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The Distribution, Status and Conservation of Hoolock Gibbon, *Hoolock hoolock*, in Karbi Anglong District, Assam, Northeast India

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Abstract: In India, the hoolock gibbon, *Hoolock hoolock*, is found only in a small part in the northeast, south of the Brahmaputra River and east of the Dibang River. This article describes its distribution, habitat and conservation and also compares its relative status over the past 15 years in Karbi Anglong, the largest district of Assam in India. The hoolock gibbon still occurs over a large part of the district but in depleted numbers. It has been recorded from altitudes of less than 100 m to above 1,300 m. Hoolocks have become rarer due to habitat loss and hunting and, except for a few protected areas and larger reserved forests, they are found in scattered groups, where they may not survive for long. Karbi Anglong has the largest known habitat and estimated population of the species in Assam. A rough population estimate indicates that the total numbers of hoolock gibbons today could be between 2,400 and 3,200. This can be compared to an estimate in 1991–1992 of 3,500–4,800. The hoolock gibbon is protected by law and occurs in all the five protected areas and in at least 20 reserved forests and 14 proposed reserved forests in the district. Of these, its continued presence is doubtful in at least four reserved forests and one proposed reserved forest. The creation of further protected areas, adequate protection of existing protected areas, control of *jhum* cultivation and poaching, and awareness and involvement of churches and village headmen in conservation are recommended.

Key words: Hoolock gibbon, *Hoolock hoolock*, northeast India, Assam, Karbi Anglong, Mikir Hills, Dhansiri

Introduction

The hoolock gibbon, *Hoolock hoolock*, is the only ape found in the Indian subcontinent. Adult males and juveniles of both sexes are black with white eyebrows. When subadult, the pelage of the females changes to greyish and then to a tan color, which they retain as adults. The range of the hoolock gibbon is between the Brahmaputra and Salween rivers, covering parts of northeast India, eastern Bangladesh, northern Myanmar (Burma), and a small area of southern China (McCann 1933; Groves 1972; Choudhury 1987). In India, it is confined to the northeast, where it is restricted to the south of the Brahmaputra River and east of the Dibang River (Parsons 1941; Choudhury 1987). Its range in northeast India was shown incorrectly in Corbet and Hill (1992). The type locality of the species is the Garo Hills in Meghalaya (originally recorded as Assam), India (Harlan 1831).

A fair amount of published information is now available on hoolock gibbons in Assam and other areas of India (see McCann 1933; Tilson 1979; Choudhury 1987, 1990, 1991,

1996, 1998, 2000, 2003, 2006; Chhetri *et al.* 2007) and there are number of synoptic works on primates or wildlife in general which also mention the species (Pocock 1939, 1941; Prater 1948; Choudhury 1988, 1997, 2001; Menon 2003; Groves 2005). Some unpublished theses and reports also provide important data (see Choudhury 1989; Misra *et al.* 1994; Kakati 1997; Das 2002). Prouty *et al.* (1983) and Mootnick and Groves (2005) reviewed the taxonomy of the species, while Takacs *et al.* (2005) reviewed that of the family Hylobatidae. Choudhury (1993) provided information on the gibbons in Karbi Anglong. In this article, I describe the distribution, habitat, status, and conservation of the hoolock gibbon in Karbi Anglong, the largest district of Assam in northeastern India, and also discuss its status over the past one and a half decades.

Study Area

The district of Karbi Anglong (25°32'–26°37'N, 92°09'–93°53'E; 10,330 km²) is in central Assam, northeast India

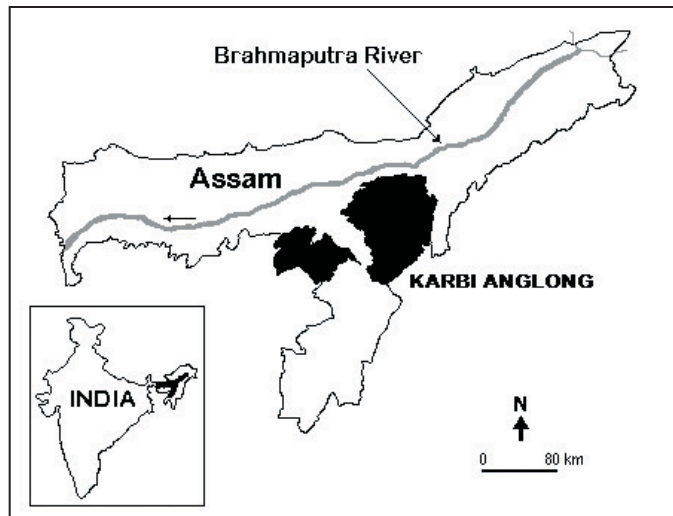


Figure 1. The location of Karbi Anglong in Assam, India. Map by Anwaruddin Choudhury, 2008.

(Figs. 1, 2). Formerly the area was called the Mikir Hills. The district consists of two disjunct regions separated by Hojai-Lanka plains. The eastern region comprises the Diphu and Bokajan Subdivisions, and the western region is the Hamren Subdivision. The area is mostly rugged and hilly, being part of an Archaean plateau (known as Karbi Plateau). The East Karbi Plateau is like an isolated 'block' linked to the main plateau through lower undulating terrain called the Lumding-Dhansiri Gap. The West Karbi Plateau is contiguous with the larger Meghalaya Plateau. There are three small plains, all formed by different rivers, namely, the Kopili, Dhansiri and the Jamuna. The highest point of Karbi Plateau is 1,360 m above sea level, and has been called the 'Hoidu Parbat' (*Hoidu* means hoolock gibbon in local Karbi parlance) by Choudhury (1993). The second highest peak is Singhason or Chenghehison Parbat (1,357 m above sea level).

The climate is tropical with hot and wet summers (May to September) and cool and generally dry winters (December to February). Annual rainfall ranges from 800 to 2,800 mm. The bulk of the rain falls during the summer monsoon (May to September). Rainfall is very variable because the southern Karbi Anglong is in a rain shadow area. The temperature ranges from less than 5°C in higher areas in winter to more than 35°C in summer (often reaching 37°C in the plains).

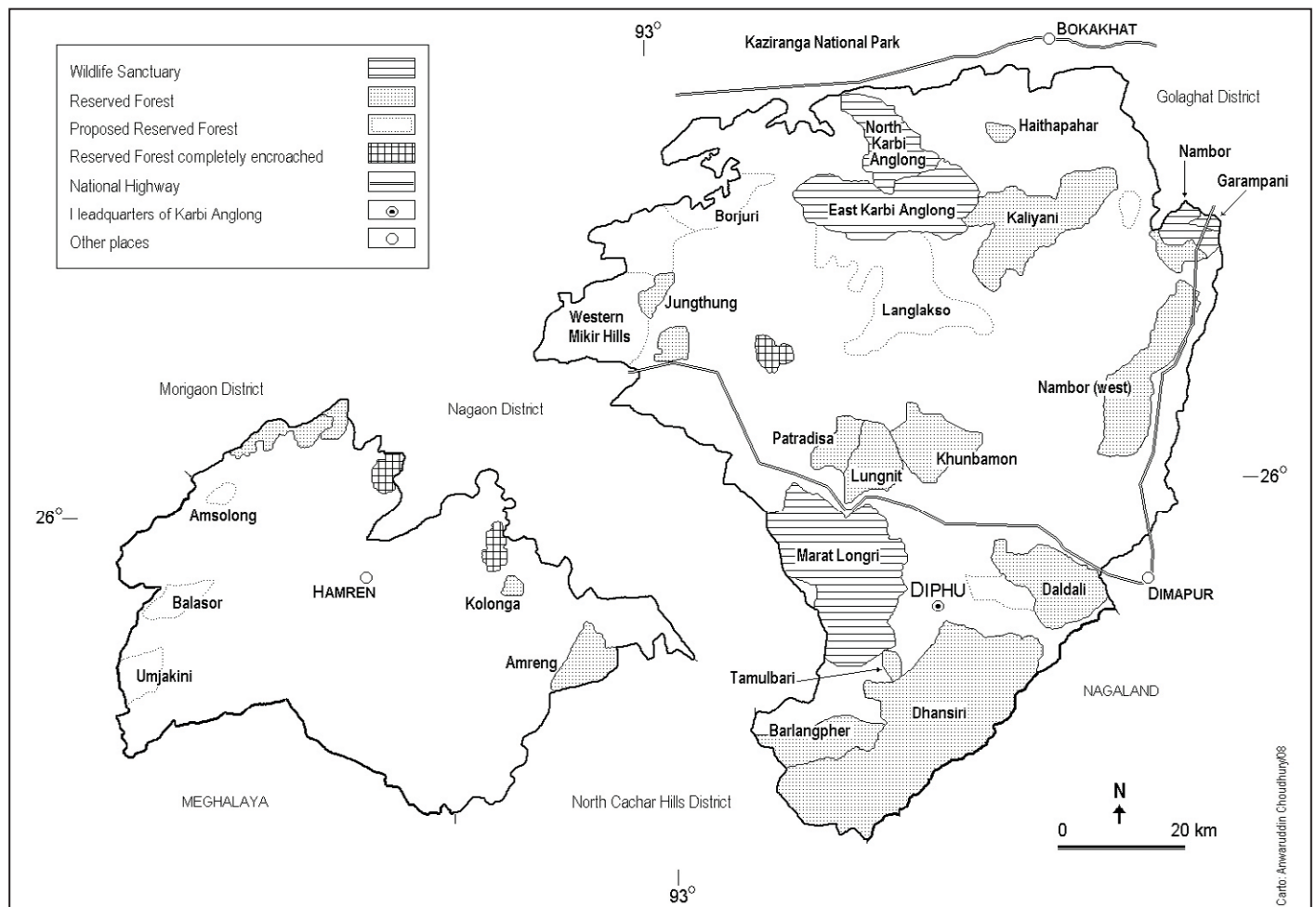


Figure 2. Karbi Anglong, showing some general features and the wildlife sanctuaries and reserved forests. Map by Anwaruddin Choudhury, 2008.

Methods

From 1991 to October 2007, I carried out field surveys in areas where hoolock gibbons occur in the district of Karbi Anglong as part of a broader survey of wildlife of northeast India. The presence of gibbons was ascertained by direct sightings or by hearing their calls, as well as through finding preserved skulls in the tribal villages and by interviewing local forest staff, villagers, and hunters (using visual aids such as photos and drawings). Direct observations and censuses were carried out along trails (mostly during foot-transect), roads (by car), and rivers (by boat).

The data were obtained during numerous field surveys carried out since 1991, and particularly between April 1991 and June 1992, when I was posted as Additional District Magistrate at Diphu, the headquarters of Karbi Anglong. Visits were sporadic after that time, but were made every year until October 2007.

Distribution

Hoolock gibbons are still widely distributed in Karbi Anglong (Fig. 3.). The species has been recorded all over the hilly and forested areas of Bokajan and Diphu subdivisions

in the eastern part of Karbi Anglong. It vanished many years ago, however, from the flat plains of Howraghat and Bokajan, due to forest clearing for human settlements. The range is largely contiguous in the central, northern and southern areas where there are still large tracts of forest. In Hamren Subdivision in the western part of the district, the range is discontinuous with only a number of fragmented pockets remaining. Hoolock gibbons have been recorded in all the wildlife sanctuaries of the district: East Karbi Anglong, Garampani, Nambor, North Karbi Anglong and Marat Longri. The protected areas, reserved forests and proposed reserved forests where they are known to occur are listed in Table 1. The larger reserved forests and proposed reserved forests still containing gibbons are Dhansiri, Langlokso, Nambor (west block), Khunbamon and Borjuri (in Table 1). They are still found in some unclassified forests as well, but in small numbers. In Hamren Subdivision of western Karbi Anglong and in parts of the central highlands in eastern Karbi Anglong populations were found to be small and isolated, in forest patches dispersed through *jhum* (slash-and-burn shifting cultivation of the hill tribes) fields. Isolated groups can be found near Habang (Umwang), Bait-halangso, Karbi Langpi, Jirikinding, Amtereng and Amkarlu, and a few gibbons still survive in sacred groves, such as those in Killing Sarpo.

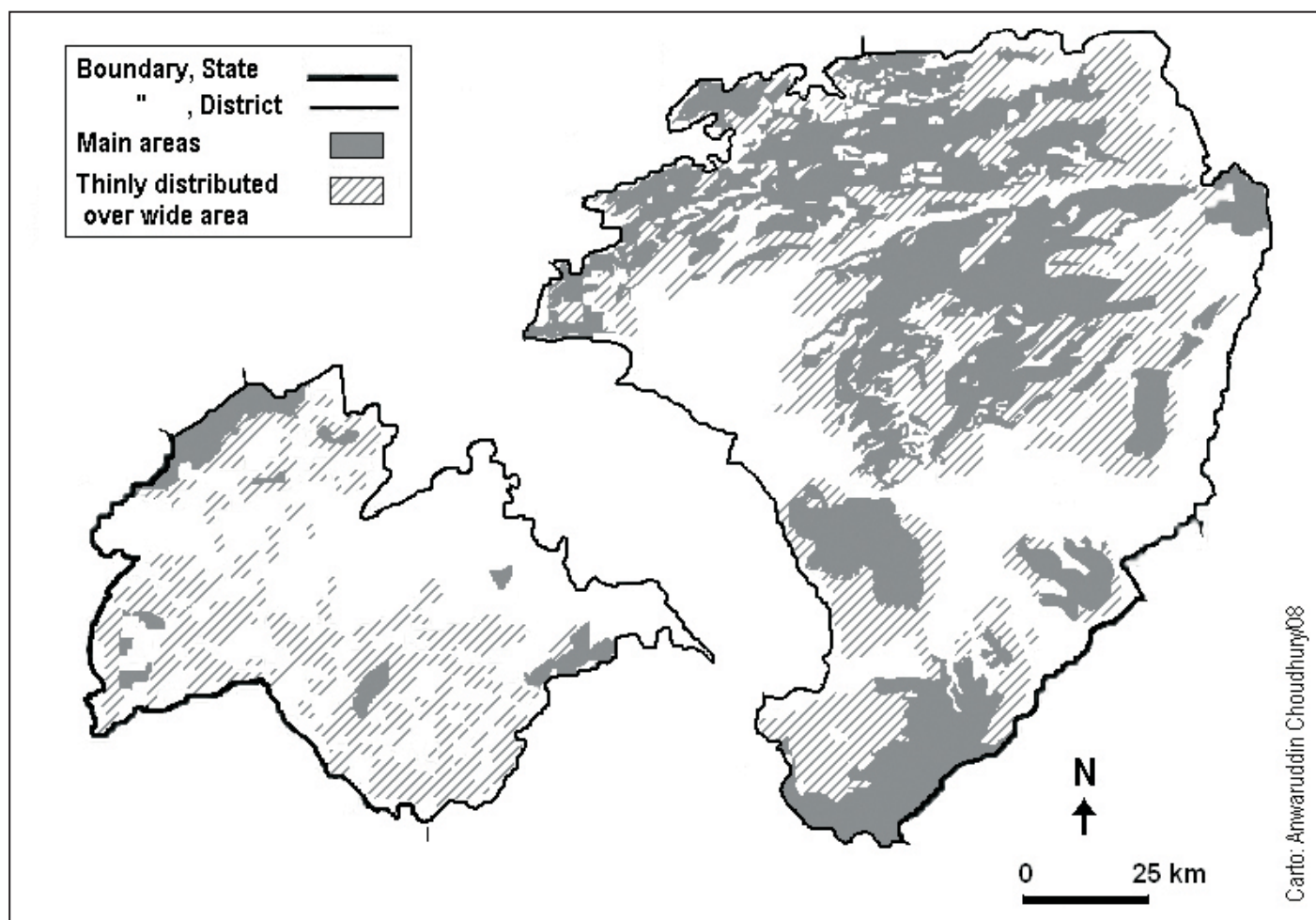


Figure 3. The current distribution of the the hoolock gibbon (*Hoolock hoolock*) in Karbi Anglong. Map by Anwaruddin Choudhury, 2008.

Table 1. Protected areas, reserved forests and other areas with known hoolock gibbon, *Hoolock hoolock*, populations. Population range: A=>200; B=100–200; C=50–100; D=20–50; E=<20; ? = current occurrence doubtful.

	Area (km²)	Population		Remarks
		1991–92	Post-2003	
Wildlife Sanctuaries				
East Karbi Anglong	221.8	A	A	Formerly Mikir Hills RF. Largely in good condition. Small areas under <i>jhum</i> . Contiguous with North Karbi Anglong WS and Kaliyoni RF.
Garampani	6.0	D	D	Some felling. A busy National Highway passes through. Contiguous with Nambor-Doigrung WS of Golaghat district and Nambor WS.
Marat Longri	451.0	A	A	Formerly Disama, Kaki, Inglonggiri and Miyungdisa RFs. Encroachment, <i>jhum</i> and felling of trees. Contiguous with Lumding RF of Nagaon district.
Nambor	37.0	B	C	Some encroachment and felling of trees. Contiguous with Garampani WS.
North Karbi Anglong	96.0	B	B	Encroachment, <i>jhum</i> and felling of trees. Contiguous with East Karbi Anglong WS and Kaziranga National Park.
Reserved Forests (including District Council Reserved Forests)				
Amreng	57.0	B	D	Encroachment (up to 17 km² in 2007) and felling of trees.
Amreng 1 st Addition	5.8	E	E	Separated from Amreng RF by an all weather road. Amreng 1 st Addition was notified as a District Council RF (*see footnote below).
Barlangpher	77.3	C	D	Large-scale <i>jhum</i> and also encroachment. Contiguous with Dhansiri RF.
Daldali	123.3	A	B	Encroachment and felling of trees. Poaching from Nagaland.
Dhansiri	770.4	A	A	Encroachment (up to 33 km² by 2007) and felling of trees but due to sheer size, still contains the single largest contiguous habitat. Poaching from Nagaland. Contiguous with Intanki National Park of Nagaland.
Haithapahar	54.4	C	D	Encroachment, <i>jhum</i> and felling of trees.
Jungthung	33.0	B	D	Some encroachment, <i>jhum</i> and felling of trees.
Kaliyoni	209.0	A	B	The entire valley area is under encroachment. Elsewhere <i>jhum</i> , felling of trees and poaching. Contiguous with East Karbi Anglong WS.
Khunbamon	166.0	A	C	Encroachment (up to 99.3 km² by 1997; some evicted), <i>jhum</i> , felling of trees and poaching.
Kolonga	17.35	C	E	Encroachment (up to 10 km² by 1997; some evicted but still about 8 km² is under encroachment in 2007) and felling of trees.
Lungnit	118.0	B	D	Encroachment (up to 35.3 km² by 1997; some evicted), <i>jhum</i> and felling of trees. Contiguous with Patradisa RF.
Mahamaya	5.6	?	?	Last seen in 1976, a pair.
Matipung	13.3	E	?	Encroachment being located close to Diphu town; also <i>jhum</i> and felling of trees.
Nambor (north block)	11.0	D	E	Large-scale encroachment (out of total area of 54 km², 43 km² forms Garampani and Nambor wildlife sanctuaries leaving only 11 km² as RF).
Nambor (west block)	166.3	A	B	Encroachment, felling of trees and poaching.
Patradisa	67.0	B	D	Encroachment (up to 13.5 km² by 1997; some evicted) and <i>jhum</i> . Contiguous with Lungnit RF.
Sarchim/Charchim	133.1	C	E	Encroachment, <i>jhum</i> and felling of trees.
Sildharampur	21.5	E	?	Encroachment and felling of trees. A busy National Highway passes through.
Sinanadi/Chinanadi	19.8	E	E	Encroachment (up to 10 km² by 1997), now cleared but small gibbon habitat.
Tamulbari	13.9	D	E	Encroachment and felling of trees. Separated from Dhansiri RF by a railway track.
Proposed Reserved Forests				
Amreng, 2 nd addition	55.3	D	E	Encroachment and felling of trees.
Amsolong	74.7	C	D	Encroachment, <i>jhum</i> and felling of trees.
Balasar	82.8	C	D	Encroachment (up to 20 km² by 1997), <i>jhum</i> and felling of trees. Contiguous with forests in Meghalaya.
Bokajan	9.8	E	?	Encroachment and felling of trees.
Borjuri	139.0	A	C	Encroachment, <i>jhum</i> and felling of trees.
Dolamara	5.5	D	E	Encroachment, <i>jhum</i> and felling of trees.
Haithapahar	54.0	E	E	Encroachment, <i>jhum</i> and felling of trees.
Hapjan	35.25	E	E	Encroachment and felling of trees.
Kalapahar	9.8	D	E	Encroachment, <i>jhum</i> and felling of trees.
Kaziranga	33.9	D	E	Encroachment and felling of trees.
Langlokso	534.7	A	A	Large-scale encroachment (up to 214 km²; some evicted but still about 64 km² is under encroachment in 2007) and felling of trees. Also, ginger cultivation, <i>jhum</i> and poaching. Contiguous with East Karbi Anglong WS.
Parkup Pahar	27.7	D	E	Encroachment, <i>jhum</i> and felling of trees.
Tikok	25.3	C	E	<i>Jhum</i> and felling of trees.
Umjakini	36.8	D	E	Encroachment (up to 6 km² by 1997), <i>jhum</i> , felling and poaching. Contiguous with forests in Meghalaya.
Western Mikir Hills	173.0	B	C	Encroachment, <i>jhum</i> and felling of trees.

Table 1. continued on next page

Table 1., continued

	Area (km²)	Population		Remarks
		1991–92	Post-2003	
Unclassed Forests				
Scattered across Singhason area outside Langlokso		A	C	Large-scale <i>jhum</i> , ginger cultivation and human settlement (not necessarily encroachment as these are not reserved forests), also poaching.
Scattered across Hamren sub-division		A	C	Same as above.
Gandhipur		E	?	c.5 km east of Hidipi
Tapat		E	?	
Umpabeng		E	?	
Habang (Umwang)		E	E	
Killing Sarpo sacred grove		D	E	Traditionally protected but small in size.

WS=wildlife sanctuary; RF=reserved forest; PRF=proposed reserved forest.

* Earlier District Council RFs were declared and controlled by the District Council while the other reserved forests were administered by the State Government. Now all the reserved forests are controlled by the Council (now upgraded from District Council to Autonomous Council). Hence, there is no longer any functional difference between these two categories of reserved forests.

In all, there are eight large fragmented forests and more than 15 smaller isolated pockets in eastern Karbi Anglong, and two large forests and more than 20 smaller isolated pockets in western Karbi Anglong (Table 2). Dhansiri RF, East Karbi Anglong Wildlife Sanctuary (formerly Mikir Hills RF), and Marat Longri Wildlife Sanctuary (especially Disama and Kaki RF areas) are the key areas for hoolock gibbons, with extensive forests and relatively large populations. Nambor (north block) forests, including Nambor and Garampani wildlife sanctuaries, are also important, but their small size, along with encroachment and felling of trees, are threats to their integrity and to the small gibbon populations remaining. Some of the forests there are contiguous with those in neighboring states (Nagaland and Meghalaya) and districts (Golaghat, Morigaon, Nagaon and North Cachar Hills) (see ‘Remarks’ in Table 1).

Habitat

A strictly forest-dwelling primate, the hoolock gibbon is found in two major types of habitat in Karbi Anglong: tropical moist deciduous and tropical semi-evergreen forests. The deciduous forests of most parts of north-eastern India, however, are not pure stands of deciduous trees but contain large numbers of evergreen trees, and there are also patches of semi-evergreen forests within the deciduous biotope forming a mosaic. The hoolock gibbon has also been observed in bamboo thickets amidst semi-evergreen or deciduous forests. Suitable gibbon habitat in the form of tropical semi-evergreen forest occurs in patches on the northern slopes and in the Nambor forests towards the north-east. The ‘hollong’ *Dipterocarpus macrocarpus* (its western limit of distribution is north-east Karbi Anglong), *Terminalia myriocarpa*, *Duabanga sonneratioides*, *Artocarpus chaplasi* and *Mesua ferrea* are some of the notable trees. Tropical semi-evergreen forest also occurs elsewhere in patches, especially along streams.

A large part of the gibbon’s range is covered with tropical moist deciduous forest. The ‘sal’ *Shorea robusta*, and the emergent *Tetrameles nudiflora*, *Gmelina arborea*, *Dillenia scabrela*, and *Bombax ceiba* are some of the species typical of these forests. The main bamboo species are *Dendrocalamus hamiltonii* and *Oxytenanthera nigrociliata/parvifolia*. Sal, however, does not occur in Dhansiri RF. An endemic species, *Mansonia dipikae* occurs in the southern part of Karbi Anglong, including Dhansiri RF. Grasslands and pine groves (*Pinus kesiya*) predominate in the tablelands of West Karbi Anglong (Hamren Subdivision), and gibbons do not occur there. The hoolock gibbons evidently prefer the mixed patches and pockets of evergreen forest. Bamboo and scrub have invaded large areas in the abandoned *jhums* in the deciduous forests. Gibbons can also be found in small forest patches in plantations of deciduous species such as ‘teak’ *Tectona grandis*, but not in the pure teak areas.

Most of the present habitat of the hoolock gibbon in Karbi Anglong is in the hills or in rugged or low undulating terrain. This is mainly because of the destruction of forest for intensive paddy cultivation in the low lying plains. Hoolock gibbons have been recorded at altitudes of less than 100 m to more than 800 m in the western part (Hamren) and up to 1,300 m above sea level in Singhason and the adjacent highlands. The known “area of occupancy” (see IUCN 2008) of hoolock gibbons in Karbi Anglong is about 8,000 km² (down from around 9,000 km² in 1991–92) of which about 4,000 km² (down from around 5,500 km² in 1991–1992) could be considered to still have a viable gibbon metapopulation. Only scattered individuals or isolated groups are found in the remaining 3,500 km².

Status

Although quite widespread, the hoolock gibbon has become rare in the district except for a few protected areas and reserved forests. Choudhury (1993) mentioned that it was

common in reserved forests such as Dhansiri, Nambor and Mikir Hills, but the situation is today very different except for a few pockets where numbers still remain relatively high. In the Dhansiri and Nambor forests, there is encroachment and felling of trees with occasional poaching. Mikir Hills RF was declared as a wildlife sanctuary following a recommendation by Choudhury (1993), but there is no enforcement. In the areas where *jhum* cultivation is extensive, lone animals or groups can be isolated by 5 or 10 km from other groups. Similarly, even in some reserved forests with encroachment, their distribution is sparse and scattered, for example, in Khunbamon and Nambor (west block). In Hamren Subdivision, the area of occupancy is around 2,000 km², but in about 1,600 km² it is encountered only in widely separated valleys and hilltops in isolated and very fragmented small groups which really have no possibility of long-term survival. In the remaining about 400 km² also the density is nowhere near Dhansiri RF.

With small numbers thinly distributed across large areas, population estimates are difficult to obtain except for some protected areas and reserved forests. We have some idea of crude density for certain sites I surveyed in six areas in 1991–1992. Density estimates were as follows: Dhansiri RF (between Langcholiet and Nailalung) 6.3 individuals/km²; Dhansiri RF (near Diphu), 0.7 individuals/km²; Dhansiri RF (Khelma), 1.67 individuals/km²; in the Nambor (north block), Garampani Wildlife Sanctuary, 3.5 individuals/km²;

Mikir Hills RF, now East Karbi Anglong Wildlife Sanctuary (between Chaprasi Rongphar to Haru Lauri Anglong and Borlangso), 4.5 individuals/km²; and the Miyungdisa DC RF, now part of Marat Longri Wildlife Sanctuary, 1.67 individuals/km².

The mean of these density estimates is 2.43 individuals/km². The highest estimate was 6.3 individuals/km² in one part of Dhansiri RF, and the lowest was 0.7 individuals/km² in another part of the same RF. Excluding the high density estimates for Dhansiri RF, Mikir Hills RF and Garampani, indicated a population (including those that are widely scattered) of 3,500–4,800 gibbons in Karbi Anglong in 1991–1992. In recent years, obtaining similar estimates has proved impossible due to social unrest and extremist activities except in the Nambor (north block)–Garampani Wildlife Sanctuary. This site indicated a decline from 3.5 individuals/km² in 1991–1992 to 2.5 individuals/km² in 2003–2004. In Dhansiri RF (between Langcholiet and Nailalung) there was no apparent decline, but there are evidently sharp declines in Dhansiri RF between Diphu and Monglumukh and at Khelma, even though a quantitative assessment was not possible. Habitat loss since 1991–1992 has been severe due to encroachment in Dhansiri RF between Diphu and Monglumukh. The current population could be inferred to be between 2,400 and 3,200; well below the estimate of around 3,500–4,800 gibbons in 1991–1992.

Table 2. Large fragmented habitats of hoolock gibbon in Karbi Anglong and their long-term conservation value.

	Area (km ²)		Remarks
	Total	Suitable habitat	
Dhansiri – Barlangper RF	847.7 (950.0 with Sarkihading forests)	600.0 (650.0 with Sarkihading forests)	Separated from Tamulbari and Daldali RFs by a railway track, and from Intanki NP by Dhansiri River. It is, however, contiguous with the forests of Sarkihading range of North Cachar Hills district.
North Karbi Anglong WS East Karbi Anglong WS Kaliyoni RF Langlokso PRF Kaziranga PRF	1094.6	600.0	Separated from other areas by <i>jhum</i> , degraded habitat and human settlements. The human settlements along the Kaliyoni River and then along the road to Samelangso are going to divide this large habitat into two within the next half decade or so.
Marat Longri WS	451.0 (675.0 with Lumding RF)	400.0 (550.0 with Lumding RF)	Separated from Lungnit and Patradisa RFs by the Jamuna River, from Tamulbari RF by an all weather road. It is, however, contiguous with the dense forests of Lumding RF of Nagaon district. An all weather road (Diphu-Lankaijan road) passes through it but is still narrow and not busy.
Khunbamon RF Lungnit RF Patradisa RF Tikok PRF	376.3	150.0	Separated from Marat Longri WS by the Jamuna River, and from other areas by <i>jhum</i> , degraded habitat and human settlements.
Jungthung RF Borjuri PRF Western Mikir Hills PRF Parkup Pahar PRF	372.7	250.0	Separated from other areas by <i>jhum</i> , degraded habitat and human settlements.
Daldali RF Matipung RF Hapjan PRF	171.85	100.0	Separated from Dhansiri RF by a railway track, and from other areas by degraded habitat, human settlements and a national highway. Poaching from Nagaland.
Nambor (west block) RF	166.3	90.0	Separated from Nambor WS by Namburnadi tea garden, and from other areas by cultivations, degraded habitat, human settlements and a national highway. Poaching from Nagaland.
Nambor WS Garampani WS Nambor (north block) RF	54.0 (178.5 with Nambor-Doigrung WS)	35.0 (90.0 with Nambor-Doigrung WS)	Isolated. A busy national highway passes through. It is contiguous with Nambor-Doigrung WS (excluding the Lower Doigrung part, which is isolated) of Golaghat district.

RF = Reserved Forest, PRF = Proposed Reserved Forest, WS = Wildlife Sanctuary, NP = National Park

Conservation Issues

Forest loss and fragmentation

Forest destruction through tree felling, encroachment, *jhum*, and monoculture tree plantations is a major threat to the survival of the hoolock gibbon in Karbi Anglong. The forest cover in northeast India is disappearing at an alarming rate. More than 1,000 km² of forest was destroyed annually in the northeastern region of India (including Assam, Arunachal Pradesh, and other states) during the 1970s and 1980s (data from the National Remote Sensing Agency). In Assam, dense forest cover has declined from 19.9% of the geographical area in 1980–1982 to 16.4% in 2004–2005 (India, NRSA 1983; India, FSI 2005).

In Karbi Anglong, the dense forest cover was 6,044 km² or 58.5% of the geographical area in 1996–1998 (India, FSI 1999). In 2004–2005 this had dropped to 4,489 km² or 43.5% (India, FSI 2005), a net decrease of 1,109 km², or nearly a fifth in less than a decade. Encroachment is a major problem in the reserved forests, and *jhum* cultivation is an important cause of forest loss and fragmentation in hilly areas such as Karbi Anglong. The Nambor and Garampani Wildlife Sanctuaries are cut into two by a busy national highway, which the gibbons are unable to cross. The number of fragmented units is as follows: 23+ in East Karbi Anglong, and 22+ in West Karbi Anglong. This is excluding the scattered groups and individuals spread all over in the abandoned *jhums* and heavily degraded tracts, for which estimates of fragmentation are extremely difficult to obtain.

Poaching

Hoolock gibbons are hunted for food by many of the tribes of Karbi Anglong and adjacent areas. Members of the largest tribe of the area, the Karbis (formerly called the Mikirs), however, do not normally kill gibbons because local folklore has it that the gibbon is a 'Karbi who was sent to the jungle for his misdeeds'. But today, there are members of the younger generation who occasionally kill them. Other tribes from Karbi Anglong who kill gibbons for their meat are the Rengma Nagas, Kukis, Hmar, Paite, Biate, Chakmas, Khasis, and Jaintias. From across the border, various Naga tribes from Nagaland often hunt gibbons in Karbi Anglong, especially along the roads and near the border. In the past, traditional weapons such as snares and self-made muzzle-loaders were used, but the last two decades has seen the increased use of automatic firearms.

Conservation Measures Taken

The hoolock gibbon is protected under Schedule-I of the Wild Life (Protection) Act of India, which prohibits its killing or capture, dead or alive. Enforcement, however, is virtually nonexistent, even in the protected areas. Most locals are unaware of its legal status. It is listed as "Endangered." on the IUCN Red List of Threatened Species (IUCN 2008). The Autonomous Council in Karbi Anglong has already shown

its positive attitude by accepting proposals for protected areas (Choudhury 1993) and as many as five wildlife sanctuaries have been declared, all of which have hoolock gibbon populations.

Discussion

Karbi Anglong is among the most important districts in northeast India for the long-term conservation of the hoolock gibbon. The reasons are the large size of the district, the relatively large areas that still sustain dense forest, and the traditional beliefs of the Karbis that discourage hunting. The district's importance in this respect is rivaled only by the Lohit and Lower Dibang Valley districts of Arunachal Pradesh where large continuous tracts of dense forest also remain and the main local tribes (Idu and other Mishmi tribes) likewise do not hunt the hoolock gibbon.

Karbi Anglong still has 4,489 km² of dense forest (canopy cover 40% or more), which is 43.3% of the dense forest left in the hoolock gibbon's range in Assam, south of the Brahmaputra River (India, FSI 2005). Conservation measures in this district are crucial for the long-term protection of this species.

The population estimates reported by Choudhury (1989) were made without full surveys being carried out in some key areas in Karbi Anglong, such as Mikir Hills RF (now North Karbi Anglong Wildlife Sanctuary), Disama and Kaki RFs (now part of Marat Longri Wildlife Sanctuary) and Dhansiri RF. As for other areas bordering Nagaland, it was presumed that Dhansiri being located right on the border had heavy poaching. However, during actual field work it was found that the location of Intanki National Park of Nagaland just across the



Figure 4. A young hoolock gibbon (*Hoolock hoolock*) in Hamren sub-division. Immatures are black irrespective of their sex. The pelage of females gradually changes to grayish and then to tan. Photograph by Anwaruddin Choudhury.

border had acted as a buffer, and there was negligible poaching in Dhansiri. Hence, in the period 1988–1992 I believe there were in fact more than at least 9,500–10,800 hoolocks in Assam.

The decline of the hoolock population in Karbi Anglong between 1991–1992 and 2004–2006 by approximately one-third is corroborated by the loss of dense forest cover, which dropped from 6,044 km² in 1996–1998 (India, FSI 1999) to 4,489 km² in 2004–2005 (India, FSI 2005), a loss of 25.7% in less than 10 years. The dense forest recorded by the Forest Survey of India (India, FSI 2005) includes, however, all forests with crown cover of 40% or more, i.e., teak plantations, village woodland, and scattered tiny forest fragments. Hence a sizeable portion is unsuitable for gibbons. In much of the dense forest where the habitat is still ideal, gibbons have long since vanished due to hunting. On the other hand, a few groups do still survive in degraded areas. Hence, in some areas along the border of Nagaland and Meghalaya, and those inhabited by Kukis, Nagas, Chakmas, Khasis and Jaintias in Karbi Anglong, the extent of dense forest may not have much bearing on gibbon abundance and distribution. In the Karbi and Dimasa Kachari areas, they are generally not molested and hence still occur even in small patches. In the hilly area outside the reserved forests, isolated gibbons in fragments isolated due to *jhum*, the gibbons are hunted down within a short time.

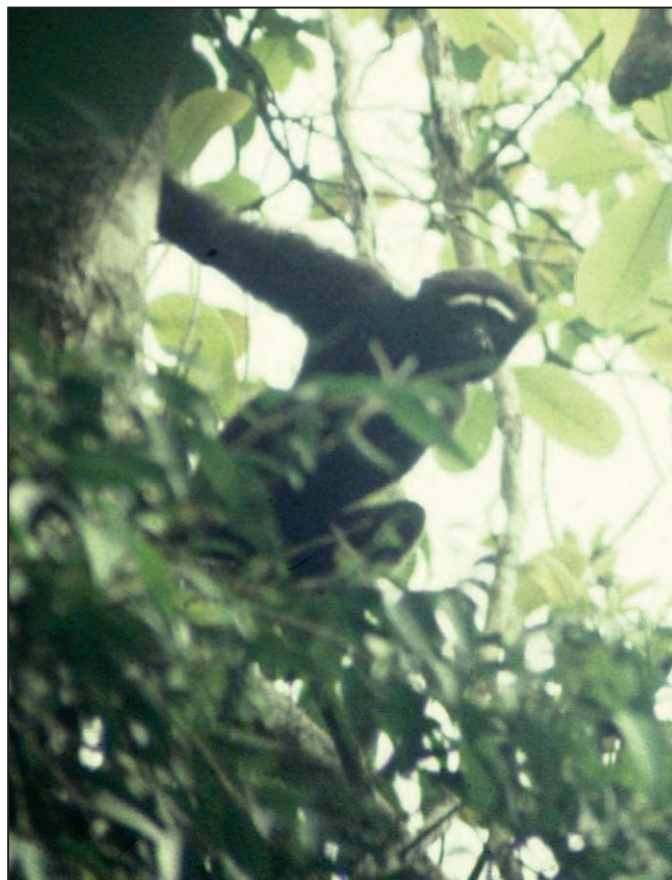


Figure 5. A male hoolock gibbon (*Hoolock hoolock*) in a canopy clearing, Dhansiri Reserved Forest. Photograph by Anwaruddin Choudhury.

In parts of larger areas such as Dhansiri RF and Marat Longri and East Karbi Anglong Wildlife Sanctuaries, the gibbons have survived largely because of relative inaccessibility rather than protection or popular belief of Karbi people. Throughout its range in Karbi Anglong, the gibbon is sympatric with other primates, including the Assamese macaque (*Macaca assamensis*), stump-tailed macaque (*M. arctoides*), pig-tailed macaque (*M. nemestrina*), Rhesus macaque (*Macaca mulatta*), capped langur (*Trachypithecus pileatus*), and slow loris (*Nycticebus bengalensis*).

Owing to the rapid growth of the human population, areas under *jhum* cultivation and the demand for firewood is increasing. The human population in Karbi Anglong grew from 0.38 million in 1971 to 0.81 million in 2001, i.e., more than double in just three decades. Since the bulk of the rural population practice *jhum* as their main occupation, and new villages and hamlets appear constantly, the large-scale destruction of natural habitat seems inevitable.

Despite all these constraints, Karbi Anglong is among the few areas that has the following advantages for protecting the hoolock gibbon:

- Still large contiguous habitat and a relatively numerous population for long-term conservation;
- the largest tribe, the Karbis, do not hunt it; and
- there is already a network of protected areas.

Adequate protective measures for the reserved forests and wildlife sanctuaries, the creation of some new protected areas, and the reduction of hunting through community awareness and enforcement are the measures needed.



Figure 6. Selective logging and clearance for human habitation (such as this case in Dhansiri reserved forest) and shifting cultivation are serious threats to gibbon habitat in Karbi Anglong. Photograph by Anwaruddin Choudhury.



Figure 7. A national highway passes through the Nambor forests (Garampani and Nambor wildlife sanctuaries) separating its gibbon population besides facilitating poaching by hunters from Nagaland. Also in the photo are a wild tusker *Elephas maximus* and the author. Photograph by Nur Hussain.

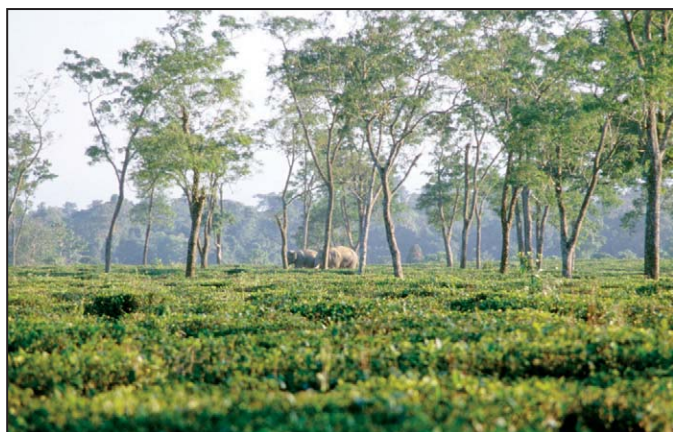


Figure 8. Much gibbon habitat has been lost to tea plantations, especially in eastern Karbi Anglong. Photograph by Anwaruddin Choudhury.



Figure 9. Exploring the interior of Karbi Anglong required crossing such fords across many unbridged rivers, such as this one on the Horgati River. Photograph by T. K. Barman.

Recommendations

A number of important known habitats for hoolock gibbons that are outside the protected area network should be declared as wildlife sanctuaries, conservation reserves and community reserves. Dhansiri should be changed from a reserved forest to a wildlife sanctuary. Dhansiri has also been recommended for a 'tiger reserve' (Choudhury 1992, 1993). Amreng RF, Kolonga RF, Jungthung RF, Tamulbari RF and the proposed Balasor RF are important areas for the hoolock gibbon and should receive better protection. Some of the smaller scattered gibbon refuges, including the sacred grove of Killing Sarpo should be declared 'community reserves' for the development of eco-tourism with community involvement.

Existing protected areas should be better protected, with increased staff, anti-poaching camps and regular patrolling. Measures should be taken to control *jhum* cultivation as well as hunting for meat. Awareness campaigns should involve the churches and the village headmen to promote conservation measures, and programs should be set up for the regular monitoring of the gibbon populations in select sites, such as those at Garampani-Nambor, Marat Longri, North Karbi Anglong and Dhansiri.

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