

# Preliminary study on Population status and Activity budgeting of Western Hoolock Gibbon (*Hoolock hoolock*) in the Inner-line Reserved Forest of Barak valley, Assam, 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. The Hoolock gibbon, a canopy dependent species, occurs in some reserve forests of Cachar district of Barak Valley, Assam. but its numbers is declining due to habitat loss and hunting. They are now surviving in some isolated pockets in the reserved forest areas, where they are occur in scattered groups and fighting for survival. A status survey was done in the Inner line reserved forest and its adjoining areas from July 2010 to Dec. 2011. Ten family groups and thirty-three individuals made up the total count. Of these the adult males and females comprised of 54.54% while the sub-adults, juveniles, and infants were 27.27%, 12.12% and 6.06% respectively. In activity budget, maximum time (%) spent in feeding i.e. 23.30% followed by foraging (27.90%), resting (23.50%), calling (3.10%) and others (13.20%). Adequate protection of existing protected areas, ban on timber logging, control of *jhum* cultivation and poaching, and conservation education/awareness and mass involvement of the local communities can help this valuable species to survive in their natural habitats in Barak Valley, Assam.

The present paper deals with the population status and activity budgeting of Hoolock Gibbon in the Inner line Reserve forest and its adjoining areas of Cachar district of Barak Valley, Assam.

**Index Terms**- *Hoolock hoolock*, conservation, Inner line Reserve Forest, Cachar, Assam, India

## I. INTRODUCTION

The northeast region in India with highest primate diversity has the most intense conservation problems and social unrest in this region has increased pressure in the forest in the form of selective logging and encroachment. Therefore, the greatest need is to continue applying some of the conservation strategies and tactics in this region hence proper planning is essential.

Gibbons are brachiates and depends solely on the continuity of the forest canopy. Habitat loss in the form of breaking of the continuity of forest canopy have restricted and isolated their populations to smaller patches (sub-populations), even within a forest. Gibbon population are more prone to extirpation from a particular area at a faster rate than the other primates, as they have inter group spacing, small group size (2-3 individuals), longer inter birth interval (3- year), long parental care (2- years), late sexual maturity (7- years) and less reproductive turnover (Adult female gives birth to 6 individuals approximately in the reproductive life of 20 years).

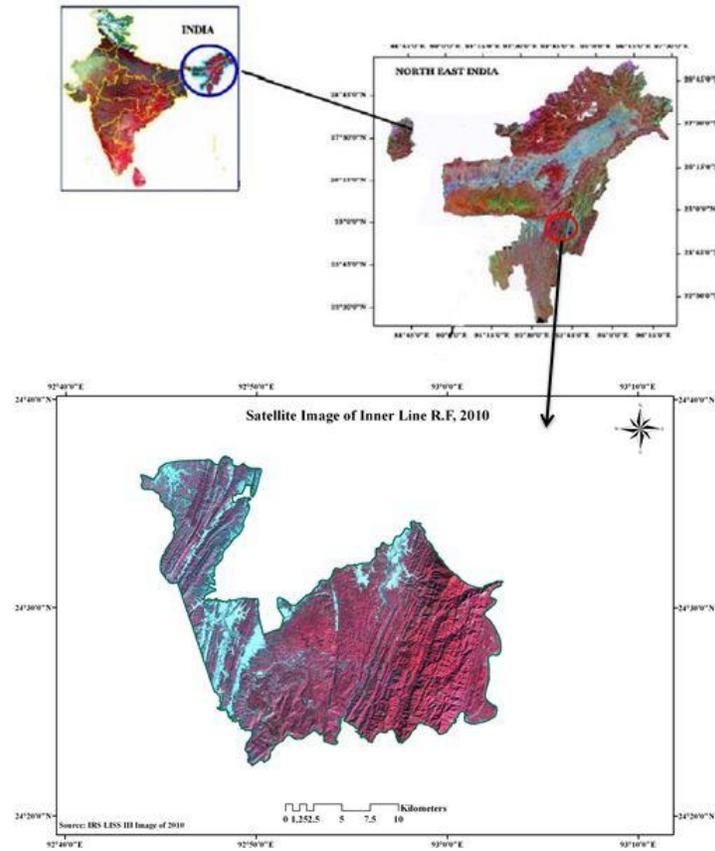
Hoolock gibbon, both eastern and western species are the two representatives of the apes in India and the status of Hoolock gibbon has been categorized as 'Endangered' A2acd+3cd+4acd based on the IUCN Red List Criteria, 2009. Western Hoolock gibbon (*Hoolock hoolock*) is one of the 25 most endangered species of primates of the world [1].

It was found that Inner line Reserve Forest one of the largest landscapes left for the gibbons in Assam with substantially good population of Hoolock gibbon [2]. Part of this reserve forest falls in neighboring Mizoram state, besides another part of it lying in the adjacent Hailakandi district. This landscape is facing lot of encroachments particularly from the illegal timber harvesting and procuring of non timber forest products. Inner line Reserve forest is very important from the point of primate conservation as this forest support eight different species of primates.

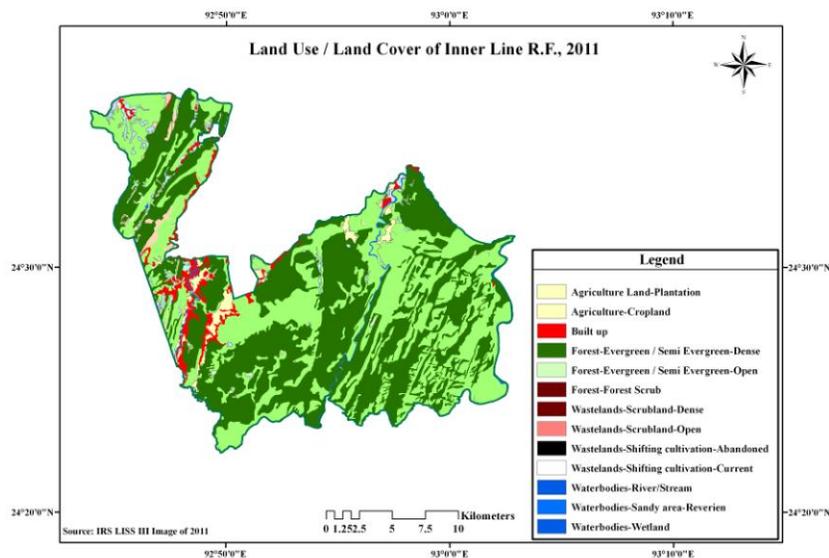
## II. MATERIAL AND METHOD

**2.1 Study Area:** The study was conducted in the Inner-line Reserve Forest of Cachar district which is situated in the Barak valley of southern Assam (Fig.1). There are 7 reserved forest in the Cachar district, the Inner line reserved forest is one of them, occupied Assam-Mizoram border. Total area of the forest is 44266 hectare and lies between 24° 22' N and 25°8' N Latitude and 92°24' E and 93°15' E Longitude. Manipur and Mizoram border lies in the east and South respectively of the said reserved forest. There are 24 nos. of forest villages inside the reserved forest (notified by the forest dept., Cachar dist.).Of the 24 forest villages 9 are inhabited solely by tribal groups such as Halem, Jaintia (P'nar), Reang, Mizo, Hmar, Dimasa, Khasi and Kuki; 5 solely by non tribes like Bengali Hindu (Scheduled Caste), Bengali Muslims, north Indian and ex tea garden laborers; and the remaining 10 by a mixed population of tribes and non tribes. Out of these, 3 are tribal forest villages, 2 non tribal forest villages and 5 having mixed population of forest villages.

The vegetation of the site is mixed evergreen and deciduous forest. Most common deciduous trees are *Artocarpus lakoocha*, *Dilena indica*, *Careya arborea*, *Acanthocephalus cinensis*, *Magnifera indica*, *Sterosperrnum personatum*, *Dysoxylum benectariferum* etc. Important evergreen trees are *Ficus bengalensis*, *Syzigium jambulana*, *Garcinia cowa*, *Pterospermum acerifolium* etc. Most of these trees make up a close canopy of about 20-30 m above the ground. Other notable vegetation are bamboo, canes etc. Other than reserve forests, all remaining forest patches are surrounded by the Jhum-fields and mostly restricted near the villages. Cultivated orchard fruit trees (mango, Jackfruit, orange, and guava) also form part of the habitat. Rivers of the district namely Barak, Sonai, Dholai, Rukni flows south north and south north-east. The most prominent primate species other than gibbons are Capped langur, Phayre's langur, Rhesus monkeys, Assamese macaques, and Slow lorises.



**Fig. 1. Map of study area (Inner-line reserve forest, Cachar, Assam)**



## Fig. 2. Landuse-landcover map of the study site

**2.2 Population status, Group Composition and Group Size:** The present distribution and population status of *H. hoolock* was carried out at 23 specific locations in the reserved forest & its adjoining areas from August, 2010 to Nov, 2011 based on information gathered from the forest department and local inhabitants. The population was estimated by line transect method [3;4] and direct count method in different forest types. The line transects were laid in a stratified random manner to cover all selected areas in the forest. Two observers walked slowly covering a distance of between 10 and 15 km per day between 0600 hr to 16300 hr or until sunset. While sighting the presence of gibbon by direct or indirect methods, such as calls, branch shaking, and sounds associated with locomotion and feeding, observers recorded the exact count of each group size with GPS point, composition, and sex. Age and sex compositions of Hoolock gibbon were classified into two major age categories, adult and immature; these were further subdivided into four sub-categories i.e. adult (7 years and above), sub- adult(4-7 yrs.), juvenile(2-4 yrs.) and infant(0-2 yrs, always carried by mother), based on morphological differences as described by Gupta et al.(2005)[5].

Study group : A total of 10 groups of gibbon were located in the Inner line reserved forest and its adjoining areas. Of these, one group consisting of one adult male, one adult female with infant and one sub-adult male located at a fragmented habitat adjoining Rose Kandy Tea Estate (adjoining part of the reserved forest) were selected for prior study.

**2.3. Data on activity :** The specific ethological pattern of gibbons were studied for a period of four months(Aug. to Nov,2011) in the field. The group was followed for four days a week, each day from dawn to dusk (total 448 contact hours; range 06-08 hours, mean = 07 hours per day) and time spent on different activities was estimated from Focal animal sampling method adopted as per Altmann (1974).The help of a local guide having versatile knowledge of forest patches was taken for locating the gibbon groups. The groups were located either by their morning calls or by the site of their roosting trees. On sighting the group, it was followed for that day. Selected behaviours have been continuously recorded every sixty seconds on a ½ hour scan data sheet . Each individual animal of the group was followed for half an hour alternately for entire active period. Binocular was also used when it was difficult to observe the animal with naked eyes. Besides focal sampling, opportunistic observations of rare but important behaviours were recorded Ad libitum [6]. A 'scan' refers to a single recording of the behavior of an individual within 15 minutes intervals, which provided data on different activities, broadly classified into feeding, resting, foraging and other activities(playing, territorial, travel, allogrooming, aggression, sexual activities). Percent time spent in feeding was estimated by the following formula;

$$T = (nf \times 100)/N,$$

where T = % daytime spent feeding, nf = number of records that included feeding, and N = total number of records for the day.

**2.4. Threats:** During the survey period all types of threats of Hoolock gibbon (anthropogenic activities) inside the reserve forest were recorded. Various threats like deforestation, poaching, illegal felling, hunting, grazing etc. were recorded in the field on the basis of direct observations as well as personal communication.

## III. RESULT AND DISCUSSION

### 3.1 Population Status

Population survey was mostly conducted in the buffer zone areas of the reserved forest except for a few areas of the core zone. The core zone of the reserved forest is completely inaccessible due to dense vegetation and hilly terrain. Six populations of *H. hoolock* were found throughout the entire tropical evergreen forest of the reserved forest and four population were recorded from sub-tropical and bamboo thick forest. They were found to be sympatric with the Capped Languor (*Trachypithecus pileatus*).

210 km of transects were laid and surveyed for the presence of Hoolock gibbon in 21 different localities of the reserved forest. Out of these from 7 localities a total of 10 groups were recorded (Table-1). Of the 10 groups, 4 groups (40%) were from one locality i.e. a fragmented habitat adjoining Rose Kandy Tea Estate (adjoining part of the reserved forest).

### 3.2 Group composition and size:

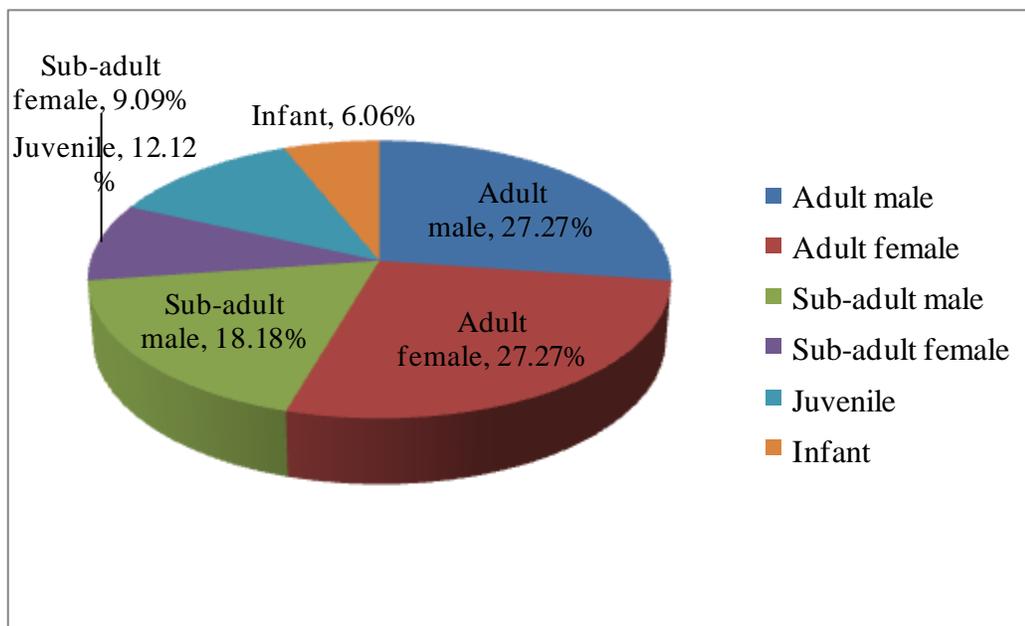
A total of 33 individuals were recorded in the 10 groups during population estimation. The group size and composition of the population surveyed in different localities are presented in Table 1. The smallest group contained a single sub-adult solitary male. Of

the 33 individuals, 09 (27.27%) were adult males, 09 (27.27%) were adult females, 06 (18.18%) were sub-adult male, 03 (9.09%) were sub-adult female, 04 (12.12%) were juveniles, and 02 (6.06%) were infants (**Fig. 3**). The sub- adults, juveniles and infants formed the immature class comprising 45.45% of the total population. The average group size was estimated to be at 3.3 individuals, ranging from 01 to 04 individuals. The estimated adult sex ratio (male: female) was 1:1.

**Table 1.Total number of groups and individuals with age-sex composition recorded from seven Surveyed localities in the Inner line R.F. of Cachar district and its adjoining areas**

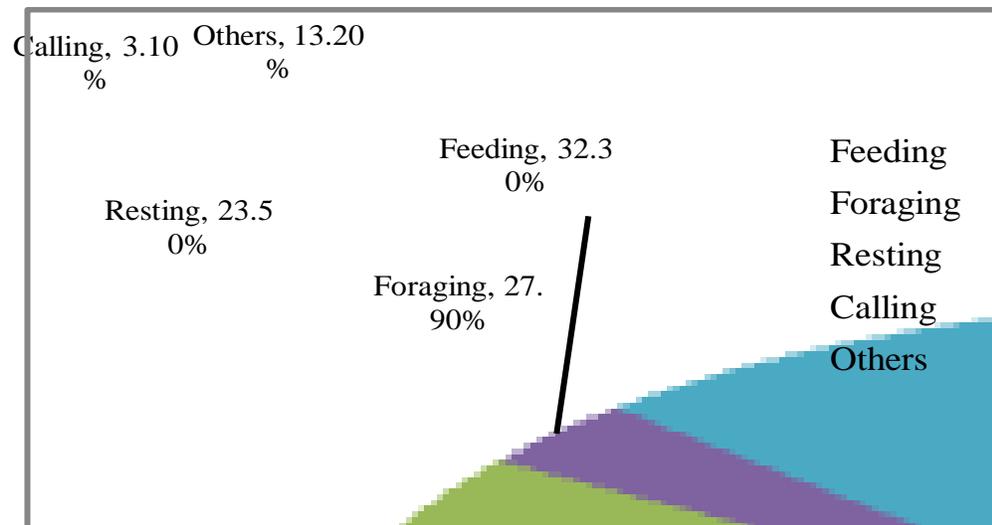
No.	L. Name	No. of Groups	GPS reading	Adults		Immature				Total	Avg. Group size
				M	F	SAM	SAF	JUV	INF		
1	Chourashikona	01	24°35'20.4"N 92°44'09.5"E	01	01	01	-	-	-	03	3.00
2	Nagathal (Khasipunji)	01	24°35'25.8"N 92°45'37.5"E	-	-	01	-	-	-	01	1.00
3	Dholabalu	01	24°34'57.5"N 92°44'42.6"E	01	01	-	-	01	-	03	3.00
4	Maragang	01	24°39'28.4"N 92°47'35.5"E	01	01	-	-	01	-	03	3.00
5	Shantosora	01	24°35'11.6"N 92°47'08.0"E	01	01	-	01	-	-	03	3.00
6	Jarultola	01	24°32'52.7"N 92°52'36.5"E	01	01	01	-	-	01	04	4.00
7	Fragmented area adjoining Rose kandy Tea Estate	04	24°25'N&24°44'N 92°40'E&92°45'E	04	04	03	02	02	01	16	4.00
<b>Total =</b>		<b>10</b>	-----	<b>09</b>	<b>09</b>	<b>06</b>	<b>03</b>	<b>04</b>	<b>02</b>	<b>33</b>	<b>3.30</b>

M- Male; F- Female; SAM- Sub-adult male; SAF- Sub-adult female; JUV- Juvenile; INF- Infant.



**Figure 3.Group composition of Hoolock Gibbon.**

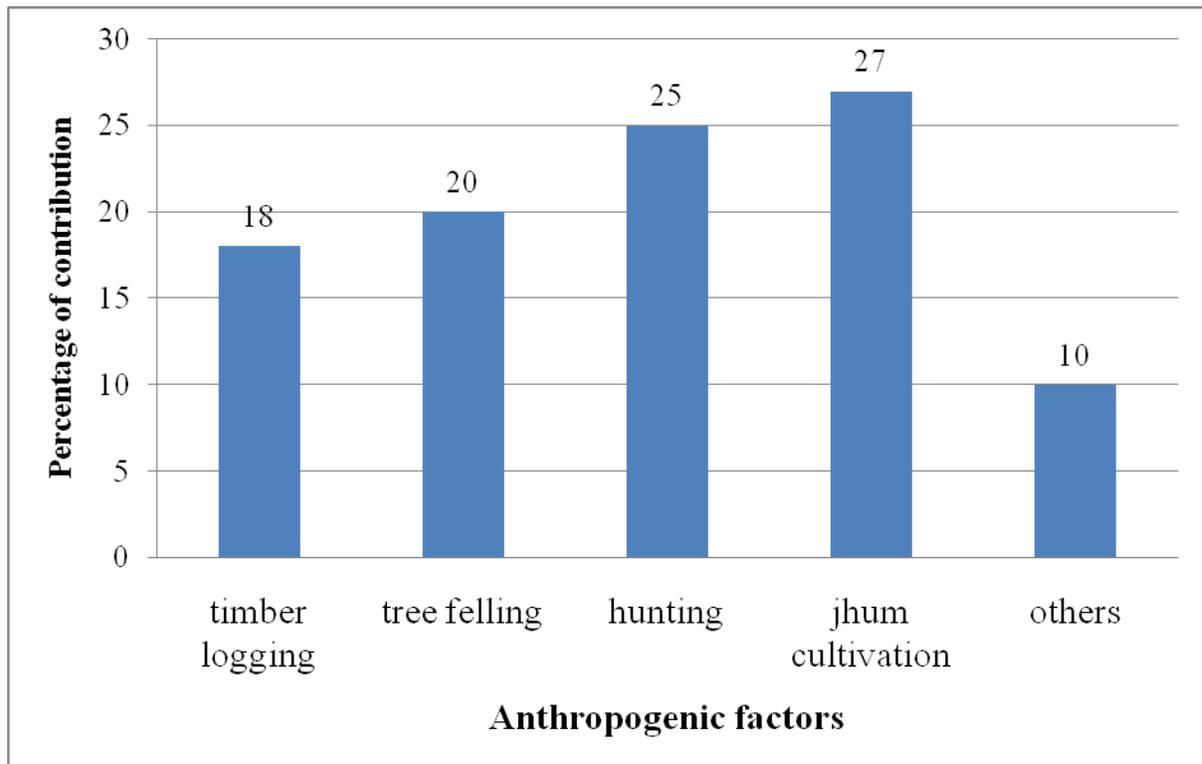
**3.3 Activity budget:** Group scan yielded 6168 records (at times all three individuals were not visible) in this study. Feeding accounted for 32.30% of the total activity time, followed by foraging (27.90%), resting (23.50%), calling (3.10%) and Other activities (playing, territorial, travel, allogrooming, aggression, sexual activities.) accounted for 13.20%.



**Figure 4: Time spent in different activities by the Hoolock Gibbon group in the study.**

### 3.4 Threats:

The main anthropogenic activities which caused the threats in the survival of Hoolock gibbon inside the reserved forest area were observed during the survey were deforestation, poaching, expansion of agriculture, encroachment, illegal tree felling, *jhum* cultivation, paan *jhum*, livestock grazing, timber logging and hunting. Based on the recorded data it was found that the timber logging, illegal felling and *jhum* cultivation and hunting of wild fauna caused maximum threats to Hoolock gibbon in the surveyed areas in the reserved forest and its adjoining areas (**Fig.5**). Timber logging and agricultural activities, hunting, illegal felling, *jhum* cultivation and hunting of wild fauna like civet, otter, slow Loris, squirrel, wild goat, deer, sambar, Hoolock gibbon and a variety of birds by local inhabitants, particularly the Reang, Mizo, Khasi and Kuki tribes for bush meat and their body parts, was a very common phenomenon. Some of the tribes believe that the bones of Hoolock gibbon have medicinal value that's why they kill them traditionally. Livestock grazing, human settlement, *jhum* cultivation and illegal felling of trees were recorded in the Khashipunji, dakhinthal, Shaytansora, Jhumkona, Dholabalu, Balisuri and Shantasora areas in the reserved forest. Rampant illegal felling of important food trees of gibbon such as *Artocarpus chaplasha* and *Michelia champaca* has caused a scarcity of food resources in the habitat.



**Fig. 5: Threats of Hoolock gibbon in the Inner-line reserved forest.**

### 3.5. DISCUSSION:

*Hoolock hoolock* survive primarily in tropical evergreen forests, tropical wet evergreen forests, tropical semi-evergreen, tropical moist deciduous, and subtropical hill forests in India [7;8]. This study clearly shows 60% of the gibbon groups observed in tropical evergreen forest. As this species is largely frugivorous, food availability may be a limiting factor for its distribution versus for a folivorous primate species [9]. There is no quantitative information on the population estimation of *H. hoolock* based on systematic studies in the Inner line reserve forest, Cachar. In north-eastern states Das et al. (2005)[10] reported the occurrence of *H. hoolock* populations in Assam (1994) and Tripura (2003) comprising 1985 and 97 individuals, respectively. *H. hoolock* are monogamous, maintain a social network within a group and social proximity with neighboring groups of the same species (Alfred & Sati 1990). Alfred & Sati (1990) also reported that a typical family group consists of a mating pair and one to three immature offspring. We compared the group composition and group size with standard literature as furnished by Choudhury (1990, 1991)[11;12] for Assam. Our group size of 3.3 individuals for 10 groups is closely comparable to other studies conducted in different part of *H. hoolock* distribution range: 3.2 individuals for 24 groups and 3.4 for seven groups [13], 3.1 for eight groups and 3.0 for 14 groups (Choudhury 1990, 1991) in Assam, 3-3.2 for six to 10 groups [14], 2.1 for 34 groups [15] in Tripura, 3.0 individual for 42 groups [16] in Meghalaya, 3.5 for six groups [17], 2.3 for five groups and 2.9 for 15 groups [18;19], and 2.9 for 13 groups [20] in Bangladesh. The economic status of local people affects the gibbon population and its habitat directly and indirectly and this has become a major concern for gibbon conservation. Local people use forest resources and land for extracting fuel wood, housing materials, medicinal plants, wild vegetables, and for agricultural activities. This results in forest fragmentation and degradation in the form of canopy gaps, and food paucity in both quantity and quality. This makes gibbons' particularly vulnerable to hunting and predation by domestic and wild dogs while moving on forest floor to forage for food, mate, and find safe shelter. Community hunting for their flesh and socio-cultural practices by tribal people is one of the major threats to primate species, including the endangered *H. hoolock* [21;22]. Further, the songs of gibbons act as a definite guide for hunters, allowing them to locate gibbons easily [5]. This has also contributed in a sharp decline of gibbon populations in the entire northeast. The majority of gibbon populations in the northeast are very

small and declining [23;24;8;25] and several fragmented populations face a high probability of extinction(75%) in the near future (Molur et al. 2005) due to isolation, decrease in habitat quality, availability of food and hunting. Gupta et al. (2005) stated that the alarming changes in gibbon habitat that has taken place in the recent years, in the ecology and landscape, have brought about a number of changes in the distribution and population structure of *H. hoolock* in the species range. *H. hoolock* can be considered a keystone and flagship species, as it helps in the local health of the forest, is a state animal and is a tourist attraction.

#### IV. CONCLUSION

Hoolock Gibbons are mostly arboreal, canopy depended frugivorous primates, who live in small family group, feeding on different plant parts including fruit, use of *Ficus* species as main food plants. Secondary forests with drastic reduction in plant species diversity fail to support resident groups of frugivorous gibbons requiring year round supply of fruit. Mean group size of gibbon populations is 3.3 mainly because of the fragmented status of the gibbon habitat coupled with the heavy pressure of shifting cultivation, which is further adding to the fragmentation of the habitat and replacement of the primary forests with secondary forests. Adequate protection of existing protected areas, ban on timber logging, control of jhum cultivation and poaching, and conservation education/awareness and mass involvement of local communities can help this valuable species to survive in their natural habitats in the reserve forest, Cachar, Assam.

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