STATUS SURVEY OF ENDANGERED SPECIES

REPORT 1

Golden Langur, *Presbytis geei* Khajuria
Phayre's Leaf Monkey, *Presbytis phayrei* Blyth
Hispid Hare, *Caprolagus hispidus* (Pearson)

Edited by the Director

Zoological Survey of India

सत्यमेव जयते

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PREFACE

The National Conservation Strategy and Policy Statement on Environment and Development of Govt. of India (1992) has re-emphasized the need for protection of living natural resources for sustainable development. The faunal resources of India is characterised by a high index of diversity and endemism. The current Conservation Strategy with regard to the endangered species demand continuous monitoring to determine the status specially of those species which have already been included in the Wildlife (Protection) Act, 1972. The Zoological Survey of India has undertaken a programme of publishing Status Survey Report of these endangered species. The present publication contains the result of such studies on three mammalian species which are included in the Schedule - I of the Wildlife (Protection) Act. The authors Dr. R.P. Mukherjee and Dr. R.K. Ghose with their long experience in the field have tried to present an up-to-date Status Report and it is expected that the same will be useful for the purpose of proper management and also conducting further studies in future. I would like to sincerely express my thanks to the authors and also to the Publication Division of the ZSI for bringing out the report within a short time

Calcutta

Dr. A.K. Ghosh
Director
Zoological Survey of India

Status Survey of Endangered Species

REPORT 1

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STATUS OF GOLDEN LANGUR, *PRESBYTIS GEEI* KHAJURIA

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INTRODUCTION

Golden langur, *Presbytis geei* Khajuria, belongs to the group of leaf eating monkeys and comes under the family Cercopithecidae. Among the five species of leaf eating monkeys that are found in India, the most common is the hanuman langur, *Presbytis entellus* Dufresne, which is very widely distributed, whereas the golden langur is rare and is distributed in a very limited area in Assam. The position of primates is, in general, alarming and many species are regarded as endangered and are fighting a losing battle for survival. In the Indian subcontinent as many as 12 species of primates are now considered as endangered. Research on non-human primates has played an important role in acquiring knowledge about Man and Biosphere as they constitute an important part of the natural fauna in India and many developing countries. A great majority of the primate species inhabits and depends upon tropical forests for their survival. These forests are being cut down at an alarming rate to provide land for farming, industrialization, urbanisation and for firewood and hardwood. These are some of the factors chiefly responsible for the destruction of the native habitats of primates. True forest living primates, such as the golden langur, are the worst sufferers by the deforestation. Studies on the non-human primates will increase the knowledge about human welfare both in terms of behaviour and diseases. The rapidly expanding field of primatology, has received tremendous impetus from field studies of the ecology and behaviour of the free ranging primates during the last decade. The most striking features of our primate heritage is life in social group. The study of communication in non-human primates is a new and rapidly expanding field. The present paper deals with the distribution, ecology, behaviour and status of golden langur since its discovery to present time with recommendation of its conservation.

DISCOVERY

This beautiful species of colobine monkey was described in 1956 by Dr. H. Khajuria of the Zoological Survey of India. In the past, number of sportsman, naturalist and photographers had reported the existence of a cream coloured

langur on the east bank of Sankosh river near Jamduar on Indo-Bhutan border of Assam and was of the opinion that it may prove to be a new species. However, no photographic record or specimen was available to the scientists for a long to prove its authenticity. Probably Shebbeare was the first man to discover its existence in this area in the year 1907. Subsequently, Baron saw this langur in the same area in 1947 and recorded its presence by putting a note in the record book for the visitors in the forest rest house and described it as a white langur, the body of which was silver gold and opined that it was an unidentified species. Another sportsman who saw this langur in the following year again recorded it in the visitors book as a Sankosh cream langur. From time to time people reported to the naturalist-tea planter E.P. Gee about the presence of cream coloured langur in Jamduar area. So, in the winter of 1953 he decided to visit Jamduar, a place near Sankosh river, in Goalpara district of Assam (= Kokrajhar) and observed these langurs on the east bank of river Sankosh adjacent to Bhutan. He had watched and photographed these langurs and in January 1955 he had shown these photographs to the members of Indian Board of Wild Life in a meeting at Calcutta. Dr. S.L. Hora, the then Director of the Zoological Survey of India, was also present in this meeting and he took great interest and decided to send a party from the survey to collect the information and specimens of this langur. The survey party under the leadership of Dr. K. Khajuria visited Jamduar, studied the langurs in the field and collected the specimens. The study revealed that it is a new species and he described it as *Presbytis geei* in the year 1956, being named after the well known naturalist E.P. Gee. This langur was seen by Griffith in Bhutan much earlier than any body else discovered its existence in India as Pemberton has mentioned Griffith's observations in his report of 1839. This species was described by him as perfectly white with a long pendant tail.

The occurence of golden langur at other palces in Assam and Meghalaya has been reported from time to time by different individuals but the surveys carried out at those places revealed the negative results. Its occurence in the Bokuamari forest in Chakrashila reserve of Dhubri district of Assam has recently been reported in many local and national news papers by Soumyadeep Datta of the Nature's Beckon Club. To find out the truth of distribution of this langur in this area a tour was conducted by the present author in May, 1992 and recorded its occurence in this area. The abundance, distribution and social structure of this langur in this newly discovered area have been studied and incorporated in this paper.

TAXONOMY

The golden langur, *Presbytis geei*, belongs to the family Cercopithecidae and comes under the subfamily Colobinae. Oboussier and Maydell (1959) considered

this langur as a subspecies of Capped langur, *Presbytis pileatus*, but Hill (1959) and Thorington and Groves (1970) assigned it as a specific status. Khajuria (1962) listed the characters by which this langur can be distinguished from the closely allied species, *P. pileatus*. Khajuria (1986) stated that the species appears to be closely related to capped langur but retains some of the characters, possibly of the ancestral subgenus *Presbytis*, such as typical white colour of the infant, ill-defined half whorl of the fore head and some osteometric data. The black face of the golden langur is practically hairless, except for long pale beard. The body colour is black in dull light but it is almost uniformly deep cream and in sunlight it appears golden in colour. The pale ventral surface shows varying shades of red colour. It shows seasonal variations in colour, becoming cream coloured in summer and dark golden to chestnut in winter. Khajuria (1962) recorded its colour as creamy white in summer and golden red in winter. Other characters : Hair of the crown not forming a mat, hair of the temples not shorter than that of the crown and the hair on the forehead appears ill defined half whorl. Long whiskers present around ears. Glans obliquely truncated in front and oval in cross section. The tail is long with a slight tassel and there is difference in the tassel between the male and the female (Mukherjee & Saha, 1978) Fig. 1. The new born is white to golden red in colour.

DISTRIBUTION

The golden langur is distributed in a restricted area in India from east of Sankosh to west of Manas river along the Indo-Bhutan border (Fig. 2) and in Bokuamari forest of Dhubri district in Assam (Fig. 3). The abundance of this langur lies in the forests of the Black Mountain Range of Central Bhutan (Saha, 1980). The range of distribution of this langur is from Assam-Bhutan border foothills in the south to the inner Himalayan range in the north and from Sankosh river in the east to Manas river in the west and further south in the Bokuamari forest. Altitudinally it ranges from the foothills 150 m to a height of 3000 m above sea level (Saha, 1980). It is nearly certain that the range of golden langur within the Indian territory is confined to the forests in the old Goalpara district of Assam, north of the river Brahmaputra, flanked by the Sankosh (Goalpara district now Kokrajhar district) in the west and Manas rivers (Kamrup district) in the east (Mukherjee, 1978) and in the recently discovered area in the Dhubri district. Judge from the sightings it seems that the golden langur is a montane species and is more common in Bhutan than in India and its distribution in the foothills along the Indo-Bhutanese border is the southern most limit of the range of distribution of Bhutanese population (Mukherjee, 1978). Gee (1961, 1964) relying on reports from animal dealers and sportsman did not discount the possibility of its occurence in the Garo hills of Meghalaya and foothills areas of Khasi hills. Initiated by a report to the Bombay Natural

History Society and a request from the Society to Zoological Survey of India to undertake a survey to find out the authenticity of its distribution in these areas, survey tours were conducted by the Eastern Regional Station, Zoological Survey of India, in 1970, 1971 and 1973. Field investigations by these parties in areas alleged to harbour the golden langur have so far failed to locate it outside its recorded range in the Indian territory (Ghosh and Biswas, 1976). However, recently it has been recorded from the Bokuamari forest of Chakrashila reserve of Dhubri district of Assam.

In the Western Bhutan the troops of golden langur were seen in the upper reaches of Sankosh river and in Bhutanese territory adjacent to Jamduar. In the central Bhutan the troops were seen between Sarbhang and Gaylegphug and all along the road from Gaylegphug to Tongsa and below Tongsa. In the Eastern Bhutan the troops of golden langur were seen in the foothills where the Manas river meets the plains (Fig. 4) and in the upper reaches along the various tributaries of the Manas river and along the road from Samdrup Jongkhar to Tashigong (Saha, 1980).

ECOLOGY

Raimona and Jamduar which fall in the old Goalpara district (now Kokrajhar district) of Assam form the major habitat of golden langur in Indian and are situated within 89°50' - 91°0' E longitude and 26°20' N latitude. The forest reserve in this area forms a compact area in the subhimalayan foothills with Fakiragram, Sapotgram, Tipkai and Gossaigaon serving as rail head for outlets from the hinterland. Practically the whole area falls within subhimalayan alluvial tract known as 'Bhabar' As the extreme north the area includes one or two undulating low foothills but on an average the lay of the land is flat with a gentle slope towards the south. The elevation varies from about 270 m in the north to about few meters above mean sea level in the south. The area is drained by a number of hill streams running north south, the chief among them being Sankosh, Janali, Ranga, Polo, Hel and Sarlbhanga. All these streams, in their course, pass through the reserve forests and are shallow and though very turbulent during the monsoon are practically dry during winter and summer months (Mukherjee and Saha, 1974). The tract is formed by boulders and gravelly sand. The top soil consists of humus varying from almost nil to over 30 centimeters in thickness. The general climate is moist tropical monsoon. The other ecological details are given in Table 1. The predominant trees in all the habitats of golden langur are different varities of Sal, *Shorea robusts*, which forms gregarious stands intermixed with some associated species. The type of forests are sal forests, miscellaneous deciduous forests, savannah forests and riverine forests, climbers are numerous and the forest floor is covered with

undergrowths of shrubs and ferns, (Mukherjee and Saha. 1974).

In the Manas sanctuary the golden langurs were recorded from the Bhutan Manas (Fig. 4). This sanctuary is situated in the Himalayan foothills in the old Kamrup district (now Barpeta district) of Assam and is a well preserved tropical moist deciduous forest. It is located about 176 km north west of Gauhati and is well connected with Barpeta road, the nearest railway station, by road. The fast moving waters of the Manas river pass through the Bhutan ravines and spill into the plains of Assam, forming three branches Manas, Hakua and Beki, near the sanctuary (Mukherjee, 1978).

In the Dhubri district golden langurs were recently recorded from the Bokuamari forest which is situated north of Brahmaputra river and about 77 km north east of Dhubri town. The forest is a mixed one with Sal as a dominant species.

Golden langur lives in tropical moist deciduous forests with sal as the dominant tree in Bhutan side. Here the trees are high with canopy almost closed. The feature of this type of forest is that trees undergo a leafless period during the dry season and at the end of which new leaves or flowers come out in the sudden rush. During the dry period the trees landscape becomes a dull greyish and reddish brown colour which match the colour of the golden langur.

The golden langur feeds actively in the morning and evening and even during this period they feed and rest alternatively. They generally feed on the higher branches but also come down to the lower branches. Gee (1961, 1964) has observed them eating the salty earth on the ground. These langurs are true arboreal and live in dense tropical deciduous forests with sal, *Shorea robusta*, as the dominant tree in their habitat. So the food consisted of leaves, buds and fruits of various plants. They feed on the plants like *Eupatorium odoratum*, *Termanalia belerica*, *Daphne cannabina*, *Lagerstroemia paniflora*, *Salmalia malabarica*, *Bridelia retusa*, *Mikania scandens*, *Castanopsis tribuloides*, *Dalbergia sissoo*, *Bombax ceiba*, *Accacia* and *Derris* sp. The monkeys, particularly the juveniles, do not remain at on place for a very long time during feeding but shift places frequently in the same tree or move into the neighbouring trees. The golden langurs do not invade the cultivated fields or damage the crops. While feeding group members remain close to each other either on the same tree or on neighbouring trees. Adult females with infants and juveniles spent more time in feeding than the others. In morning the feeding follows by other activities like resting and playing.

The range of movement of a group in a day varies from season to season and it

appears that the range of movement of a group in a day is very small (Mukherjee and Saha, 1974). In a day a group covers a distance of about 1/2 to 1 km. The group members while crossing the forest roads during their movement use the trees linning the roads and whose branches met and formed a continuous canopy or are separated by narrow gaps. When alarmed the group moves fast from tree to tree and the individuals leap 4 to 6 meters through the air descending from higher branches of one tree to that of lower branches of another tree with leags splayed apart at right angles to the trunk and tail raised vertically above. The range of movement of the groups overlap with each other. It appears that the groups do not maintain rigid home range.

STATUS

Golden langur lives in groups of 7-40 individuals, mostly 10-18. Groups are largely unimale bisexual, occasionally multimale bisexual and all male. A group usually has a dominant male who controls and coordinate the group movements. The field studies have been made on social structure, social relation and vocalization of the golden langur. The usual social organisation of the group is that of an adult male, a number of females, juveniles and infants.

Golden langur is a montane species and the southern most limit of distribution of Bhutanese population touches Bhutan-Assam border (Mukherjee, 1978). From the Table 2 it is apparent that the golden langurs are more abundant in central Bhutan and the population spills over to east and west of this area. It is also apparent from the above table that the population is more on the upper reaches than on the foothills.

Mukherjee (1980) based on his study at Jamduar, Raimona and Manas Sanctuary gave the population composition, group structure, incidence and abundance of golden langur in these areas. The findings of his studies are included in Tables 3 and 4. The social structure of 4 groups of golden langur of Bokuamari forest is given in Table 5.

It is apparent from the Table 3 that the population of adult males varied from 7.0% to 22.2% and that of adult females from 34.6% to 44.8%. The juveniles and infants population varied from 20.2% to 31.0% and 17.2% to 25.8% respectively. The adult sex ratio varied from 13.3% to 39.0% and that of the infant and adult female and the sub-adult to total varied from 38.5% to 63.9% and 33.3% to 48.3% respectively. Table 4 indicates that during summer months an average of one group was seen in every 8.0 km, whereas during the winter months an average of one group in every 4.6 km was observed. Out of the three localities, Jamduar showed the maximum concentration of golden langur and

during summer months one group was observed in every 7.8 km, whereas during winter months the incidence of distribution was one group in every 3.6 km in the same area. The average group size of 12.5 individuals in 10 groups was recorded during the summer months and it consisted of 2.0 adult males, 4.9 adult females, 2.6 juveniles and 3.0 infants. The average group size of 9.5 in 19 groups was counted during the winter months and it composed of 1.8 adult males, 3.5 adult females, 2.3 juveniles and 1.9 infants. Tables 3 and 4 indicate that in the studied groups the juvenile and infant populations are well balanced and the groups are viable. The increase in the concentration of golden langur in Jamduar area during the winter months may be due to severe cold on the upper reaches in Bhutan and the availability of food and water on this area during this period.

A total of four groups were encountered during the survey conducted at Bokuamari forest in May, 1992. The group size varied from 7-26 with an average group size of 12.5 individuals. Out of the four bisexual groups, three were with one male whereas the remaining one was with two males. On an average the four groups consisted of 1.22 adult males, 7.50 adult females, 3.00 juveniles and 0.75 infants. The sex ratio of adult male to adult female was 1:6. In the four groups a total of 50 langurs were recorded.

BEHAVIOUR

The golden langurs are shy and are true arboreal and come down to the ground occasionally. Their activities have been studied by Mukherjee and Saha (1974) in the field. They sleep on high trees and like other langurs they are diurnal in habit. Their activities are confined to light hours between sunrise to sunset. Invariably the monkeys woke up at dawn, before the sun comes up on the horizon. Their morning activities usually start when some of the members reach for the ends of twigs to nibble at the buds, fruits or leaves. The monkeys remain on the trees where they have passed the previous night for varying period of time, depending upon the morning weather conditions, feeding, playing, resting and shifting from one branch to another. After the early morning activity the group starts to move slowly and silently from the roosting trees. They move from tree to tree and are less noisly than Hanuman langusrs. The group movement is controlled by the dominent male and generally the other members follow the dominant male. During movement the group moves as a well-knit unit. In case of an alarm the dominant male allows other members to retreat first and then follows the group. Thus, there is considerable coordination in the movement of the dominant male and other members in a group.

Like many other primate species the golden langurs also show clear peaks of activity in the early part of the day and in the evening and are inactive during the heat of the day. In the summer the morning activity is short and is interrupted with frequent spells of short rest. With the rise in day temperature their activity generally quiet down and the mid-day is invariably spent in resting. They select the thick and shady branches of trees for their rest. The juveniles may remain busy in playing and feeding when the adult members are resting. While sleeping and resting on the thick branches occasionally the monkeys assume astraddle position with hands, legs and tail hanging. The members are active again in the afternoon.

Play is common among the juveniles but infants at times also join the play group. Play includes chasing, wrestling, climbing, running and jumping.

It appears that there is no fixed breeding season for these langurs and the breeding may occur throughout the year. Gee (1964) recorded the new born infants in August and September. Wayre (1968) suggested the breeding season for these langurs between December and February. Mukherjee and Saha (1974) reported that the infants are born in February or early March.

The relation between the all members in a group are peaceful. They move silently and are less noisy than the common langurs. The agonistic behaviour among the group members and between the groups are less. Different groups though come close to each other but avoid contact. At times during feeding the groups come close to each other but show no intergroup interactions. Interspecific relations with rhesus and domestic animals are peaceful.

The golden langurs are quite and shy animals but when disturbed they made loud vocalizations. When vocalize the males jump from branch to branch and occasionally defecate and urinate. In case of sudden alarm the langurs are become nervous and retreat into the forest. The two types of vocalization that the male gives can broadly be divided into short and high pitch and act as alarm calls. The infants when frightened also produced screeching notes.

CONSERVATION PROBLEMS

In langurs the type of vegetation appears to be an important limiting factor on the population in an area. The langur group distribution is equally affected by the presence of suitable sleeping trees in its habitat. The golden langur lives and depends upon the mountain rain forest from the foot hills of about 150 m to a height of about 3000 m for its survival. It is usually found in the lush green habitat of trees, ferns, orchids and vines rather than on the more open areas of

the forest. The forests in which the golden langur lives are being cut down at an alarming rate to provide land for farming, industrialization, resettlement and urbanisation for expanding human population. These are some of the chief factors responsible for the destruction of the habitat of this species of langur. The most conspicuous change that is taking place in the golden langur habitat is that the trees are cut down which interrupted the forest canopy and permitting more sunlight to reach the forest floor which resulted in the ecological chages and in the flora and fauna. The golden langur is true arboreal and the large scale clearence of the forest may have interrupted its territorial range.

CONSERVATION MEASURES TAKEN

Most of the habitats of golden langur are now included either into the wildlife sanctuaries or under the reserve forests. The golden langur is placed under Schedule-I of the Indian Wild Life Protection Act, 1972. According to the IUCN/SSC Primate Specialist Group-Action Plan for Asian Primates Conservation, 1987-91, published in February, 1987, the golden langur is considered as "Vulnerable" and in ratings placed under 'Degree of Threat' This rating is made on the basis of the available existing evidence. Under this category it has been defined that the populations of golden langur have limited distribution and / or ecological tolerance, and current rates of habitat alteration and / or hunting pressure likely to intensify; or, current rates of habitat alteration and / or hunting are slowly but significantly reducing most populations. It has also been mentioned that it has high probability of moving to category of "Highly vulnerable" by the year 2000 AD if no new conservation action is taken. The golden langur is considered as "Rare" by the IUCN, 1986 Red List of Threatened Species of Asian Primate Species and is defined as Taxa with small world populations that are at risk. United States Department of Interior has identified golden langur as endangered species. If the populations of golden langur and the ecosystems of which it is a part are to be safeguared then it is necessary that effective conservation measures and management programme should be initiated throughout its range of distribution.

RECOMMENDED ACTIONS

The actions that are needed for the effective conservation of golden langur are :-

Surveys are needed in its entire range of distribution to acertain its present distributions in different areas. The surveys should aim to producing recommendations for further conservation action. The highest

priority of survey should be given to those areas believed to contain seriously threatened populations.

* After the identification of potential conservation sites support and technical advice should be given to the proper authorities for the establishment and effective management of the Reserves or Protected Areas. Highest priority should be given to large reserves or potential reserves. For this purpose areas should be selected in Bhutan, Assam and along the two sides of the Assam-Bhutan border. Only one reserve can not be regarded as totally secure.

* Research studies should be initiated on the ecology, behaviour and population dynamics. Bhutanese nationals should also be trained to carry out such work.

* Periodic monitoring of some of the selected groups in different habitats are needed to know the population trend.

* To explore the possibility of the introduction of this species in the other suitable potential areas in the north eastern India.

* Areas of forest already clear felled in the golden langur habitat should be replaced with mixed species to provide adequate food and shelter for the golden langur and other wildlife.

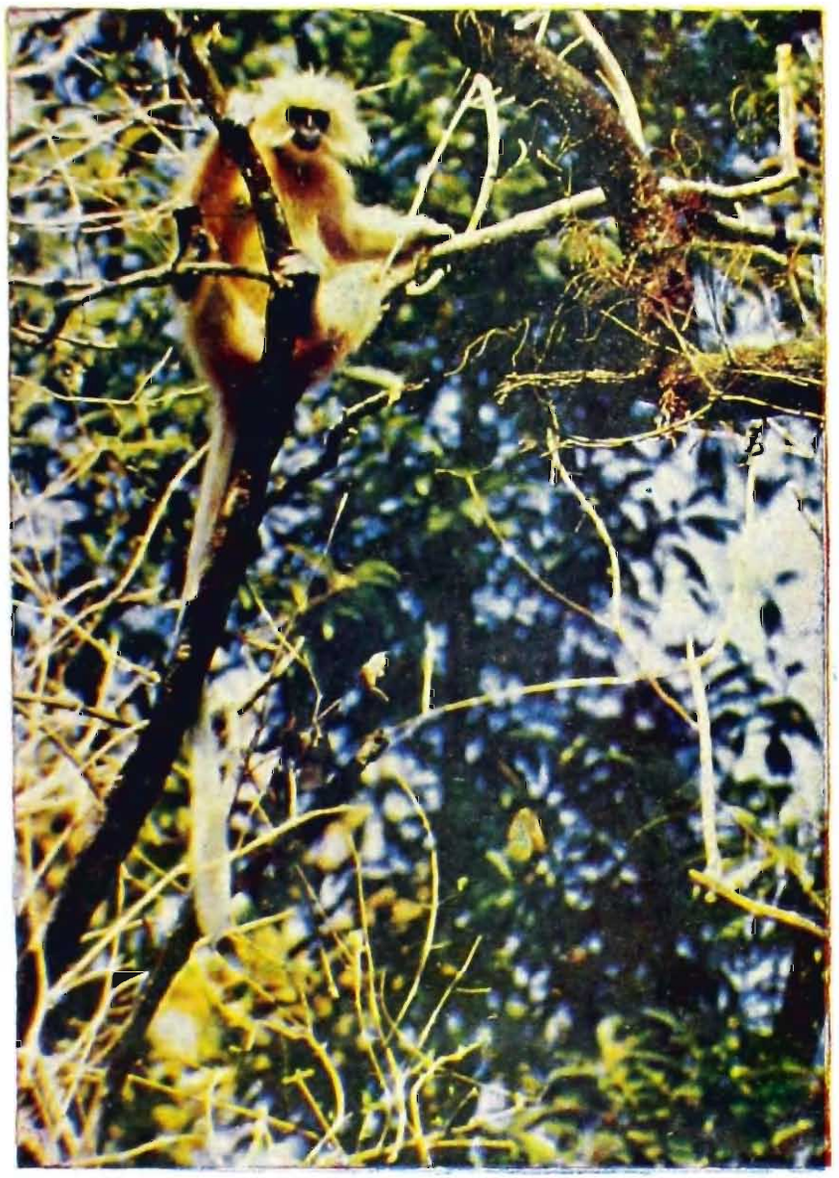
* Highest priority should be given to stop clear felling in Assam-Bhutan border and in other habitats of golden langur. If tree-felling and other human disturbances at Jamduar, Raimona and Bokuamari forest are kept to a realistic minimum, the habitats of these places seem likely to be able to sustain in large moneky population.

* For conservation efforts, emphasis should be placed on the involvement of both India and Bhutan and the various institutions of these two countries. Cooperative planning and implementation are both important for the long term success of the conservation project of this species. Training should take place at all possible levels, from researches to reserve managers to government officials.

* To open a Primate Field Survey Section at ZSI to study the primates in the field and for the collection and centralization of information on the current status of non-human primates of India.

MUKHERJEE

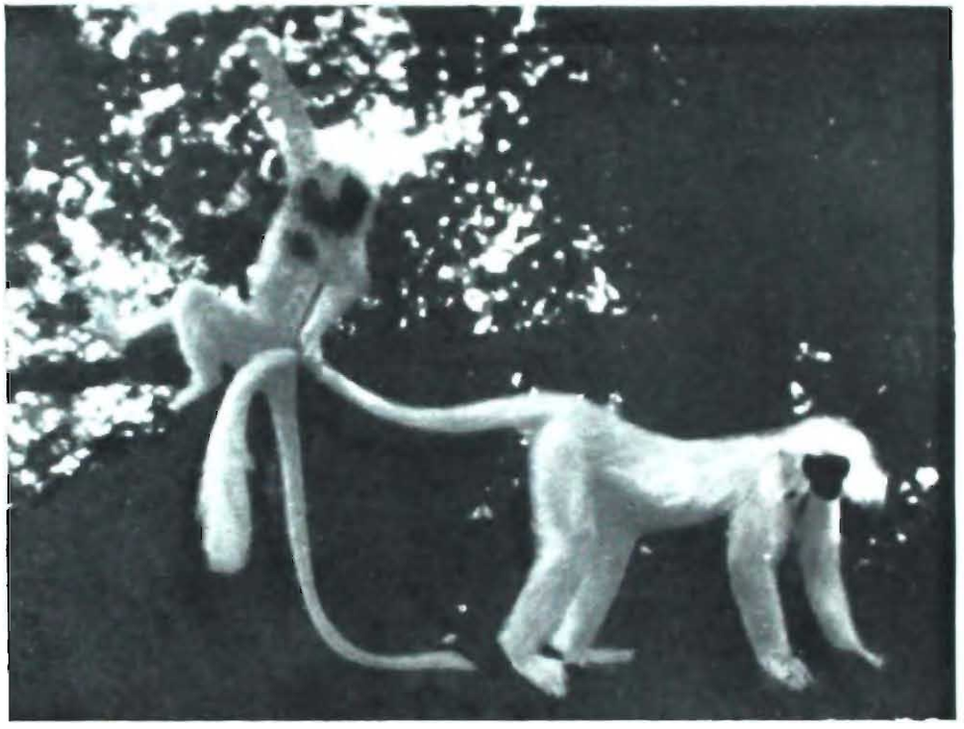
Fig.1A



Golden langur (Photo by Kushal Mookherjee)

MUKHERJEE

Fig. 1B



The male (right) and female (left) of golden langur

Table 1.
Ecology of Ripu Reserve

Characters	Ripu Reserve
Land under cultivation or **dwelling**	80.304 hecters
Forest area	81.024 hecters
Human population	15.324
Surrounding land in virgin **condition** or in forest regrowth	Except the northern side all the other sides are surrounded by villages
Summer hot season	17°-32°C Raimona 11°-41°C Jamduar
Annual rainfall	3673-6357 mm Raimona 3988-7294 mm Jamduar
Water supply	Rivers and streams
Altitude	60-121 meters
Coldest months	December and January
Winter Showers	67 mm Raimona 94 mm Jamduar
Forest type	Sal forest intermixed with some associated species
Associated fauna	Domestic animals, elephants, tigers, leopards, jackals, wild dogs, ydeer, wild pigs, snakes, jungle fowls, etc.
Possible predators of **non-human** primates	Tigers, leopards and pythons.

Table 2.
Group size and adult sex ratio of golden langur as reported from different habitats

Places	Group size	Total No. of groups	Adult sex ratio ♂ : ♀	Authors
J	10		1 : 1.5	Mukherjee & Saha
a	17		1 : 7.0	1974
m	11		1 : 5.0	
d	12	7	1 : 5.0	
u	11		1 : 5.0	
a	18		1 : 1.7	
r	10		1 : 2.0	
Raimona	13		1 : 2.0	Mukherjee & Saha
	18	2	1 : 9.0	1974
Manas	16		1 : 7.0	Mukherjee, 1978
Sanctuary	13	2	1 : 6.0	Mukherjee, 1978
(West of Manas	9		1 : 1.0	Ghosh & Biswas,
river)	6	2	1 : 2.0	1975
Bokuamari	9		1 : 5.0	Mukherjee, Murmu
Forest	26	4	1 : 7.5	& Chaudhuri, 1992
Chakrashila				
Reserve	8		1 : 5.0	
Dhubri Dist.	7		1 : 5.0	
Western Bhutan				
Foothills	50	4	–	Saha, 1980
Upper reaches	90	5	–	
Central Bhutan				
Foothills	350	20	–	
Upper reaches	500	25	–	
Eastern Bhutan				
Foothills	60	5	–	
Upper reaches	150	8	–	

Table 3

Population composition of golden langur at Jamduar, Raimona and Manas Sanctuary

Location	Months & Year	No. of Groups	No. of Monkeys	♂♂ %	♀♀ %	JJ %	II %	♂♂/Ad %	II/♀♀ %	Sub adult/ Total %
Jamduar	May-June 1973	7	89	13.5	40.5	20.2	25.8	25.0	63.9	46.1
	December 1973	15*	136	22.1	34.6	22.8	20.5	39.0	59.6	43.4
Raimona	May-June 1973	3**	36	22.2	36.2	22.2	19.4	38.1	53.8	41.7
	December 1973	2	15	13.3	40.0	26.7	20.0	25.0	50.0	33.3
Manas Sanctuary	January 1976	2	29	7.0	44.8	31.0	17.2	13.3	38.5	48.3
Total	–	29	305	17.7	37.7	23.0	21.6	31.9	57.4	44.6

* Out of 15,3 were all male groups but the calculation is based on all the 15 groups.

** Out of 3,1 was all male group but the calculation is based on all the 3 groups.

Table 4

Incidence, abundance and group structures of golden langur at Jamduar, Raimona and Manas Sanctuary

Location	Groups counted	Distance coverred (km)	Km per group	Adults ♂♂	Adults ♀♀	Sub-adults JJ	Sub-adults II	Average group size
Jamduar (May-June, 1973)	7	55	7.8	1.7 ± 0.4	5.1 ± 0.6	2.6 ± 0.5	3.3 ± 0.3	12.7 ± 1.3
Raimona (May-June, 1973)	3	25	8.3	2.7 ± 1.2	4.3 ± 2.6	2.7 ± 1.3	2.3 ± 1.2	12.0 ± 3.8
Average	10	80	8.0	2.0 ± 0.5	4.9 ± 0.8	2.6 ± 0.5	3.0 ± 0.4	12.5 ± 1.3
Jamduar (December 1973)	15	55	3.6	2.0 ± 0.6	3.1 ± 0.6	2.1 ± 0.4	1.9 ± 0.4	9.1 ± 1.0
Raimona (December 1973)	2	25	12.5	1.0 ± 0.0	3.0 ± 0.0	2.0 ± 0.0	1.5 ± 0.5	7.5 ± 0.5
Manas (January, 1976)	2	8	4.0	1.0 ± 0.0	6.5 ± 0.5	4.5 ± 0.5	2.5 ± 0.5	14.5 ± 1.5
Average	29	168	4.6	1.8 ± 0.5	3.5 ± 0.5	2.3 ± 0.4	1.9 ± 0.3	9.5 ± 0.9

Table 5
Group size and social structure of golden langur at Bokuamari forest

Sl. No.	♂♂	♀♀	JJ	II	Total
1.	1	5	2	1	9
2.	2	15	7	2	26
3.	1	5	2	–	8
4.	1	5	1	–	7
Total	5	30	12	3	50

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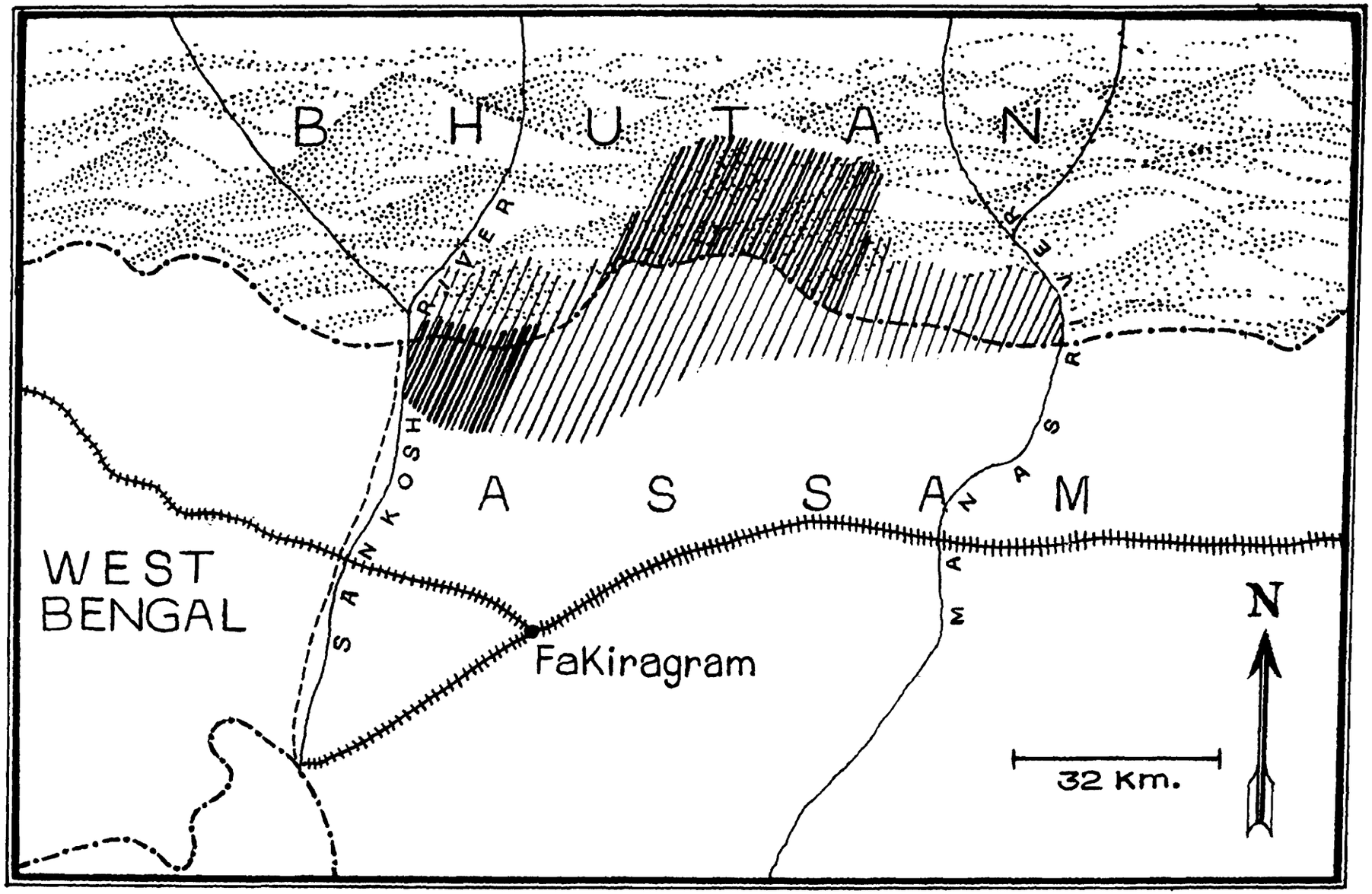

Fig. 2. Map showing the distribution of golden langur from east of Sankosh to west of Manas rivers. The area with double line shows the area of their maximum concentration.

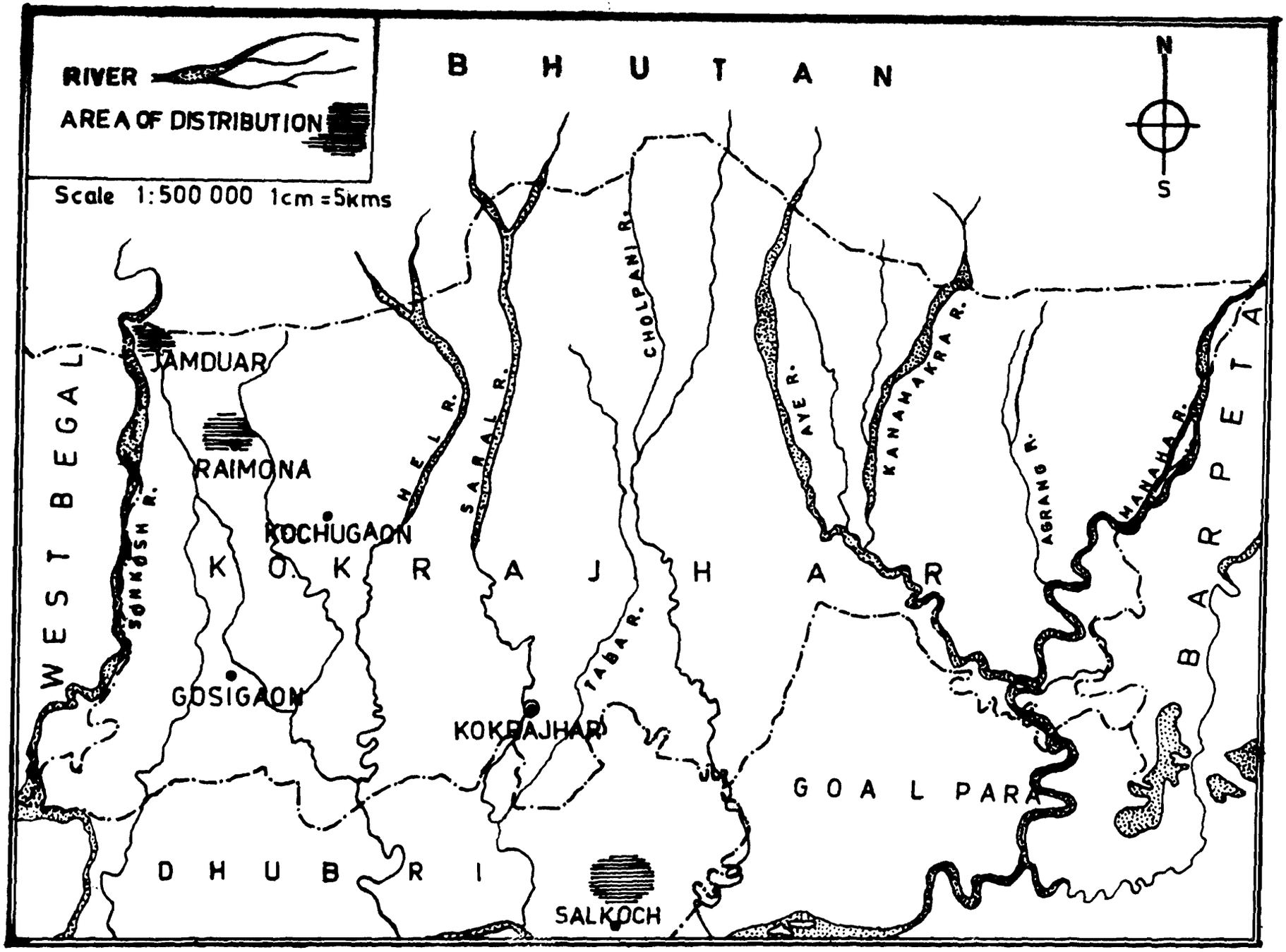

Fig. 3 Distribution of Golden Langur in India

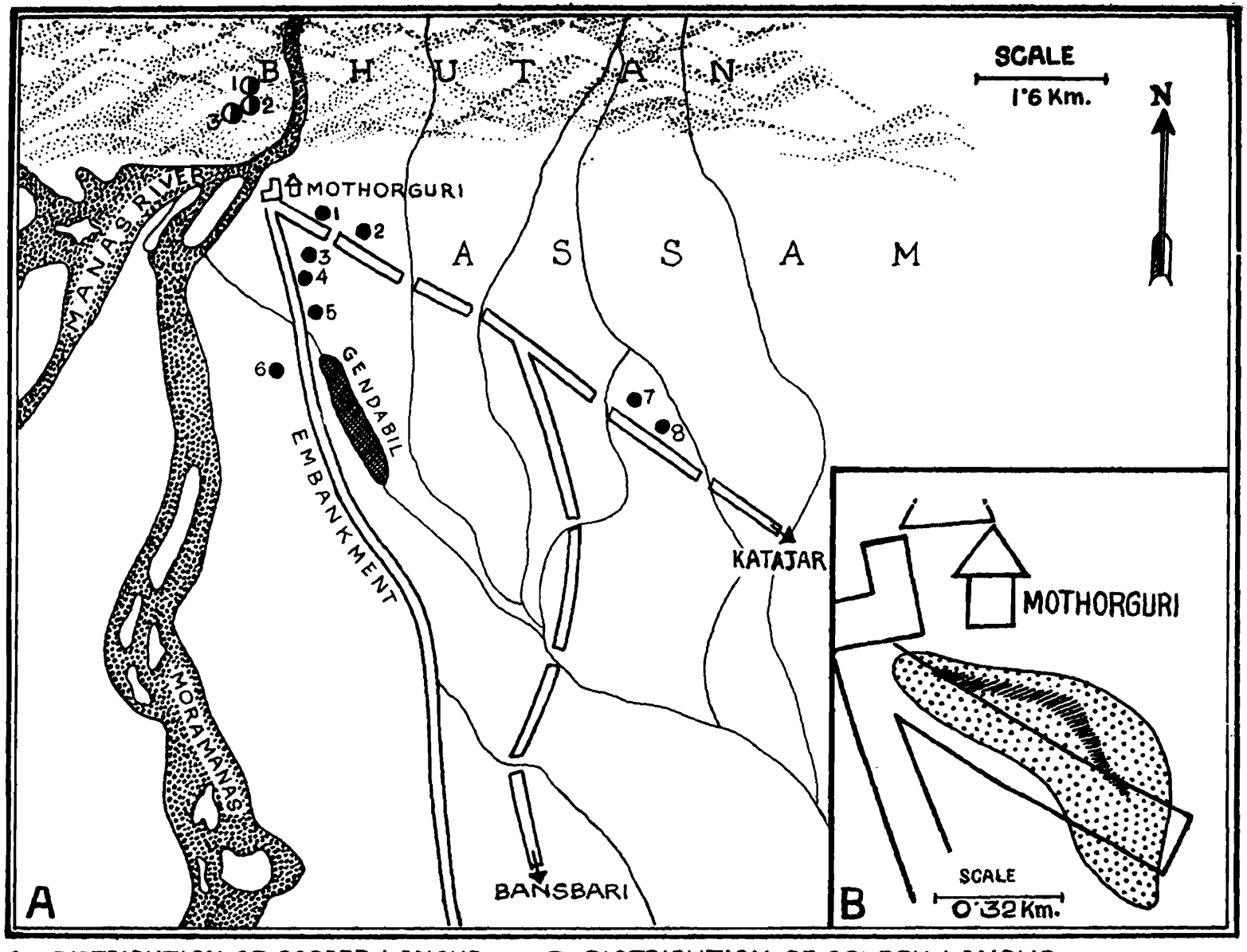

Fig. 4 (A) Distribution of golden and capped langurs in one part of Manas Sanctuary

(B) Home range and core area of a group of capped langur.

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STATUS OF PHAYRE'S LEAF MONKEY, *PRESBYTIS PHAYREI* BLYTH

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INTRODUCTION

The northeastern India is rich in variety of primate species. Most of these species are restricted in their distribution and some are rare. The Phayre's leaf monkey, *Presbytis phayrei* Blyth, 1847 is one of them. It is found in the state of Tripura and south Cachar (Cachar and Karimganj districts) of Assam. Originally it was known to occur only in Tripura but in recent years it has also been reported from the south Cachar district of Assam. There is possibility of its occurrence in Mizoram. The other non-human primates that are found in its range of distribution in India are rhesus macaque (*Macaca mulatta*), stumptailed macaque (*Macaca arctoides*), pigtailed macaque *(Macaca nemestrina)*, hoolock gibbon *(Hylobates hoolock)*, capped langur *(Presbytis pileatus)*, slow loris *(Nycticebas coucang)* and common tree shrew *(Tupia glis)*. In recent years this species has been studied in the field in India (Agrawal, 1974; Mukherjee, 1977, 82 a & b; Bhattacharya and Chakraborty, 1990; Choudhury, 1990).

TAXONOMY

Blyth (1847) described a new species of leaf monkey as *Presbytis phayrei* based on the collection from Arakan, Burma. This monkey belongs to the family Cercopithecidae and the subfamily Colobinae. It is dark ashy brown in colour with head, extremities and tail tip are darker in colour. Like other langurs the face is black except the lips and the area around mouth and eyes are white. The underparts of the body are silver white. The head sometimes has a crest but not a cap. Infants are straw coloured. The head and body measures about 60-62 cm and the tail is about 75 cm in length. Bhattacharya and Chakraborty (1990) reported that the head and body length of live specimen of male varies from 1.07-1.1 m (N = 5) and that of female from 1.15-1.3 m (N = 7). They have also noted that the tail is longer than body and constitutes approximately 68% of the total length from head to the tip of the tail and the males and females are almost equal in size and colour and it is difficult to identify the sexes in the field. However, morphological differences in the ocular markings of the two sexes and sexual dimorphism is known in this species In

the case of males the inner lines of the white ocular markings around the eyes run almost parallel by the side of the nose with the result that the black strip between these two white lines appears to be uniform in width whereas in case of females the two inner white ocular lines bend inwards forming a triangular black patch between the two inner white lines, forming a conical projection of the white patch at the base of the nose in case of females. The outward bending of the inner margin of the white ocular patch forms a conical projection above the white patch of the upper lip in case of females whereas in case of males it rounds more or less bluntly in this region which resulted in a wider gap of black patch between the white ocular circles and the white mark on the upper lip in males than in females. This character may be used in the field to identify the sexes in the free ranging groups.

Out of four subspecies, three are found in South Asia and they are *P. p. crepusculus* Elliot, *1990, P. p. phayrei* Blyth, 1847 and *P. p. shanicus* Wroughton, 1917.

DISTRIBUTION

The Phayre's leaf monkey is found in India, China, Bangladesh, Myanmar, Thailand, Laos and Vietnam. In India it is restricted in distribution to the state of Tripura and South Cachar of Assam. In Bangladesh this monkey is recorded from the evergreen forest of Chittagong and Sylhet (Green, 1978 and Khan and Ahsan, 1986). From China it is reported from sourthern China in sourthwestern Yunnan, mainly in the tropical forest district of Xishuangbanna (Tan & Bangjie, 1985). The eastern range of this monkey extends throughout most of the Transhimalayan Mountains Biogeographical Province. This Province extends from east of the Irrawaddy river in the north of the Myanmar Shan State and from western and southern Yunnan southeastward through Laos and northwestern Vietnam and along the Annamitic Cordillera, including Plateau des Brolovens to just south of 14°N latitude at 108°E longitude in Vietnam. The distribution of this monkey in India and Bangladesh falls in the Biogeographical Province of Assam-Kra Rain forest. This province extends from the Isthmus of Kra northward, through Tennasserim, the Mergui Archipelago and the Shan State in Myanmar and adjacent areas of western and northwestern Thailand and Laos, and westward through the mouths of Irrawaddy and the Arakan region in Myanmar into northeastern India and the western hills of Myanmar and the Chittagong region in Bangladesh. The distribution of this species in Laos include Thai-Indochinese Dry Forest besides the Biogeographical Provinces of Transhimalayan Mountains and Assam-Kra Rain Forest. The Thai-Indochinese Dry Forest Biogeographical Province extends southeastward from northwest Thailand through southwest and central Laos and much of Kampuchea to the region north of the Central Highlands in

Vietnam. The primate fauna of Vietnam also includes the Phayre's leaf monkey and this falls in the Biogeographical Provinces of Tonkin-Chinese Rain Forest, Transhimalayan Mountains, Thai-Indochinese Rain Forest and Thai Indochinese Dry Forest. The Tonkin-Chinese Rain Forest Biogeographical Province encompasses southeastern most China and the island of Hainan and the coastal strip of northern Vietnam east of the Annamitic Cordillena almost as far south as 13°N latitude. The Thai-Indochinese Rain Forest extends from the Central Highlands of Vietnam southward and westward through central and southern Kampuchea to the central plain of Thailand, extending eastward along the Thai-border with northern Kampuchea. The Myanmar Dry Forest Biogeographic Province encompasses the Irrawaddy river basin, into which flows the Chindwin river from the northwest, and seperates the forested mountains in the west from those in the east of Myanmar; this area contains a small, scattered populations of Phayre's leaf monkey.

This monkey has been studied in the field at Tripura (Mukherjee, 1982, a & b) and its distribution in this state is shown in Fig. 1.

ECOLOGY

The Phayre's leaf monkey that are found in different Biogeographical Provinces are rich in moist evergreen, subtropical moist evergreen, semi evergreen and hill forests. In the Thai-Indochinese Rain Forest Biogeographic Province, *Presbytis cristatus* is the most widespread colobine monkey and this species may be parapatric with *Presbytis phayrei* at the western boundary of the province. In the Thai-Indochinese Dry Forest Biogeographical Province, *P. phayrei* may also occur in the mountain forests of north-central Thailand. *Presbytis phayeri* is the most widespread colobine monkey in the Assam-Kra Rain Forest Biogeographical Province which is characterised by moist evergreen forest in the Isthmus of Kra and regions on the Andaman sea and Bay of Bengal while tidal dune and swamp forest are found in the mouths of Irrawaddy. In this province in the east the moist deciduous and dry evergreen forest or subtropical moist hill forest and hill savanna forest are replaced by moist evergreen forest at higher elevations. In the northwest of this Province the moist semi-evergreen and evergreen forest are replaced by subtropical hill and temperate evergreen forest successively at higher elevations. In the Myanmar Dry Forest Biogeographical Province the central zone consists of open scrub land with Acacia, from which radiate out zones of dry upper mixed deciduous forest and moist mixed deciduous forest respectively. Small and scattered populations of *P. phayrei* occurs in these suitable forest habitat of this province.

The state of Tripura where the Phayre's leaf monkey is well distributed is situated 23°50'N latitude and 91°15'E longitude and it is located at an average

altitude of about 338 m. The configuration of the land is mostly hilly, gently undulating or flat. There are two main hill ranges in the southern division namely Barmura-Deotamura and Tekkatulsi. These two hill ranges are parallel to each other and run north to south. In the flat lands there are many low hillocks localy known as tillas. Many rivers and their tributaries criss-cross the flat lands. Almost all the flat lands are put to agricultural use and the cultivations have extended into the valleys between the hillocks with the result that at many places the forest is discontinued.

The hills in Tripura, which are clayey, appear to be of recent origin and belong to tertiary age and are related to Surma and Tipan series. The soil is formed by the disintegration and weathering of these rocks and is generally sandy loam to loamy sand or clayey loam to pure clay. Its colour mostly varies from grey to brown. The soil in the forested areas is generally loamy sand and is practically without humus. The soil of the state has been classified into three broad types - alluvial, red and yellow. The ash produced by the annual forest fire or by shifting cultivation is washed down into the fields in the valleys.

The climate is tropical and the tropic of cancer passes through this state. It is generally hot and moist and there are three distinct seasons–summer, rains and winter. The high temperature in summer lasts from March to May is tempered occasionally by rain. The monsoon starts from June and continues upto October. Pre-monsoon showers are also common in the month of May. The winter lasts from November to February. The average maximum and minimum temperatures recorded were 29.15°C and 15.50°C respectively. The highest and lowest temperatures are usually reached in May and January respectively. Almost the entire rainfall is received during the monsoon but summer and winter rains are fairly common. At times mild frost occurs in low lying areas during winter. The average annual rainfall is about 1582 mm. The maximum and minimum humidity recorded were 100% and 42% respectively. The humidity varies from 68% to 71%. The highest humidity reached in the month of July. The winter is characterised by the fall of dew. The various rivers and streams are the source of water supply.

The forests of Tripura belong to the moist tropical type and can broadly be divided into tree and bamboo forests with open scrub jungles and grasslands. The tree forests can be grouped into sal forests *(Shorea robusta)*, garjan forests *(Dipterocarpus turbinatus)*, dense mixed deciduous and rain forests, mixed bamboo forests and open scrub forests with thatch and tall grasses. The total forest area is about 574000 ha, out of which the forest with crown density of dense forest of above 40% is 34000 ha and the crown density of open forest with 10% to 40% is 54000ha. The principal trees which form the top canopy are *Albizzia procera, A. stipulata, Artocarpus chaplasha, Bursera serrata, Careya arborea, Garuga pinnta, Gemelina arborea, Lagerstroemia parviflora, Lannea*

grandis, *Schima wallichii*, *Shorea robusta*, *Sterculia villosa*, *Syzygium cumini*, *Terminalli belirica*, *Vitex peduncularis*, *Stereospermum and Machilus species*, *Dipterocarpus turbinatus*, *D. macrocarpus*, *Alscodaphne odinii*, *Duabanga sonnserotioides*, *Micheiia champaca*, *Samalia malabarica*, *Tetramelos nudiflora*, *Angiehertia spikata*, *Acquilaria agalochor*, *Trewia nudiflora*, *Artocarpus lacoocha*, *Mangifera silvatica*, *Chukrassia tabularis*, *Cedrella toona*, *Rubia cordifolia* and *Saraca indica*. The middle storey is generally composed of *Careya arborea*, *Dillenia pentagyna*, *Lagerstroemia parviflora*, *Mallotus ohilippensia*, *Premna bengalensis*, *Shorea robusta* and the species of *Bridela*, *Machilus* and *Wrightia*. The undergrowth consists of *Coffea bengalensis* and species of *Clerodendron*, *Eupatorium*, *Flemingia* and thatch. These undergrowths are usually thin in the flat areas and on the gently sloping hill tops but are thick in moist areas. The climbers that are found in these forests are *Acacia pennata*, *Bauhinia vahlii*, *Butea parriflora*, *Dalbergia stipulacea*, *Mikania scandense* and *Millettia pachycaros*. In the mixed forest the canopy is very much open and broken. The damage to the forests are caused by enchroachment, jhuming (shifting cultivation), illicit felling and fires. The main ecological features are presented in Table 1.

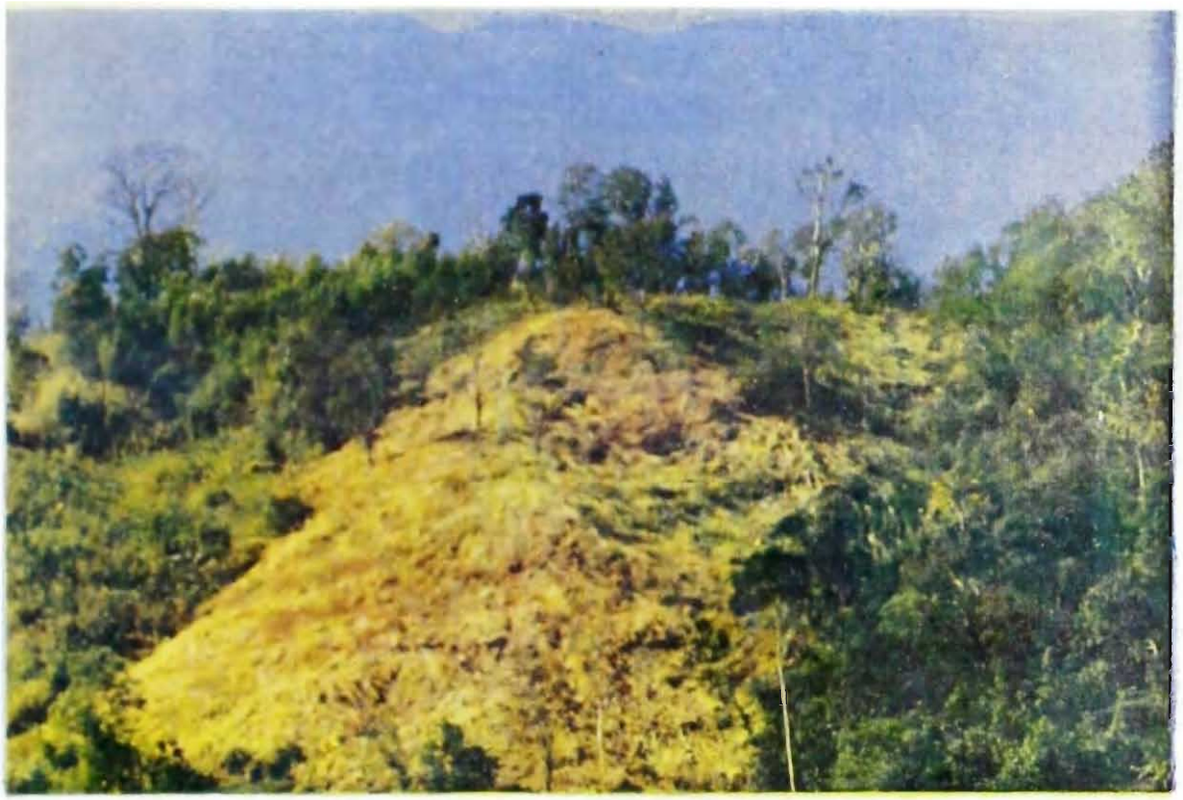
Table 1. Ecological features of Tripura

Characters	State of Tripura
Altitude	11 M to 937.7 M
Longitude	91°10' to 92°20' E
Latitude	22°55' to 24°35' N
Rainfall	1582.38 mm
Temperature	16.6°-29.4°C
Summer months	March-May
Main monsoon	Southeast
Monsoon months	June-October
Humidity	42-100%
Forest type	Tropical rain forest
Area of forest	574000 ha
Crown density with above 40%	34000 ha
Crown density of open forest with 10-40%	54000 ha
Human population	Dense
Non-human primates	Rhesus, Stump-tailed and Pig-tailed macaques; Capped and Phayre's leaf monkeys; Hoolock gibbon; Slow loris.

Phayre's leaf monkey feeds almost entirely on leaves. The groups are generally found in the mixed forest but occasionally they move to the sal forest for rest. The members of a group start to feed actively shortly after waking up in the morning and continued to feed for a considerable period. During feeding the monkeys remain on the same tree for a long time and change their position or they may move from tree to tree. Like hanuman langur the whole group feeds and moves as a unit. The intensity of feeding decreases considerably at noon, particularly during summer months, but it increases again in the evening. Feeding is not a continuous process and it is frequently interrupted by short non-feeding spells during which the individuals either rest or move. The feeding activities decline during rains when they rest on the thick branches of the trees for hours together. The group remains at one place and spent the major part of their activity in feeding when the food is available in plenty. The group feeds and rests while moving from tree to tree. While feeding the group mostly utilize the upper and the middle canopy. Table II shows the various plants on which the Phayre's leaf monkey was found to feed in the field (Mukherjee, 1982a.)

Table II. Food plants of Phayre's leaf monkey

Plants	Type of plants	Parts eaten
Artocarpus chaplasha	Tree	Leaves & Petiole
Albizzia procera	Tree	Leaves
Bursera serrata	Tree	Leaves
Dalbergia stipulacea	Climber	Leaves & Buds
Dendrocalamus longispathus	Bamboo	Shoots
Dellenia pentagyna	Tree	Leaves
Dipterocarpus turbinatus	Tree	Leaves
Eugenia jambolana	Tree	Leaves & Fruits
Ficus carica	Tree	Leaves & Fruits
Gmelina arborea	Tree	Leaves
Lagerstroemia flosregina	Tree	Leaves
Lagerstroemia parviflora	Tree	Leaves
Mangifera indica	Tree	Fruits
Mikania scandens	Climber	Buds, Flowers & Leaves
Schima wallichii	Tree	Leaves
Salmalia malabarica	Tree	Flowers
Terminalia bellirica	Tree	Leaves



(Top)—Jhumed area of a forest.
(Bottom)—Habitat of Phayre's and other non-human primates.

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(Top)—Phayre's leaf monkey (*Presbytis phayrei*)
(Bottom)—Members of a group of Phayre's leaf monkey feeding on the flowers and fruits of a tree.

The group moves in search of food from tree to tree and the range of movement of a group in a day varies from season to season. A group covers much more distance in summer and winter than the rainy season. In summer maximum movement was observed in the morning and in late afternoon and the movement was very much restricted during noon when the temperature was high. The group members during movement use the tree and very rarely they come down on the grounds. When alarmed the group moves very fast from tree to tree cross the large gaps by long jumps. The home range of the groups overlap with each other.

STATUS

In the surveys carried out at Tripura in 1976 and 1978 (Mukherjee 1982a), 36 groups of Phayre's leaf monkey were encountered in the study areas of north, south and west districts. During these surveys 8 groups were recorded in the north district, 17 groups were observed in the south district and 11 groups were encountered in the west district. In these three districts a total of about 1484 sq. km., 1797 sq. km. and 664 sq. km. areas were surveyed. Out of the 36 groups, one was an all male group of 7 monkeys whereas the rest 35 were bisexual groups (Table III). The average group size of the bisexual groups in these three districts were calculated to be 14.25 (±3.58), 12.18 (±1.22) and 8.10 (±1.12) respectively (Table IV). In 36 groups a total of 408 monkeys were counted, out of which 73 were males, 169 were females, 95 were juveniles and 71 were infants. The group size varied from 4 to 38. The bigest group of 38 members was recorded from the north district. Out of the 35 bisexual groups, 14 were unimale groups and the equal number of groups contained two males, whereas the remaining 4 and 3 groups contained three and four males respectively. Majority of the groups that contained more than one male, only one was an adult male and the rest were subadult males. The percentage of males, females, juveniles and infants were calculated to be 17.89,41.43,23.28 and 17.40 respectively. The sex ratio of adult males to adult females in south, west and north districts were 1 : 2.44, 1:1.45 and 1: 3.27 respectively. The overall sex ratio of adult males to females was 1: 2.32.

Green (1978) recorded 4 groups of Phayre's monkey in secondary forest with total individuals of 23 with the mean group size of 5.7 and 2 groups from the primary forest with a total individuals of 12 monkeys with a group size of 6.0, in Bangladesh. Charkaraborty (1988) recorded 10 groups of Phayre's leaf monkey at Sepahijala Wild Life Sanctuary at Tripura with a total population of 122 individuals. In his study area the group size varies from 6 to 35 individuals. Gupta (Personla communication) recorded 17 groups of Phayre's leaf monkey in the Gumty Wild Life Sanctuary, Tripura. The 17 groups contained a total of 274 individuals with 38 adult males, 79 adult females, 109 juveniles and 48 infants. The latest survey conducted in Tripura (Mukherjee & Chakraborty, 1990) recorded

Table III. Group size and composition of Phayre's monkey at Tripura

Sl No.	Districts	Male	Female	Juvenile	Infant	Group size	Remarks
1.	S	2	5	3	4	14	
2.		1	6	3	–	10	
3.		3	11	3	2	19	
4.		4	7	4	3	18	
5.	O	3	6	3	1	13	
6.		2	3	3	1	9	
7.		2	2	2	–	6	
8.		2	4	2	3	11	
9.	U	2	4	2	2	10	
10.		2	2	1	2	7	
11.		1	3	1	1	6	
12.		4	8	5	8	25	
13.	T	1	4	2	1	8	
14.		3	4	2	–	9	
15.		1	6	3	2	12	
16.		1	6	5	3	15	
17.	H	2	7	2	3	14	
18.	W	1	2	2	1	6	
19.		1	3	2	1	7	
20.		2	2	–	1	5	
21.	E	1	5	2	2	10	
22.		1	5	2	3	11	
23.		2	3	2	–	7	
24.		7	–	–	–	7	All male group
25.	S	3	3	2	1	9	
26.		2	2	–	2	6	
27.		1	6	5	4	16	
28.	T	1	1	1	1	4	
29.	N	4	17	12	5	38	
30.	O	2	3	2	3	10	
31.		1	4	3	3	11	
32.	R	2	3	2	–	7	
33.		2	5	2	2	11	
34.	T	1	7	4	1	13	
35.		1	3	2	1	7	
36.	H	2	7	4	4	17	
Total		73	169	95	71	408	
Mean		2.03	4.69	2.63	1.97	11.33	
Population composition		17.89%	41.43%	23.28%	17.40%		

Table IV

Population survey and social structure of bisexual groups of Phayre's Monkey at Tripura

Districts	Sq. Km. area surveyed (approx.)	Total No. of bisexual groups observed	Average Group size	Adult ♂♂	Adult ♀♀	Sub-adult ♂♂	Sub-adult ♀♀
North	1484	8	14.25 ±3.58	13 1.88± 0.35	49 6.12± 1.66	31 3.88± 1.20	19 2.71± 0.57
South	1797	17	12.18 ±1.22	36 2.12± 0.24	88 5.18± 0.56	43 2.69± 0.30	40 2.78± 0.50
West	664	10	8.10 ±1.12	15 1.50± 0.22	32 3.20± 0.51	18 2.25± 0.41	16 1.78± 0.36

75 Phayre's leaf monkeys in 8 groups in the south district, 41 monkeys in 5 groups in the north district and 148 monkeys in 8 groups in the west district. The group size varies from 5-14 in south district, 4-12 in north district and 7-42 in the west district. In this study it was found that the males, females, juveniles and infants were 12.50 %, 55.68%, 18.94% and 12.88% respectively. This shows the decline in the population of males, juveniles and infants from that of the earlier survey. The 1990 survey shows the sex ratio of adult male to adult female was 1:3.54, 1:3.71 and 1:5.46 in the south, north and west districts respectively with an overall sex ratio of 1: 4.45. This shows an increase in the sex ratio or the loss of adult male population.

Khan and Ahsan (1986) recorded 15 groups of Phayre's leaf monkey containing 205 individuals with a mean group size of 13.67 from the evergreen forest of Bangladesh. John and MacKinnon (1987) while dealing with the primates of the Indo-Chinese subregion stated that the areas of original habitat of this species was 708,572 km^2 but now the habitat is reduced to 193.172 km^2 and the loss of habitat is 73%. They have also estimated that now the protected area is about 27,337 km^2. They have estimated that the distribution of Phayre's monkey per km^2 is about 4.0 with a total population of 515,000 out of which 72,900 is the protected population.

BEHAVIOUR

The leaf forms the main food item of the Phayre's leaf monkey. They were never ovserved to raid the cultivated fields. Individuals generally caught hold of the nearby hanging twigs and bent them to the level of their mouths and either nibbed directly at the leaves, buds and flowers or plucked them with hands. They usually plucked the fruits with their hands. Like hanuman langur the water requirements are met from the water content of their food. However, it was observed that they lick the water from the leaves and the water collected on their bodies after rains. During a winter month a group was observed to cover a distance of about 402 m in three and a half hours (Mukherjee, 1982a). During summer mostly they eat the petiole and throw away the leaf blades of the mature leaves.

In the field a marked tolerance was noticed between the Phayre's leaf monkey and the other non-human primates. Not much inter and intragroup agonistic behaviour was noticed. The Phayre's leaf monkey and Capped langur are sympatric (Mukherjee, 1982a).

CONSERVATION PROBLEMS

Phayre's leaf monkey which occurs in evergreen forest and even secondary forest has been hunted in many areas of its distribution. It has been hunted to extinction in some parts of Myanmar. The population of this species has declined in Indochina during the war years due both to direct military activity and to an increased number of individuals being killed for food or as crop raiders. The main factors that are operating in its habitat at Tripura in India are the high human population density, illicit felling, encroachment, "jhuming" or shifting cultivation and bringing more and more forested land under tea, cofee and rubber plantation. Due to the destruction of the habitat the non-human primates in Tripura faced with the loss of potential food trees and disruption of the pathways which resulted in the isolation of the population and this affected the leaf eating monkeys and hoolck gibbon to great extent. The destruction of habitat is the main factor which affects the non-hman primate population in Tripura.

CONSERVATION MEASURES TAKEN

Some of the habitats of the Phayre's leaf monkey in Tripura (Sepahijwala, Trishna and Gumti) are now included under the Wild Life Sanctuaries. It has also been placed under Schedule 1 of the Indian Wild Life Protection Act, 1972. According to the IUCN/SSC Primate Specialist Group-Action Plan for Asian Primates Conservation, 1987-91 published in February, 1987, the Phayre's leaf

monkey is considered as "Vulnerable" It is regarded that the populations of this monkey have limited distribution and / or ecological tolerance, and current rates of habitat alteration and / or hunting pressure is likely to intensify; or, current rates of habitat alteration and/or hunting are slowly but significantly reducing most populations. It has high probability of moving to category "Highly vulnerable" by the year 2000 if no new conservation action is taken.

RECOMMENDED ACTIONS

The latest survey conducted at Tripura, the only state in India, where the Phayre's leaf monkey is widely distributed indicates a slow decline of population. So to check further depletion of population and to boost the present population, it is necessary to take certain measures. With this point in view certain suggestions are given below :

- The primary cause of decline in its population is the destruction of its habitat by encroachment of forest, jhumming, etc. It is necessary to restore and develop the habitat.
- Periodic survey and the monitoring of the population at least in certain pockets like Sepahijala, Trishna, Gumti, Manu, etc., should be carried out to know the further trend of population.
- Phayre's leaf monkey and Capped langur are sympatric in Tripura hence, more quantitative surveys together with systematic comparison of the vegetation are needed to determine the relationship of vegetation with the pattern of sympatry between the two species.
- Further surveys are needed to determine the pattern of distribution, group density, group size, social structure, age-sex-class ratio, ranging behaviour, etc. This will help to understand as to how the animals have adopted under different changing ecological conditions and the type of vegetation that support them at the highest density level. This will help to draw up the management policy regarding this species.
- Mixed plantation should be encouraged in its habitation area.

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STATUS OF HISPID HARE, *CAPROLAGUS HISPIDUS* (PEARSON)

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INTRODUCTION

The Hispid hare *Caprolagus hispidus* (Pearson) had been reported as being quite common in regions of Ayodhya in Uttar Pradesh (Wilson 1924). The specimens of this species in the collection of the Bombay Natural History Society from North Kheri area (Uttar Pradesh) dates back to 1926 and 1930 (Santapau and Humayun 1960). The latter authors also recorded another specimen from the same area, shot in 1938. However, the species evidently survived in this region for at least another twenty years or so, since two more specimens were collected in 1951 and 1956 by the Rajah of Kasmanda—the first of which was shot, but the second suffered the greater misfortune of being accidently trodden by a tame elephant during a shikar; and another was sighted at Chuka Dhaya in Pilibhit Forest Division in April 1960 (IUCN 1974).

As far as known, a German Expedition party obtained a single specimen from the Goalpara District, Assam, in 1956. The Hispid hare was evidently rediscovered in Baranadi Reserve Forest in 1971 and at about the same time in the Manas Tiger Reserve—both sites fall within the reserve forest belt of northwestern Assam. The circumstances associated with the rediscovery of this species, and the closely associated Pigmy Hog. (*Sus salvanius* Hodgson) have been well documented by Mallinson (1971a, b). The loss of most of the subsequently described small population, in recent years, has been narrated by Oliver (1979, 1980, 1981, 1985). These losses may be attributed to the destruction of grass in the former habitat through continued encroachment of forests by rapidly expanding local and immigrant human population, and/or the severe degradation of remaining habitat by extension of tea gardens and agricultural fields, and various forestry practices including dry-season burning and thatch collection.

By 1981, therefore, the only certainly known viable population of the Hispid hare and Pigmy hog were those which were reported from the Manas Tiger Reserve. Recent informations are unavailable on the status of a few other small relictual populations of one or other of these species in certain neighbouring

reserve forests (Oliver 1981). In these circumstances, both species were naturally considered endangered, even critically, in view of an emergent threat to the Manas Sanctuary by a proposal to construct two dams on the Bhutan side of the Manas River in order to supply power and irrigation to Assam and northern West Bengal. This scheme, part of a major network of flood control measures in northeastern region, may destroy the Manas Sanctuary in Bhutan and irretrievably damage the adjoining Indian side of the Reserve.

Since Manas was the only area within the known range of the *Caprolagus hispidus*, it was felt that the reports of the possible occurence of the species in parts of its former range would not only be of some general interest but, if confirmed, assume considerable potential importance with respect to the overall survival prospects of this species. Unfortunately, there had been no concerted attempt to investigate the possible continued occurence of the species within the western and southern limits of its former range in India, i.e. in those parts of northern Uttar Pradesh and northern Bihar which are contiguous with the Terai region of southern Nepal, and which expand through Duars on northern West Bengal to northwestern Assam. Within this region there are a number of descrete areas which still harbour suitable habitats where small remnant populations of this species and Pigmy hog might survive. These areas included Dudwa Tiger Reserve, Kishanpura Wildlife Sanctuary and grassland in Philibhit, Lakhimpur-Kheri and Bahraich Districts—now restricted to Valmiki Tiger Reserve and its buffer reserves in northwestern Bihar; and Jaldapara and Gorumara Wildlife Sanctuaries and Buxa Tiger Reserve in the Jalpaiguri District of northern West Bengal.

Notwithstanding the recent reports of *Caprolagus hispidus*, the same situation exists with respect to the possible occurence of this species in Nepal and northeastern Bangladesh, although a little information about their former distribution is available over these regions. The Hispid has been variously reported during recent times in Nepal and Bangladesh (Mukherjee 1974, Ghosh 1981); the latter area being contiguous with southern Assam, where (in Sylhet) Pigmy hog was reported as recently as 1968.

The Hispid has very recently been reported from the Kanha Tiger Reserve in Madhya Pradesh (Oliver 1985; Ghosh, personal observation in 1991). Incidentally, the area lies on the southern side of the river Ganga and at least 600-700 km in linnear distance from U.P. Terai Region.

In this paper, a detailed discussion has been made on the taxnomy, distribution, status, ecology, behavior, etc. of the highly endangered Hispid hare in India along with some recommendations for its conservation.

TAXONOMY

The Hispid hare (Plate 1A), as it is more commonly known because of its coarse bristly fur, is similar to the Rufoustailed hare in body-size, but has a much shorter tail (head and body 476 mm, tail 53 mm, ear 70 mm, hind foot 98 mm.). The species is dorsally brown, intermingled with black hairs; brownish white ventrally, with the breast a little darker than the abdomen; tail longer than the forelegs. Claws are straight and strong. The skull is thick; occipitonasal length 85 mm; incisive foramina small; nasal shorter than in *Lepus*; frontal bone very wide; bulla smaller; palatal bridge more than 140% of mesopterygoid space behind it. There are 6 teats (2 pectoral and 4 inguinal), similar to those of the Rufoustailed hare or the European hare.

DISTRIBUTION

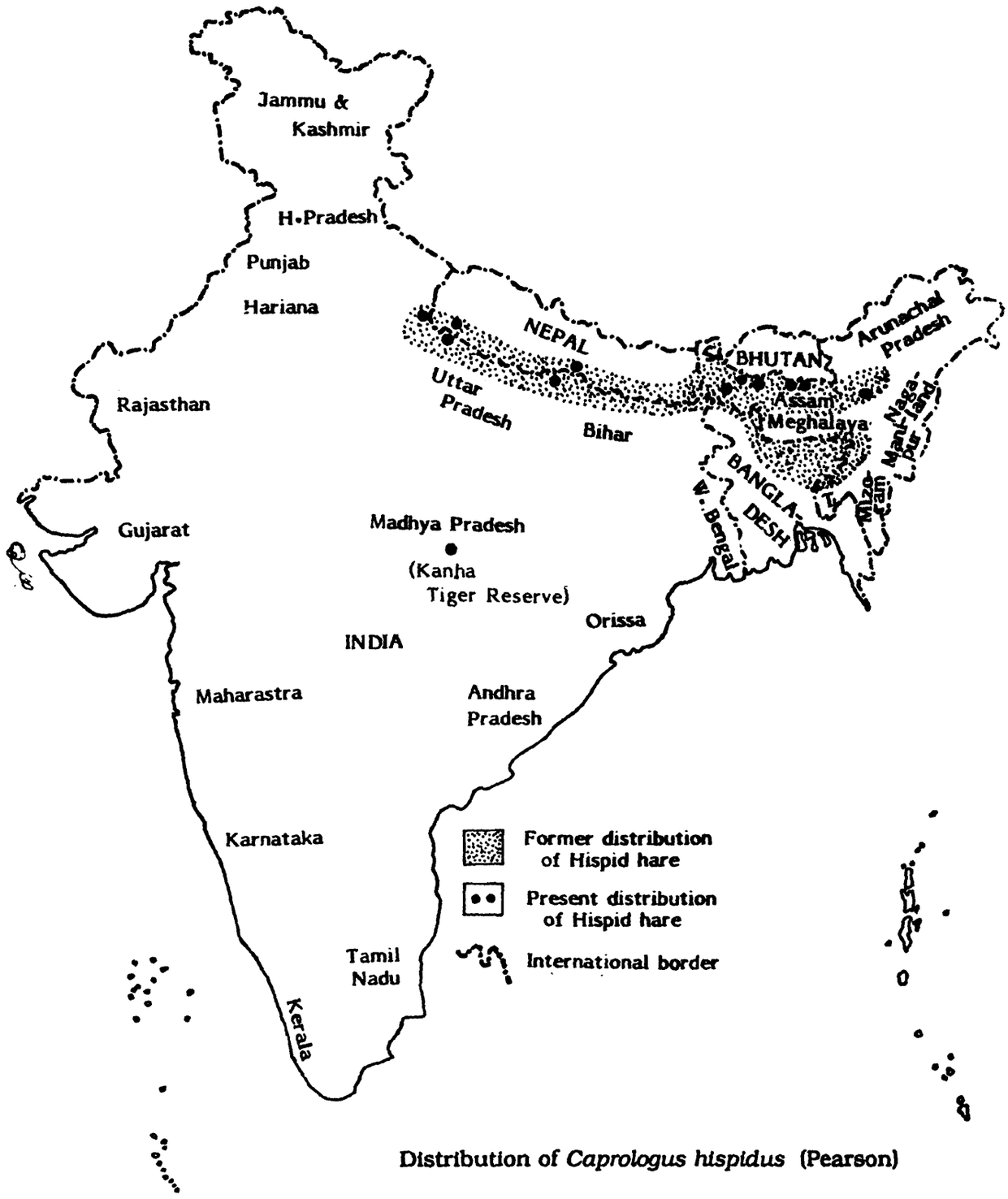
Historically recorded along the southern Himalayan foot-hills from Uttar Pradesh through Nepal and West Bengal to Assam, extending southwards as far as Dacca in Bangladesh (Text-fig. 1). Unrecorded for a number of years, then specimens were recorded from the north Kheri, Uttar Pradesh/Nepal border, from Chuka Dhaya, Philibhit Forest Division, Uttar Pradesh in 1951 and 1960 respectively, from the Goalpara District of S.W. Assam and from the Rajagarh area of the Mangaldai sub-division of Darrang District of N.W. Assam in 1971 (IUCN 1974). The live capture of the latter specimen was made from the vicinity of Baranadi Reserve Forest near Rajagarh Village. It was taken to the Attareekhat Tea Estate, where it was kept alive for approximately one month (Mallinson 1971; Tessier-Yandell 1972). Several specimens were subsequently reported and/or collected from Manas Sanctuary, Khalingdaur and Gohpur Reserve Forests respectively (Oliver 1980). The Khalingdaur population is now reported to be extinct as a result of the complete swamping of that area by illegal immigrants in 1979 (Oliver 1981). The continuing existence of the Hispid in Rajagarh is also doubtful now. The three other areas in Assam where *Caprolagus* has recently been reported are Ripu Reserve Forest, Subankhata Reserve Forest and the Orang Wildlife Sanctuary.

Outside Assam, the species has been subsequently reported in the Jaldapara Wildlife Sanctuary (Ghosal 1984) and Buxa Tiger Reserve (Oliver 1985) in West Bengal; valmiki Wildlife Sanctuary, West Champaran District; Northwest Bihar (Ghose, personal observation in 1986), Dudwa National Park in the Kheri District of Uttar Pradesh (Oliver 1985; Singh 1987; Ghose, personal observation from 1985 to 1986; Kanha Tiger Reserve in Madhya Pradesh (Oliver 1985, and the present author sited two individuals of Hispids in 1991); and Royal Chitwan National Park, Royal Baradia Wildlife Reserve and Royal Suklaphanta Wildlife Reserve in the Terai area of southern and south-western Nepal (Oliver 1985).

RECENTLY KNOWN AREAS OF THE OCCURRENCE OF *CAPROLOGUS HISPIDUS* IN INDIA

State	Area	Year (S) of Report	Source of information	Remarks
Assam	Goalpara District, South Brahmaputra	1956	IUCN 1974	A single specimen was obtained by the German Expedition. The species is assumed to be extinct in the area, following the destruction of the former grass land here.
	Kochugaon R.F.	1980	Forest Dept. of Assam	Grasslands here are subject to uncontrolled burning.
	Subankhata R.F.	1977	Oliver 1980, 1981	Still survives in the area?
	Khalingdaur R.F.	1977	Oliver 1980, 1981	No more survives here for destruction of habitat.
	Baranadi (Rajagarh) R.F.	1971 1977	Mallinson 1971 Tessier 1971 Yandell 1972 Oliver 1980, 1981	There is some doubt whether the species still survives here.
	Gohpur R.F.	1977	Oliver 1980, 1981	The species extinct here since 1979.
	Orang Wildlife Sanctuary	1981	Oliver 1984	A single specimen was caught here in 1981.
	Haltugaon	1977	Oliver 1980	The area is contiguous with Manas Wildlife Sanctuary.

State	Area	Year (S) of Report	Source of information	Remarks
Assam	Manas Tiger Reserve	1971 1977 1987	Various sources. Also, Oliver 1980	Reported to be increasing in numbers in some areas.
West Bengal	Jaldapara Wildlife Sanctuary	1982 1983 1984	Ghose 1984 Oliver 1985	Still survives here; also see text.
Bihar	Valmiki Tiger Reserve	1987	Ghose (personal observation of the present author)	Survives in the core area of the Tiger Reserve.
Uttar Pradesh	Pilbhit	1960	IUCN 1974	No evidence of continuing existence was found by Oliver (1984).
	Dudwa National Park	1985 1984 1985 1986 1987 1987	Oliver 1985 Ghose (Personal observation of the present author) Singh 1987	The species survives in different grasslands of the Tiger Reserve.
Madhya Pradesh	Kanha Tiger Reserve	1985 1991	Oliver 1985 Ghose (Personal observation)	Ghose (the present author) observed one individual at Kisli and other at Mukki. The area is some few hundred kilometres south of the known range of the species.



Distribution of *Caprologus hispidus* (Pearson)

ECOLOGY

Low lying tall thatch scrub jungle interespersed with tracts of dense forest predominated with Sal (*Shorea robusta*) is the usual habitat of the *Caprolagus hispidus* (Person) (Plate IB). This habitat is flat and well drained. Grasses are the primary colonisers in this natural habitat, or in forest clearings and abandoned cultivation and village sites. Tall grassland may also form an understory during later stages of succession, particularly near rivers. In relatively undistrubed areas, the tall grasslands are maintained by prolonged inundation during the monsoon or by periodic burning resulting in fresh sprouting; in distrubed areas, they are maintained by regular burning, and by grazing pressure and/or regular harvesting for thatch and domestic animal fodder.

There are many species of tall grasses, which dominate in different situations. *Caprolagus* evidently utilise all of these which are of varying importance to this species at different times of the year according to the availability of cover. During the dry season, most of these grass communities in most areas are subject to extensive, regular controlled or uncorntrolled burning, which deprives the animals of cover and all other resources, until the regrowth of vegetation occurs following the onset of the rains a few weeks, or even up to two or three months later. During this period, the animals are obviously dependent on any cover left unburnt, e.g. marshy sward, usually dominated by *Phragmites* and *Arundo* spp., and/or *Saccharum spontaneum* along river banks which are maintained by prolonged innundation and, therefore, usually left unburnt. It remains unclear whether these are preferred habitat or *Caprolagus* is forced to utilise it in absence of cover elsewhere during the post-burning period. Equally, by the presence of older faceal deposits exposed by the burning it may be concluded that these areas are inhabited by *Caprolagus* at other times of the year too.

The thatch or the tall grass jungle in Assam consists mainly of the *Sanccharum munja, S. spontaneum, S. arundinacea, Erianthus ravenne, Anthestria giganted, Phragmites karka;* in Jaldapara-Chilapata area, West Bengal, of *S. spontaneum. S. procerum, Phragmites karka, Eriauthus elephantina, Anthestria brasilliens,* etc. in Valmiki tiger Reserve, Bihar, of *S. munja, S. spontaneum, Imperata cylindrica, Phragmites karka, E. elephantina, Themida* sp. *and Naranga* sp.; in Dudwa Tiger Reserve, Uttar Pradesh, of *S. spontaneum, Imperata cylindrica, Cyonodon dactylon, Cymbopogon flexuosus, Polygonum* spp., *S. bengalensis,* etc.; and Kanha Tiger Reserve, Madhya Pradesh, of *Imperata, Themida, Veliveria* and / or *S. spontaneum* which resembles the tall grass communities that are evidently the preferred habitat of *Caprolagus hispidus* but such habitat are very limited in occurrence and nowhere plentiful.

It is solitary in habit except during breeding season (Nowak and Paradiso 1983). Their diet consists mainly of shoots and roots of grasses, including thatch species (Ghose 1978, Oliver 1979). It is reported that they also feed on bark and root of trees (Hodgson 1847). The faecal pallets (Plate 2B) in adults are about 10 to 17 mm in length. Probably two or three broods are produced per year between January and March and litter size varies from 2 to 5 young at a birth.

STATUS

No attempt has been made to estimate the population size but there is no doubt that the species has declined dramatically in recent years as a result of the loss of its tall grassland habitat due to agriculture, agro-based industry, forestry, flood control schemes and human settlement. A few pockets of tall grassland habitat are present within Reserves, National Parks and Wildlife Sanctuaries across the former distributional range and elsewhere. Whilst the survival of these several population is encouraging it is important to emphasize that these isolated, relict hispid populations remain at risk because of the continuing degradation of habitat within these protected areas due to overgrazing by domestick stock, thatch collection and often uncontrolled and regular burning of grassland during the dry season.

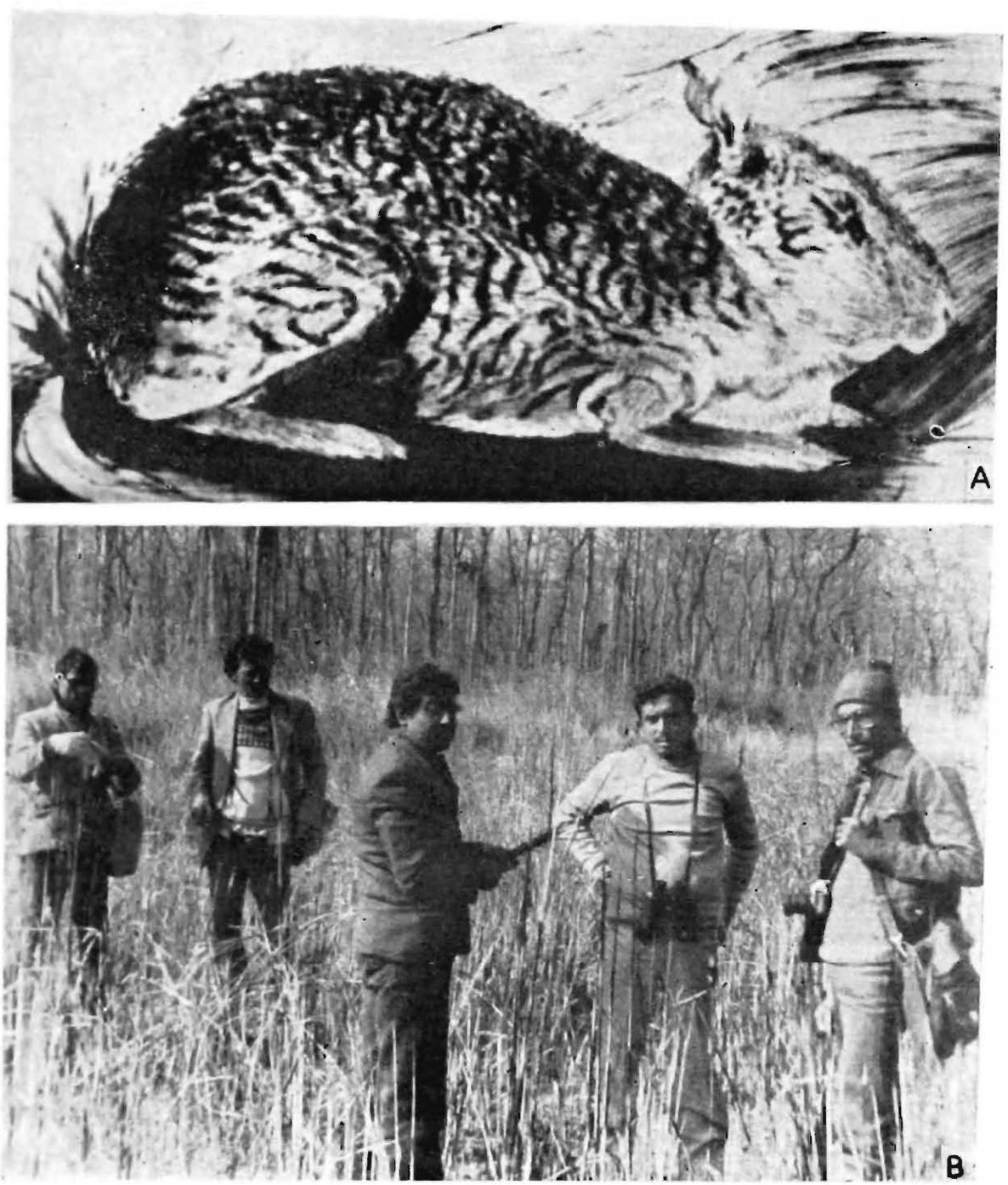
Apart from Dudwa National Park, where the tall grasslands are pre-emptively burned by Park staff (to prevent causal burning later in the dry season), the annual burning in the other Hispid areas is primarily undertaken by thatch collecting villagers. Burning of the typical thatchland grass species, such as *Saccharum, Imperata themida* spp. etc., facilitates the exploitation of thatch material so that the following culms can be harvested more easily. In Dudwa, thatch is collected by villagers during selected periods, under varying degrees of supervision and after payment of nominal admission fees. However, adequate supervision of a large number of people (e.g. approx. 10,000) is problematical and expensive to organise.

The proposed development of extensive flood control schemes threaten the ecological diversity of several areas encompassing tall grassland habitat. For example, the hispid population in Pilibhit and North Gonda Forest Divisions in Uttar Pradesh and in Champaran districts in Bihar has been seriously effected following the construction of irrigation/flood control barrages and canal. No evidence of continuing existence of *Caprolagus* could be found in Pilibhit and Gonda areas.

The result of a study of the Hispid in Nepal by Bell (1986, 1987) suggested that the population carrying capacity in an area may be determined by the extent of the small patches of tall grassland which escape the annual dry season burning.

GHOSE

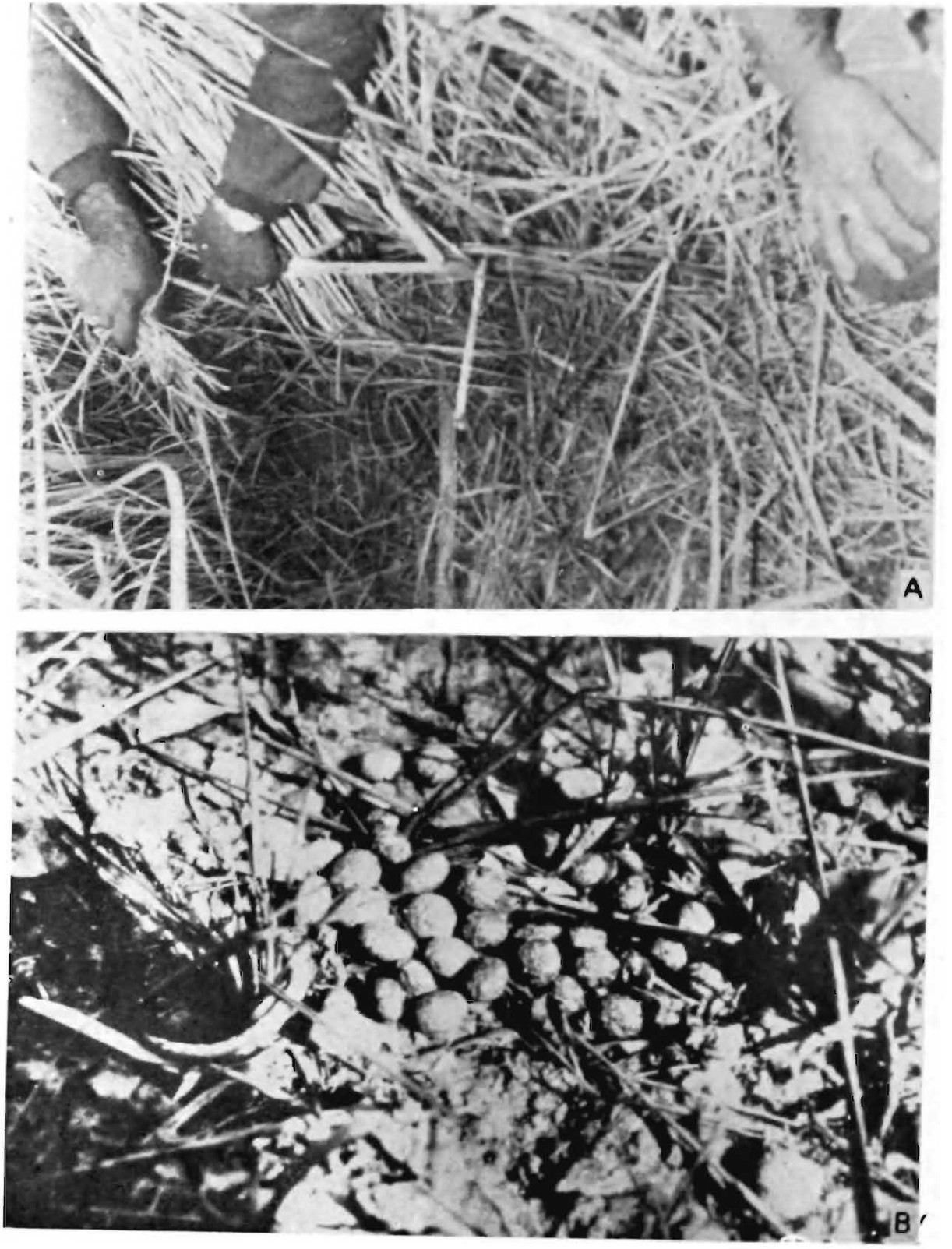
Plate I



A, showing a Hispid hare (adopted from Hodgson 1847).
B, photograph showing grassland habitat of Hispid hare at Dudwa Tiger Reserve.

GHOSE

Plate II



A, photograph showing characteristic thatch cutting of Hispid hare observed at Dudwa Tiger Reserve.

B, photograph showing pellets of Hispid hare taken at Jaldapara Wildlife Sanctuary.

During this period, fresh signs of *Caprolagus* is found only in small pockets of tall reverine grassland which had escaped the early dry season burning due to their marshy location. Home ranges plotted by Bell (*op. cit.*) for Hispids radio-collard within these areas revealed that during these months, the animals movements were entirely restricted to these narrwo strips of tall, marshy riverine sward. The estimated density of Hispids recorded in unburnt tall grassland again reflects their confined distribution within the few patches of refuge available at a time when the species was also breeding. Concentration within the isolated patches of post-burn cover may also increase the susectibility of the Hispids to predation.

The study of Hispid distribution during the post-burn period needs to be followed up by further investigations into the distribution of the animals during the rest of the year, particularly during the monsoon period when the marshy post-burn refuge areas are likely to be amongst the first to become inundated.

BEHAVIOUR

Nesting behavior : Hodgson (1847) states that like the European rabbit, the hispid is a habitat burrower using its strong legs and pointed nail for burrowing, and that it resides singly in the subterranean abode. During recent studies in Rajagarh forest it was noted that hsipids are slow moving and do not dig burrows themselves (Ghose 1978, Oliver 1980). It is less endowed with the power of running, seeing and hearing in comparison to other rabbits and hares. The hispid is, therefore, dependent for its safety on concealment provided by the heavy forest undergrowth. The rough hair of its coat affords protection against contact with the huge, serrated grasses, seeds and shrubs in the midst of which it dwells.

In general practice it neither leaves the forest shelter, nor does it wander far from the nest. The nesting sites in Rajagarh and Dudwa have been recognised by the thatch cuttings and faecal deposits only; several such sites are found in small areas probably representing the territory of an individual.

Feeding habits : The hispids feed chiefly on roots and soft pulp of the stem of tall grasses in their habitat. The greater development of their teeth, specially the incisors, helps them to devour this food. Hodgson (1847), however, reported that it also feeds on the bark of trees. A specimen kept in capitivity for a few days in the Attareekhat Tea Estate was noticed to feed on the roots of other grasses like *Cyonodon dactylon*. The daily feeding activity, as observed in Rajagarh in Assam and Dudwa Tiger Reserve in Uttar Pradesh, primarily consists of cutting the bases of the thatch grass and eating of roots and pulp (Plate 2A). The hispid also occasionally visits the adjoining cultivated fiedls for more attractive food. As such, it has to compete with the Rufoustailed hare for food.

Breeding and social organisation : It is thought that 2 or 3 broods are produced in a year and the litter-size consists of 2 to 5 young each time. Information gathered in Rajagarh in Assam indicates that between January and March, young are usually cauht. A pair of young hispid was said to have been raised from January to May 1975 by a 'Shikari' at Rajagarh and subsequently sold in Dima Kusi Bazar. Oliver (1979, 1980) had a pregnant Hispid in mid-April, 1977 at Rajagarh. The forest officials in the Manas Sanctuary have observed juveniles in June and July.

Overlapping home ranges revealed from the radio-tracking data in Nepal suggest that the hispids live in male/female pairs, although the total range of individual males were larger than those of individual females. Two of the three females caputred were pregnant, showing that in western Nepal Terai, *Caprolagus* breeds during January and February. The uniformly small size of the scrotal testes in the males captured suggest the possibility of a monogamous mating pattern in this species (Bell 1987).

A single foetus was found during post mortem inspection of a pregnant female in Nepal. Thorough searches of all females captured at Royal Suklaphanta Wildlife Reserve revealed the presence of only four nipples instead of the six reported by Blanford (1888). However, it is to be ascertained whether the reproductive pattern of *Caprolagus* resembles the altricial pattern of most 'rabbit' species or the precocial pattern found in most *Lepus* species.

The faecal pellets of two sizes collected from nests indicate the presence of two individuals of different sexes or of mother and young.

CONSERVATION PROBLEMS

The tall grassland – Hispids natural habitat, once had an almost continuous distribution along the subhimalayan foot hills from Uttar Pradesh to Assam. Denudation of this forest tract for over hundred years due to increasing irrigation, agro-based industry and sprawling conurbation have brought a sizeable shrinkage in the natural habitat of the species. The resultant changed effects in the environment and biota have greatly reduced its population so that the animal has perforce been restricted to a few scattered pockets only. Habitat destruction due to the practice of planned and unplanned large scale burning of grasslands before monsoon and the collection of tall grasses for thatching in dry season are also considered to be important factors greatly effecting the survival of the species. Moreover, the species has also declined due to indiscriminate killing for the pot. It is subject to easy hunting following burning of the grasses in the pre-monsoon season when the Hispids concentrate in the unburnt areas of the thatches.

CONSERVATION MEASURES TAKEN

The species is entitled to maximum protection under Schedule I of the Indian Wildlife (Protection) Act, 1972 and is also listed under Appendix of CITES. Several attempts to delineate the distribution of *Caprolagus* and to determine the management needs of the species were suggested by many workers (Oliver 1980, 1981; Ghose 1981; Bell 1986, 1987). This is now well protected in Manas, Buxa, Valmiki, Dudwa and Kanha Tiger Reserves, Jaldapara Wildlife Sanctuary and a few sanctuaries in Assam.

ACTIONS RECOMMENDED

In line with the findings of the surveys, and information received from various sources, it is understood that immediate protection measures for the continued survival of the species are needed.

A shift from uncontrolled dry season burning to a system of carefully controlled rotational burning, so that a large areas of suitable habitat (e.g. providing optional cover, food resources, etc.) be available throughout the year, may help to alleivate the immediate risk for the relic populations of the species. In Dudwa Tiger Reserve, there are plans to reduce the present level of controlled burning from an estimated average of 75% available grassland burned per annum to around 60% on a rotational basis. In Jaldapara, the stated objective of rotational burning approx. 33% of grasslands per annum has been frustrated by continued casual burning.

Long term studies on the effects of several disturbance factors (i.e. burning, thatch harvesting, grazing, etc.) operating in the habitat are required, if appropriate long term management plans are to be formulated.

Study on the biology and ecology of the hispid hare in India should be taken up immediately. Except for the wildlife laws and habitat preservation in the sanctuaries and forest reserves, neither anything has been done in our country to save the species from extinction nor are we aware of its biology and ecology (besides imperfect information on food, reproduction, nesting habit, etc.).

Investingations are desireable on whether large variety of insecticides used in the tea gardens in Assam and West Bengal and agricultural fields in Bihar and Uttar Pradesh, play any role in decimation of its population.

Attempt should be made of rearing the species and to study its behaviour in captivity. Up till now all attempts of its rearing in captivity in Attareekhat Tea Estate and in the Forest Department in Assam has failed.

Rufoustailed hare (*Lepus nigricollis ruficaudatus*) in northern India and Pachmari hare (*L. n. malladeva*) in Kanha Tiger Reserve in M.P. are sympatric in distribution with the Hispid hare (*Caprolagus hispidus*). Quantitative and qualitative study, both in field and laboratory, along with systematic comparison of the vegetative matters devoured by each species are necessary to determine the relationship of vegetation with the pattern of sympatry among them.

Survey and monitoring of the population in the recently established pockets of occurrence of the hispids should be undertaken at regular intervals to know the trend of population.

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