

# Distribution and Conservation of *Nycticebus bengalensis* and *Macaca munzala* in Arunachal Pradesh, Northeastern India

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## 1 ABSTRACT

Northeastern India, a global biodiversity hotspot region, is impressive in its primate species diversity, yet many of these primate populations remain relatively unexplored in terms of their demography, ecology and behaviour. Of these, the nocturnal Bengal slow loris *Nycticebus bengalensis* and the newly discovered Arunachal macaque *Macaca munzala* remain least-known in terms of their population and conservation status. We conducted a distribution survey of the two species in the state of Arunachal Pradesh from December 2010-December 2011 in order to assess the survival threats that affect the survival of these species in the state. Additionally we also conducted an attitude survey in the state of Manipur from February to April 2012 in order to investigate people's awareness of primate species in their region and their attitudes towards primate conservation. We surveyed 11 of 16 districts in the state of Arunachal Pradesh and sighted a total eight Bengal slow loris individuals and one troop of Arunachal macaques. Based on our study results we evaluate that the Bengal slow loris is relatively more abundant in the foothills and plains of Arunachal Pradesh which border Assam and that the occurrence of the species declines towards the hilly regions of the Anjaw district. We were unable to ascertain any new information regarding the distribution of the Arunachal macaque. The Bengal slow loris is traditionally not hunted in Arunachal Pradesh; hence this is not a major threat affecting the species at present in the state, although gradual erosion of such taboos may imperil it in the future. Hunting however is a major factor that threatens the future existence of macaque populations in Arunachal Pradesh. Our study in Manipur reveals that very few people are aware of the different primate species inhabiting their region. Hunting is major threat affecting primate species in the state and poses a grave threat to the future existence of the Bengal slow loris and macaque species in Manipur. We strongly recommend the need for long-term conservation education programs in both states that instil greater awareness of wildlife species and encourage local inhabitants to take on the responsibility of conserving wildlife populations in their regions.

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## 3 PROJECT OBJECTIVES

### 3.1 Introduction

The northeastern region of India, comprising the seven states of Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Tripura and Nagaland, is a part of the eastern Himalaya global biodiversity hotspot. Impressive in its biodiversity richness, this region supports the highest diversity of primates in the country; yet much of its wildlife remains relatively unexplored (Kumar et al. 2005; Sinha et al. 2005; Srivastava 2006). This is perhaps best exemplified in the case of two virtually unknown primate species that are found there – the nocturnal Bengal slow loris *Nycticebus bengalensis* and the newly discovered Arunachal macaque *Macaca munzala*.

Until recently, very little was known about the distribution patterns of the Bengal slow loris in northeastern India. Although it was reported that the species was present in the northeastern states of Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland and Tripura, there was no information on its abundance or distribution patterns (Choudhury 1992, Srivastava 1999). Over the past few years, however, surveys carried out in Assam, Meghalaya and Tripura present some information on the distribution and conservation status of *Nycticebus bengalensis* in these states (Radhakrishna et al 2006, 2007, 2010, Swapna et al 2008, 2009) These studies also indicated that existing populations were severely threatened by hunting, trapping, deforestation and forest fires, and urged for studies in other parts of northeastern India in order to obtain a clearer perspective of the distributional status of the species. Although anecdotal reports confirm the presence of the Bengal slow loris in many of the protected areas of Arunachal Pradesh (Choudhury 1992, Singh 2001, Chetry et al 2003, Chetry and Medhi 2006); information on species abundance or factors affecting its presence in different habitats is, however, sorely lacking. Also, though many studies have emphasised the major threat posed by hunting to the continued survival of primates in Arunachal Pradesh (Borang and Thapliyal 1993, Singh 2001, Chetry et al 2003); it has not been investigated if the slow loris is seriously impacted by this threat in Arunachal Pradesh.

The Arunachal macaque *Macaca munzala*, is nearly as unknown as the Bengal slow loris in terms of distributional information, though for different reasons. New to primate science, the Arunachal macaque was only discovered as recently as 2004 in Tawang, Arunachal Pradesh (Sinha et al 2005).

Following this startling discovery, surveys in the high altitude regions of western Arunachal Pradesh reported the presence of the species in the western-most districts of the state, Tawang and West Kameng (Kumar et al 2008). However further information on its presence in other parts of the state is sorely lacking, and there is little data on the geographical range of the species. Hence the primary objective of this study was to conduct population surveys for the Bengal slow loris and the Arunachal macaque in the forests of Arunachal Pradesh, in order to obtain a clear picture of the distributional status of the two species. It has been well established that hunting is the most serious threat to wildlife species across Arunachal Pradesh (Datta 2002). Primate species are hunted not only in retaliation against crop raiding but also for food, trade, sport, ceremonial and medicinal purposes (Aiyadurai 2007, Kumar et al, 2007). Hence, an important secondary aim of our study was also to investigate survival threats that may endanger the continued existence of the two species in the state. People's attitudes towards primate species strongly affect their conservation status, particularly when human settlements are found in close proximity to forests, as it occurs in many parts of northeastern India. Therefore as a sub-component of our study, we also conducted an investigation of people's attitudes towards primate presence and conservation in northeastern state of Manipur.

### 3.2 Aims

The goal of our study was to obtain an accurate overview of the current distributional and conservational status of the Bengal slow loris and the Arunachal macaque in the state of Arunachal Pradesh in northeastern India. More specifically the objectives of our study were:

- i. To survey for the presence of the Bengal slow loris and the Arunachal macaque in certain unexplored forest areas of Arunachal Pradesh, and
- ii. To assess the nature and extent of survival threats to existing populations of the two species in the state.

Additionally, we also aimed to evaluate, through our study in Manipur:

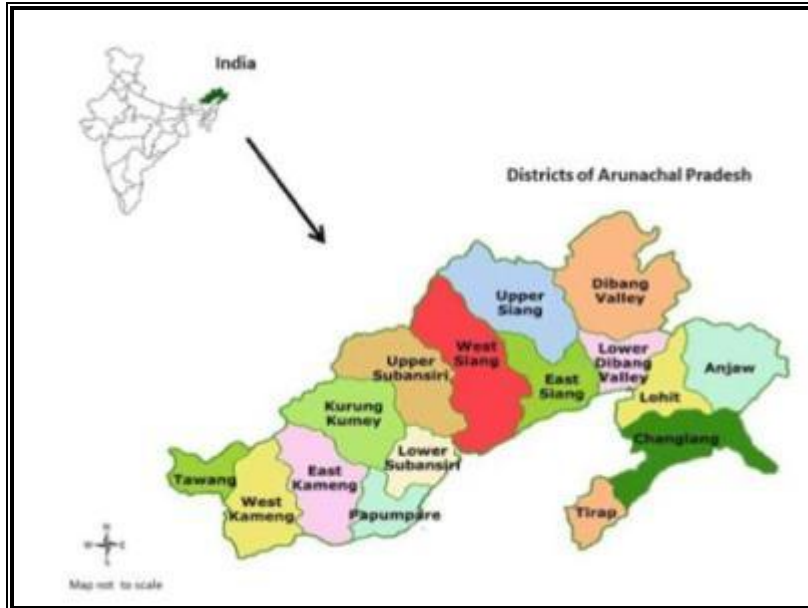
- iii. People's awareness of the presence of different kinds of primate species in their region
- iv. And their attitudes towards primate conservation.

## 4 METHODOLOGY

### 4.1 Areas Surveyed

The study was carried out in the states of Arunachal Pradesh and Manipur in northeastern India. Arunachal Pradesh (26° 30' N to 29° 30' N and 91° 30' E to 97° 30' E) is bordered by Assam to the south and shares international borders with China to the north and east, Bhutan to the west and Myanmar to the east. Situated at the junction of the Eastern Himalaya and Indo-Burma biogeographical zones, the state experiences a wide altitudinal range and an associated diversity of habitats (tropical rainforests, subtropical and temperate forests, alpine meadows) that have contributed to a rich diversity of mammalian fauna (Mishra et al, 2006). Six broad vegetation types have been identified in the state including lowland tropical evergreen (below 1000m), subtropical (1000m –2000m), temperate broad-leaved and temperate conifers (2000 – 4000m), alpine vegetation (above 4000m) and permafrost (Kaul & Haridasan, 1987).

Arunachal Pradesh also exhibits an incredible range of cultural diversity. The population is predominantly tribal comprising 82 major tribes and sub-tribes of Indo-Mongoloid and Mongoloid lineage (Singh 1999). The major tribes are the Nyishi, Adi, Apatani, Nocte, Mishmi, Miri, Monpa, Tagin, etc. Agriculture is the main occupation of the people, and as in most of the northeastern states, *jhum* cultivation (slash and burn) is widely practised across the state. In suitable areas, wet rice farming is also practiced. The major crops grown in most parts of the state are rice, maize and millet. In the higher areas, especially those towards the eastern part of the state, opium cultivation is common. In places where the climate is suitable, horticulture, involving fruits like oranges, pineapples, kiwis and apples is also a major occupation.

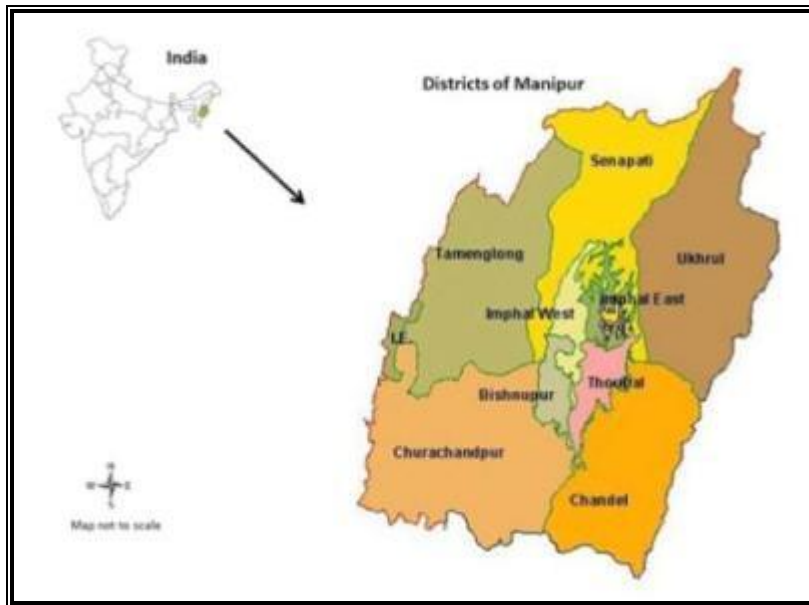


**Figure 1: Map of Arunachal Pradesh and its position within India**

(Courtesy: <http://www.ne2.bsnl.co.in/ap.html>)

Manipur ( $23.80^{\circ}$  N to  $25.68^{\circ}$  N and  $93.03^{\circ}$  E to  $94.78^{\circ}$  E) in northeastern India is bordered by the states of Nagaland, Mizoram and Assam in the north, south, and west, and by Myanmar in the east and south. Physiographically the state can be divided into three main sectors: the Eastern hill ranges, and Western hill ranges and the Imphal Valley that separates the hill ranges in the central plains. The valley region is dominated by the Meitei community who mainly follow the Hindu religion whereas the hilly regions are occupied by different tribal communities with distinctive culture and traditions. The climate is tropical 'monsoon' and the vegetation is largely tropical wet evergreen and semi evergreen in the lower and middle elevation areas. We conducted our study across six districts in Manipur: Imphal East, Imphal West and Bishnupur which are situated in the lower elevation valley region and Churcharpur, Senapati and Tengnoupal at higher elevations in the hilly region.





**Figure 2: Map of Manipur and its position within India**

(Courtesy: <http://www.travelindia-guide.com>)

## 4.2 Field Methods

### 4.2.1 Arunachal Pradesh

The survey was carried out from December 2010 to December 2011. We conducted night surveys to detect the presence of the slow loris and other nocturnal animals and day surveys to sight macaques and other primate species. Survey areas were chosen in consultation with local guides, hunters and forest guards, and preference was given to areas where secondary information reported recent sightings of the species. We used beat roads, animal trails and small paths within the forest as transect routes. On occasions where there were no existing beat paths within the deep forest or very thick and high undergrowth, we cut a path through the undergrowth while surveying. A team of 2-4 persons conducted the transects, and in areas where there was potential danger from wild elephants, armed guards accompanied us.

The night surveys were conducted between 1600 h and 0200h. We used headlamps (Petzl) and systematically searched all forests levels from the canopy to the undergrowth to detect the characteristic red-orange eye shine of the slow loris. Whenever we spotted an eye shine, we used a brighter LED flashlight along with binoculars to identify the species of the sighted animal. We also noted

down the time of any mammal calls that we heard. We used a GPS instrument (Garmin) to record sighting locations and the length of transects. We also recorded information on salient features of the surveyed habitat such as vegetation type, signs of hunting or trapping, evidence of logging or branch lopping and severity of other anthropogenic disturbances.

We carried out informal interviews and group discussions with several village headmen (*gaon burrahs*), hunters and other local persons in order to gather secondary information about the study species. We enquired about the presence of the lorises and macaques and various nocturnal and arboreal animals present in the nearby forest. If respondents confirmed that they were familiar with the primates or volunteered information about their sightings, we used photographs of the species to confirm species identity. We also enquired about instances of slow loris rescue and checked Forest Department records for information on confiscation and rehabilitation of loris individuals. During our interactions with villagers, we questioned them on hunting taboos and norms and reasons for hunting, particularly with respect to primate crop-raiding and retaliatory hunting.

#### **4.2.2 Manipur**

We conducted our study in Manipur from February to April 2012. We selected 24 villages across six districts of Manipur for the purposes of our study and used a questionnaire survey method to collect information about the residents' awareness of primate species and their attitudes towards them. The villages selected for the survey were Mahabali, Uyumpok, Irinbung, and Takhel in Imphal East district; Leikrinthabi, Iroishemba, Phayeng, and Game in Imphal West district; Konung, Leimram, Thanga, Keibul Lamjao in Bishnupur district; Kom Keirap, Reandeilung, Tolbung, and Gitemuan in Churcharpur district; Sapermeina, Chalkot, Leimakhong and Seikul in Senapati district, and Mitong, Komlathabi, Kwata and Moreh in Tenglopan district. We questioned respondents on their knowledge of the occurrence of various primate species in their region and the frequency of their sightings; their perception of primate-caused crop damage; and details about primate hunting practices in their village. We also conducted informal discussions involving large groups of people, on issues such as threats affecting wildlife species and wildlife conservation and management techniques, and noted information from respondents regarding the use of primates in cultural practices or religious rituals.

## 5 RESULTS

### 5.1 Arunachal Pradesh

We surveyed 11 of the 16 districts in the state during the course of our study, and investigated areas inhabited by the Nyishi, Apatani, Adi, Monpa, Gallong, Idu-Mishmi, Digaru-Mishmi, Miju-Mishmi and Khampti tribes. We carried out a total of 24 day surveys and 28 night surveys, and surveyed a total of 332.42 km (Tables 1 and 2). The surveys were carried out mainly in Protected Areas, Reserved Forests and Unclassified Forests. We carried out 2 night surveys in community owned Toko and bamboo plantations, and on one occasion surveyed forest areas bordering tea estates and orange orchards. We surveyed areas close to human habitation, as well as those more remote. Surveyed areas covered a wide altitudinal range, from around 130m to 2300m asl.



**Figure 3: Day transect in Pakke Tiger Reserve**

**Table 1: Locations of night surveys**

S. No.	Sites Surveyed*	District	Distance Covered (in Km)	Disturbance levels <sup>♦</sup>
1	Itanagar WLS	Papumpare	14.89	++
2	Pakke TR	East Kameng	21.27	–
3	Boing UCF	East Siang	4.46	++
4	Mehao WLS	Lower Dibang Valley	10.77	++
5	Kombo UCF	West Siang	9.60	+
6	Kayi UCF	West Siang	7.47	++
7	Moralali RF	East Siang	9.56	++
8	Dirang RF	West Kameng	3.10	+
9	Hapoli RF	Lower Subansiri	5.69	+
10	Pamluk UCF	Lower Subansiri	3.08	++
11	Mipi-Anini UCF	Dibang Valley	27.41	+
12	Mebo RF	East Siang	5.13	++
13	Poba RF	East Siang	13.82	+
14	Parshuram Kund UCF	Lohit	5.71	++
15	Lathao UCF	Lohit	5.23	+
16	Bailiang UCF	Anjaw	3.74	+
17	Magi UCF	West Siang	5.56	+
18	Likabali UCF	West Siang	3.39	+

\* WLS: Wildlife Sanctuary, TR: Tiger Reserve, RF: Reserved Forest, UCF: Unclassified Forests

♦ -: none/low,+: medium, ++: high

**Table 2: Locations of day surveys**

S. No.	Sites Surveyed*	District	Distance Covered (in Km)	Disturbance levels <sup>♦</sup>
1	Itanagar WLS	Papumpare	5.02	++
2	Pamluk UCF	Lower Subansiri	7.24	++
3	Pakke TR	East Kameng	30.31	-
4	Anini	Dibang Valley	10.48	+
5	Moralali RF	East Siang	13.12	++
6	Bomdo UCF	Upper Siang	4.80	+
7	Damro UCF	Upper Siang	11.72	+
8	Kombo UCF	West Siang	7.72	++
9	Bole UCF	West Siang	5.82	+
10	Yibuk UCF	East Siang	6.31	+
11	Dirang UCF	West Kameng	14.74	+
12	Hong apatani	Lower Subansiri	5.14	-
13	Anini Landing Ground	Dibang Valley	7.40	+
14	Rotte	East Siang	6.13	+
15	Parshuram Kund	Lohit	8.59	++
16	Lathao UCF	Lohit	6.18	+
17	Hayuliang UCF	Anjaw	5.28	++
18	Bailiang UCF	Anjaw	10.21	++
19	Magi UCF	West Siang	6.33	+

\* WLS: Wildlife Sanctuary, TR: Tiger Reserve, RF: Reserved Forest, UCF: Unclassified Forests

<sup>♦</sup>- : none/low,+ : medium, ++: high

Most of the surveyed areas showed medium to high levels of anthropogenic disturbance with clear signs of hunting and deforestation. Most households have licensed guns, and a majority of these are used for hunting wildlife. Much of the hunting is carried out for meat or sport and the level of hunting increases during festivals and ceremonies. Retaliatory hunting due to crop raiding is also common, with monkeys, wild boar and bears being the main targets. We observed that hunting pressures were much lower in the areas inhabited by Buddhists, viz. Dirang and Lathao.

### 5.1.1 Slow Loris Sightings

We sighted a total eight Bengal slow loris individuals in three different areas across Arunachal Pradesh (Figure 1). Of the 3 areas, 2 were Wildlife Sanctuaries and one was a Reserved Forest. The highest abundance of lorises was seen in Moralali Reserved Forest in East Siang district, while the least abundance was seen in Itanagar WLS in Papumpare district (Table 3).

**Table 3: Relative abundance of Bengal slow loris in Arunachal Pradesh**

Study Site	Total Distance Surveyed	No. of Slow lorises seen	Index of Relative Abundance
Itanagar WLS	14.89	1	0.07
Pakke TR	21.27	4	0.19
Moralali RF	9.56	3	0.31

All the lorises sighted were solitary. Seven of the eight sighted lorises were first seen on trees; one loris individual was first sighted in the undergrowth, but sensing our presence, it immediately climbed up the nearest tree. All lorises were sighted in the vegetation along the survey path. Due to the short duration of the encounter, and the thick vegetation, we could not identify the age or sex of the sighted animals. Apart from lorises, we sighted viverrids on 8 occasions, bats on 2 occasions and flying squirrels on 3 occasions.



**Figure 4a**



**Figure 4b**

**Figures 4a and 4b: Slow loris sighted in Moralali RF, Pasighat**

**Table 4: Sighting records of viverrids, bats and flying squirrels**

Area	Viverrids	Flying squirrels	Bats
Pakke TR	2	0	0
Moralali RF	1	0	1
Boing UCF	0	0	1
Lathao UCF	2	1	0
Parshuram Kund UCF	2	2	0
Magi UCF	1	0	0
Total	8	3	2



### 5.1.2 Macaque Sightings

We sighted 3 troops of macaques in different areas during the survey:

- A troop of rhesus macaques moving quickly through the canopy in Pakke Tiger Reserve, East Kameng.
- A troop of Assamese macaques on a rocky slope near Damro Village in Upper Subansiri.
- A troop of Arunachal macaques at the edge of Yewang Village, near Dirang in West Kameng district.

We came across 3 instances of macaque individuals being kept as pets (Figure 4). Two individuals had been caught after they were injured during a hunt, and the third macaque individual was reported to have been bought from outside the state. However, in general the practice of keeping primates as pets was not observed in the study sites.



**Figure 5: Captive macaque individual near Dirang, West Kameng**

### 5.1.3 Secondary Information

Secondary sources of information indicated the presence of the Bengal slow loris in several areas across 6 districts in Arunachal Pradesh: Papumpare, East Siang, West Siang, East Kameng, Lohit and Lower Dibang Valley (Table 5). Most of these reports were based on sightings during the past 3 years. In Lilling Village in the northern part of East Siang, there was a single report of a slow loris individual being killed



in 2003, but since then no lorises had been sighted, trapped or killed from that area. However, local people in villages around Lilling were not familiar with the slow loris. Similarly, people in Lower Subansiri, Upper Siang, Dibang Valley, West Kameng and the central part of West Siang, had not heard of or seen the slow loris nor could they identify it from photographs.

We came across reports of 5 instances of lorises entering human habitation. Interestingly, on none of these occasions were the lorises killed or persecuted.

The local name for the slow loris differed among the various tribes. The Adi-Minyong tribe refers to the species as *Besurai*, while the Adi-Galong tribes call it *Baederi*. The Nishi tribe identifies it as the *Lajuki Bandar*, which is the same as the Assamese name for the slow loris. In the Lohit District, the Khamptis call it *Ngangaay*, while the Mishmis call it *Rinkho*.

**Table 5: Secondary Information on Bengal slow loris presence in Arunachal Pradesh**

S. No.	Location	Source of information	Frequency of sighting*	Year (when last sighted)
1	Itanagar WLS, Poma Range	Seen and killed by laborers.	++	2010
2	Itanagar WLS, Lobi Range	Local hunters	+	2009
3	Pakke TR, Seijusa	Villagers. In 2010, a loris individual entered the village but was rescued and relocated to PTR	++	2010
4	Moralali RF	Local hunters	+++	2011
5	Boing Village	Villagers. Lorises caught in traps set by villagers. Casualties increase during Aran	++	2011
6	Pasighat	Forest dept personnel	++	2010
7	Renging	Local hunters	++	2011
8	Silluk Village	Village elders	+	2010

S. No.	Location	Source of information	Frequency of sighting*	Year (when last sighted)
9	Rotte Village	Local hunters	+	2010
10	Ledum Village	Local hunters. Loris skin shown by one of them	++	2009
11	Kakki Village	Local hunters	++	2010
12	Monku Village	Local hunters	++	2011
13	Lilling Village	Local hunter	+	2003
14	Manglang, Poba RF	Villagers. In 2011, a loris individual entered the village but was caught and released in the forest	+	2011
15	Rayang RF	Forest dept personnel	+	2011
16	Parshuram Kund	Local hunter	+	2011
17	Lathao Village	Village elders	+	2011
18	Magi Village	Local Hunters	+	2011
19	Likabali	Forest dept personnel	+	2010
20	Roing	Specific information not available.	?	?
21	Hayuliang	Unconfirmed isolated report	?	?

\*+ : Rare ++ : Occasional +++ : Frequent

Information gathered from secondary sources indicated the presence of the Arunachal macaque only in the areas around Dirang in the West Kameng district. In other areas, the description of macaques reported by the locals did not match the characteristics of the Arunachal Macaque. The most common macaque species in the other parts of Arunachal were the Assamese and Rhesus Macaque.

#### 5.1.4 Survival Threats

*Hunting:* Hunting is one of the major threats that affect the survival of macaque species in Arunachal Pradesh. Apart from the Arunachal macaque, other macaque species are also hunted extensively in the

state. Macaque meat is popular food among most tribes in the state, and this is one of the main reasons for which macaques are hunted. Some of the tribes also believe that macaque meat has medicinal value, and this increases the tendency to hunt the species.

Macaques also hunted and killed in retaliation for crop raiding. Macaques, along with wild boars, bears and rodents were reported to be major crop depredators, and people often resorted to killing them either in retaliation or as a preventive measure. Apart from the Myoko festival in Lower Subansiri<sup>1</sup>, hunting macaques for sport or tradition did not appear to be common in Arunachal Pradesh. Unlike many other mammals that are killed for ritualistic or traditional purposes, and whose skins or bones are commonly exhibited in villagers' homes, macaque skins were not displayed in any of the villages/homes we visited. Only on 2 occasions did we come across the skull of a macaque being displayed along with other skulls and trophies.



**Figure 6: Animal skulls and bones on display in a villager's home**

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<sup>1</sup> See next section on cultural practices for a description of the Myoko festival.



**Figure 7: Langur skins for sale in the local market in Ziro**

In contrast, the slow loris is not prized for its meat by the tribal communities, and is rarely hunted for this purpose. In the areas inhabited by the Adi and Galong communities, the slow loris is never intentionally hunted, though it does fall prey to accidental hunting. Many hunters reported that they had mistakenly killed slow lorises, confusing the loris eye shine for that of a civet. In such cases, typically, the carcass is never eaten or taken back by the hunter. However, some younger hunters, who did not



follow or believe in the traditional hunting customs, reported that they occasionally killed the slow loris for sport if they came upon it. Neither the Nyishi community of Papumpare nor the Mishmi community of Lohit consumed the meat of the slow loris. However, a group of migrant labourers in the Itanagar WLS, an area dominated by the Nyishis, confirmed that they had killed and eaten a slow loris just two days previous to our enquiry.

*Trapping:* In areas where the slow loris was reportedly present, we received several reports about slow loris individuals being caught in traps. Although these traps are actually set to catch squirrels, civets or birds, slow lorises often get caught in them. Typically, traps are set out just

**Figure 8: Jhum cultivation near Pamluk, Lower Subansiri**

before weddings or festivals, as wild meat is an important part of these rituals, and slow loris mortality rate is much higher during these times.

*Deforestation:* The primary causes of deforestation were logging for commercial purposes, and clearing of the land for jhum cultivation. Deforestation due to jhum cultivation was particularly high in Anjaw and West Siang districts. In many parts of Arunachal Pradesh, illegal logging has escalated in forest areas, due to increasing demand for timber from urban areas.



**Figure 9: Slopes cleared for jhum cultivation, Anjaw District.**



**Figure 10: Logging near Pamluk, Lower Subansiri**

### 5.1.5 Cultural Practices and Primate Conservation

Birds and animals play an important role in the customs, traditions and rituals of the different tribes in Arunachal Pradesh. Beliefs with respect to various species dictate the form of hunting or trapping customs people practice and this in turn deeply impact the conservation of wildlife species in this region. For example, a week before the Aran festival that is celebrated by the Adi community, traps are set in the forest to catch birds and rodents, and men go on hunting trips, sometimes lasting several days, to catch any wildlife that they can. The success of these trips often determines the status and prestige of the men within their community. The Myoko festival which is celebrated by the Apatani Community in the lower Subansiri district, involves men from a select village hunting as many macaques as possible and bringing them back to the village. The carcasses are used as a part of a ceremony during the festival. Many villagers indicated that the number of macaques is decreasing, and they are forced to go deeper into the forest to hunt macaques for the festival.

The Monpa tribe of the Tawang and West Kameng Districts follow Buddhism and since the Dalai Lama visited this region in 2003, the practice of hunting has significantly declined (Mishra et al 2006). Local villagers that we interviewed in Dirang, West Kameng indicated that in spite of heavy crop raiding by macaques, primate persecution has been relatively low in recent years. A confirmation of this could be the fact that we sighted a troop of macaques at the edge of one of the villages in Dirang. People did not express any anger or discontentment at the troop presence, nor did the macaque individuals avoid proximity to humans. In contrast, in other areas in Arunachal Pradesh, macaque troops could not be sighted near human settlements. Villagers confirmed that macaques were shot on sight and that they were reported to be extremely scared of humans.

The presence of the Arunachal macaque was reported only in areas which were inhabited by the Monpa tribe. Although traditionally, there is no particular belief or practice that protects the munzala macaque, and there were occasional reports of the species being killed in retaliation to crop raiding, overall, belief in the teachings of the Dalai Lama protects the species from hunting. In areas where the Hoolock gibbon is present, the levels of gibbon hunting depend upon the tribes inhabiting the area. The Mishmis do not hunt the gibbon, as they consider it taboo. Hence gibbon population numbers are higher than other primate species in the areas inhabited by the Mishmis. In the areas we surveyed, the langur was not protected by any traditional beliefs. On the other hand, the species was particularly hunted by members of the Nyishi community as its skin is used to make 'Dao' (local knife) covers.



Many folk dances, songs and tales of different communities are based on or refer to animals and birds. In some dances practiced by the Adi Galong community of West Siang, the dancers dress in brown costumes and imitate the behaviour of monkeys. One of the folk songs of the Adi community refers to a story about the slow loris (*Besurai*). However, people were not aware of the exact contents of the song, though they knew that it existed. Among the Adis, it is prohibited to harm the slow loris. Its meat is not eaten by tribe members, and if an Adi hunter comes across a slow loris, he does not kill it and may sometimes even abandon his hunting for that day and return to the village. When a slow loris individual has been mistakenly killed, hunters typically perform expiatory rituals to ward off any evil. Any loris individuals that are found in traps, if still alive, are immediately freed.

It is interesting to note that in all reports of slow loris individuals entering villages or homes, the animal was not killed, but caught and released in the forest. Our enquiries regarding this revealed that, if a slow loris entered a villager's house, it was believed to bring bad luck and purifying rituals were carried out in that house. Overall, traditional cultural practices in Arunachal Pradesh favour the welfare of the slow loris, and encourage species conservation. However, information gained from younger hunters indicated that, in more recent times, slow lorises are increasingly being killed for sport and that taboos against slow loris hunting may not protect the species for very long.

#### **5.1.6 Conservation Education**

During the course of our study, we conducted a total of eight structured workshops, apart from several informal group discussions, wherein we explained the aims and goals of our study and emphasised the importance of wildlife conservation. We also used these opportunities to engage in friendly debates with the local people about the role they should play in preserving the biodiversity of their region and how they can be involved in such an exercise. The main aims of these formal and informal workshops were:

- To discourage the practice of hunting, without decrying cultural traditions.
- To discourage the hunting of smaller wild animals and birds for sport or as a pastime.
- To elucidate the importance of biodiversity conservation and the role of primates in sustaining the cycle of life in forests.
- To explain the concept of an eco-system and how all living beings are connected in this ecosystem.

- To highlight the importance of wildlife research and how the local youth, particularly students, could and should be a part of it.
- To point out the economic gains of wildlife conservation, particularly in terms of increasing tourism and how it could benefit the local community.
- To describe the consequences of badly disposed garbage and how it could affect their lives and the environment.

We conducted seven of the formal workshops in schools and one in the village. In our school workshops, we largely addressed students in the age group of 12-15 years, though we also involved younger children (ages 7-11) in drawing and colouring activities that focussed on environmental issues. During the school workshops, we gave talks on environmental conservation and engaged respondents in discussions on primate welfare and cultural practices that could affect their future survival. We assigned respondent students the task of making posters, based on the workshop lectures and encouraged them to do them at home and involve their family members in the task.

The response of the students to these workshops was much better than we expected. Though initially, many of the students were distracted and showed signs of boredom, as the workshops progressed, they became more involved in the activities and paid close attention to the talks and discussions. The assignments they submitted at the end of the workshops were very creative and indicated that they grasped the content of the workshops.



**Figure 11: Students assembled for the conservation education workshop**





**Figure 12: Children involved in colouring exercises during the workshop**



**Figure 13: Certificate awarded to the students for their participation in the workshop assignments**

Our informal group discussions were primarily aimed at village headmen and other local persons of influence, as they wield much authority in village settlements in terms of modifying cultural practices. During these discussions, we introduced the concept of conservation and the importance of local cooperation and participation for the successful implementation of any wildlife project. We initiated debates on the positive and negative aspects of wildlife tourism, and questioned respondents on their

attitude towards tourists, and whether, in the future, they would be interested in having a structured and controlled eco-tourism system/program in place, which would benefit the community as well as the forest.

The responses of the villagers to the discussions were positive in most cases. Though most of them had extensive knowledge about animals and birds in their region, very few of them were aware of the concept of an ecosystem and how different species were interdependent on each other. Most of them expressed an interest in working with research and conservation projects in the future. However, to convert this awareness among the local people into positive actions that promote the cause of conservation, a long term conservation education program will be necessary.

In addition to these activities, we also collaborated with a local NGO called Future Generations to organize a clean-up drive in Ziro Village in the Lower Subansiri District. Although Future Generations has carried out a number of conservation-related activities in the past, it was the first time they had helped organise a clean-up drive. We involved students in the exercise and collected 7 full sacks of strewn plastic and other litter from only a 1.5 km stretch in the village. These were later disposed in the garbage dump of the nearest town. The overwhelmingly positive response to the drive from amongst the students encouraged Future Generations to think about organizing more such drives in the surrounding villages.



**Figure 14 : Clean-up drive in Ziro village**



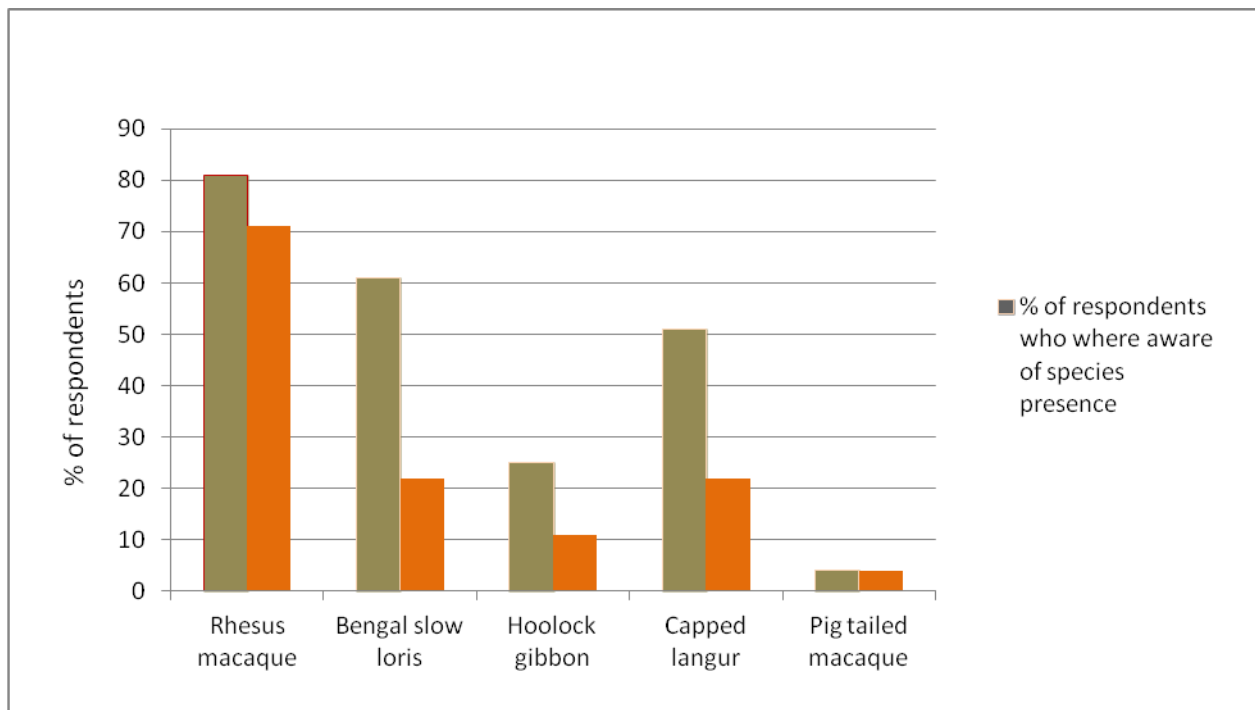
**Figure 15: Students who participated in the clean-up drive**

## 5.2 Manipur

We interviewed a total of 120 individuals (five in every village) in the age group of 30 to 80 years. Manipur is home to seven species of primates: the Assamese macaque *Macaca assamensis*, Rhesus macaque *M. mulatta*, Stump-tailed macaque *M. arctoides*, Pig-tailed macaque *M. nemestrina*, Capped langur *Trachypithecus pileata*, Hoolock gibbon *Hylobates hoolock* and the Bengal slow loris *Nycticebus bengalensis*. Yet the larger majority of the respondents showed little awareness about the different primate species inhabiting their region. Nearly 85% of people (largely from valley districts) were only aware of 1 or 2 primate species, the rhesus macaque and/or the slow loris. A small minority (about 11%) of respondents from the hill districts answered that a total of four primate species - Rhesus macaque, Bengal slow loris, Hoolock gibbon, Capped langur, occurred in the forest areas around their villages while less than 5% of respondents claimed occurrence of five primate species including the pig-tailed macaque (*Macaca leonina*). The rhesus macaque was the most commonly known species, with 81% of the respondents reporting that the species existed in their neighbourhood or in the nearby forest and 71% of the individual confirming that they had actually sighted the species. The Bengal slow loris was the second most-commonly known species; 61% of the respondents answered that they were aware of the presence of species in nearby forests, while 22% responded that they had directly

encountered its existence. The pig-tailed macaque was the least-known species with only 4% of the respondents confirming that it was present in forest areas.

Study results revealed interesting information about the distribution of primate species across the study areas. While respondents in all the districts reported the presence of Rhesus macaques, the Hoolock gibbon was only reported by respondents in the Chandel, Churчанpur and Senapati districts. The presence of the Bengal slow loris was reported by all respondents except for those in Imphal East district. Capped langurs were largely reported by respondents from the Senapati and Churчанpur district, while the pig tailed macaque was only reported by people in Churчанpur district.



**Figure16: Presence of primate species as reported by respondents in Manipur**

### *Human-primate interactions*

Study participants identified three main ways in which people interacted with primate species: 1) Macaque-provisioning by people 2) Crop-raiding by primates, and, 3) Hunting of primates by humans.

*Macaque provisioning:* Macaque provisioning is not a common occurrence in Manipur, but particularly occurred in two areas: Mahabali in Imphal West District and Kunung area in Bishnupur. Both these districts are dominated by the Hindu Meitie community and in both areas the rhesus macaque was the only species that was provisioned by people.



**Figure 17: Rhesus macaques being provisioned at Mahabali**

Primate crop-raiding: Although respondents did mention that primate crop-raiding occurred, complaints regarding the crop-raiding activities of primates was not uniform across study districts. More people in Senapati, Churhanpur and Tengnoupal districts expressed discomfort over primate crop-raiding than people in the other study districts. However all respondents attested that the damage caused due to primate crop-raiding was rather minimal. Rhesus macaques were reported to be most commonly involved in crop raiding issues and crops such as rice, maize, potato, sugarcane, cucumber and fruits were typically damaged. Apart from raids on farms, rhesus macaques would also enter households and damage kitchen gardens and household property. Such disturbances due to primates occurred rather infrequently once a season or perhaps 5-6 times in a season.

**Table.6: Primate Species and crop damage in Manipur**

Name of district	Main crops damaged	Primate species	Number of respondents	Level of damage reported
Imphal East	Rice, maize	Rhesus macaque	6 (30%)	Low
Imphal West	Rice, maize	Rhesus macaque	4 (20%)	Low
Bishnupur	Rice, maize	Rhesus macaque	3 (15%)	Low
Senapati	Rice, maize and vegetables	Rhesus macaque	17 (85%)	Low

Name of district	Main crops damaged	Primate species	Number of respondents	Level of damage reported
Churchanpur	Rice, maize and vegetables	Rhesus macaque	12 (60%)	Low
Tengnoupal	Rice, maize and vegetables	Rhesus macaque	16 (80%)	Low

*Primate hunting:* Hunting of primate species was common practice in many of the study villages. Macaques (67% of the respondents) and the Bengal slow loris (44% of the respondents) were hunted most often, followed by Capped langur (4%). Respondents also reported the hunting of other animals such as barking deer, wild pig, pheasant, and leopard. Among all the interviewees, 29% claimed to be hunters and mostly used licensed guns to hunt animals. Respondents in Senapati districts stated that they avoided hunting of primates over other mammals; however, respondents in other villages of hilly region revealed that it was a status symbol to kill macaques. Study participants also informed that it was easier to kill macaques as they were often seen on forest edges and sometimes in crop-fields, whereas langurs were more difficult to hunt as they remained in the dense parts of the forests and high in the canopy. We observed that hunting practices were more common among respondents from the hill districts, whereas people in valley regions did not display much involvement with hunting.

*People's attitudes towards primate conservation:* Respondents showed interesting differences in their attitudes towards wildlife and primate conservation depending on their regions of residence. When questioned on factors driving loss of wildlife, respondents identified hunting or habitat destruction as important factors. About 17% of the individuals who quoted hunting as the major cause belonged to valley region while only 3% of individuals from the hilly region identified hunting as an important factor. The remaining respondents either avoided the topic or stated that the destruction of forest land and loss of habitat were primary reasons for the decline in wildlife species and number. Individuals from the hill districts who practiced hunting generally appeared indifferent about protection measures for wildlife and stated that it was the responsibility of the government to ensure such matters. Most respondents from the valley regions however accepted that management strategies were necessary to safeguard the future of wildlife.



## 6 CONCLUSIONS AND RECOMMENDATIONS

Our studies in Arunachal Pradesh and Manipur present important information on the distribution status of the Bengal slow loris and the Arunachal macaque and on people's attitudes towards primate conservation. Slow lorises were sighted in 3 of the 17 areas surveyed in Arunachal Pradesh, and were reported from 6 other areas. Based on direct sightings and secondary information gathered during the survey, we evaluate that the Bengal slow loris is relatively more abundant in the foothills and plains of Arunachal Pradesh which border Assam. The species population is scarce towards the hilly regions and the local inhabitants are unfamiliar with the species as the altitude increases. Towards the eastern part of the state, the occurrence of the slow loris appears to decline towards the hilly regions of the Anjaw district.

In areas where the slow loris is present, their populations are highly fragmented, and their survival presently faces many threats. Apart from increasing habitat loss, changes in cultural practices also threaten the continued existence of the species. Until recently, the slow loris was not intentionally hunted, as many communities believed that it is taboo to harm the loris. However, the strength of this belief has eroded with time, and the species is now hunted for sport. In areas where people were familiar with the Bengal slow loris, the local people felt that the population of slow lorises has fallen in the past 5-10 years and that sightings are becoming rarer. This underlines the need to implement conservation programs at the earliest in these regions to protect the remaining populations of the Bengal slow loris.

Although we did not conduct a population survey in Manipur, our questionnaire surveys suggest that the slow loris is distributed across the five districts of Imphal West, Bishnupur, Churachandpur, Senapati and Tenglopan. However this distribution may be patchy, as in Arunachal Pradesh. Hunting is a critical threat to the continued existence of the Bengal slow loris in Manipur and conservation interventions are urgently required, not only for the Bengal slow loris, but also for macaque species found here.

The low number of macaque sightings in Arunachal Pradesh could be attributed to the high level of hunting across Arunachal Pradesh. Macaque surveys in the past too, have yielded a low number of sightings. (Kumar et al 2007, Chetry and Chetry, 2009). Our study could only confirm the presence of the Arunachal macaque in the West Kameng district where it has been previously reported by Kumar et al

(2006). As recommended by an earlier study on the macaques of central Arunachal Pradesh (Kumar et al 2007), a more detailed study is sorely required to confirm the distribution limits of the Arunachal macaque.

In most of the protected areas and Reserved Forests we surveyed, there was little or no protection and hunting and illegal logging was being carried out quite freely. Secondary information gathered from villagers nearby indicated the same. In some cases people were not even aware of the presence of a protected area in the vicinity. However, the level of protection in the Pakke Tiger Reserve was very high due to the presence of a well equipped patrol team and awareness and co-operation of the local communities surrounding the park. The effects and success of such protection was evident by the presence of birds, mammals and reptiles, and low levels of human disturbance. Other forest areas, especially PA's and RF's must be given similar levels of protection in order to preserve the biodiversity of the Region.

Slow loris abundance was highest in Moralali RF and the Pakke Tiger Reserve in Arunachal Pradesh. Although protection levels are relatively high in Pakke Tiger Reserve, Moralali RF is nearly ignored in terms of protection levels. Disturbance in the form of hunting and logging is quite high in this area. Forest department personnel indicated that due to a lack of funds, they were unable to efficiently patrol and protect this area. Apart from the high loris population, this forest patch is used occasionally by elephants. Hence we recommend that this area be declared a Wildlife Sanctuary, and adequate levels of protection be implemented at the earliest.

No conservation initiatives can be successful without the co-operation of the local community, hence it is integral to carry out long term conservation-education among the locals and involve them in conservation efforts. In most of our interactions with the local inhabitants in Arunachal Pradesh, we found them to be highly interested and supportive of our survey and research work. Several people showed keen interest to participate in future projects. When we explained the relevance of and the need for conservation, most people responded positively. Thus long term conservation education in these regions can help garner local support and can involve the local community in conservation efforts. More community based eco-tourism initiatives that will benefit the community and conservation efforts must be set up in this region.



Similar interventions are urgently required for Manipur too. Here the majority of the people we interacted with appeared unaware of government laws protecting wildlife or resentful of them. Long-term conservation education programs are sorely required in this state to encourage local communities to take part in conservation activities. What is encouraging is that people do not face harassment from primates due to crop-raiding activities, and therefore are not impelled to hunt primates for retaliatory purposes. This bodes well for the success of potential conservation programs in this region.

Finally, we emphasise the urgent need for similar studies in other parts of northeastern India to obtain a more comprehensive picture of the distributional range and conservation status of the Bengal slow loris and other primate species in northeastern India.

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