sex class in the data sheet and complemented by data on perpendicular sighting distance and habitat parameters. All data collection was marked in the GPS units. In case of song, while animals remains far away from the transect, the direction of the song was followed to locate the group and related data was collected.

b) Vegetation records: During transect walk, distance was measured by the GPS unit and marked and vegetation data were collected in a circular plot of 10 meter radius at every 500 meter intervals during a transect walk and at each location where primates were encountered. These includes

visibility of that point, lat-long and altitudinal gradient, forest type, canopy height, visually estimated the percentage of canopy cover in that circular plot of 10 m radius above as 1-20%, 21-50%, 51-75%, or 76-100%, ground cover, dominant tree, shrub and herb species and their phenological state at every sampling point. Data on the degree of encroachment by people, including grazing, jhooming and logging pressure were also collected. Details of the habitat type and dominant tree species were recorded.

c) <u>All count method</u>: For secondary fragmented habitat and open scrub as well as in the fringe village areas where primate s' were reported, all count method applied where all the primate groups were located as per accessibility of the area and counted as per their age-sex class supplemented with GPS data (Indo-US primate project, 1995-98).

II. For night Survey:

For *Slow loris* survey, an encounter rate survey, the 'recce' (reconnaissance) survey (Walsh and White, 1999) in conjunction with line transects (Burnham *et al*., 1980) methods, the Recce-Survey Transects was employed instead of formal 'fixed-point' line transects (Burnham *et al*. 1980) as previously proposed for this study due to some security and logistic problem at night. We considered individuals/km as an index of the relative abundance of slow lorises in the surveyed areas. To determine population status in the form of relative abundance, 2 line transects were conducted each night. One transect survey was conducted during the early part of the night between 18.00–2130 h and another in the late part of the night between 2230-0200 h (White & Edwards 2000. Transects were generally 2 -3 km in length and randomly selected in the existing trails and in the edges of the forest. A total of 5% of the total forest habitat area was walked at each PA. Transects were walked slowly (1km/hr) by two individuals so that both sides of the transects were equally observed. Observers recorded the following information upon encountering a slow loris: time, number of individuals, location on the transect, distance of the animal from the observer, and angle of the animal from the transect line.

A headlight and flashlight was used during transects to identify eye shine. Use of red or infrared light has a number of advantages: it is not strongly reflected by surrounding vegetation, and at least some nocturnal animal species are unable or less able to see these wavelengths. Barrett

(1984) confirmed this effect for *Nycticebus*. The animals are therefore less aware of observation, show a more normal behaviour and a diminished tendency to retreat or hide their faces for camouflage. Disadvantages of red light: it does not allow proper judgment of the colour of eye shine, and its diminished intensity may be still sufficient in more open vegetation; in tropical rainforest, loss of light by canopy may make use of the stronger white light necessary (Southern 1955; Barrett 1984).

When the source of light is held close to the eyes of the Slow loris, the *tapetum lucidum* in the eyes of the animals (reflecting layer of cells behind the retina) causes a reflection well visible as long as the animal is looking towards the light. The tapetum causes light rays to cross the retina twice and probably shifts ultra-violet light into visible wavelength for better vision in darkness. Differences in the colour and strength of the eye-shine, the size and distance of eyes provide some information about identity of species. Even light of rather low intensity causes a visible eye-shine in *Loris*; the bright reflexion of *N. coucang* eyes is well visible from a distance of 200 m in the wild (B. Meier, unpublished; Hladik & Petter, 1970; Barrett, 1984).

Results

Nearly 1200 kilometers of transects were laid down and surveyed in the 13 PAs of Assam. Additional 200 kilometers of drive transects were surveyed in different corners of PAs. We recorded 3111 individuals of primates belonging to seven species and three sub species.

During the survey we found impressive and interesting primate species assemblage from 13 protected areas of Assam locating different corner of the state. We recorded seven species of primates from Gibbon WLS - highest primate diverse PA of Northeast India followed by Borajan-Bherjan-Podumoni WLS and Dehing Patkai WLS having five species in the eastern part of the state. Similarly in the western part, Manas NP have five species, Nameri NP and Barnadi WLS have four species. In the central part of the state, Garampani WLS have five species and Nambar WLS have four speiecs and Amchang WLS have five species of primates.

Sl. No	Forest	Forest Division	Species observed / reported
1	Amchang WLS	Guwahati WL	HG, CL, RM, AM, SL*
2	Barnadi WLS	Udalguri	CL, RM, AM, SL*
3	Burachapori WLS	Nagaon WL	RM
4	Lowkhowa WLS	Nagaon WL	RM
5	Borajan Bherjan Podumoni WLS	Tinsukia WL	HG, CL, PTM, AM, RM, SL
6	Dehing Patkai WLS	Dibrugarh	HG, CL, RM, AM, SL
7	Garampani WLS	Golaghat	HG, CL, AM, RM, SL
8	Chakrashilla WLS	Kokrajhar WL	GL, RM
9	Nameri NP	Estern Assam WL	CL, RM, AM, SL
10	Gibbon WLS	Jorhat	HG, CL, STM, PTM, AM, RM, SL
11	Dibru Saikhowa NP	Tinsukia WL	HG, CL, PTM*, AM, SL*
12	Manas NP	Manas FD	GL, CL, AM, RM, SL

Table-II-1: Primate species assemblage in different Protected Areas of Assam.

The status and distribution of different primate species found during the study are elaborated in the table-II-2. During our survey, we recorded 228 numbers of Hoolock gibbon in 76 groups (~ 3, range 1-5), 715 individuals of Golden langur in 89 groups (~ 8.03, range 3-19), 721 individuals of Capped langur in 77 groups (~ 9.3, range 4-22), 83+ individuals of Pigtailed macaques in 4 groups (~ 20.75, range 18-32), 172+ numbers of Stump tail macaques in 2 groups (~ 86), 357 numbers of Assamese macaque in 16 groups (~ 22.3, range 12-38), 810 individuals of Rhesus macaques in 39 groups (~ 20.7, range 15-37) and 25 individuals of Slow loris (Table-II-2).

No	Name of the PAs	Hoolock gibbon			Golden langur			Pig tailed macaque			Stump tail macaque			Assamese macaque			Rhesus macaque		
		T. N	GS	NG	T. N	GS	NG	T. N	GS	NG	T. N	GS	NG	T. N	GS	NG	T. N	GS	NG
1	Amchang WLS	*	-	-	-	-	-	-	-	-	-	-	-	73	24.3	3	89	21.8	4
2	Barnadi WLS	-	-	-	-	-	-	-	-	-	-	-	-	22+	22	1	45+	15	3
3	Burachapori WLS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43+	14.3	3
4	Lowkhowa WLS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51+	25.5	2
5	Borajan Bherjan Podumoni WLS	8	2.7	3	-	-	-	37	19.5	2	-	-	-	64	32	2	39+	19.5	2
6	Dehing Patkai WLS	133	2.8	47	-	-	-				-	-	-	79	19.7	4	132+	22	6
7	Garampani WLS	3	3	1	-	-	-	-	-	-	-	-	-	12+	12	1	28	28	1
8	Chakrashilla WLS	-	-	-	501	7.6	66	-	-	-	-	-	-	-	-	-	86	28.6	3
9	Gibbon WLS	75	3.4	22	-	-	-	46+	23	2	172+	86	2	30+	30	1	41+	20.5	2
10	Nameri NP	-	-	-	-	-	-	-	-	-	-	-	-	41	20.5	2	57+	19	3
11	Dibru Saikhowa NP	9	3	3	-	-	-	-	-	--	-	-	-	13+	13	1	103+	20.6	5
12	Manas NP	-	-	-	214	9.3	23	-	-	-	-	-	-	23+	23	1	95	19	5

Table-II-2: Total number of individuals, average group size and number of groups of different primate species observed different Protected Areas of Assam

CHAPTER – III

Status and Distribution of Capped langur in PAs of Assam

Capped langur, *Trachypithecus pileatus* (Blyth, 1884), a Colobine monkey is widely distributed in Northeast India, North Central Bhutan, Northern Myanmar, South west China and Bangladesh. It is also called Capped leaf monkey for its profound leaf eating habit. The species is allopetric to its congeneric Golden langur or leaf monkey (*Trachypithecus geei*) in the east bank of the river Manas. The natural barrier between the ranges of two leaf eating monkey is the broad Manas river (Mukherjee, 1978) and high elevation at upper reaches of Bhutan. But unlike Golden langur, the species occupies a wide geographical range with diverse ecological conditions ranges from moist deciduous, tropical rain fed semi-evergreen, evergreen to mixed deciduous forests and also in temperate broadleaf forest and even in conifer forest zone. The species is reported to be well adapted to changed habitat condition in secondary forest and in bamboo thicket thus achieved outstanding evolutionary success (Biswas, personal communication). It is also unique in its altitudinal distribution as the occurrence of the species ranges from 30m to 3000m altitudes that portrays brilliant ecological adaptability and behavioral flexibility.

Five subspecies or races so far been recognized based on the pelage colour viz. Blonde Capped langur (*Trachypithecus pileatus pileatus*); Orange bellied Capped langur (*T. p. durga*); Buff bellied Capped langur (*T. p. brahma*); Tenebrous Capped langur (*T. p. tenebricus*) and Short ridgei (*T. p. shortridgei*). Although Choudhury (1997) was skeptical about the existence of one or two sub species due to the seasonal change of the pelage while other have the opinion of categorizing one sub species viz. *T. p. shortridgei* in to separate species (Brandon-Jones *et. al*., 2004). Thus all four sub-species of Capped langur are reportedly found in Northeast India and Assam. These subspecies are allopetric to each other by the physical barrier like altitudinal gradient or rivers although there are some sorts of overlapping between *T. p. durga* and *T. p. pileatus* has been reported. As per available information the sub-species distributed in Manas NP and adjoining Bhutan and north western Assam, is the Tenebrous Capped langur (*T. p. tenebricus*) which is bounded by the river Manas, thereby restricting the sub-species in the northeastern part of Assam up to the north bank of

river Brahmaputra and some part of Arunachal Pradesh in India and north Central Bhutan. This sub-specie seems to be sympatric to Buff bellied Capped langur (*T. p. brahma*) in its northeastern range. Unfortunately except the first taxonomic note and specimen collection from "Seajuli" under Dafla hills, North Lakhimpur, there is no information available on the sub species status and distribution about Buff bellied Capped langur. In SAP/CAMP workshop the status of Buffed bellied Caped langur was reevaluated as "Data Deficient" category due to lack of information regarding their distributional status, population and other ecological data. Even some of the workers are skeptical about the existence of the sub-species and categorize it as 'C' taxon. On the other hand the distribution of Blonde bellied Capped langur (*Trachypithecus p. pileatus*) was reported so far from Nagaland, Manipur, Mizoram, Meghalaya, Cachar and hill tracks of Assam and Bangladesh apart from north eastern Myanmar. Choudhury reported the subspecies from Karbi plateau and Barail range of Assam also (Choudhury, 1997). While Orange bellied Capped langur was reported from low line area of Brahmaputra valley overlapping with Blonde bellied sub species.

Although few studies have been conducted on the behaviour and ecology of the species but there is no information available on the present status and distribution of the species in the protected areas of Assam. Hence no conservation action plan has been formulated. In the present study we cover 12 protected areas of Assam to know the present population status and demography of Capped langur.

Method

Study area & Methods:

Extensive field surveys for distribution and status of Capped langur were conducted between March 2007 to May 2008 in 12 PAs of Assam. Surveys were carried out using modified line transect method (Burnham, *et al*., 1980; NRC, 1981; Strushsaker, 1997; Mohnot *et al*., 1995-2001) and direct spot observation method. Transects were laid in the existing forest trails in a stratified random manner to cover all representative areas (Mueller-Dombois *et al*., 1974). When a Capped langur group was encountered, they were counted according to their age-sex class viz. adult male,

adult female, juvenile and infants etc and characteristics of the individuals were also recorded. Once visible, individuals were counted carefully to obtain the total group counts to get demographic details before leaving the transect.

Results

Group size and composition:

We recorded 721 individuals of Capped langur in 77 troops in different protected areas of Assam. Of these, 57.28% were adult individuals and about 42.7% were immature. Group size, composition, and population in different PAs are given in table-III-1. The average group size is 9.36 ± 4.2 individuals per group ranging from 3 to 22 individuals. Of these 721 individuals, 20.2% were adult males, 33.4% were adult female, 3.6 % were unidentified adult (whose sex could not determined), 4.5% were juveniles and 8.2% were infants (Fig-III-1). The adult sex ratio was 1:1.65

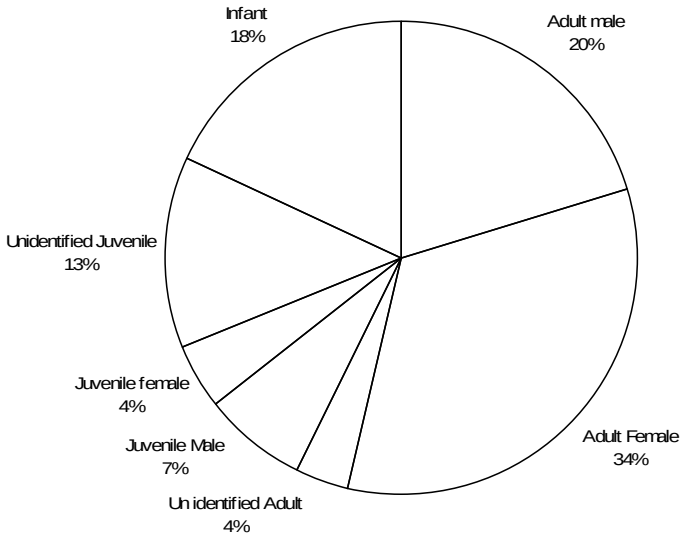


Fig –III-1: Age sex class of Capped langur recorded during the study from different PAs of Assam.

Group structure:

Four types of social structure have been observed in the Capped langur groups. The majority of groups had more than one adult male (53.3%) of which, 30.6% were two male bisexual groups and 22.6% were multi male bisexual groups. Other than this, one male bisexual groups (38.6%), all male band (4%) and lone males (4%) were also observed during the survey. The adult sex ratio, group size and composition of Capped langur observed during the study in different forest are given in Table-III-2.

Population density:

Population density of Capped langur in different protected areas has been work out from the sample area of respective forests and estimated in Table-III-2. The density estimates reveals that Mans NP and Gibbon WLS holds a substantial population although Manas NP has only small area as Capped langur habitat since 80% of the Manas NP is grassland and only in he northeastern part of the park support Capped langur habitat. On the other hand Dehing Patkai WLS also holds a good population but encounter rate is very less then predicted depicts some sort of hunting pressure. Since the sanctuary share common boundary with Arunachal Pradesh and national highway passes through the periphery of the sanctuary, it is apparent that hunting by Arunachal tribe is common which result low density despite very good habitat for Capped langur.

Sub specific distribution of Capped langur:

In the present study we also investigate the sub specific distributional status of capped langur in PAs of Assam.

Photo- Tenebrous Capped langur

Tenebrous Capped langur (*T. p. tenebricus*):

Diagnostic feature: The pelage colour of this subspecies is much darker ranging from ashy black to slate-grey particularly on the head, back, outer surface of the arm and legs.

Table-III-1: Age sex classification of Capped langur.

Sl no	Name of the Forest	No of Group	Age-Sex composition									Total
			A♂	A♀	A?	J♂	J♀	J?	In♂	In♀	In?	
1	Amchang WLS	15	34	40	6	5	4	19	1	1	13	123
2	Barnadi WLS	5	6	12	3	1	2	5			5	34
3	Burachapori WLS	-	-	-	-	-	-	-	-	-	-	-
4	Lowkhowa WLS	-	-	-	-	-	-	-	-	-	-	-
5	Borajan Bherjan Podumoni WLS	1	2	3	-	1	1	-	-	-	1	8
6	Dehing Patkai WLS	12	28	41	5	11	9	12	1		22	129
7	Garampani WLS	1	3	6	1	1	1	3	1	-	2	18
8	Chakrashilla WLS	-	-	-	-	-	-	-	-	-	-	-
9	Nameri NP	12	17	39	4	9	4	12	-	1	19	105
10	Gibbon WLS	14	23	41	1	13	2	19	4	-	17	120
11	Dibru Saikhowa NP	2	3	5	1	1	1	3	-	-	4	18
12	Manas NP	15	30	54	5	10	8	20	1	1	37	166
Total:		**77**	**146**	**241**	**26**	**52**	**32**	**93**	**8**	**3**	**120**	**721**

Table-III-2: Age sex classification of Capped langur.

Sl. No	Name of the Forest	Average group size	Density	Estimated population	Sex Ratio		Percentage of age class		
					A♂	A♀	Adult	Juvenile	Infant
1	Amchang WLS	8.25	3.28	250	1	1.18	62.9	24.2	12.9
2	Barnadi WLS	6.8	2. 82	125	1	2	61.8	23.5	14.7
3	Borajan Bherjan Podumoni WLS	8	1.14	8	1	1.5	62.5	25.0	12.5
4	Dehing Patkai WLS	10.75	4.01	440	1	1.46	57.4	24.8	17.8
5	Garampani WLS	18	4.5	25	1	2	55.5	27.7	16.6
6	Nameri NP	8.75	2.3	250	1	2.29	57.1	23.8	19.04
7	Gibbon WLS	8.57	6.7	140	1	1.27	57.2	27.3	15.5
8	Dibru Saikhowa NP	10	-	-	1	2.3	55.00	25.00	2.00
9	Manas NP	11.06	9.2	500	1	1.8	53.6	22.9	23.5

Tail is also ashy black, which turns much darker at the tip. Marked variation in pelage has been observed from different location and in different seasons. The hairs of the cap are semi erected and ashy black to darker in colour. The exposed portions like ears, palms, and soles, are black. Ears are smaller and heavily surmounted with yellowish orange to red hue whisker hairs whose tips become grayer on the tip. The throat, chest and shoulder in male is whitish tint with buff to pale yellow in male while in female the throat, breast and shoulder are pale red to orange in colour.

Manas NP

Barnadi WLS

Nameri NP (Buffer area)
West bank of Jia Bharali

East bank of river Jia Bharali, Nameri NP

Distribution:

The distribution of the subspecies lies in tropical semi evergreen, mix deciduous; Sal dominated moist deciduous and sub-tropical broad leaf forests of Assam and Arunachal Pradesh. Although there is no physical barrier as such to separate the sub species from buff bellied, but with the change of vegetation in low elevation the Capped langur populations are darker, with short pelage. Since these forests are more or less influenced by season, it has been observed that the pelage colour of the races' also changes along with the changes in the season and forest foliage.

Our study confirms the distribution of tenebrous Capped langur (*T. p. tenebricus*) from Manas NP, Barnadi WLS and buffer areas of Nameri NP. From these three protected areas, we recorded 270 individuals of tenebrous capped langur in 30 troops. The average troop size is 9

individuals. Thus tenebrous Capped langur, which was previously reported only from north Kamrup and Manas areas of Assam (Biswas *et. al*., 2006; Groves, 2001; Choudhury, 1997) have also been observed in Barnadi WLS and Namri NP in Assam as well as two sanctuaries viz. Eagle nest WLS and Sessa WLS of Arunachal Pradesh portrays fairly large range towards southeast Arunachal Pradesh and northeaster Assam further in the north bank of the river Brahmaputra. The animals are found in mid elevation to lower elevation in the foothills of Himalayas and might be extending at least up to the Dhansiri river in the east we suppose in Arunachal Pradesh and Assam ranging from 50m to 800m.

Even within this race mark variation in the pelage colour was observed from different localities with the changes in forest and elevation level. In Nauduar Forest of Assam (western buffer of Nameri NP), the individuals of the race are pale in colour with short crown hair and small cheek whisker. Both the male and female individual of the location have pale orange hair tint with copper tan on their throat and abdomen. While individuals of Bhalukpong, or river bank of Jia Bharali river the individuals are slate-gray to black in colour with long whisker hair. The crown in being dark grey to ashy gray in colour and cap is prominently distinguished. The tail tip is bushy and darker than base of the tail. Similarly in the east bank of Jia Bharali river, individuals are leass darker compare to west bank.

Blonde bellied Capped langur (*T. p. pileatus*):

Diagnostic feature: The body pelage is generally denser and longer compared to other sub-species of Capped langur although marked variation observed in different elevation, with the furry tail distinctly tufted at its tip. The exposed areas like ears, palms, and soles, are deep black in coloration. Ears are smaller and heavily surmounted with long white to buffy hairs. The pelage colour is of grayish or ashy gray on the dorsal side intermingle with pale white hairs that becomes a more fawn-gray on the lower portion and buffy to creamy yellow and dull-white on the ventral side.

Dehing Patkai WLS (Dirok side)

Dehing Patkai WLS (Jeypur side)

Amchag WLS

Belly somewhat gray white tint with yellow while chaste and throat paler than abdominal portion. The insides of the limbs are pale gray, and the hands, feet, and tail are pale ashy black. The cheeks contrast with the rest of the face and the crown in being whitish to buff with a paler yellowish tinge.

Distribution:

The blonde bellied subspecies is found to be distributed in mid to high elevation in tropical, sub tropical and temperate broad leaf forest from 400m to 3000m. This sub species in Assam seems to be overlapped with orange bellied Capped langur in south bank of the river Brahmaputra particularly in the hills. Even during rainy season marked variation in pelage colour has been observed and the ventral pelage during monsoon changes to orange and much brighter compare to winter season. We observed blonde bellied Capped langur from Amchang WLS, Dehing Patkai WLS adjacent to Arunachal Pradesh.

Orange bellied Capped langur (*T. p. durga*):

Diagnostic feature: Above average size and weight for its subgenus *Trachypithecus*, *Trachypithecus pileatus durga* is an orange-bellied, grey subspecies. The pelage is generally denser, softer and longer, with the furry tail distinctly tufted at its tip. The side of the black face and of the upper lip have a few fine sparse black hairs. The strongly contrasting, glistening, almost white cheek hairs extend behind the ear, whose lower part is concealed by their lateral and posterior projection.

The relatively short, backward-directed, pale forehead hair is intermingled with longer, laterally-directed, black hairs which extend posteriorly to laterally blacken the crown. There is no frontal whorl or erect crest. The slightly lengthened crown hairs project behind, cap-like, over the occipit whose hair is relatively short. The pelage colour is a delicate pale grey, somewhat darker on the upper part of the back and tending to whitish on the limbs. The tail is slightly suffused with yellowish brown and darker towards its greyish brown tip. The sparse beard is whitish. The whole underside, including that of the limbs, is dull "fulvous" (orange) white to dark orange. Except on the penultimate phalanx of the digits, the hand is slightly blackened. The foot is similarly blackened on the first or basal phalanges only

Distribution:

Endemic to Bangladesh, western Burma and the States of Manipur, Meghalaya, Nagaland and perhaps Mizoram in India, generally at high altitude, but descending to 400 m in western Meghalaya and Assam. Paratypes were collected at Golaghat, (90-120 m), Sibsagar, Lanka (120 m), North Cachar, Cachar Hills, Assam and at Lamsakhang (240 m) and Lakhuni (600 m), Naga Hills (Nagaland) (Hinton, 1923, pp. 81-82; Hinton and Lindsay, 1926, p. 386; Pocock, 1928, pp. 663-664; 1939, pp. 125-127). All type localities are in India.

Gibbon WLS

Garampani WLS

Borajan-Bherjan-Podumani WLS

In present study we reported this sub species from Gibbon WLS, Borajan-Bherjan-Podumani WLS, Garampani WLS, Nambar Doigurung WLS and parts of Dehing Patkai WLS. Within the sub species, marked variation in the pelage and colour observed in different location and in different season. During dry season the pelage colour changes to lighter shades with yellow tinge in the ventral side resembling it with Blonde bellied sub species. Similarly the pelage is also varies in the south western part of Assam where crown hairs are much elongated compared to the Upper Assam and tail tips are some what bushy.

Tribes from Arunachal hunt Capped langur for food as well as for skin. They use skin of the tail for the cover of their traditional dao (machete). A part from hunting there are several problems viz., rapid habitat loss, fragmentation, alteration of habitat, jhoom cultivation, hydro electrical dam construction etc. Both the sub species viz. tenebrous as well as blonde bellied attain the status of Endangered as per recent CAMP assessment (Molour *et. al*., 2003). So, sincere efforts for conservation with long-term vision are required and prior to that a detail study on their distribution and population status is prerequisites.

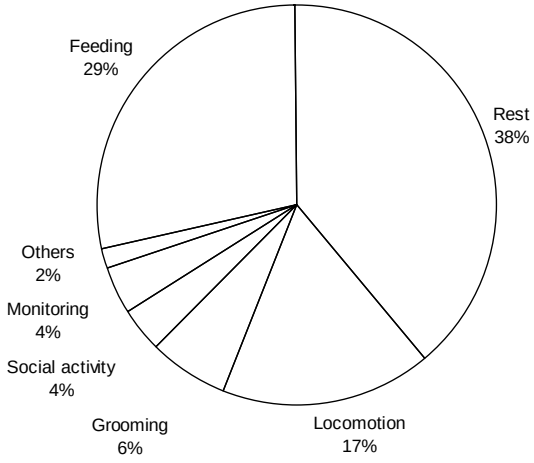
Photo courtesy: A. Kumar

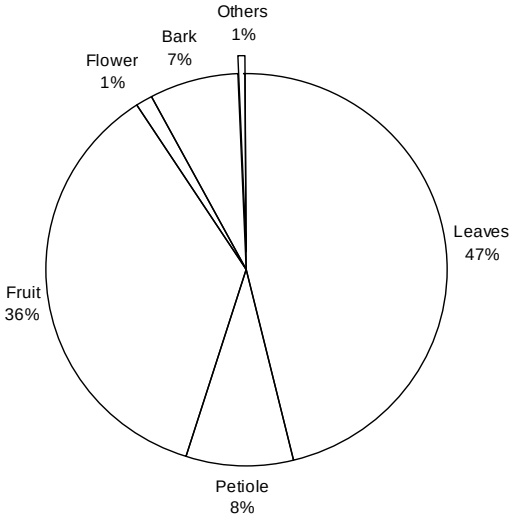
Arunachali tribes using tail as the cover of their 'Dao'.

Long term study on feeding ecology:

Long term study has been initiated in Gibbon Wildlife Sanctuary, from March 2008 to February 2009 to investigate habitat use and food preference of Capped langur. Study were conducted in 4 seasons, i.e. pre monsoon season (March to May 2008), monsoon (June & July 2008), re-treating monsoon (September to October 2008) and winter season (December 2008 to February 2009) where data were collected using 5 minutes instantaneous scan sampling method (Altmann, 1974).

For activity pattern, one groups of Capped langur comprising 9 individuals was followed from dawn to dusk where all the activities were scanned and recorded in the half an hour protocol sheet in every 5 minutes intervals in Gibbon Wildlife Sanctuary. The group spent 39% of their active diurnal time in resting, 28.7% in feeding, 16.8% in locomotion, 6.4% in grooming, 3.7% in social activities, 3.9% in monitoring and 1.6% in other maintenance activities annually, which varies significantly from season to season.





The individuals of the study group took different food categories as their diet, namely new leaves, mature leaves, petioles, bark, flowers, unripe fruit, ripe fruit etc. In the semi evergreen forest of Gibbon wildlife sanctuary capped langur spent 46.21% of their feeding time in leaves, 36.20 % in fruits, 8.46 % in petioles, 7.18 % in barks, 1.28% in flowers and 0.66% in other food items.

CHAPTER – IV

Distribution and Population status of Bengal slow loris *Nycticebus bengalensis* in Protected Areas of Assam, India.

Lorises are the only prosimian monkeys that are distributed in South and South east Asia. Five species were recognized so far, based on genetic and morphological analysis, are *Nycticebus bengalensis, N. coucang, N. javanicus, N. menagensis,* and *N. pygmaeus* (Roos 2003; Chen *et al*. 2006; Nekaris & Jaffe 2007). The Bengal slow loris (*Nycticebus bengalensis*) is now one of five recognized slow loris species, which was previously considered a subspecies of *N. coucang*, (Groves 2001; Roos 2003). It is distributed throughout northeastern India, Bhutan, Myanmar, Cambodia, Southern China, Laos, northern Thailand, and Vietnam (Nekaris and Bearder 2007). Owing to their nocturnal lifestyle, cryptic nature and relatively small body size, the slow lorises (*Nycticebus* spp.) are amongst the least studied Asian primates (Srivastava & Mohnot 2001). And there is absolute paucity of research addressing the distribution and conservation status of Bengal slow loris in India.

Due to the limited information, the Bengal slow loris, has been until recently categorized as Data Deficient in IUCN Red list (2006) and under Schedule I of the Wildlife (Protection) Act of India, 1972. Recently it was up listed from Appendix –II to Appendix – I by CITES (2007) and it is now considered as Vulnerable (IUCN 2008; Nekaris *et al.* 2008) in South and Southeast Asia. But in South Asia, however, this assessment was made on the basis of habitat loss alone since few data are available from the field.

To date very limited effort has been made to document the population status and threats of Bengal slow loris in Assam and virtually nothing is known about its behaviour and ecology in the wild. Recent publications report that populations of Bengal slow loris are declining (Srivastava & Mohnot 2001; Radhakrishna 2006). Choudhury in 1992 estimated the population size at 16,000 -17,000 individuals (based on availability of potential habitat) but we are skeptical about the size of this projected population owing to the fact that nothing is known about the

density or ranging behaviour of these cryptic species, on the basis of which one can made such assessment. Habitat destruction, hunting for food and road accidents are the major threats for this species (Choudhury 1992; Gupta 2001; Radhakrishna 2006). In the present study we surveyed 12 different protected areas of Assam and two reserved forest adjacent to PAs and one PA of Arunachal Pradesh.

Method

We adopted the 'recce' (reconnaissance) survey method (Walsh & White 1999) in conjunction with line transects method (Burnham *et al.* 1980). The 'recce' method was used to estimate loris encounter rate (MIKE 2006), and has been used in previous studies of closely related species (Nekaris & Jayewardene 2004; Kumara *et al.* 2006). Surveys were done at night (1800 – 0200 h) from February 2008 to May 2009 on foot. Two transects were walked each night and selected randomly to avoid bias, one between 1800 – 2130 h and another between 2230-0200 h (White & Edwards 2000). Transects were walked at a speed of 1km/h.

Due to the elephant and other large predators, the survey team comprised of three individuals; two were involved in searching both sides of the transect, with one involved in sighting of other animals for security reasons. All types of vegetation were searched by Petzl headlamp for detection of *Nycticebus*, with the aim to detect an orange/red reflection produced from its eye. We used a red filter over the headlamp to observe and confirm the animal, as red light produces less disturbance to loris than white light (Nekaris 2003). On confirmation of loris, data relevant to the survey including transect length, animal transect distance, number of individuals, distance of the animal from the observer, angle of the animal from the transect line, latitude and longitude, time of detection, activity when first detected, tree height in which it was sighted, tree where it was detected and vegetation type were recorded (Nekaris & Jayewardene 2004). Photographs of the sighted animal were taken when and where possible. The average length of transect was 2.5 – 3 km per night. Out of the total area covered, 15% distance was along areas bordering forests. The remaining distances walked were in interior of the reserve.

Results

During the survey, we survyed 13 different protected areas of Assam covering almost all representative areas except southern Assam. A total of 20 slow lorises were recorded from 7 different protected areas and confirmed the presence of slow loris from 4 different protected areas from secondary information and past record of captured animals (Table – IV-2).

During the survey we spent 99 full survey nights and 28 partial survey nights covering 329 km long transect. All the loris encountered was lone animals. Since the density or actual abundance of the species could not be calculated due to its cryptic nocturnal habits and shyness, eye shine detection is the only method of animal sighting at night - which is also very intermittent, reduces the chances of any density estimates. During our survey efforts, only in 22.0% (n = 25) survey nights we were successful in encountering lorises in side the PAs. Because of these difficulties workers are estimating the average encounter rate per kilometer and considered it as abundance estimate instead of true abundance.

In this study, the average encounter rate or abundance of the species in all the PAs of Assam was calculated to be 0.11 individual/ km. This estimates varies in different protected areas as we observed and highest abundance observed in Gibbon WLS (0.18 loris /km) followed by Borajan-Bherjan-Podumani WLS (0.17loris / km) and Garampani WLS and Nameri NP (0.10 loris / km).

Apart from these protected areas, we also surveyed two Reserved Forest of Assam viz. Chirrang RF and Joypur RF which constitute the buffer area of protected areas. In these two reserved forests, we encountered two animals spending another 8 full survey nights and one

partial survey nights covering 26 km transect distance. The estimated abundance of the two reserved forests was calculated to be 0.06 loris /km and 0.09 loris/km respectively.

Gibbon WLS

Borajan-Bherjan-Podumani WLS

Garampani WLS

Dehing Patkai WLS

Similarly we spent 5 full survey nights in Namdapha NP cum Tiger Reserve in Arunachal Pradesh, which is a contiguous landscape with Dehing Patkai WLS and encountered 3 lorises covering a transect distance of 15 km. The abundance of loris from this observation was calculated to be 0.2 loris / km which is quite high compared to the observation in protected areas of neighboring Assam. Thus the total animal sighted during this study was 25 animals in 8 PAs and two RFs.

On every occasion all lorises were found in solitary conditions. All lorises were seen at average heights of 12.24 m (range 3m - 15 m) (Table: IV-3) with respect to the ground. The heights, at which the animals were sighted, however made it difficult to identify their sex and

age. The average sighting encounter distance from transect was 17.4m (range 6m – 28m) depending on the vegetation pattern and degree of disturbance of the forests (Table: III-2). The nearest loris encountered distance generally observed in bamboo thickets and bushes (~ 7.5m), where slow lories were concealed with the local environment and immediately disappeared if disturbed. The average height at which lorises were sighted was 12.25 m (range 5m – 15 m). The details of the tree where the lorises sighted were and average height of the animal sighted and the sighing distance in different protected areas and RFs are given in the table-IV1 & 3.

The present study also reveals abundance rate of Bengal slow loris population suitable for comparison with the only other available abundance estimate reported for Assam. Radhakrishna, Goswami, and Sinha in 2004 conducted these surveys in some parts of Assam, and found 0.03–0.33 loris individuals/km and in Gibbon Wildlife Sanctuary (Radhakrishna *et al*. 2006). This survey estimated an abundance rate of 0.11 individuals/km, which is slightly higher than that found by Radhakrishna *et.al*. Generally all loris species are sparsely distributed throughout much of their ranges (Nekaris *et al.* 2008). The present abundance estimate of Bengal slow loris in all the PAs and RFs falls within the ranges as reported by some authors in its distribution areas (table-IV-5) which portrays a substantial population of Bengal slow loris in few PAs of Assam which are isolated from each other. Despite a serious danger of becoming extinct in many parts of Assam (Radhakrishna *et al*. 2006), conservation action for this species is still neglected in the western part of its distribution range. While Namdapha NP, Arunachal Pradesh may have holds a good population put rampant hunting in the peripheral areas for medicinal use is a cause of concern.

Feeding ecology study:

Long term study has been initiated, in Gibbon Wildlife Sanctuary, from June 2008 to investigate habitat use and food preference of Bengal Slow loris. Study were conducted in 3 season, i.e. Monsoon season (June & July 2008), winter season (December 2008 to January 2009) and Pre-monsoon (April & May 2009) through line transect using existing trails by 1

km/hr pace walk at night. On first detection position, location trees, substrate used and food types were recorded. Behaviors were noted via “focal instantaneous sampling at 5 min intervals".

A total of 117 feeding incidents during 80 night walks were recorded. During the study Slow loris used different plant parts from 18 plant species. It was found that as high as 83.70 % of feeding bouts were of plant exudates (gum and sap). This was followed by bark (6.30 %), floral parts (4.80%), insects (3.50%) and fruits (1.70%). During the study, the Slow loris used 14 different tree species of 9 families for exudates eating. Out of these, it preferred 5 tree species, comprising 71% of the total exudates feeding bouts.

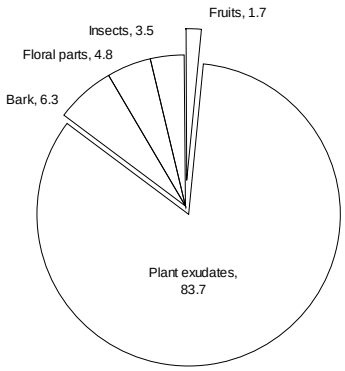


Fig-IV-1: Different plant parts eaten by Slow loris during the study.

The study ravels that slow loris preferred exudes of certain plant species as their staple food items, which have high medicinal value and commonly used by the local communities of the region for medicinal purpose.

Photo: In Bamboo thickets

Out of total exudates eating, Bengal slow loris preferred 5 tree species, comprising 71% of the total exudates feeding bouts. The highly preferred plant species are Silikha (*Terminalia chebula*; Family: Combretaceae), Nahor (*Mesua ferrea*; Family: Clusiaceae), Arjun (*Terminalia arjuna*; Family: Combretaceae), Dimoru (*Ficus hispida*; Family: Moraceae) and Outenga (*Dillenia indica*; Family: Dilleniaceae). Most exudates eating plants were between 5 and 18 m in height (58%). The fruit types eaten most were berries (42.7%) and drupes (31.5%). The comparison of eaten and not eaten fruits revealed that prefer smaller fruits and seeds for feeding. The eaten fruits had a length of 13.8mm and a width of 10.4mm.

These observations suggest that the food preference and dietary composition of Bengal slow loris is highly enriched with medicinal plants which might have some implication on its physiology and socio-sexual behaviour. An emphasis on the dietary affinity of the species towards the medicinal plants is offering a strong vista for successful conservation in the region.

Sl No	***Tree species***	***Families***	***No. of Slow loris sighting***
1	*Terminalia myriocarpa*	Combretaceae	3
2	*Manglietia hookeri*	Magnoliaceae	3
3	*Magnolia hodgsonii*	Magnoliaceae	3
4	*Terminalia chebula*	Combretaceae	3
5	*Lagerstroemia speciosa*	Lythraceae	2
6	*Dillenia indica*	Dilleniaceae	2
7	*Artocarpus chamma*	Moraceae	1
8	*Ilex godjam*	Aquifoliaceae	1
9	*Spondias mangifera*	Anacardiaceae	1
10	*Pothos scandens*	Araceae	1
11	*Castanopsis indica*	Fagaceae	1
12	*Pseudostachyum polymorphum*	Poaceae.	1
13	*Elaeocarpus rugosus*	?	1
14	*Mesua ferrea*	Clusiaceae	1
15	*Melia azedarach*	Meliaceae	1
		Total	**25**

Table-IV-1: Sighting of Slow loris in different trees.

Surveyed Areas	Night survey	Distance Covered (km)	No. of Loris sighting	Sighting rate per km	Remarks
Manas NP	8 full & 3 partial nights	39	3	0.08 loris/km	Western most distribution recorded
Nameri NP	7 full nights	21	2	0.10 loris/km	
Dibru Saikhowa NP	6 full nights.	23.5	0	-	One animal caught two years back and one animal released on 2006
Chakrasilla WLS	6 full nights & 4 partial nights	27	0	-	
Laokhowa WLS	7 full & 4 partial nights.	31.5	0	-	
Burachapori WLS	6 full & 3 partial nights.	29	0	-	
Borajan-Bherjan-Padumani WLS	6 full night.	18	3	0.17 loris/km	
Gibbon WLS	12 full & 3 partial nights.	38	7	0.18 loris/km	
Dehing Patkai WLS	10 full nights and 3 partial nights	34.5	3	0.09 loris/km	
Garampani WLS	3 full nights & 1 partial nights	10	1	0.10 loris/km	
Nambor-Doigurung WLS	4 full nights & 2 partial nights	18	1	0.06 loris/km	
Amchang WLS	6 full nights & 1 partial night	16.5	0	-	Three animals were caught and handed over to State Zoo, Assam.
Barnadi WLS	5 full nights & 3 partial nights	23	0	-	Loris dry body parts were confiscated from poacher
13 PAs of Assam	**86 full & 27 partial nights.**	**329 km**	**20**	**0.11 loris / km**	
Namdapha NP, Arunachal Pradesh	5 full nights	15 km	3	0.2 loris/km	Good habitat for Slow loris
Joypur RF, Assam	3 full nights & 1 partial night	11 km	1	0.09 loris/km	Good habitat for Slow loris
Chirrang RF	5 full nights	15 km	1	0.06 loris/km	Good habitat

Table – IV-2: Slow loris encounter rate per km in some protected areas of Assam.

Survey sites	Individual	Date and time of sightings	Height on trees	Distance from Transects	Loris activities when detected
Manas NP	1	25.01.09 / 2245 h	13 m	19 m	Sitting / Resting
	2	27.01.09 / 2000 h	10 m	27 m	Sitting / Resting
	3	30.01.09 / 2225 h	9 m	22 m	Sitting / Resting
Nameri NP	4	04.12.08 / 2235 h	10 m	13 m	Feeding
	5	06.12.08 / 1930 h	14 m	23 m	Moving
Padumani -Bherjan	6	09.04.08 / 0145 h	14 m	8 m	Sitting
-Borajan WLS	7	10.04.08 / 2215 h	15 m	17 m	Moving
	8	10.04.08 / 0100 h	13 m	12 m	Moving
Gibbon WLS	9	29.03.08 / 0240h	15 m	8 m	Moving
	10	31.03.08 /2215 h	15 m	15 m	Sitting/ Resting
	11	01.04.08 / 2345 h	03 m	10 m	Searching/ moving
	12	28.10.08 / 0020h	12 m	10 m	Feeding
	13	28.10.08 / 2215h	10 m	3 m	Feeding
	14	31.10.08 / 2215 h	12 m	4 m	Moving
	15	03.11.08 / 0035h	15 m	7 m	Moving
Dehing Patkai WLS	16	09.01. 09 / 2015 h	16 m	18 m	Sitting / Resting
	17	12.01.09 / 0240 h	9 m	25 m	Moving
	18	13.01.09 / 0130 h	13 m	15 m	Moving
Garampani WLS	19	22.05.09 / 0215 h	10 m	18 m	Sitting/Resting
Nambor-Doigurung WLS	20	25.05.09 / 0240 h	11 m	20 m	Moving
Namdapha NP, Arunachal	21	15.01.09 / 2020 h	15 m	20 m	Moving
Pradesh	22	15.01.09 / 0210 h	10 m	10 m	Moving
	23	16.01.09 / 1935 h	12 m	15 m	Searching/Moving
Chirang RF	24	21.01.09 / 2140 h	15 m	17 m	Sitting
Joypur RF	25	07.01.09 / 1930 h	15 m	20 m	Moving

Table-IV-3: Slow lorises encounter distance, height and activities in different PAs & RFs.

Sl No	Botanical name	Family	Parts consumed
1	*Terminalia chebula*	Combretaceae	Exudates ,gum and bark
2	*Terminalia myriocarpa*	do	Exudates and Bark
3	*Manglietia hookeri*	Magnoliaceae	Do
4	*Terminalia arjuna*	Combretaceae	Exudates.
5	*Artocarpus chama*	Moraceae	Exudates and fruit.
6	*Eurya acuminata*	Theaceae	Bark
7	*Ficus hispida*	Moraceae	Exudates, flower nectar and bark.
8	*Pseudostachyum polymorphum*	Poaceae	Tender leave and Ants of bamboo
9	*Catonopsis indica*	Fagaceae	Insect on tree
10	*Mesua ferrea*	Clusiaceae	Exudates
11	*Spondias mangifera*	Anacardiaceae	Exudates and gum
12	*Lagerstroemia regianae*	Lythraceae	Nectar & Exudates
13	*Magnolia hodgsonii*	Magnoliaceae	Exudates and Bark
14	*Lagerstroemia speciosa*	Lythraceae	Exudates and Bark.
15	*Ficus benjamina*	Moraceae	Exudates
16	*Dysoxylum procerum*	Meliaceae	Exudates and sap.
17	*Canarium bengalensis*	Burseraceae	Exudates
18	*Dillenia indica*	Dilleniaceae	Gum and Bark.

Table-IV-4: Bengal slow loris feeding trees in Gibbon WLS

Study site	Abundance estimate	Surveyor
Phou Xang He, Central Laos	0.30 – 0.65 loris/km	Duckworth, 1994
Nakay-Nam Theun, Central Laos	0.04 – 0.08 loris/km	Duckworth, 1998a
Xe Piang, Central Laos	0.13 – 0.27 loris/km	Duckworth *et* al, 1994
Muang Hom, Central Laos	0.10 – 0.21 loris/km	Evans *et al*. 2000
Nam Kading, Central Laos	0.10 – 0.22 loris/km	Do
Nam Ao, Central Laos	0.14 – 0.30 loris/km	Do
Bang Navang, Central Laos	0.09 – 0.20 loris/km	Do
Xe Namoy, South Laos	0.40 – 0.87 loris/km	Do
7 PAs of Assam*	0.06 – 0.18 loris/km	Present study
Namdapha NP, Arunachal Pradesh*	0.2 loris/km	Present study
2 RFs of Assam*	0.06 – 0.09 loris/km	Present study

Table- IV-5: Comparative accounts of Slow loris abundance rate in other study areas of South Asia.

CHAPTER - V

Conservation issues

We recorded 5 primate specie from western and northern Assam and 7 species assemblage in upper and central Assam. Out of these 7 species Hoolock gibbon, Golden langur and Capped langur are globally endangered as per IUCN Red Data Book and protected under Indian Wildlife Protection Act, 1972. While Stump tail macaque, Pig tailed macaque, Assamese macaques and Slow Loris are vulnerable according to IUCN Red Data Book.

Although primate enjoy a special position in the culture and government of Assam gave special emphasis on it by declaring few PAs solely for primate conservation like Gibbon WLS, Dehing Patkai WLS and Chakrashilla WLS. But primates are hunted particularly among the hilly tribes and area adjacent to Arunachal Pradesh, Nagaland, Mizoram and Manipur as such hunting is culturally as well as traditionally practiced in these states. More over traditionally hunting is protected under local law.

Other than meat, primates particularly Capped langurs are being hunted for their skin to prepare cover of their Dao (stiletto) and other materials like cap. Slow lorises are being hunted for medicinal use. Even the body parts of Slow loris like hands and feet's were used for witchcraft and local traditional doctors.

Habitat loss itself is a biggest threat to both the primates. Large scale destruction of forest habitats in the form of fuel wood collection, timber extraction and encroachment resulting fragmentation and degradation of their primary habitat. Forest fire and burning is also a threat to loris since they are very slow mover and could not escape it.

There is a complete lack of awareness of conservation of wildlife among the tribe and its needfulness and weak implementation of conservation laws are the major threat to primate conservation.

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Photo: Road transect at night

Photo: Forest burning