

# Distribution and Current Status of the Capped Langur *Trachypithecus pileatus* in India, and a Review of Geographic Variation in its Subspecies

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**Abstract:** In India, the capped langur (*Trachypithecus pileatus*) occurs in Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura. Elsewhere it is found in Bhutan, Bangladesh, northwestern Myanmar and a small area of Tibet, China. It is a forest-dwelling primate occurring in lowland, wet, evergreen rain forest to temperate forest. It ranges from the plains, 5 m above sea level, to 2,800 m in the Himalaya. Although it is the second most abundant primate of Assam, its populations are declining due to continuous destruction of its forests, and also hunting. Since the 1980s, one-third of the capped langur habitat in Assam has been lost because of tree felling and encroachment. It has been recorded in 53 protected areas in Northeast India. Of five subspecies recognized in the past (*pileatus*, *durga*, *brahma*, *shortridgei* and *tenebricus*) *shortridgei* is now considered to be a full species, and *durga* a junior synonym of *pileatus*. *Trachypithecus p. pileatus* occurs south of the Brahmaputra River; *T. p. brahma* and *T. p. tenebricus* occur north of the river. The lower reaches of the Jia-Bhoreli–Kameng River separate *tenebricus* (in the west) from *brahma* (in the east), but in the upper reaches in the higher Himalaya there is possible intergradation. Here, I report on hitherto unrecorded differences in facial hair patterns (especially the cap) that differentiate the three subspecies. The langurs south of the Brahmaputra (*pileatus*) have shorter whiskers, and a distinct, conspicuous “army-cut hairstyle”-like cap, well separated from the ears. The subspecies to the north can be separated by the form of the cap—hairs radiating from the forehead to form a shaggy cap in *tenebricus*, and a less shaggy cap, resembling that of *pileatus*, but which extends to the ears in *brahma*. The distinguishing features are more dependable than overall color patterns, which vary individually and with age, sex, and season.

**Key Words:** Capped langur, *Trachypithecus pileatus*, distribution, geographic variation.

## Introduction

In India, the capped langur, *Trachypithecus pileatus* (Blyth, 1843), occurs in the northeastern states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura (Choudhury 1989b, 2013). Elsewhere, it extends into Bhutan (Choudhury 1990c), Bangladesh (Khan 1981), northwestern Myanmar (west of the Chindwin River), and a small area of Tibet, China (Choudhury 2012, 2013; Groves 2001; Groves *et al.* 2013).

Five subspecies have been recognized—*Trachypithecus p. pileatus* (Blyth, 1843), *T. p. durga* (Wroughton, 1916), *T. p. brahma* (Wroughton, 1916), *T. p. shortridgei* (Wroughton, 1915), and *T. p. tenebricus* (Hinton, 1923) (see Pocock 1939; Ellerman and Morrison-Scott 1951). The subspecies *shortridgei* was upgraded to a full species by Groves (2001, 2005; see also Groves *et al.* 2013), and *durga* is now considered to be a synonym of *pileatus* (see Choudhury 2012, 2013).

The ranges of three subspecies, *pileatus*, *brahma*, and *tenebricus*, are separated by the wide Brahmaputra River and its tributary, the Jia-Bhoreli. *Trachypithecus p. pileatus* occurs to the south of the Brahmaputra, and *T. p. brahma* and *T. p. tenebricus* to the east and west of its northern tributary, the Jia-Bhoreli River, respectively. There is no barrier, however, between *brahma* and *tenebricus* in the upper reaches of the Jia-Bhoreli–Kameng (in the higher Himalaya), and there are possible intergrades.

The capped langur is found in tropical, wet, evergreen rain forest (annual rainfall above 3,000 mm, and in places exceeding 10,000 mm) to moist, deciduous forest (annual rainfall often less than 900 mm). It ranges from the low plains (10 m above sea level in Tripura, but as low as 5 m in Bangladesh) to 2,800 m in Nagaland and the eastern Himalaya (there is an extreme record at 3,000 m in temperate forest, near Thungri, West Kameng district in Arunachal Pradesh) (Choudhury 2012, 2013). In the high mountains, groups show

seasonal altitudinal movements that are governed by snowfall. They move up the slopes in summer, and return to the middle slopes in the winter.

Although the capped langur is the second most abundant primate in Assam, it is declining due to the continuous destruction of its habitat and hunting. At least one-third of the capped langur's habitat in Assam has been lost since the 1980s because of tree felling and encroachment.

Until the mid-1980s, the scanty literature available for *T. pileatus* was restricted to publications by Hinton (1923), Pocock (1928), McCann (1933, 1942), Oboussier and Maydell (1959) and Khajuria (1962), with some information also provided by Blanford (1888–1891), Finn (1929), Prater (1948), Ellerman and Morrison-Scott (1951), Napier and Napier (1967), Roonwal and Mohnot (1977), and Khan and Ahsan (1981). Hinton (1923) and Pocock (1928) gave detailed accounts on taxonomic variation; the others provided general information, including characteristics, distribution, and aspects of their ecology and behavior. Subsequent studies carried out in Northeast India are reported in Choudhury (1988, 1989a, 1990b, 1990c, 1992a, 1993, 1996b, 1997a, 1996b; mainly in Assam but also other states); Borang and Thapliyal (1993; in Arunachal Pradesh); Mukherjee and Chakraborty (1992; in Tripura), Mishra *et al.* (1994; in Mizoram), and Kumar and Solanki (2008; in Arunachal Pradesh). Choudhury (1989b, 1990a) and Kumar (2006) studied their ecology and behavior. General information on capped langurs, including their distribution in Bhutan, is provided by Choudhury (1990c, 2008a) and Wangchuk *et al.* (2004). Gittins and Akonda (1982) and Ahsan (1994) reported on capped langurs in Bangladesh. Stanford (1989, 1991) carried out in-depth studies on their ecology and behavior in Bangladesh (see also Kabir and Islam 1994). A detailed review covering various aspects of capped langur biology and conservation is found in Choudhury (2012), and mapping with further updates in Choudhury (2013).

Here, I review the information available from my surveys and those of others reported in the published literature to better describe the geographic ranges of the three subspecies and, using photography backed up by the examination of specimens in a number of museums and collections, I describe hitherto unrecorded differences in facial hair patterns, especially the cap, to clarify further the differences between the subspecies. The langurs south of the Brahmaputra (*pileatus*) show a conspicuous “army-cut hairstyle”-like cap. While the earlier segregation was based on pelage color that was always somewhat confused due to significant seasonal color variations, the new features added in this study do not change with season, making them more comprehensible and consistent than the earlier characteristics used.

## Methods

Mammal surveys, carried out in different parts of North-east India since the early 1980s, have provided information on the distribution and status of the capped langur (Choudhury

1982, 1986, 1992b, 1997a, 2001, 2002a, 2008a). I have travelled widely in Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland and Tripura, and also visited Bhutan, Bangladesh and Myanmar (Choudhury 2013). At times, specific survey projects on primates were also undertaken; for example, between 1986 and 2000 (Choudhury 1989a, 1995, 1996a, 1997b).

I carried out an extensive literature search when compiling entries for *Mammals of South Asia* (Choudhury 2012 in Johnsingh and Manjrekar 2012) and also when writing *The Mammals of North-East India* (Choudhury 2013). In 2001, I examined specimens in the following museums: the National Museum of Natural History, Smithsonian Institution, Washington DC; the American Museum of Natural History, New York; the Field Museum of Natural History, Chicago; and the Museum of Vertebrate Zoology, Berkeley, CA. I also visited collections of the Zoological Survey of India (Kolkata, Shillong and Itanagar); the Bengal Museum of Natural History, Darjeeling; Itanagar Museum; Museums of the Forest Department at Shillong and Guwahati; the Museum of the Bombay Natural History Society; the collection of the Forest Museum of Project Tiger at Miao, near Namdapha National Park; the Assam State Museum, Guwahati; Kohima Museum, Nagaland; and the State Museum, Itanagar.

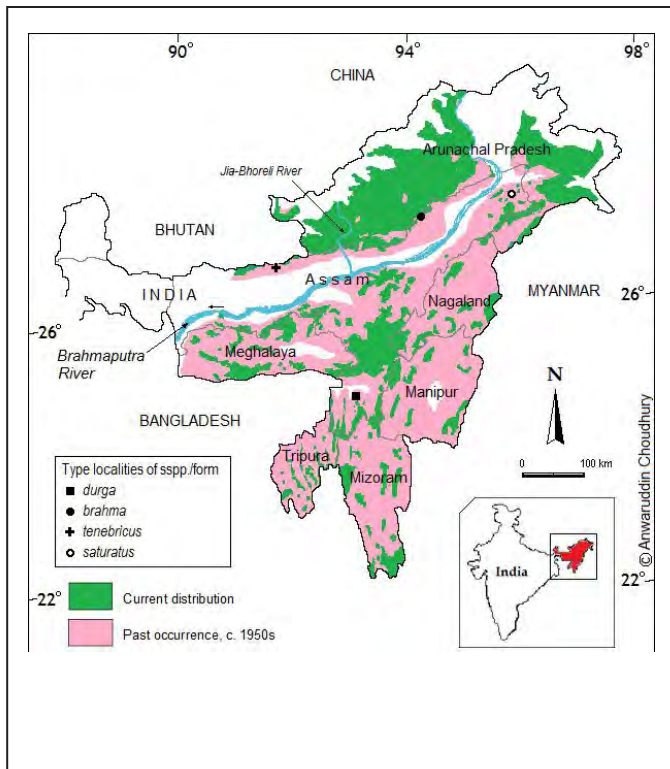
I photographed as many langurs as I could to examine variations in pelage in Assam (since 1983), Arunachal Pradesh (since 1989), Manipur (since 1988), Meghalaya (since 1995), Mizoram (since 1987), and Nagaland (since 1991). Some photographs were provided by other photographers; they are listed in the acknowledgements. Cameras used were Canon T50, Nikon FM2, D5100 with telephoto and telezoom lenses, and Lumix FZ28.

## Results

### *Distribution*

The capped langur is found throughout a large part of the states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura, both north and south of the Brahmaputra River. It is not found to the west of the Manas River—there, it is replaced by the golden langur *Trachypitecus geei*—and between the Siang and Dibang rivers. It has been recorded in 53 protected areas, and it may occur in three more, but this has yet to be confirmed. Elsewhere, it occurs in eastern Bhutan, Bangladesh, north-western Myanmar (west of Chindwin River), and in a small part of Tibet (west of the Yarlung Zangbo; George B. Schaller, pers. comm., seen in 2001; Appendix 1). The distribution of *T. pileatus* is shown in Figures 1 and 2. The distribution in each of the Indian states is described below. Protected areas having capped langurs are listed in Table 1.

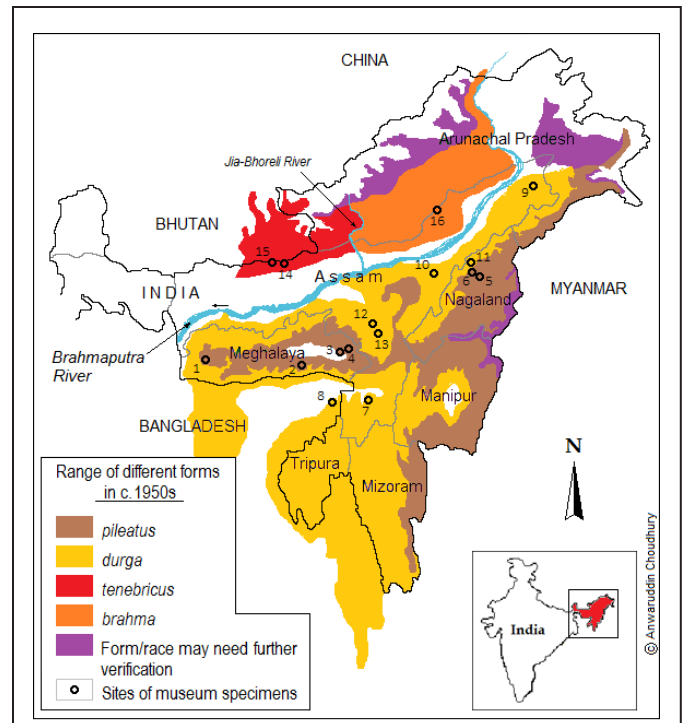
**Arunachal Pradesh.** The capped langur occurs in all the districts west of the Siang River and east of the Dibang River. Strangely, no langurs occur in the tract between these two rivers; a finding also confirmed by Borang and Thapliyal (1993). Outside the protected areas, there are sizeable



**Figure 1.** The past and present distribution of the capped langur, *Trachypithecus pileatus*, in India. Adapted from Choudhury (2013) with some changes, viz. the Jia-Bhoreli River, and the type localities of *T. p. durga* (Wroughton, 1916), *T. p. brahma* (Wroughton, 1916), *T. p. tenebricus* (Hinton, 1923), and *T. p. saturatus* (Hinton, 1923). Map drawn by Anwaruddin Choudhury.

populations in some of the reserved forests, such as Doimara, Amortola, Manabhum, Talle, Tengapani and Papum. The largest contiguous tracts of habitat are also found in this state (Fig. 1). There are still large tracts in relatively remote areas where the langur is likely to hold its ground in the decades to come. However, in easily accessible areas it is declining (except in the west, especially Tawang and higher West Kameng, where the influence of Buddhism means that there is little hunting).

**Assam.** The capped langur is found in all the districts within its range to the north and south of the Brahmaputra River. Although its known western limit is the Manas River, in the north, there are a few reports of capped langurs from Bhairab Pahar and Kabaitari Tilla (near Jogighopa) in the Bongaigaon district (formerly the undivided Goalpara district), to the west of the river (the late Mohd. Moosa, pers. comm. 1988). It is more common than the Rhesus macaque *Macaca mulatta* in forested areas. The districts which are outside its range are Bongaigaon, Chirang, Dhubri (north bank), and Kokrajhar—all part of a formerly undivided Goalpara, and all have the golden langur (*Trachypithecus geei*)—and Barpeta, Nalbari and Darrang. It still occurs in the remaining 20 districts. It has vanished from most of the plains of the Brahmaputra valley. Unlike the other states where hunting was the key factor for its decline, in Assam it is mainly habitat loss and organized encroachment. Outside the protected areas



**Figure 2.** North-East India and adjacent areas of Bhutan, Bangladesh and China (Tibet) showing the ranges of the different forms in the 1950s, with museum specimen locations. For reference to the sites and specimens, see Hinton (1923) and Pocock (1928). The sites are: 1. Tura; 2. Laitkynsew; 3. Raliang; 4. Khonshnong; 5. Mokokchung; 6. Chongliyemsem; 7. Cachar; 8. Sylhet; 9. Bar Hapjan; 10. Golaghat; 11. Lakhuni; 12. Lanka; 13. Lamsakhang; 14. Motonga River; 15. Menoka Nadi; and 16. Siajuli. Map drawn by Anwaruddin Choudhury.

there is sizeable habitat in the Dhansiri, Inner Line, Joypur, Katakhal, Langting–Mupa, Lumding, and Upper Dihing (east and west blocks) reserved forests. The largest that has suitable habitat is in the district of Karbi Anglong. A small population of langurs frequent the Panjabari area of Guwahati city where they come from the fringe of the Amchang Sanctuary. Other populations in the hillocks of Guwahati city were extirpated in the 1980s.

**Manipur.** The capped langur is mainly confined to five hill districts (Chandel, Churachandpur, Senapati, Tamenglong, and Ukhrul) and the Jiribam subdivision of Imphal East district. In the Manipur valley proper it is no longer found. Outside the protected areas there are sizeable forest patches in the Tolbung reserved forest and Moreh proposed reserved forest. There is a specimen (male) in the Zoological Survey of India from Kalanaga, Barail Range in Senapati district, which was obtained in 1936.

**Meghalaya.** The capped langur is patchily distributed in all the districts. South Garo Hills, Ri-Bhoi and East Jaintia Hills districts are the main areas, having the largest forests where the capped langur is still present. There is sizeable habitat in Narpuh (blocks I and II) reserved forests in East Jaintia Hills district, Nongkhylllem reserved forest in Ri-Bhoi district, and in the private and community forests of West and South-west Khasi Hills districts.

**Mizoram.** Overall the capped langur is still widespread. It has been recorded in all the districts. Outside protected areas there are scattered populations in the Inner Line, Tut Lungkaih, Puankhai and Ngengpui reserved forests, and also in forests in the extreme south, covering the southern parts of Lunglei, Lawngtlai and Saiha districts. Populations otherwise are small and scattered.

**Nagaland.** Although the langur has vanished from many areas, scattered groups still occur in all the districts. It is doubtful that any survive in Pulie Badge Wildlife Sanctuary near Kohima town. It has been extirpated from Rangapahar Wildlife Sanctuary near Dimapur. Capped langurs occur in the mountain range along the India–Myanmar border, including Saramati and Noklak where some good habitat can still be found. In Saramati, it occurs at elevations up to 2,800 m. There are three specimens in the American Museum of Natural History from Changchang Pani, Mokochung district that were obtained by Charles McCann in 1930.

**Tripura.** Capped langurs were recorded in all the districts. However, its range is no longer contiguous and is heavily

fragmented. Most langurs are now found in the low hills, as the plains areas have come under human occupation. There are still scattered groups outside the protected areas.

### Status

*Trachypitecus pileatus* is the most common langur of Northeast India. It is the second most abundant primate in Assam after the Rhesus macaque (Choudhury 1989a, 1996b). In Arunachal Pradesh it is the second most abundant species after the Assamese macaque *Macaca assamensis*. Populations, however, are declining everywhere. Capped langurs are common in the forests of Assam and Arunachal Pradesh but, due to hunting, not in Manipur, Meghalaya, Mizoram, Nagaland and Tripura. In Arunachal Pradesh the species is particularly common in some areas, especially where it is not molested, such as in Tawang and West Kameng districts. Unlike these parts of Assam, in other states hunting means that any isolated group or few remnant individuals have little chance of survival.

**Table 1.** Protected areas with known populations of *T. pileatus*.

Name of the protected area	Area (km <sup>2</sup> )	Subspecies
<b>Assam</b>		
Amchang Wildlife Sanctuary	78.64	<i>pileatus</i>
Barail Wildlife Sanctuary	326.25	<i>pileatus</i>
Bherjan–Borajan–Podumoni Wildlife Sanctuary	7.2	<i>pileatus</i>
Bornadi Wildlife Sanctuary	26.2	<i>tenebricus</i>
Dibru–Saikhowa National Park	340.0	<i>pileatus</i>
Dihing–Patkai Wildlife Sanctuary	111.19	<i>pileatus</i>
East Karbi Anglong Wildlife Sanctuary	221.8	<i>pileatus</i>
Garampani Wildlife Sanctuary	6.0	<i>pileatus</i>
Hollongapar Gibbon Sanctuary	20.0	<i>pileatus</i>
Kaziranga National Park	473.0	<i>pileatus</i>
Laokhowa Wildlife Sanctuary	70.0	<i>pileatus</i> (nearly extirpated)
Manas National Park	500.0	<i>tenebricus</i>
Marat Longri Wildlife Sanctuary	451.0	<i>pileatus</i>
Nambor Wildlife Sanctuary	37.0	<i>pileatus</i>
Nambor–Doigrung Wildlife Sanctuary	97.1	<i>pileatus</i>
Nameri National Park	200.0	<i>brahma</i> , <i>tenebricus</i> (latter just outside, W of the river in Potasali)
North Karbi Anglong Wildlife Sanctuary	96.0	<i>pileatus</i>
Sonai–Rupai Wildlife Sanctuary	220.0	<i>tenebricus</i>
<b>Arunachal Pradesh</b>		
Eagle’s Nest Wildlife Sanctuary	217.0	<i>tenebricus</i>
Itanagar Wildlife Sanctuary	140.0	<i>brahma</i>
Kamlang Wildlife Sanctuary	783.0	<i>pileatus</i>
Kane Wildlife Sanctuary	31.0	<i>brahma</i>
Mehao Wildlife Sanctuary	281.5	<i>pileatus</i>
Mouling National Park	483.0	<i>brahma</i>
Namdapha National Park	1985.0	<i>pileatus</i>
Pakke Wildlife Sanctuary	862.0	<i>brahma</i>

Name of the protected area	Area (km <sup>2</sup> )	Subspecies
Sessa Orchid Sanctuary	100.0	<i>tenebricus</i>
Talle Wildlife Sanctuary	337.0	<i>brahma</i>
Yordi Rabe Supse Wildlife Sanctuary	397.0	<i>brahma</i>
<b>Nagaland</b>		
Intanki National Park	202.0	<i>pileatus</i>
Fakim Wildlife Sanctuary	6.4	<i>pileatus</i>
<b>Manipur</b>		
Bunning Wildlife Sanctuary	115.0	<i>pileatus</i>
Jiri–Makru Wildlife Sanctuary	198.0	<i>pileatus</i>
Kailam Wildlife Sanctuary	187.0	<i>pileatus</i>
Yangoupokpi Lokchao Wildlife Sanctuary	184.0	<i>pileatus</i>
Zeilad Lake Wildlife Sanctuary	21.0	<i>pileatus</i>
<b>Mizoram</b>		
Dampa Wildlife Sanctuary	480.0	<i>pileatus</i>
Khawnglung Wildlife Sanctuary	35.75	<i>pileatus</i>
Lengteng Wildlife Sanctuary	60.0	<i>pileatus</i>
Murlen National Park	100.0	<i>pileatus</i>
Phawngpui National Park	50.0	<i>pileatus</i>
Pualreng Wildlife Sanctuary	50.0	<i>pileatus</i>
Ngengpui Wildlife Sanctuary	110.0	<i>pileatus</i>
Tawi Wildlife Sanctuary	35.0	<i>pileatus</i>
Thorangtlang Wildlife Sanctuary	198.0	<i>pileatus</i>
Tokalo Wildlife Sanctuary	250.0	<i>pileatus</i>
<b>Tripura</b>		
Gumti Wildlife Sanctuary	389.5	<i>pileatus</i>
Sepahijala Wildlife Sanctuary	18.5	<i>pileatus</i>
Trishna Wildlife Sanctuary	170.6	<i>pileatus</i>
<b>Meghalaya</b>		
Balpakram National Park	<200.0	<i>pileatus</i>
Nokrek National Park	68.0	<i>pileatus</i>
Nogkhyllem Wildlife Sanctuary	29.0	<i>pileatus</i>
Siju Wildlife Sanctuary	5.2	<i>pileatus</i>

**Table 2.** Differences between three subspecies of *Trachypithecus pileatus*.

Subspecies	<i>pileatus</i>		<i>brahma</i>		<i>tenebricus</i>	
	<i>durga, argentatus, saturatus</i>					
Synonyms	W	D	W	D	W	D
Gray cap extends to the ear	–		+			+
Side of cap has ‘army-cut’ ‘hair’-style look	+		–			–
Cap generally shaggy	–		Less shaggy			+
Hair on the cap/crown are laid straight or nearly so from the forehead	+		+			–
Hair on cap/crown radiates from forehead and other points	–		–			+
Hairs on both sides of head (cap) gives a ‘horny’ look	–		+			+
Side whiskers very long extending much beyond ears	–		+			+
Side whiskers long extending just beyond ears	+		–			–
Whitish tufts on point of ears (like <i>T. shortridgei</i> but shorter)	–		+			+
Dark dorsum narrower	+		–/+			–
Seasonally lower part of dorsum and flanks has lot of yellowish and/or paler	+		+ in western animals (in Pakke) – in eastern animals			–
Dorsum	Gray or brownish gray	Gray. Darker in eastern areas	Darker gray (lighter than in wetter months)	Darker gray	Dark gray	Very dark gray
Dorsum: lower part	Gray or brownish gray	Gray with yellow	Darker gray (lighter than in wetter months)	Darker gray with reddish-yellow	Darker gray (lighter than in wetter months)	Very dark gray with small reddish areas marginally
Ventrum: upper part	Yellowish buff or light yellowish orange	Golden yellow or yellowish orange	Buff white	Buff white with some orange	Buff to creamy	Reddish or orange red
Ventrum: lower part (abdomen)	Yellowish buff or light yellowish orange but lighter	Golden yellow or yellowish orange but lighter	Buff white	Buff white but with less orange	Lighter; mostly buff to creamy with faint red	Lighter; mostly buff to creamy with no or little red
Cheek whiskers	Yellowish buff	Yellowish orange	Buff and light gray	Buff	Buff and light gray	Orange buff and light gray

+ Present; – Absent; D = drier seasons (c. November/December to March/April; such coat color may be seen also up to May in some animals); W = wetter seasons (c. April/May to October/November).

At least one-third of the capped langur’s habitat in Assam has been lost since the 1980s due to felling and encroachment. Reserved forests such as Balipara, Charduar, Naduar and Biswanath in Sonitpur district, all prime habitat of the langur till the mid-1990s, have lost almost 90% of their forests for the same reasons (Choudhury 2002b). Likewise, the reserved forests of Upper Dihing (west block) in Tinsukia district, Inner Line in Cachar and Hailakandi districts, and Nambor (north block) in Golaghat district have been reduced by 50% since 1980. The entire habitat and langur populations of some reserved forests in Assam such as Gohpur, Gali, Nambor (south block), Diphu, Doyang and Rengma vanished in the 1970s and 1980s. In Meghalaya and Nagaland, and the hill areas of Manipur, Mizoram and Tripura, only the protected areas still have reasonable populations of capped langurs that have otherwise become scattered, scarce and locally

extirpated in many areas because of *jhum* cultivation and hunting. Despite excellent habitat, in some parts of Arunachal Pradesh they are now very rare or locally extirpated due to hunting for their skins, used by some tribes in making traditional *dao*-sheaths (the *dao* is a long knife).

#### Geographic variation

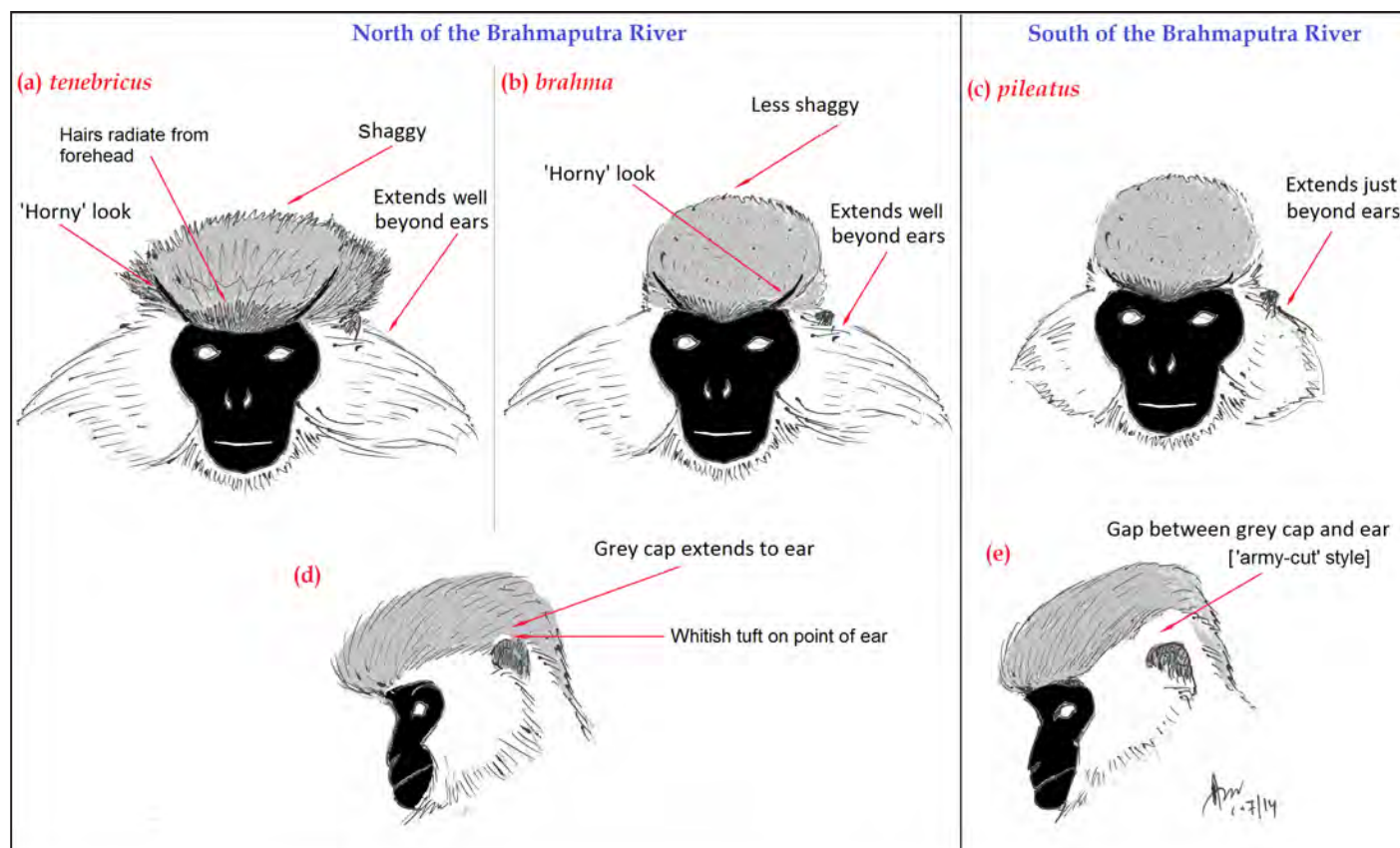
Five subspecies or races used to be recognized (Hinton, 1923; Pocock 1939; Ellerman and Morrison-Scott 1951): *pileatus*, *durga*, *brahma*, *tenebricus* and *shortridgei*. *Trachypithecus shortridgei*, which occurs in northern Myanmar and extreme western Yunnan (China), was upgraded to a species (Groves 2001, 2005; Groves *et al.* 2013). *Trachypithecus p. brahma* and *T. p. tenebricus* are found north of the Brahmaputra River and west of the Siang River, *T. p. durga* and *T. p. pileatus* occur south of the river (Choudhury 1994, 1997a).

Choudhury (1997a) recommended that a fresh review is needed in view of seasonal variations in pelage color and of observations in the wild of individuals with characteristics of two or even three races in the same area and even in the same group. Choudhury (2013) recognized just three subspecies, considering *durga* Wroughton, 1916, to be a synonym of *pileatus* owing to insignificant color variation and their occurrence in the same geographical area without any barrier (Table 2). As such, populations south of the Brahmaputra are now considered to belong to just one subspecies; *pileatus* Blyth, 1843.

Further studies, including extensive photography, have provided new insights. The subspecies *brahma* and *tenebricus*, both to the north of the Brahmaputra, have features in common that differ from the langurs south of the Brahmaputra. The Jia-Bhoreli (known as Kameng in Arunachal Pradesh) is an effective barrier separating the two subspecies only in its middle to lower reaches. It is not an effective barrier in its upper reaches. There, besides showing seasonal variation, the pelage is variable even within a group, and assigning any of the color patterns that characterize the subspecies is difficult. Even the dark *tenebricus* seems to be similar to the langurs of eastern Assam, south of the Brahmaputra, when they have their seasonally dark pelage. The pattern of the cap of *brahma*

and some differences in pelage color, however, still separate them from *tenebricus*. The shape of the cap of *brahma* is more akin to *T. p. pileatus* to the south of the Brahmaputra.

Regarding the capped langurs separated by the Brahmaputra River (Choudhury 1989a, 2013), field observations and a review of several hundred photographs have indicated features that distinguish them. The most distinct characteristic is the cap and its contact with the ears. In capped langurs to the south of the Brahmaputra, the gray cap is separate, forming an “army-cut hairstyle”: *pileatus* (Fig 3; Photos 4a and 5a). In capped langurs to the north of the river, the darker gray cap extends to the ear: *tenebricus* (Fig. 3; Photos 4b and 5b), *brahma* (Fig. 3; Photos 4c and 5c). The side-whiskers of *tenebricus* and *brahma* are notably longer than those of *pileatus* (Fig 3). The key feature distinguishing *tenebricus* from *brahma* is the cap (Fig. 3). In *tenebricus* it is shaggy, with hairs radiating away from the forehead. In *brahma* the cap is less shaggy and more of a pom-pom similar to that of *pileatus*, but with the gray cap extending down to the ears (not in *pileatus*) (Fig. 3). See Table 2, Figure 3, and photos 1–10 for other distinguishing features.



**Figure 3.** Variation between capped langurs north (left and center) and south (right) of the Brahmaputra River. Drawings based on individuals observed in Manas (a); Harmoty, Lakhimpur (b); Kaziranga (c and e); and Potasali, Balipara Reserved Forest, outside Nameri (d). See also the photographs. Illustrations by Anwaruddin Choudhury.

## Discussion

Digital cameras and careful observation facilitate a more discerning identification of consistencies in subspecific variation in capped langurs. The seasonal variation in pelage is so significant that photos of the same group of langurs (Photos 1a, 1b and 2a, 2b) or langurs from the same locality (Photos 3a, 3b, 3c) could well be described as two distinct races if based on a few specimens deposited in a museum. Even in the same group at the same time of year colors can be markedly different, darker or lighter gray backs for example, in different individuals. After more than three decades observing this species in the wild, I have been able to identify differences that consistently apply to each of the subspecies. The cap and its extent vis-à-vis the ears is the most noteworthy, separating capped langurs north and south of the Brahmaputra. To the north of the river, the langurs are separated in Assam by the Jia-Bhoreli River, and in Arunachal Pradesh, where it is known as the Kameng River, they are separated as far as the middle reaches. In the higher elevations of the Himalaya, the river is narrower and there is no barrier. Visitors to Nameri National Park see both *tenebricus* and *brahma* and there is a likelihood of confusion. The main part of the park is to the east of the Jia-Bhoreli River where *brahma* occurs, while *tenebricus* occurs in the tourist facilities at Potasali, outside the park boundary (in Balipara reserved forest) to the west of the river.

There is no zoogeographic barrier separating the nominate race and *durga* Wroughton, 1916. The elevational differences used to justify the separation of the two forms are insignificant—*pileatus* believed to occupy higher elevations (above 600 m) and *durga* lower elevations (below 600 m) (Groves 2001). The specimens of *pileatus* from near Tura, Garo Hills, were from about 420 m above sea level (Hinton 1923), while *durga* has been observed above 1,000 m in Mizoram and central Assam. Langurs from higher elevations have a seasonally brighter color, like *durga*, and *durga* also shows seasonal changes to a lighter color. The cap patterns, including the “army-cut” style, are also similar. In a single group or in adjacent groups, there can be individuals resembling *durga* and *pileatus* (Photos 3a, 3b, 3c). Hence, these I consider to belong to a single subspecies.

Capped langurs in the Mishmi Hills to the north of the Lohit River, and at very high elevations, for example, above 2,500 m in Nagaland (Saramati area) and eastern Arunachal Pradesh (Dapha Dum), may need further observation/examination to assign them to one or other of the subspecies. Similarly, those occurring at high elevations in the Great Himalaya in northernmost Arunachal Pradesh need to be studied further. The high elevation langurs have thicker fur and are slightly paler, but photos year round are required to reach any conclusion regarding their affinity.

It is unlikely that all individuals in a population change their coat color at the same time, and there is also the transitional period to be considered, as well variation between individuals, and differences in sex and age. On December 2, 1992, in Borajan Reserved Forest (now part of the

Bherjan–Borajan–Podumoni Sanctuary), Tinsukia district in eastern Assam, I was able to observe two adult male *pileatus* (form *durga*). On one the whiskers and upper ventrum were orange, like *durga*, while in the other the whiskers and ventrum were pale yellow, like *pileatus*. On October 6, 1992, one of the males looked like a *tenebricus* (except in its cap pattern) with a deep gray dorsum and yellowish-orange ventrum. On June 12, 1993, one of the males had a similar dark coloration, but an adult female had a gray (not dark) dorsum. On November 1, 1991, in the Dhansiri reserved forest, Karbi Anglong district, I observed two adult females both with a pale gray dorsum, but one had a creamy with reddish-tinged ventrum and the other (with an infant) had a deep orange-yellow ventrum.

The original descriptions of the subspecies were based on the pelage color of the specimens when they were collected. There was no mention of individual or seasonal variation. Pocock (1928), however, did write that “the colour, however, varies in different individuals assigned to this race.” Hinton’s (1923) descriptions were in greater detail than those of Wroughton (1916). Pocock (1928) erroneously said that the form *durga* also occurs north of the Brahmaputra on the assumption that there was specimen from Lakhimpur (from where *brahma* was also taken). However, Lakhimpur at that time extended north and south of the Brahmaputra. While the specimens of *brahma* were from the north of the river, those of *durga* (obtained as *saturatus* Hinton, 1923, from Bor Hapjan, now in Tinsukia district) were from the south of the river.

The distinguishing features of the *T. pileatus* forms, especially the facial hair patterns (Table 2), clearly and consistently distinguish *T. pileatus* north of the Brahmaputra River (*tenebricus* and *brahma*) from those to the south (the nominate subspecies *pileatus*). To the north of the Brahmaputra, this is also true for *tenebricus* and *brahma* along the lower reaches of the Jia-Bhoreli River, but forms intermediate between them appear as the river narrows in the upper reaches. The consistent differences between the three forms indicate the possibility of classifying them as distinct species following the Phylogenetic Species Concept, as espoused by Groves (2001, 2004, 2012). However, I continue to treat them as subspecies rather than full species. The three populations identified are segregated completely by one very large river and incompletely by one large river, and I see them clearly as diverging lineages, best characterized as races of a single species. This arrangement follows the subspecies designations of other populations of large mammals in the region, including, for example, tigers, leopards, and wolves.

The survival of the capped langur, and other forest-dwelling animals, is threatened by habitat destruction through logging, encroachment, *jhum* or slash-and-burn shifting cultivation (of the hill tribes), and monoculture forest plantations. Such destruction of the forest is not only resulting in a decrease in habitat and a decline in numbers of langurs, but also creating fragmentation. Hunting for its meat is a serious threat in some parts of Assam, central and eastern Arunachal Pradesh, parts of Meghalaya and Tripura, hill districts of Manipur, and

throughout Nagaland and Mizoram. The Nyishis of Arunachal Pradesh also hunt it to use its pelt to make traditional *dao*-sheaths. Unsustainable harvesting of bamboo for large paper mills (for example, at Jagiroad, Panchgram and Jogighopa in Assam, and Tuli in Nagaland), petroleum mining and exploration (eastern Assam and adjacent areas of Arunachal Pradesh), and open-cast coal and limestone mining (in parts of Meghalaya and eastern Assam) are some of the other conservation issues; they not only destroy the habitat, but also cause pollution and disturbance.

*Trachypitecus pileatus* is protected under Schedule I of the Wild Life (Protection) Act of India, the highest conservation status in the country. Enforcement in the field, however, is virtually non-existent except in some protected areas. Most local communities are unaware of its legal status. *Trachypitecus pileatus* occurs in at least 53 notified protected areas in Northeast India (Table 1).

Although the capped langur is still widely distributed throughout Northeast India, there are many small, isolated populations as a result of the rapid fragmentation of their forests. Many of these populations are not viable in the mid- to long term, and it is only a matter of time that the species will become locally extinct in pockets such as Mijikajan tea estate (Sonitpur district), Hatipoti village (Tinsukia district), Diroi and Sola reserved forests (both in Sivasagar district). It has already been extirpated in many areas; for example, Manipur valley, many parts of Nagaland and Mizoram except in some isolated pockets, the plains of Lakhimpur district, most of the tableland of the Meghalaya plateau, and many parts of Sonitpur district in Assam. The entire population of langurs and also other primates have vanished from the 900-km<sup>2</sup> rain forest tract comprising the Nambor (south block), Diphu, and Rengma reserved forests in Golaghat district (Assam) because of the border problems with Nagaland and subsequent felling, poaching and encroachment (Choudhury 1999). The last stray langurs were reported there in the 1980s.

What could be the estimated number of capped langurs? An exercise was carried out in Assam in the 1980s estimating the number of groups present, and multiplying them by mean group size. The figure for Assam came to 39,000 (Choudhury 1989a). No population estimate was available for other states of Northeast India, but none were likely to have higher numbers than Assam at that time. The presence of groups was ascertained through direct observation and from local forest staff and people from fringe villages.

A similar exercise between 2008 and 2014 in the same areas of Assam, using a mean group size of 9.97 (range: 5–14; n= 33; Choudhury 2012) indicated 18,600 (range: 17,500–20,000) langurs, reflecting well the extent of habitat loss. A similar exercise was not possible for the entire northeast, but in view of the larger area of available habitat, much of it in relatively inaccessible areas, the state of Arunachal Pradesh is currently likely to have a larger number than Assam.

Adequate protection of the existing national parks and sanctuaries, and the creation of more protected areas (such as Dhansiri and Lumding in Assam; Satoi and Saramati in

Nagaland, Inner Line in Mizoram), enlargement (wherever possible) of existing protected areas, stricter enforcement of the wildlife law, provision of synthetic or cotton *dao*-sheaths (that could mimic a capped langur skin) for the Nyishi tribe of Arunachal Pradesh (they would find it acceptable as they told me during various contacts with them), and awareness programs will help ensure the survival of the capped langur.

## Conclusions

1. The Brahmaputra River clearly separates populations of the northern capped langurs (*tenebricus* and *brahma*) from the southern *pileatus* with its distinct “army-cut hairstyle” cap. Both *pileatus* and *durga* have this unique cap.
2. The subspecies *tenebricus* is distinct in having a cap/crown with radiating hairs.
3. Both *brahma* and *tenebricus* lack “army-cut hairstyle” caps. The cap of *tenebricus* differs from that of *brahma* in having radiating hairs.
4. The north bank langurs have longer cheek whiskers than their southern counterpart.
5. Pelage color has seasonal variations that may not occur at the same time over the range. The form *durga* (now synonymized with the nominate race) in Bangladesh and southern Assam may assume a deep orange-yellow ventrum earlier or later than those in Kaziranga and Tinsukia in eastern Assam.
6. The adults and immatures, and males and females show variations. In the same group, not all adults assume the bright ventral color at the same time.
7. Immatures are generally less bright and may have pale tail ends.
8. The facial hair patterns, including the cap, provide a more clear-cut segregation of the subspecies than the variable and confusing pelage colors.
9. The number of capped langurs is declining.

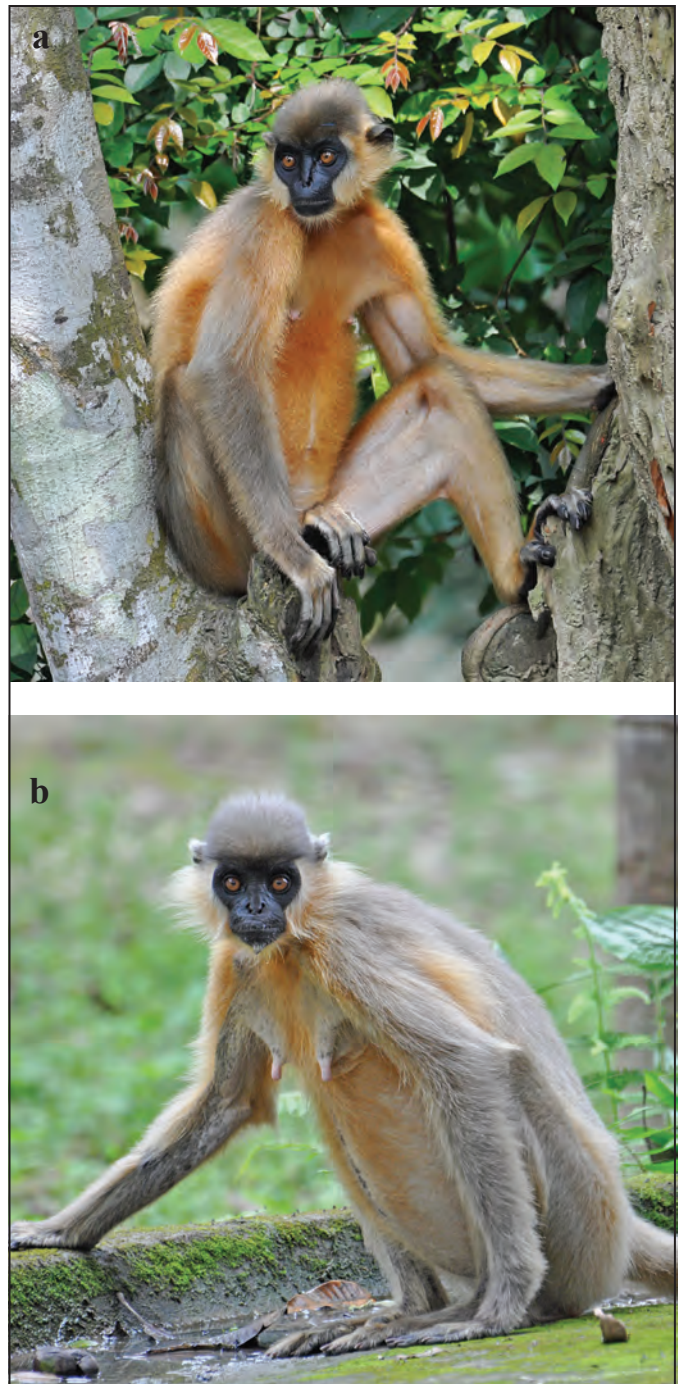
## Acknowledgments

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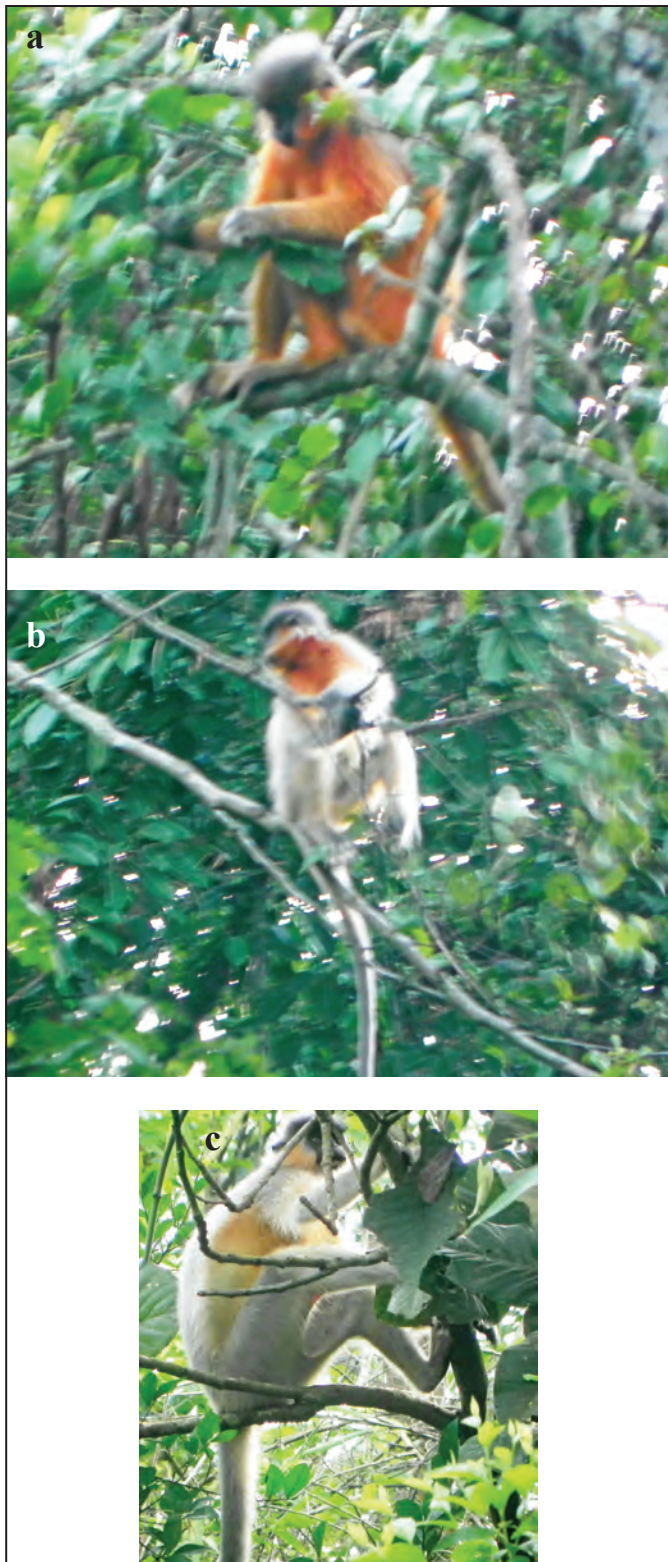




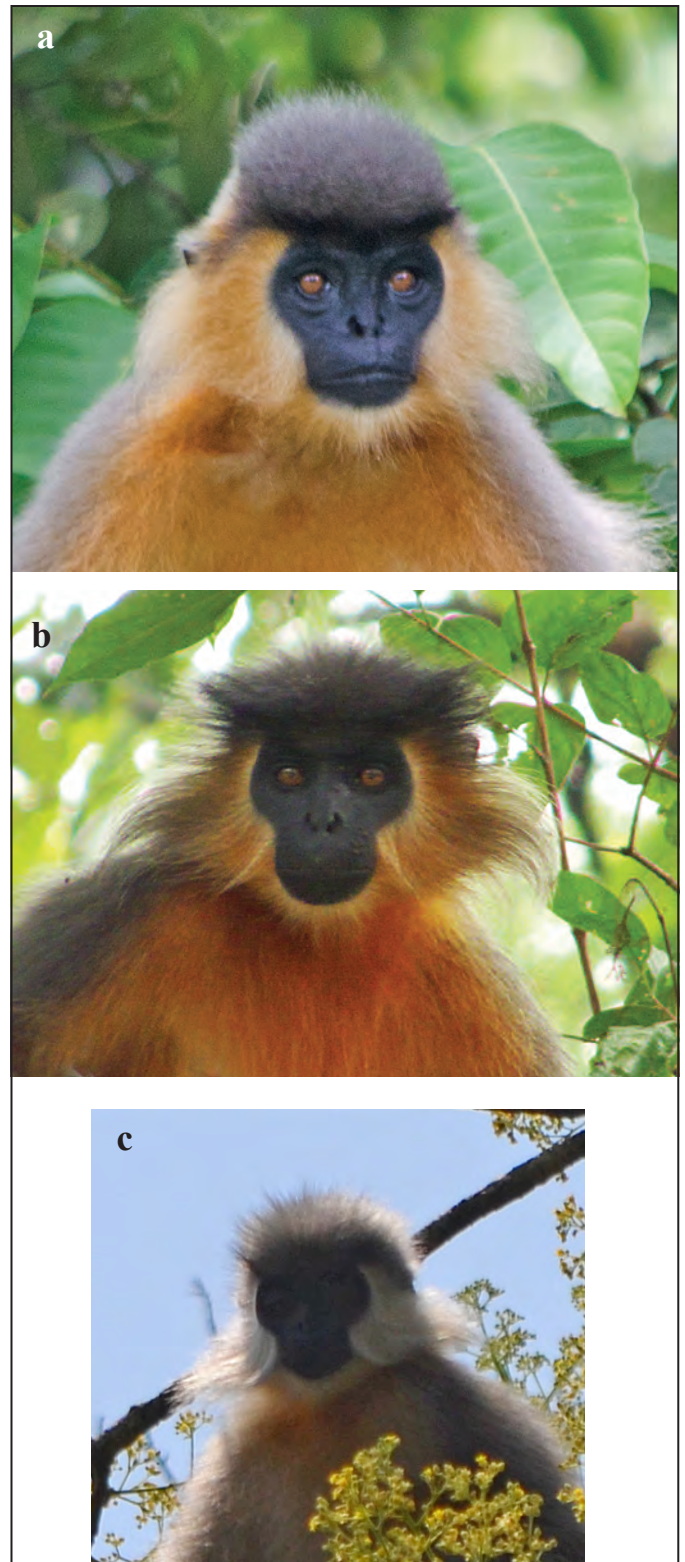
**Photos 1.** Pelage color. Seasonal color variation makes pelage color redundant for the segregation of subspecies. (a) *T. p. tenebricus* from Manas Tiger Reserve, north of the Brahmaputra River and west of the Jia-Bhoreli River, 15 November. (b) *T. p. tenebricus* from Manas Tiger Reserve, 22 February. Photos by Anwaruddin Choudhury.



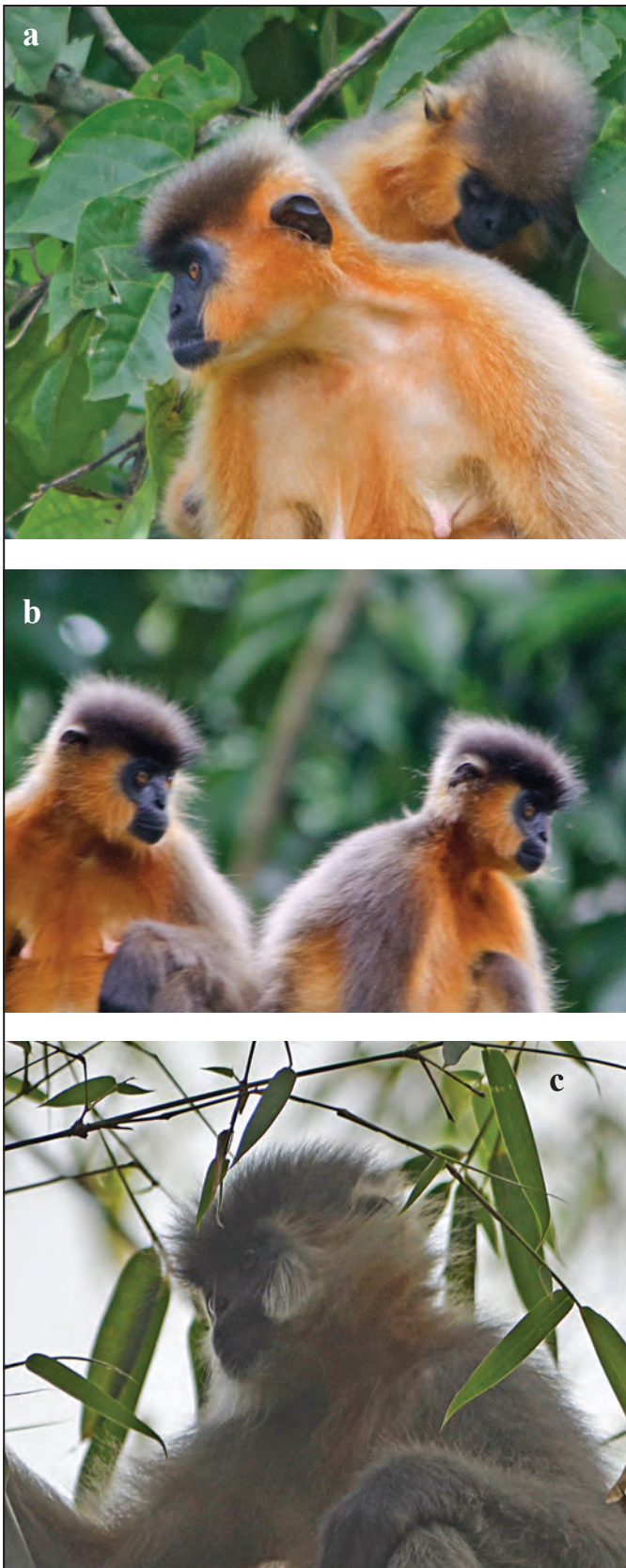
**Photos 2.** Pelage color. Variation in color among individuals on the same day in the same group makes pelage color redundant for the segregation of subspecies. (a) *T. p. pileatus* from Hollongapar Gibbon Sanctuary, south of the Brahmaputra River, in May showing deep orange venter. (b) *T. p. pileatus* from the same group in Hollongapar Gibbon Sanctuary in May showing light orange venter. Photos by Arup Ballav Goswami.



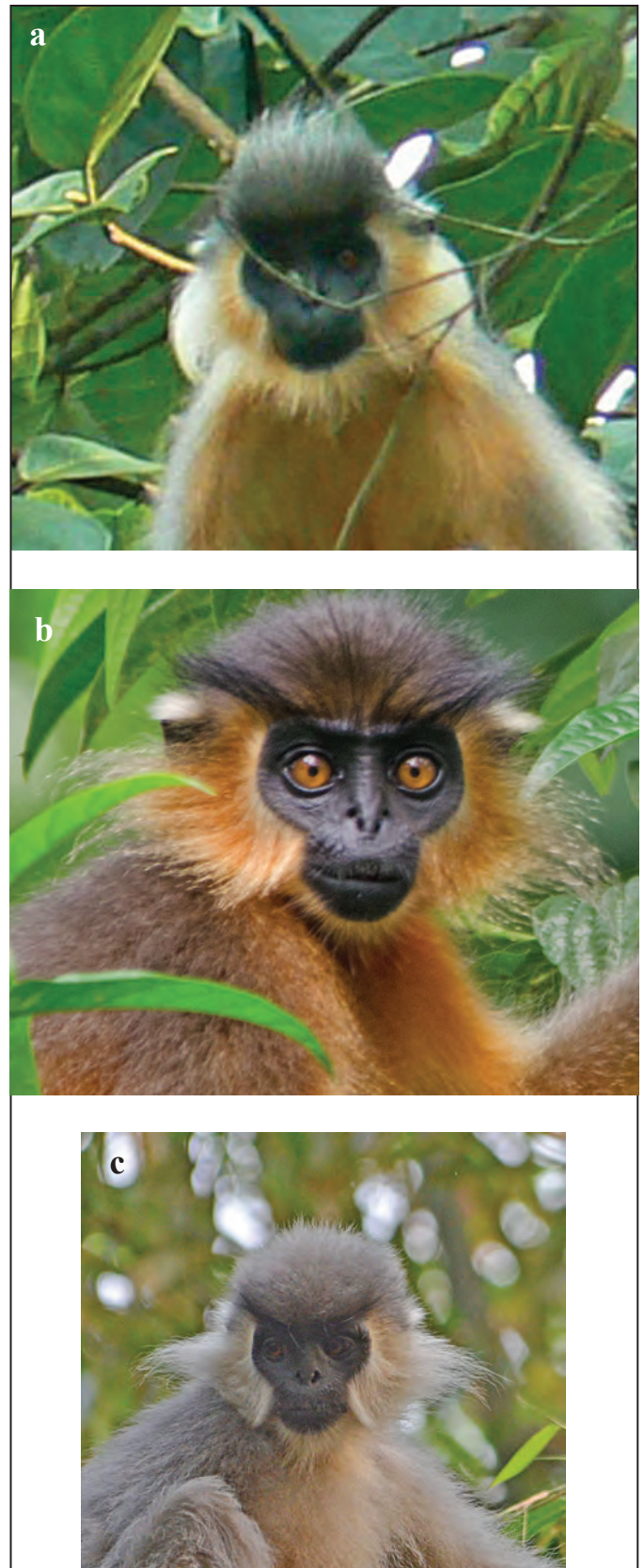
**Photos 3.** Pelage color. Color variation in a single locality showing how pelage color as a character can confuse attempts to distinguish subspecies. These photos show why the forms *pileatus* and *durga* should be considered synonyms. (a) *T. p. pileatus* (form *durga*) from Rosekandy, Cachar district, Assam, showing an unusually deep orange even on the arms and thighs, 4 June. (b) *T. p. pileatus* (form *durga*) from Rosekandy, Cachar district, Assam, showing orange whiskers and ventrum and grey arms and thighs, 4 June. (c) *T. p. pileatus* (form *durga*) from Rosekandy, Cachar district, Assam, showing a lack of any orange or reddish but uniform creamy or light yellowish whiskers and ventrum, resembling the description of the nominate form *pileatus*, 22 May. Photos by Khairuzzaman Mazumdar.



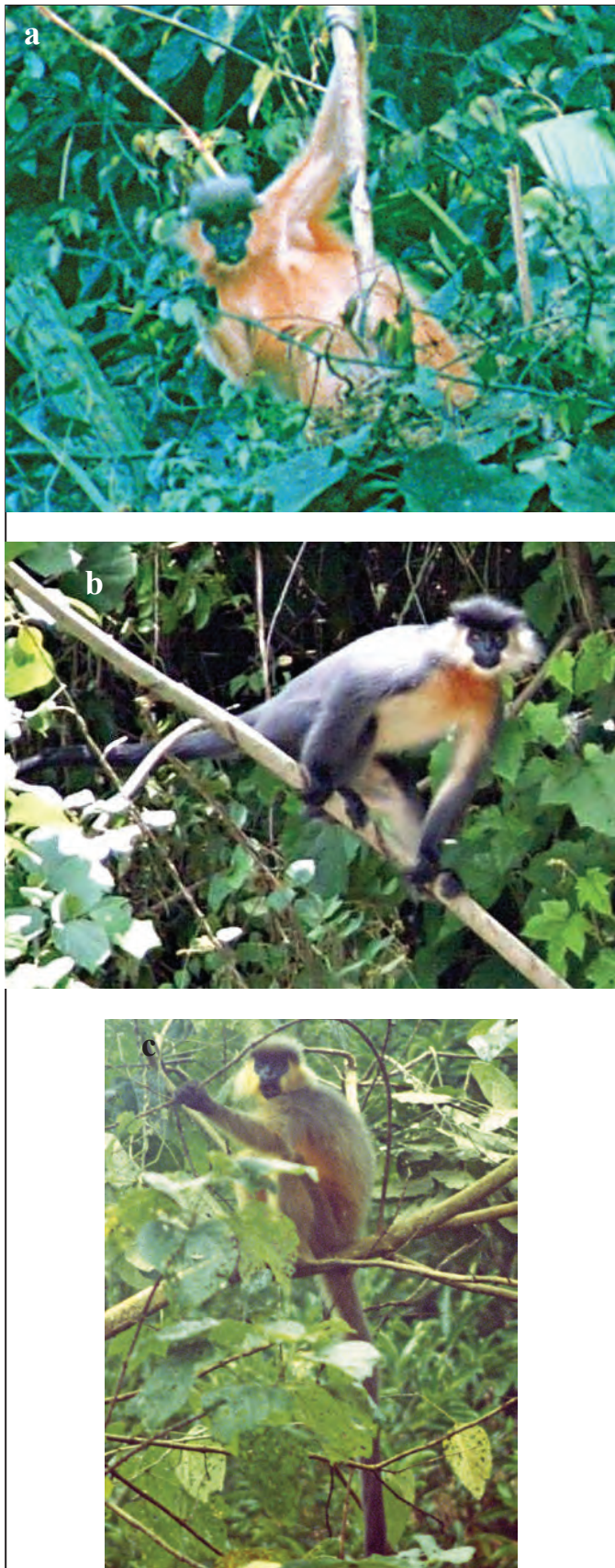
**Photos 4.** Frontal view. Note the cap, length of the side whiskers in relation to the ears, the contact zone of the cap and forehead, and the sides of the cap (giving an appearance of horns). (a) *T. p. pileatus* male from Kaziranga National Park, south of the Brahmaputra River, 21 July. (b) *T. p. tenebricus* male from Manas National Park, north of the Brahmaputra River and west of the Jia-Bhoreli River, 15 November. (c) *T. p. brahma* male from Behali Reserved Forest, north of the Brahmaputra River and east of the Jia-Bhoreli River, 1 April. Photos by Anwaruddin Choudhury.



**Photos 5.** Side view: Note the cap in relation to the ear. (a) *T. p. pileatus* from Kaziranga National Park, south of the Brahmaputra River showing the 'military-style' hair-style of the cap. (b) *T. p. tenebricus* from Balipara Reserved Forest, north of the Brahmaputra River and west of the Jia-Bhoreli River. The location is near but outside Nameri National Park and is separated from it by the Jia-Bhoreli River. (c) *T. p. brahma* from Harmoty, Lakhimpur, north of the Brahmaputra and east of Jia-Bhoreli River. Photos by Anwaruddin Choudhury.



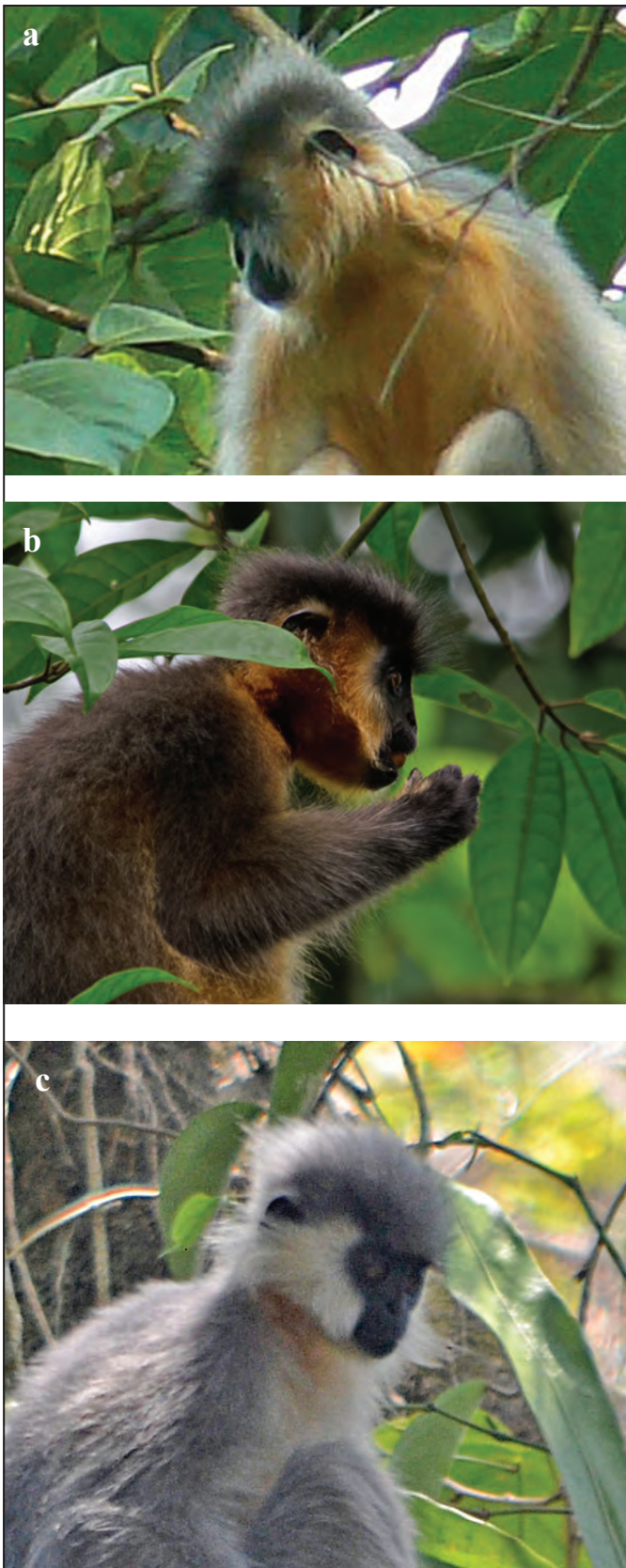
**Photos 6.** Frontal, general views. (a) *T. p. pileatus* from Baghmara Reserved Forest, Garo Hills, south of the Brahmaputra, 30 May. Photo by Anirban Datta Roy/ Samrakshan. (b) *T. p. tenebricus* from Balipara Reserved Forest, north of the Brahmaputra River and west of the Jia-Bhoreli River, 21 July. Photo by Anwaruddin Choudhury. (c) *T. p. brahma* from Harmoty, Lakhimpur, north of the Brahmaputra River and east of the Jia-Bhoreli River, 8 April. Photo by Anwaruddin Choudhury.



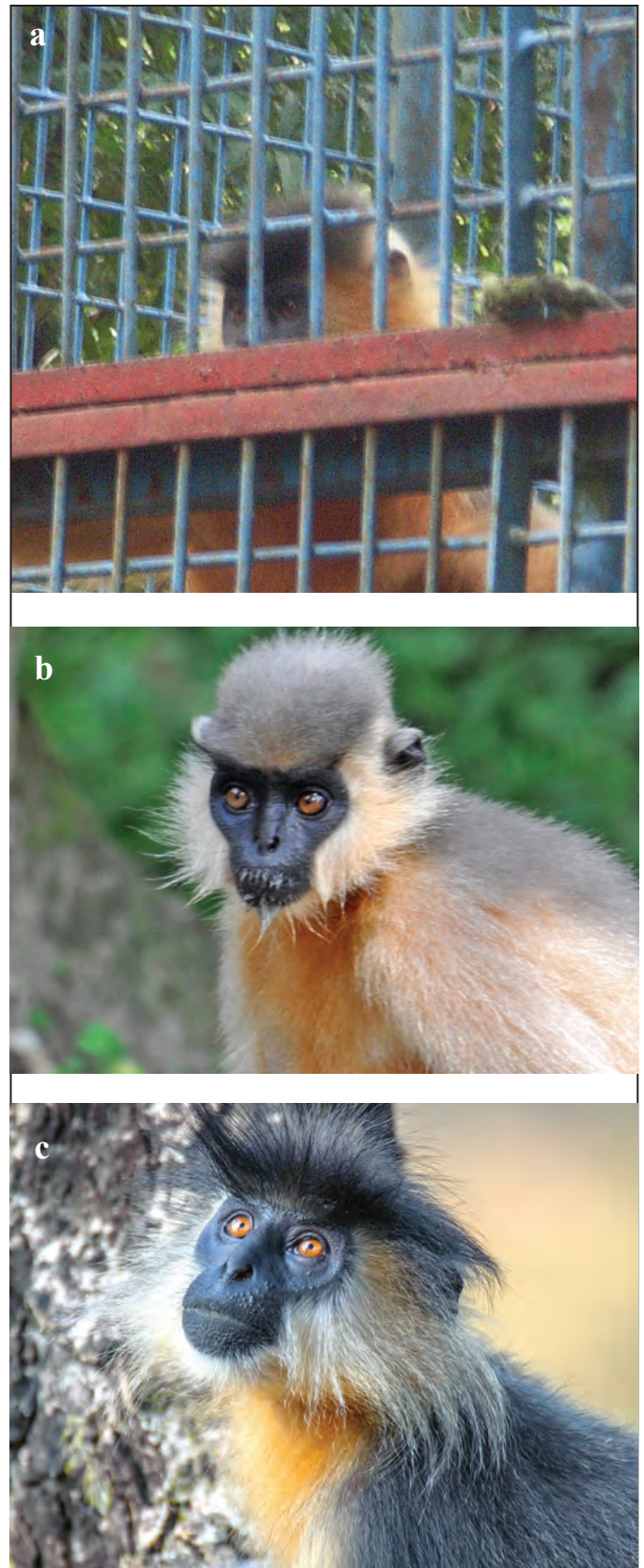
**Photos 7.** Frontal, general views. (a) *T. p. pileatus* from Inner Line Reserved Forest, Hailakandi, south of the Brahmaputra, March. (b) *T. p. tenebricus* from Deothang, Bhutan, north of the Brahmaputra River and west of the Jia-Bhoreli River, 30 May. (c) *T. p. brahma* from Mijikajan, Sonitpur, north of the Brahmaputra River and east of the Jia-Bhoreli River, September. Photos by Anwaruddin Choudhury.



**Photos 8.** Frontal, general views. (a) *T. p. pileatus* from Dhansiri Reserved Forest, Karbi Anglong, south of the Brahmaputra River, December-January. (b) *T. p. tenebricus* from Sessa Orchid Sanctuary, Arunachal Pradesh, north of the Brahmaputra River and west of the Jia-Bhoreli River, May. (c) *T. p. brahma* from Behali Reserved Forest, Sonitpur, north of the Brahmaputra River and east of the Jia-Bhoreli River, 1 April. Photos by Anwaruddin Choudhury.



**Photos 9.** More side views. (a) *T. p. pileatus* from Baghmara Reserved Forest, Garo Hills, south of the Brahmaputra River. Photo by Anirban Datta Roy/Samrakshan. (b) *T. p. tenebricus* from Balipara Reserved Forest, north of the Brahmaputra River and west of the Jia-Bhoreli River. Photo by Anwaruddin Choudhury. (c) *T. p. brahma* from Behali Reserved Forest, Sonitpur, north of the Brahmaputra River and east of the Jia-Bhoreli River. Photo by Anwaruddin Choudhury.



**Photos 10.** More side views. (a) *T. p. pileatus* in Dhaka zoo, Bangladesh, south of the Brahmaputra River. Photo by Anwaruddin Choudhury. (b) *T. p. pileatus* from Hollongapar Gibbon Sanctuary in May. Photo by Arup Ballav Goswami. (c) *T. p. tenebricus* from Manas National Park, north of the Brahmaputra River and west of the Jia-Bhoreli River. Photo by Udayan Borthakur.

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**Appendix.** Letter from Dr. George B. Schaller concerning capped langurs. Dated: 2000–2001

Dear Dr. Choudhury:

You were correct: the langur in Tibet is the capped not gray one (see photo) in the southeastern part inside the big bend of the Yarlung Tsangpo. I spent over a month in that area. Also of interest is that red muntjac is found below about 1800m and black muntjac (*M. crinitifrons*) from about 1800–2500m. You may want to look for that species in eastern India at those elevations. However, where only red muntjacs occur they may go up to 3000m. I hope your work continues well. I'll be busy in the Congo and Kazakhstan for a bit but look forward to meeting you again in India sometime. Please give my warmest regards to Anne Wroughton.

Sincerely

George Schaller