

A/10 Rockside  
112, Walkeshwar Rd  
Bombay-6  
4<sup>th</sup> Dec '78

Dear Mr Deb Roy

We arrived from Calcutta last evening after a wonderful holiday. We went to Kohima and Imphal also. At Kaziranga we saw all the animals except a tiger, but that is our luck. I have been to so many sanctuaries but I will always remember Hanes. It is the most beautiful Sanctuary and going down the river in a boat for miles is an experience one rarely gets. You took a lot of trouble to show us everything and it was a pity the weather was so

bad. We hope that ~~some~~ day we will  
come again and you are there to  
take us out! We did not see the  
famous golden langur even in a  
zoo!!

Please remember me to Mr Roy,  
Mr Sharma and Mr Phukan. They  
were very kind and thoughtful and  
gave us such good meals, which  
one does not expect in a jungle.  
The hot parathas for breakfast were  
a treat also the sweets.

My thanks to you all for everything.  
Do look us up when you come to  
Bombay.

With very warm regards

Yours Sincerely  
Puslpa Hidayatullah



B. Venkataramani

महा प्रबन्धक  
पूर्वोत्तर सीमा रेलवे  
मालीगाँव, गौहाटी - 781011

GENERAL MANAGER  
NORTHEAST FRONTIER RAILWAY  
MALIGAON, GAUHATI-781011

D.O.No.BV/Misc/79

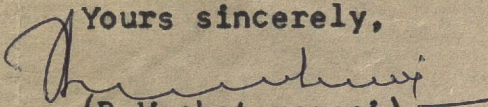
October 29, 1979.

Dear Shri Deb Roy,

While acknowledging receipt of your letter dated 24.10.79, I thank you most sincerely for the very good arrangements made during my stay at Manas Rest House. The staff of the Rest House looked after us well. I would like to convey my special thanks to Shri Choudhury who was detailed to look after us and who explained to us the various projects. We do hope that it will be possible for us to make another trip in January '80 when you are there.

With regards,

Yours sincerely,

  
(B. Venkataramani)

Shri S. Deb Roy, I.F.S.,  
Field Director,  
Project Tiger, Manas,  
Barpeta Road,  
Assam.



UNION INTERNATIONALE POUR LA CONSERVATION DE LA NATURE ET DE SES RESSOURCES  
INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

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CH-1196 Gland - Suisse/Switzerland

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iucnature, Gland

Référence/Reference : JWT/sr/1

Sanjoy Deb Roy  
Field Director  
Project Tiger  
Barpeta Road  
Assam  
India

26 February 1985

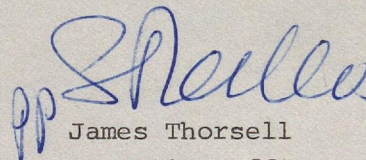
Dear Roy,

It was a pleasure to see you again in your own niche in Manas. My time there was short but intensive and I thank you most sincerely for the programme you had for me. Manas is certainly a reserve of universal significance and we will do all we can to present it to the World Heritage Committee in the most favourable light.

I now await the slides of the reserve plus some from Kaziranga and the management plan. Attached is a brochure on the World Heritage Convention that you can use with the appropriate person in Bhutan, as we discussed.

Thanks again for your hospitality and save a mahseer for my next visit.

Sincerely yours,



James Thorsell  
Executive Officer  
CNPPA

(dictated by Dr. Thorsell  
signed in his absence)

Encl.

Mr. S. Deb Roy, I.F.S.,  
Field Director,  
Tiger Project,  
Barpeta Road.

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P. O. DHUBRI

( ASSAM )

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( ASSAM )

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Telephone: Dhubri 497

Wimco Ltd.  
Amco Road Post Office  
Pin 783323 (Assam)

March 14, 1985.

Dear Mr. Deb Roy,

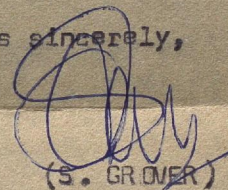
Our Match Division General Manager Mr. Jagjeet Singh is visiting Dhubri next week. He is very keen to make a visit to Manas. I shall be extremely thankful to you if you kindly allow us use of two good rooms at Manas Guest House for one night on Saturday, the 23rd March, 1985.

We propose to reach Manas on 23rd early evening and leave on 24th in the afternoon. Our Sri P.K. San Gupta will be meeting you in this connection for necessary instructions from you. I do hope that it will be possible for you to accommodate us.

Indeed it will be a pleasure for us if you and your family join us for dinner on 23rd night at Manas; alternately if this is not possible, please join us for lunch on Sunday, the 24th. You have been promising me some time back at Manas but somehow it could never materialise and I do hope that this time, you will keep up your word.

With kind regards,

Yours sincerely,



(S. GROVER)

Mr. S. Deb Roy, I.F.S.,  
Field Director,  
Tiger Project,  
Barpeta Road.



CHIEF CONSERVATOR OF FOREST (WL)

ASSAM :: REHABARI

GAUHATI-781 008

Phone ( Off. ) : 27484

Phone ( Res. ) : 26926

D.O. NO. WL/FG. 20/46

Dt. Gauhati, the 10th. April '1985.

From:-

Shri P.C. Das,  
Chief Conservator of Forests,  
Assam, Wildlife,  
G A U H A T I - 781 008

Dear Mr. Shahi,

I have received your letter of 25.3.1985. In the meantime I have filled up the remaining questionnaires & sent these to Shri Roy Choudhury by a letter dated 25.3.85, a copy of which was endorsed to you also.

I am now enclosing herewith the required write-up for the Biogeographic project. The write-up will have to be improved and arranged properly by you and this may kindly be attended to. The report will be incomplete without the proper maps and this will be prepared on receipt of maps from Shri Roy Choudhury, as already called for by me. In the write-up, the emphasis has been on Assam and I did not try elaborate details for the other North Eastern States. The classification indicated by me will cover the states as far as the category of Biotic province is concerned. For Southern Arunachal Pradesh, Nagaland, Manipur and Tripura, I have not attempted classification in-to the Biotic Sub-province and Biomes, as I did not have any opportunity of visit and first hand information on the forests of these States. This may kindly be looked into at your end.

I am having a very busy programme during the 2nd. half of April '85, with some expected visit of Chief Conservator of Forests of another State and in some state-level co-ordination meetings with Police. Probably further



CHIEF CONSERVATOR OF FOREST (WL)

ASSAM :: REHABARI

GAUHATI-781 008

Phone ( Off. ) : 27484

Phone ( Res. ) : 26926

finalisation effort at Gauhati can be taken up in May '85, after the required maps are ready. I will write to you as soon as these are available.

With r e g a r d s,

Sincerely yours,

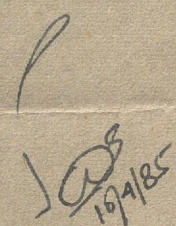
To:-  
Shri S.P.Shahi,  
Rtd.Chief Conservator of Forests,  
(Bihar), P.O.HEHAL,  
Ronchi-834 005  
Bihar.

(P.C.Das),

Copy to Shri P.C.Roy Choudhury, Deputy Director, Wildlife, Eastern Region, Govt. of India, Nizam Palace, 6th Floor 2nd M.S. Building, 234/4 Acharyya J.G. Bose Road, CALCUTTA-700 020 for information and needful.

INDEPENDENT

Copy to Shri S. Deb Roy, Field Director, Manas Tiger Project and Shri P. Lahon, Director, Kaziranga National Park for information. A copy of the write-up is enclosed. They are requested to go through it and add any information that may be deemed to be necessary (particularly regarding endemism and faunal aspects).

  
(P.C.Das),

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John

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NOTES FOR BIOGEOGRAPHIC PROJECT IN ASSAM

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I. THE ZONE

In North-East India, of which Assam is a constituent state, there is a remarkable degree of intimate relationship between topography and geology. This is convenient to adopt the following topographical divisions of the area for descriptive purposes:-

- 1) Eastern Himalayas : Covering the northern & eastern parts of Arunachal Pradesh.
- 2) The Brahmaputra Valley : Confined to Assam.
- 3) Central Assam Hill Range Covering Meghalaya & forming western half of watershed between the two big valleys in Assam.
- 4) The Barak Valley : Confined to Assam.
- 5) The South Eastern Hill Country : Covering parts of Southern Arunachal, Nagaland, Manipur, Mizoram & Tripura. Also intrusions into southern parts of Barak Valley & eastern N. C. Hills.

On a very rough generalisation, it can be stated that the two valleys mentioned above are largely alluvial. The Central Assam Range is mainly Precambrian gneissic complex with a fringe of tertiary rocks on the south & east, the east Himalayan Range include metamorphic rocks with a fringe of tertiary rocks in the south; the remaining area - south-eastern Hill country is composed principally of tertiary rocks.

The Eastern Himalayan hill ranges lying north to the Brahmaputra Valley, curve round from an east-west direction in the western part to a south-west north-east directions in the eastern part. Thence there is a big sweep round the head of the valley to the flank formed by the south-eastern hill country. Extremities of spurs & low hills intruding from these northern mountains occur along the northern fringe of the state.

The Brahmaputra valley proper may be divided into two distinct parts. In lower or western Assam the plains are broken by isolated groups of low hills, which are structurally outlying portion of the Meghalaya metamorphic complex, the surrounding plains having been formed by the alluvial material brought down by the Brahmaputra and its tributaries. In upper or eastern Assam, the extensive plains (Jorhat, Sibsagar, Dibrugarh & Lakhimpur districts) in contrast are entirely devoid of any hillocks. Towards the head and sides of the valley undulating grounds formed by broad gently sloping alluvial 'cones' occur. Low spurs which structurally <sup>are</sup> part of the neighbouring hills formation, intrude into some of the areas in the fringe. Alluvial terraces, of varying heights, representing deposits of different periods are of universal occurrence.

The Central Assam hill range forming the watershed between the Brahmaputra and Barak valleys, is made up of two different formations. The hills of the Meghalayan plateau, Karbi Anglong and plateau country covering western part of North Cachar hills district represent an older formation which has undergone very little tertiary folding. The eastern part of the range is made up of irregular hills of the north-cachar hills district, known as the Barail range, which ultimately joins up with the Naga hills formation. This is composed of very intricate faulted and folded structure, and geologically this is part of the South-eastern hill country of the Zone.

The Barak Valley consists of alluvial plains, swampy flats and low isolated hills and hill ranges. On the north the valley abuts against the foot of the Central Assam hill range, forming an impressive escarpment. To the South of the valley, long spurs of hills project from the Mizo-hills formation and between these are valleys of varying width usually diversified with many low isolated hills & low ranges. The geological strata of the <sup>valley</sup> belong entirely to the newer divisions, the oldest series of the tertiaries being absent from the valley proper.

The South-eastern hill country forming the eastern and south-eastern flanks of Assam cover parts of Southern Arunachal, Nagaland, Manipur, Mizoram and Tripura. Eastern

North Cachar Hills and hill & ranges of Barak Valley are structurally part of this topographical formation. The North Cachar hills and further north-east contain very intricate folded and faulted structures. The Mizo Hills, Western Manipur, Eastern Cachar and Tripura exhibit structure in which the folding is in the form of a series of north-south corrugations. Imphal plains is the only flat ground of substantial extent within this topographical division.

## II ASSAM

The various geomorphological formations found in Assam can be classified as follows:-

- 1) Alluvial flood plains of Brahmaputra river.
- 2) Alluvial plains of the tributaries of Brahmaputra river as well as those of Barak river.
- 3) Higher alluvial terraces formed by coarse detritus washed down from the Himalayan zone.
- 4) Other high alluvial terraces of different hill streams.
- 5) Outlying extensions of hillocks, spurs and valleys of tertiary folded mountain formations.
- 6) Intrusions of pre-cambrian gneissic complex of Meghalayan plateau.

From the point of view of climatic considerations, the following broad regions can be easily recognised :-

- 1) Eastern Assam high & well distributed rainfall zone.
- 2) Heavy seasonal rainfall zone in southern slopes of foothills of sub-Himalayan & Central Assam hill range formations.
- 3) Comparative lesser rainfall zone of Central Assam.
- 4) Barak Valley.
- 5) Rest of the western Assam portion of Brahmaputra valley.

The north-eastern region of India, of which Assam is a part, is one of the richest region in the World from the angle of diversity of both flora and fauna. The area is a meeting ground for Indian, Tibetan and South-east Asian elements.

Actions and interactions of numerous influencing factors (including biotic inter-ferece of men) and various permutations and combinations of the above broad habitat-types, have yielded numerous habitat subtypes, each with its distinctive fauna and flora. As many as 36 broad sub-types of forests (Champion and Seth's - Revised Survey of Forest Types of India) occur in the State, but the number of species (particularly in the consociations) are so bewildering that very often a field-worker is at a loss to assign a particular niche to the formations encountered in the course of his works. The subtypes of the following major groups (Champion & Seth) are found in the State.

- Group 1 - Tropical Wet Evergreen Forests.
- Group 2 - Tropical Semi-evergreen Forests.
- Group 3 - Tropical Moist Deciduous Forests.
- Group 4 - Littoral and Swamp Forests.
- Group 5 - Tropical Dry Deciduous Forests.
- Group 6 - Subtropical Broadleaved Hill Forests.
- Group 9 - Subtropical Pine Forests.

The climax forest formation in Assam - reached through various routes of sub-climax formations - is the type "1B/C2-Upper Assam Valley Tropical Evergreen - Pure Mesua forests."

### III - DISTRIBUTION OF SPECIES AND ECOSYSTEMS

In distribution of species - both flora & fauna - it is found that some of the elements have become localised - owing probably to physical barriers - and do not occur elsewhere in the State.

As described earlier, two large valleys - Brahmaputra and Barak - make up the State of Assam, with the Central Assam Hills Range forming the watershed between the valleys. The difference in the floristic composition of the forests in the two valleys are readily apparent - and this has led to Champion and Seth classifying the evergreen and semi-evergreen formations into different subtypes, specifically assigning subtypes to each of the valleys. In general, it can be stated that Barak Valley contains more of the South-east Asian elements. Of the

two valleys, Brahmaputra is of course much larger, as the river traverses the entire length of the state in the northern part from east to west. Barak, a smaller river, traverses the breadth of the southernmost Cachar and Karimganj districts only. Some of the examples of the floristic differences between the two valleys are:-

- 1) *Gynis shorea* & *Phoebe* : common in Brahmaputra valley, but altogether absent in Barak Valley.
- 2) *Palaequium* sp., : Common in Barak Valley, but  
*Gynostrea polyandra* absent in Brahmaputra Valley.  
*Dipterocarpus turbinatus*

If the Brahmaputra Valley is taken up for examination, three very broad and crude vegetation-type zones are readily apparent - Western or lower Assam Sal Zone, Central Semi-evergreen and mixed deciduous forests zone, Eastern or Upper Assam evergreen zone. Some of the examples of marked degree of endemism in plants are:-

a) Khoir-Sisoo forests (grouped under Tropical Dry deciduous forests by Champion and Seth) - a pioneer formation - occurs only in the north bank (of Brahmaputra) areas and that too from the western boundary of the State eastwards upto Dhansiri river (tri-junction of Bhutan, Assam, Arunachal) approximately.

b) *Shorea robusta* extends to areas on either bank of Brahmaputra river in the western half of the state. The distribution is in more or less continuous stretch in the south-bank upto the north-western end of Karbi Anglong district. But in the north-bank, sal stretches from western boundary to about Aie river - then for a continuous stretch of more than 150 Km. sal is conspicuous by its absence, although the associates of sal are frequently met with. Then it reappears in a few isolated patches in Sonitpur district till it reaches its eastern most global geographical limit.

c) The species *Dipterocarpus macrocarpus* & *Shorea assamica* are confined to South bank (of Brahmaputra) areas of the eastern or Upper Assam evergreen formations. Similarly the species *Mesua assamica* (*Kayea assamica*) is confined to the north-bank areas only of the same Zone.

The watershed region separating the two valleys present some interesting features. It has already been described earlier that western and northern parts of Karbi Anglong district and western part of the North Cachar hills district are structurally extensions of the Meghalayan plateau. The southern and eastern parts of the above two districts are more akin to the folded mountain formations of the south-eastern hill country. The vegetation on both the slopes of these hill ranges reflect<sup>ec</sup> affinities respectively to the vegetation type of Brahmaputra valley in the northern slopes of the watershed and those of the Barak Valley in the southern slopes of the watershed. Higher up, there is apparent differences in the vegetation structure between the eastern part and western parts of the Central Assam hill range. Subtropical broadleaved hill forests (particularly *Quercus - schima*) and Assam subtropical pine savana found in the western half, is entirely absent in the eastern parts. Eastern North Cachar hills, Manipur, Mizoram, Tripura and Hills of Barak Valley contain extensive areas of the secondary bamboo brakes of the single culm bamboo (which does not form clumps) - *Melocanna bambusoides* - & such formations are absent in rest of the zone.

Some of the formations occurring in Assam, particularly of the Moist Mixed Deciduous forests, Semi-evergreen forests and Wet evergreen forests do not exactly fit into the subtypes in the classification of Champion and Seth. It will be too lengthy and elaborate to deal with the various differences here. One of the most important formation (not from the angle of commercial forestry, but from the view of habitat for wildlife) is the Tall-reed<sup>e</sup> swamps with *Salix* sp. as coloniser element found in the alluvial plains of eastern or Upper Assam, and this has been omitted altogether in the classification of Champion & Seth. This formation is being described elsewhere (proposal for Dibru Wildlife Sanctuary) in this paper later on.

Some of the examples of endemism in fauna also in Assam can be cited as below:-

- 1) Rhino - Fairly widespread in Brahmaputra Valley but absent in Barak Valley.
- 2) Golden langur - Confined to north-western part of the state between the rivers Sonkosh & Manas - and in adjoining belt in Bhutan to the north.
- 3) Hoolock Gibbon - Only ape in India. Confined to South bank (of Brahmaputra) areas, Barak Valley, Central Assam Hills. Also in neighbouring South-eastern States, Burma, Shan states etc. Obviously a South-east Asian element which has been unable to negotiate Brahmaputra river and migrate across it.
- 4) Stumptailed Macaque - Confined to fringes of forests bordering folded mountain range forests in the South-bank (of Brahmaputra) in eastern or Upper Assam
- 5) Pigmy Hog - Confined to high alluvial terraces of sub-himalayan zone in western half of the state.
- 6) Hispid Hare

#### IV - BIOGEOGRAPHIC CLASSIFICATION FOR NORTHEAST INDIA.

From what has been detailed above, it will be apparent that in a land of such immense diversities, it is well-nigh impossible to frame a satisfying Biogeographical classification. It will also be apparent that climatic, geomorphological and biotic factors have contributed to the diversities in the zone.

In the Biogeographic classification framed by Wildlife Institute of India, the north-eastern states have been placed in two zones. Most of Arunachal Pradesh has been placed in "Zone 2 - Sino-Himalayan" and the biotic province indicated in "2d - Eastern Himalayas". Rest of the north-east India has been placed in "Zone-8-North-East India" - but the biotic provinces indicated are entirely inadequate to provide a proper classification. From the descriptions furnished earlier, it is easy to realise that there is a close relation between the geomorphology and vegetation types in the zone. Therefore, the following biotic provinces are suggested for the "Zone-8-North East India".

- 8 a - Brahmaputra Valley.
- 8 b - Central Assam Hill Range.
- 8 c - Barak Valley.
- 8 d - The South-Eastern Hill Country.

Even the above broad classification is felt to be inadequate, while dealing with various aspects of the Biogeographic project in Assam. It will be essential to recognise certain subprovinces for a more proper stratification for the Biogeographic project. The following classification is, therefore, proposed for Assam (this may have to be further developed for dealing with other north-east India States).

Biogeographical Zone	Biotic Province	Biotic Subprovince	Biomes
8-North-East India	8a-Brahmaputra Valley	8(a)(i)-Eastern Assam Tropical West Evergreen Region	Subhimalayan High Alluvial Terraces Alluvial Flood plains. Tall reeds-salix swamps. South-bank high alluvial formations. Other Wetlands.
		8(a)(ii) Central Assam Semi-evergreen & mixed-deciduous region	Subhimalayan high alluvial terraces. Highland Savana. Alluvial Flood plains. Wet Savana. South-bank high alluvial terraces. Other wetlands
		8(a)(iii) Western Assam Sal Region	Subhimalayan high alluvial terraces. Sal savana Tropical dry deciduous forests & Bhabar Sal. Heavy Alluvial Sal. Eastern Hill Sal. South-bank high alluvial terraces. Alluvial floodplain. Other wetlands.
	8b-Central Assam Hill Range		Eastern Alluvial Secondary Semi-evergreens. Eastern Moist Mixed Deciduous forests. Northern Subtropical Broad leaved Hill Forests Assam Subtropical Pine Savana. Secondary Bamboo Brakes. Other Wetlands.
	8c-Barak Valley		High Alluvial Terraces. Alluvial Floodplains. Cachar Tropical Evergreen. Cachar Tropical Semievergreens. Secondary Bamboo Brakes. Other Wetlands.

Biogeographical Zone	Biotic Province	Biotic subprovince	Biomes
8d The South-Eastern Hill Country			Tropical Semi-evergreens of both northern Assam & Cachar. Moist Mixed Deciduous formations. Secondary Bamboo Brakes. Wet lands.

V - PROPOSALS.

The proposals detailed vide Questionnaire 4 can be conveniently discussed in the following groups.

A. Extension of existing protected areas. In order to provide viable and integrated habitats, extension of all the areas of existing National Park and Wildlife Sanctuaries in Assam is a arying need. In this group falls the proposals for (1) Addition to Kaziranga N.P (2) Addition to Laokhowa W.L.S. (3) Addition to Manas W.L.S. and upgrading it to National Park (4) Addition to Garampani W.L.S. Out of these the first three areas contain resident population of Rhinos.

B. According protected status to areas containing Rhino population - There<sup>are</sup> a number of areas, where Rhinos are resident in Assam, but these areas have not been accorded adequate legal protected status. These proposals cover - (1) Proposed Orang W.L.S. (2) Proposed Mayang - Pabitora W.L.S. (3) Proposed Desangmubb W.L.S. (4) Proposed Panpur W.L.S. (5) Proposed Kurua W.L.S. All these areas fall in the alluvial flood plains Biome of Brahmaputra valley and some of these (Srl. 2 and 5) contain <sup>w</sup>intercropping hillocks of extensions of Central Assam Hill Range.

C. Covering of representative ecosystems by network of protected areas - The various proposals are mentioned below according to the Biotic Provinces and Sub-provinces the classifications of which have been given earlier.

8(a) - Brahmaputra Valley - (i) Eastern Assam Evergreen Region

1) Proposed Dibru Wildlife Sanctuary - This is the most important proposal for Assam and this need be pushed through on an emergent basis to bring it under protected category, before the area is <sup>s</sup> lot for ever due to onslaught of commercial interests. The <sup>↑</sup> proposal covers about 425 sq.km. in two blocks - separated by a stretch of road and human habitation. The western block is to be composed of Dibru Reserved Forests, Saikhowa Reserved Forests, Rangdoi Unclassed State Forests, aquatic body of a channel of Brahmaputra, revenue deptt. land between an embankment & the river and a riverian island called Kopleng Chapari. The eastern block is to comprise of the Kumsang Reserved Forests, Hahkati Reserved Forests, Mesaki Reserved Forests and revenue deptt. land between an embankment and the river to the north. Some of the striking attributes of this proposed area are:-

— Contain an unique vegetation subtype, which has not been covered by Champion and Seth. Tall Reeds (Phragmites - Arundo - Saccharum <sup>kw</sup> association) swamps dot the area. These formations - both in high ground as well as in waterbodies are capable of hiding two elephants, one put on top of the other. In the marshy areas these reed associations contain a floating mass of roots, decayed vegetation etc. which cannot be negotiated by any animal even the size of a dog or cat. The reed-beds contain open stretches <sup>e</sup> of water, either as <sup>et</sup> enclaves or in its margin - and is ideal for aquatic <sup>birds</sup> and smaller animals <sup>birds</sup> - both for feeding and nesting. Wherever, further successional steps have brought in a little firm <sup>e</sup> soil, pure colonies of salix sp. occur. Other seral stages approximating to 4D/335 are - Dillenia-Bischoffia, Terminalia-Sapium, Kydia-Sapium, Albizia-Aphanomaxis - Dillenia, Bischoffia-Dillenia-Stereospermum-Terminalia associations. Tall-grass in seasonally flooded zone contain Phragmites-Brianthus-Alpinia community. Silted up waterbodies are considerable in extent containing Cynodon-Leersia-Andropogon-Hemarthria etc. communities providing ideal forage for herbivores. Aquatic vegetation in numerous waterbodies are prolific.

- Only area in Assam now to contain the rare and endangered south-east Asian species - whitewinged Woodduck. Last resort for the species.
- Area already contain Wild Buffalo<sup>e</sup>s - an associate species of Rhino. Rhinos migrated to the area in the past, but were shot out. Last known Rhino killed is in the mid-sixties. The area has the same potential - if not better - as that of Kaziranga National Park, and can easily accommodate a large population of Rhinos.
- Large numbers of migratory birds (more than fifty species recorded till now) utilise the area every season. In the light of recent Indo-Soviet convention protection of such wet-lands have become an <sup>e</sup>mergent necessity.
- About two hundred elephants are resident in the area. A further 600-800 elephants migrate annually from Arunachal and across the Brahmaputra river to ~~the~~ utilise the area as their seasonal home-range.

## 2) Proposed Tingkhopani-Namphai Wildlife Sanctuary.

In the extreme north-eastern corner of Assam, this area is very near to the Namdapha Tiger Reserve of Arunachal Pradesh. The vegetation types - 1B/C1-Assam Valley Wet Evergreen Forests and 1B/C2-Upper Assam Valley Tropical Evergreen forests - found in this area - are not represented in any protected area in Assam, and hence it is essential that this area of Reserved Forests be converted into a status of protected category. Area also contains numerous salt-licks favoured both by animals and birds. Formation is undulating due to intrusions<sup>or</sup> of extremities<sup>e</sup> of folded mountains.

3) Proposed Poba Wildlife Sanctuary. Located in high alluvial terrace at the foot of the eastern Himalayas, the area contains sub-Himalayan Secondary wet mixed forests. All the Reserved Forests in this region are under tremendous pressure of encroachments and saving of some pockets for future is immediately necessary. This is the

only forested area <sup>of the region</sup> which has a link with the elephant country of Arunachal and elephant herds use the area from time to time.

4) Proposed Zamzing Wildlife Sanctuary. - Same location as for the preceding proposal, but the area contain large wetlands and highland Savana. It is important from the point of view of migratory birds.

8(a) - Brahmaputra Valley - (ii) Central Assam Semi-evergreen & Deciduous Region

1) Proposed Namōri Wildlife Sanctuary. - Area located in undulating ground at the foothills bordering the eastern Himalayas and form an important catchment <sup>for</sup> from the Bharali river and its tributaries. The area is rich in fauna and besides species like Elephants, Gaur and Cappad langurs, it contain as many as fifteen tigers. Other than Manas, this is the only other safe one known in Assam now, for breeding and thriving of the king of sporting fish - the "Golden Mahseer." The area is contiguous to the Paki Wildlife Sanctuary <sup>of Arunachal</sup> and will provide an excellent complement for the conservation efforts.

2) Proposed Sonai-Rupai Wildlife Sanctuary. This area is also located in a high alluvial terrace abutting on the slopes of the foothills of the eastern Himalayas, and is adjacent to Arunachal. Area contains Tropical semi-evergreen formations, with a few patches of climax pure *Mesquite* <sup>ferrea</sup>. In the past the area was treated as Wildlife Sanctuary (although not legally notified), there was no exploitation of forest produce and it remained more or less undistributed <sup>unexploited</sup>. A number of streams pass through the area, containing wetland grasses and in the past there were some Rhinos also in the area. Even now the area is utilised by herds of elephants. But after 1962 Chinese aggression, five small arms field-firing ranges of the Defence dept. have been allowed to be set up in the area. The area needs to be given a legal protected status by a formal notification.

8(a) - Brahmaputra Valley - (iii) - Western Assam Sal Region.

1) Proposed Ripu-Chirang Wildlife Sanctuary - Lying at the

extreme North-west corner of Assam, the proposed area forms parts of two Reserved Forests - Nip<sup>u</sup> & Chiring. Out of these, the relevant part of the former has already been notified as a Game Reserve. In order of priority, this area is next to the proposed Dibru W.L. Sanctuary described earlier. The area contains Sub-himalayan light alluvial semi-evergreen forests, east Himalayan upper Bhabar Sal, west Himalayan lower Bhabar Sal, west Himalayan moist mixed deciduous forests, sal savans, broken ground wetlands and other associate subtypes. Some of the important attributes of this area are

— It is rich in wildlife containing populations of elephant, tiger, leopard, Lesser Cats, Sambhar, Barking deer, Chital etc. It is also the western limit of the home range of the rare and endangered primate - the 'Golden Langur' and can provide an alternative protected abode for this rare species besides Manas.

— area is already in the buffer zone of the Manas tiger reserve, and with the elevation of protected status to that of an wildlife sanctuary, can serve as a satellite core for Manas.

— The area is also contiguous to 'Buxa' tiger Reserve of West Bengal and conversion to Wildlife Sanctuary is essential for provision of the ultimate 'Manas Buxa' link.

— The formations in the area - particularly Sal forests - are not represented in any other protected area of the State.

3 (b) Central Assam Hill Range

3 (d) - The South Eastern Hill Country.

1) Proposed Barail Wildlife Sanctuary. - The proposal covers two adjacent Reserved Forests - Barail and North-Cacher Hills - lying in the watershed region dividing the Brahmaputra and Barak Valley. Starting from the ridge the area covers part of the Southern Slopes, and it covers two biotic provinces. The western part is an extension of the Meghalayan plateau i.e. the Central Assam Hill Range,

December 14, 1993

Shri Kamal Nath  
Minister of State for Environment & Forests,  
Paryavaran Bhavan,  
C.G.O. Complex, Lodhi Road,  
New Delhi - 110 003.

Dear Kamal Nathji,

I had been bothering you time and again about the happenings at Manas, which has experienced unparalleled vandalism during the past 5 years or so. But it appears to me that nothing has so far been done to improve the situation there. The wildlife/forest authorities have so far failed to establish any semblance of their authority on this Park and in reality the area has virtually turned into a sanctuary for the armed miscreants. The wildlife staff and whatever armed police that is available for protection of Manas is huddled up outside the core area on static duty, leaving the entire Park at the mercy of the militants. The moral of the field staff is at the bottom and leadership seems to be sadly lacking.

Poaching is reported to be the order of the day. The initial thrust of poaching had been borne by the Rhino and reports say that this species is virtually on its way out from Manas. Other species like deer, wild boar and buffalo etc. are also being hunted simultaneously.

But today a friend of mine from Assam informed me over phone that close to 40 tigers have been killed in Manas during the last 3 months or so. This sudden spurt in Tiger poaching, reports my friend, is mainly for the bone trade, which is being utilised by the militants for their questionable objectives. It is also reported that even valuable trees are now being felled in the core area, which means the most important aspect of conservation - the natural habitat is also now being massacred.

I am unable to believe that when the most important mega diversity area of bio-diversity conservation of this country is being abused and raped by a militant group, the government should look on helplessly, be it a political problem or otherwise. If Hazaratal and Kashmir is important to Indians, Manas is also so, and ~~any~~ <sup>may</sup> be even more, in another context and for another reason, which is probably more pertinent to the humanity. I am sure with your dynamism, you will be able to find a way to save Manas, at a point of time when biodiversity conservation is a serious global concern and India hopes to show the way, at least to the developing world. Saving Manas should be, I feel, taken up as a national issue and there should be no holds barred in fighting the problem.

I would again suggest to you to consider posting some army con-

tingents at Manas for practising 'jungle warfare'. Such army groups may train/practice there under the overall supervision of the Field Director. All the wildlife field staff may assist the army men, when they camp inside the Park. Usually such training or practice of the army is for 6 to 8 weeks. So the army units may keep changing, as their period of training finishes. I am positive this will bring out the desired effect.

Posting of armed Police on static duty is of just no use for protecting the wildlife of a National Park. And even when such force was on duty at the Range H.Q. of Banshari, the Range Office was very nearly killed by a group of armed miscreants and the Range office ransacked and looted, without any obstruction. The Bodo movement is gaining fresh momentum, as per press reports and so things don't show any possible signs of improvement in near future. I don't therefore think that without posting the army into Manas, there remains any chance of saving this area and its huge biodiversity. Whatever informations are available from various sources about Manas needs to be verified immediately as there seems to be no official admission or denial about these reports.

With kind regards

Yours sincerely

S. DEB ROY



শিল্প বিকাশ ক্ষেত্ৰত  
কাৰ্যসূচীৰে এক প্ৰশিক্ষণ  
শালা অনুষ্ঠিত হয়। উক্ত  
আৰু কৰ্মশালাত কলিকতাৰ  
ছচাইটি অৱ ইষ্টাৰ্ণ ইণ্ডিয়াৰ  
স্বামী, অৰুন্ধতী বেনাৰ্জী আৰু  
য় ভাগ লয়।

কৰ্মশালাত আৰু প্ৰশিক্ষণ শিবিৰ  
শিক্ষয়িত্ৰীৰ লগতে অক্ষম  
অভিভাৱকৰ বাবেও মুকলি  
হ'ল। ইয়াৰ উপৰি শাৰীৰিক  
সিকভাবে বাধাগ্ৰস্ত ছাত্ৰ-ছাত্ৰীৰ  
মুহুৰ্শ পৰীক্ষা কৰে। পিতৃ-  
মাতৃৰ মৰণেৰে এনে ধৰণৰ  
পৰীক্ষা দিব লাগে তাৰ বিষয়েও  
অনুষ্ঠিত হয়।

যোগ্য যে স্পাচটিক ছচাইটি  
ৰ্ণ ইণ্ডিয়াৰ অন্তৰ্ভুক্ত অনুষ্ঠান  
এই পৰ্য্যন্ত প্ৰতিবন্ধী শিশুৰ  
এক পৰিবেশ সৃষ্টি কৰি  
বিশেষ অৱদান আগবঢ়াইছে।  
লয়ত পানী যোগানৰ বাবে  
মোদন

অন্যান্য চিকিৎসালয়ৰ দৰেই  
অসামৰিক চিকিৎসালয়ো বিভিন্ন  
উপৰিও খোৱাপানী সমস্যাবে  
যোৰহাট পৌৰসভাৰ অন্তৰ্গত  
যোগান আঁচনিসমূহত অনিয়মিত  
যোগান ব্যৱস্থাত চিকিৎসালয়খনৰ  
থকা আবাসিক অঞ্চলত থকা  
কৰ পৰিয়ালসমূহে দীৰ্ঘদিন  
ৰ সমস্যা ভোগ কৰি আহিছে।  
অনিয়মীয়া বিদ্যুৎ সেৱা বাবেই  
লয়খনত পানী যোগান ব্যাহত

প্ৰতি এখন চিকিৎসালয়ত  
য় পানী যোগান নিয়মীয়া কৰাৰ  
ক চিকিৎসালয়খনত থকা সমগ্ৰ  
গান আঁচনিটো নবীকৰণ কৰাৰ  
যোৰহাট জিলা উপায়ুক্তই  
ত পুঁজিৰ পৰা ২ লাখ ৩০  
কা আগবঢ়াইছে। উক্ত ধনেৰে  
লয়খনে বহুতদিন ধৰি ভূগি অহা  
ী সমস্যা আংশিকভাৱে সমাধান  
লৈ যোৰহাটীয়া ৰাইজে আশা  
কৰিছে।

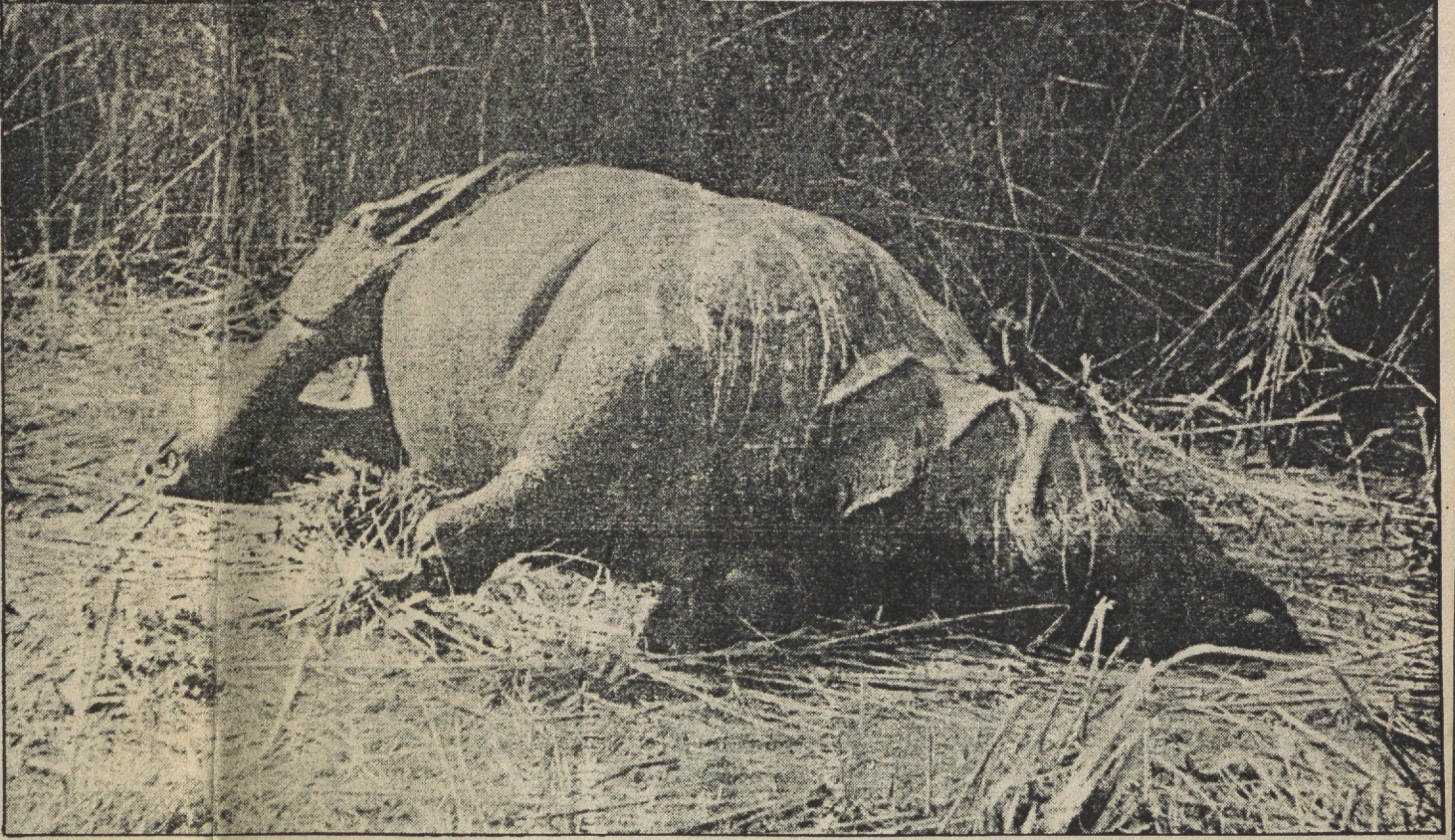
বঞ্চিত কৰি  
ৰিয়া সাৰ



□ প্ৰাকৃতিক সৌন্দৰ্য্যত অনুপম মানাহৰ মঠৰগুৰী

# মানাহ, ইন্দিৰা গান্ধী আৰু ইন্দিৰা কংগ্ৰেছ

ইংৰাজৰ শাসন কালত  
ব্যাপক হাৰত বন্দুক-  
বাৰুদ ব্যৱহাৰ কৰি বনা  
প্ৰাণী বধ কৰা হৈছিল যদিও  
চোৰাংকৈ গছ কটা লোকৰ আৰু  
চোৰাং চিকাৰীৰ অত্যাচাৰত মানাহৰ  
অস্তিত্ব নিঃশেষ হোৱাৰ উপক্ৰম কৰে।  
১৯৫৬ চনলৈ মানাহৰ গছ-গছনি,  
অভয়াৰণ্যত যথেষ্ট গছ কটা আৰু



□ যোৱা তিনিটা বছৰত মানাহ ৰাষ্ট্ৰীয় উদ্যানৰ শতাধিক গঁড় চোৰাং চিকাৰীয়ে হত্যা কৰিছে

উপভোগৰ বাবে এৰাতি মানাহত  
কটোৱাৰ উদ্দেশ্যে মানাহলৈ যায়।  
মানাহৰ গভীৰ অৰণ্যৰ মাজতো ৰাতি  
তেওঁৰ ভালদৰে টোপনি নহ'ল। গছ  
কটা লোকৰ কুঠাৰৰ শব্দই তেওঁক  
আমনি কৰিছিল। ৰাতিপুৱা অনুসন্ধান  
কৰি তেওঁ গম পায় যে অসম  
চৰকাৰে 'খয়ৰ মহল' আৰণ্টন দিয়া  
নীতি অব্যাহত ৰখাৰ সুবিধাতে এচামে  
অভয়াৰণ্যত যথেষ্ট গছ কটা আৰু

মানাহক উক্ত ব্যাপ্ত-যোজনাৰ সামৰি  
মানাহ অভয়াৰণ্যক (৩৯১ বৰ্গ কিঃ  
মিঃ) অন্তঃখল হিছাপে লৈ পশ্চিমে  
ধনশিৰী নদীৰ পৰা পূবে সোণকোষ  
নদীলৈকে সৰ্বমুঠ ২৮৩৭ বৰ্গ কিঃ  
মিঃ সামৰি 'মানাহ-টাইগাৰ-ৰিজাৰ্ভ'  
গঠন কৰা হয়। মানাহৰ প্ৰথম ক্ষেত্ৰ  
সঞ্চালক শ্ৰী সঞ্জয় দেববৰয়,  
বাঁহাবাৰীৰ ৰেঞ্জাৰ শ্ৰী শ্ৰীকান্ত শৰ্মা  
আৰু মানাহ টাইগাৰ ৰিজাৰ্ভত

ইন্দিৰা গান্ধীয়ে ৰক্ষা কৰি থৈ যোৱা  
মানাহ ৰাষ্ট্ৰীয় উদ্যান সৰ্বাঙ্গে ধ্বংস  
কাৰ্য্য চলোৱা দুৰ্ভুক্তিকাৰী সকলৰ প্ৰতি  
আৰু দুৰ্নীতি পৰায়ণ বিষয়াৰ প্ৰতি  
যে উদাৰ নীতি লয় তাৰ বিস্তৃত বৰ্ণনা  
এই কাকততে ধাৰাবাহিক ভাবে  
প্ৰকাশ পাইছে। শেহতীয়াকৈ যোৱা  
আগষ্ট মাহৰ শেষৰ পিনে ভূঞাপাৰা  
বনাঞ্চলিক কাৰ্যালয়ৰ চৌহদত বন্ধা  
অৱস্থাৰ পৰা অপহৰণ কৰি নি  
আনন্দৰ সন্মত প্ৰিন্সপাল দাঁতাল

নহয়। সকলোতকৈ গুৰুত্বপূৰ্ণ কথাটো  
হ'ল ৰাজনৈতিক নেতাৰ প্ৰবোচনাতে  
কুকলুং-পানবাৰী, ভালাগুৰী,  
নাৰায়ণগুৰী অঞ্চলকে ধৰি মানাহৰ  
হাজাৰ হাজাৰ বিঘা মাটি  
বেদখল হৈছে।  
১৯৯০ চনৰ আগলৈ মানাহ টাইগাৰ  
ৰিজাৰ্ভ বেদখল মুক্ত আছিল। আনকি  
স্বৰ্গীয়া গান্ধীয়ে ককিলাবাৰী কেন্দ্ৰীয়  
কৃষি ফাৰ্মক মানাহৰ ক্ষতি হ'ব বুলি

সকলে ইন্দিৰা কংগ্ৰেছী বুলি দিয়া  
পৰিচয়ৰ জহত আধিপত্য বজাই ৰাখি  
আছে,— সেই ইন্দিৰা কংগ্ৰেছী  
সকলে কি স্বৰ্গীয়া ইন্দিৰা গান্ধীৰ  
অৰণ্য আৰু অৰণ্য প্ৰাণী সংৰক্ষণৰ  
আদৰ্শ তিলাৰ্জও অনুসৰণ কৰা নাই।  
যোৱা তিনিটা বছৰত ইন্দিৰা কংগ্ৰেছী  
দলৰ ধ্বজাবাহী অসমৰ হিতেশ্বৰ  
শইকীয়া নেতৃত্বাধীন চৰকাৰখনেই

শ্ৰুগত কৰাইছে; (২) বাট পথত  
চোৰাং কাঠ ধৰ-পাকৰ কৰিলে,  
নেতাই হস্তক্ষেপ কৰি মোকোলাই  
দিয়া নজিৰ প্ৰচুৰ; (৩) ৰেল,  
মটৰকে ধৰি চৰকাৰী পৰিবহন সংস্থা  
সমূহেও অবিশ্বাস্য পৰিমাণে বে-  
আইনী কাঠৰ চালান পঠোৱাৰ  
গুৰিতে যে ৰাজনৈতিক নেতাৰ  
অনুগ্ৰহ সেই কথা কাৰো অবিদিত

আগবতাইছে। উক্ত খন্দেৰে  
নয়খনে বহুতদিন ধৰি ভূগি অহা  
সমস্যা আংশিকভাৱে সমাধান  
লৈ যোৱাটোয়া বাইজে আশা  
কৰিছে।

## বঞ্চিত কৰি

# বিয়া সাৰ য়া হ'ল

কে পুনৰ 'হিন্দুস্থান সাৰ'  
কমিছনৰ ভিত্তিত বিক্ৰীৰ  
য়ে।

মধ্যে অসম চৰকাৰে অসমৰ  
ৰ বাবে অহা উক্ত সাৰ জিলা  
ৰয়া সকলক তেওঁলোকৰ বাবে  
দিত অংশ কৃষিৰ বাবে সাৰ  
সকলৰ যোগেদি (ডিলাৰ  
যোগেদি) সংগ্ৰহ কৰিবলৈ  
দিয়ে। সেই মতে তিনিচুকীয়া  
সাৰ বিতৰক (ডিলাৰ) সকল  
ছেপ্টেম্বৰ তাৰিখে হিন্দুস্থান সাৰ  
গুৱাহাটীৰ কাৰ্যালয়ৰ পৰা  
অনাৰ বাবে যায়। কিন্তু

গাকে কাৰ্যালয়লৈ গৈ আচৰিত  
য আৰ আগদিনা অৰ্থাৎ ৭  
ৰ দিনাই হিন্দুস্থান সাৰ নিগমে  
কছু ডিলাৰক বিক্ৰীৰ বাবে সেই  
দিলে। যিসকল ডিলাৰক সাৰ  
ল সেই সকলে সাৰ বিক্ৰী কৰে  
গিচা সমূহক। প্রকৃততে এইখিনি  
আছিল অসমৰ কৃষিজাত  
ব্যৱহাৰৰ বাবেহে। যিসকল  
এই সাৰ বিক্ৰীৰ বাবে দিয়া  
সেই সকলৰ চালানত এই কথা  
কৰা হোৱা নাই। এনেদৰেই চাহ  
ৰ বৃহৎ মালিক গোষ্ঠীৰ স্বার্থত  
খেতিয়কক বঞ্চিত কৰা হ'ল।  
পৰা মতে তিনিচুকীয়া জিলাত

এনেবোৰ কাৰণতে শস্যৰ  
ন ৬০ শতাংশ কম হ'ব বুলি  
ভাগে ক'ব খোজে।

# আৰু হান্দৰা কংগ্ৰেছ



ইংৰাজৰ শাসন কালত  
ব্যাপক হাৰত বন্দুক-  
বাৰুদ ব্যৱহাৰ কৰি বন্য  
প্ৰাণী বধ কৰা হৈছিল যদিও  
ইংৰাজেই ভূমি, বন আৰু লগতে  
বন্যপ্ৰাণীৰ সংৰক্ষণৰ আইন-কানুন  
প্ৰণয়ন কৰি কঠোৰ বাধা-নিষেধৰ  
মাজেৰে ভাৰতৰ লগতে অসমবো  
অৰণ্য সম্পদ সংৰক্ষণৰ ইতিহাস  
ৰচনা কৰি থৈ গৈছে। অসমত  
সৰ্বপ্ৰথম আধুনিক পদ্ধতিৰ সংৰক্ষণ  
বিধিখন আছিল ১৮৭৯ চনৰ "হাতী  
সংৰক্ষণবিধি"। তাৰ পিছত ক্ৰমে  
১৮৮৭ চনত "বন্যপক্ষী আৰু গেম-  
ফৰেষ্ট সংৰক্ষণ বিধি", ১৮৯১ চনত  
অসম-বন নীতি আৰু ১৯১২ চনত  
"বন্য-পশু-পক্ষী নিৰাপত্তা বিধি"  
প্ৰবৰ্ত্তন কৰে। অসমৰ অন্যান্য  
বনাঞ্চলৰ লগতে বৃটিছ চৰকাৰে  
মানাহ বনাঞ্চলৰ গুৰুত্ব বুজি উক্ত  
অঞ্চলৰ আপুৰুগীয়া বন-সম্পদক  
বিধি সন্মত ৰক্ষণাবেক্ষণ দিয়াৰ  
ব্যৱস্থা কৰে। ১৯০৭ চনৰ পহিলা  
অক্টোবৰত মানাহ বনাঞ্চল গঠন কৰি  
যে-মধ্যে গুলীয়াই বন্যপ্ৰাণী বধ  
কৰাটো নিষিদ্ধ কৰে। ১৯১৭ চনত  
সংৰক্ষিত বনাঞ্চল আৰু ১৯২৮  
চনত মানাহক অভয়াৰণ্য ঘোষণা কৰি  
মানাহৰ আৰণ্যক পৰিবেশৰ নিৰাপত্তা  
ব্যৱস্থা তাহানি বৃটিছৰ দিনতে  
কটকটীয়া কৰিছিল। ভাৰতে স্বাধীনতা  
লাভ কৰাৰ আগলৈ, অৰ্থাৎ ১৯৪৭  
চনলৈ মানাহৰ পৰিবেশ নিকপকপীয়া  
আছিল।

স্বাধীনতা লাভৰ পিছত এটা  
সময়ত মানাহৰ নিৰাপত্তা ব্যৱস্থা  
নিশকটীয়া, দুৰ্বল হোৱাৰ সুযোগতে

চোৰাকৈ গছ কটা লোকৰ আৰু  
চোৰাং চিকাৰীৰ অত্যাচাৰত মানাহৰ  
অস্তিত্ব নিঃশেষ হোৱাৰ উপক্ৰম কৰে।  
১৯৫৬ চনলৈ মানাহৰ গছ-গছনি,  
জীৱ-জন্তুক নিৰাপত্তা প্ৰদানৰ আইন-  
কানুন তথা চৰকাৰৰ কঠোৰ নীতি-  
নিৰ্দেশনা থকা সত্ত্বেও জাতীয়  
চৰকাৰে সেই আইন-কানুন, নীতি-  
নিৰ্দেশনা কাৰ্যকৰীভাৱে প্ৰয়োগ  
কৰাত মনোযোগ দিয়া নাছিল।  
আনপিনে দায়িত্বত থকা বিষয়া-  
কৰ্মচাৰী অধিকাংশই চৰকাৰৰ নীতি-  
নিৰ্দেশনা বিসৰ্জন দি দুৰ্নীতিত লিপ্ত  
হৈ অৰণ্য উৎখাতিত দুৰ্ভুক্তিকাৰীৰ  
লগত হাত মিলোৱাৰ ফলত মানাহ  
অভিয়াৰণ্যৰ অৱস্থা শোচনীয় হৈ  
পৰে। মানাহ অভয়াৰণ্যৰ এনে  
দুৰ্য্যোগৰ সময়ত স্বৰ্গীয়া ইন্দিৰা-গান্ধী  
মানাহত এদিনৰ বাবে বিশ্ৰাম লবলৈ

গৈছিল। ৰাজনৈতিক নেত্ৰী, বা  
ভাৰতৰ প্ৰধানমন্ত্ৰী হিছাপে স্বৰ্গীয়া  
ইন্দিৰা গান্ধী সম্বন্ধে আমি মন্তব্য  
দিবলৈ খোজা নাই। কিন্তু তেওঁ যে  
এগৰাকী প্ৰকৃততে প্ৰকৃতিপ্ৰেমী  
আছিল আৰু তেওঁৰ কাৰণেই যে  
মানাহে কেবাটাও দুৰ্য্যোগপূৰ্ণ সময়ৰ  
হাত এৰাব পাৰিছিল সেই কথা  
আজিৰ প্ৰবন্ধৰ আলোচ্য বিষয়।

১৯৫৬ চনৰ ফেব্ৰুৱাৰী মাহত  
বৰপেটা চহৰত অতি আড়ম্বৰপূৰ্ণকৈ  
অসম প্ৰদেশ কংগ্ৰেছৰ ৰাজনৈতিক  
সম্মিলনী আৰু অসম প্ৰদেশ কংগ্ৰেছ  
মহিলা সম্মিলনী অনুষ্ঠিত হৈছিল।  
স্বৰ্গীয়া গান্ধীক মহিলা সম্মিলনীৰ  
মুকলি সভাৰ সভানেত্ৰী কৰিবলৈ  
আমন্ত্ৰণ কৰি অনা হৈছিল। সেই  
সুযোগতে তেওঁ মানাহৰ সৌন্দৰ্য্য

উপভোগৰ বাবে এৰাতি মানাহত  
কটোৱাৰ উদ্দেশ্যে মানাহলৈ যায়।  
মানাহৰ গভীৰ অৰণ্যৰ মাজতো ৰাতি  
তেওঁৰ ভালদৰে টোপনি নহ'ল। গছ  
কটা লোকৰ কুঠাৰৰ শব্দই তেওঁক  
আমনি কৰিছিল। ৰাতিপুৱা অনুসন্ধান  
কৰি তেওঁ গম পায় যে অসম  
চৰকাৰে 'খয়ৰ মহল' আৰণ্টন দিয়া  
নীতি অব্যাহত ৰখাৰ সুবিধাতে এচামে  
অভয়াৰণ্যত যথেষ্ট-মথেষ্ট গছ কটা আৰু  
বন্যপ্ৰাণী বধ কৰাৰ সুবিধা গ্ৰহণ কৰি  
থাকে। তেতিয়া শ্ৰীমতী গান্ধীৰ হাতত  
ৰাজনৈতিক ক্ষমতা নাই যদিও,  
তেওঁৰ পিতৃ ভাৰতৰ প্ৰধানমন্ত্ৰী,  
স্বৰ্গীয় জৱাহৰলাল নেহৰুৰ  
দুহিতা হিছাপে তেওঁক তেতিয়া  
ৰাজনৈতিক ক্ষেত্ৰৰ সকলোৱে সমীহ  
কৰে। শ্ৰীমতী গান্ধীয়ে মানাহত গছ  
কটাকে ধৰি সকলো প্ৰকাৰৰ মহল  
আৰণ্টন দিয়া বন্ধ কৰিবলৈ অসমৰ  
মুখ্যমন্ত্ৰী স্বৰ্গীয় বিষ্ণুৰাম মেধীলৈ  
অনুৰোধ কৰি লেখা চিঠিৰ মৰ্মে  
অসম চৰকাৰে মানাহত খয়ৰ-মহল  
বা আন মহলৰ আৰণ্টন দিয়া প্ৰথা  
ৰহিত কৰে। কিন্তু তাৰ পিছতো  
মানাহৰ নিৰাপত্তাৰ সন্দৰ্ভত বিশেষ  
কঠোৰতা অবলম্বন কৰা হোৱা নাছিল।  
ফলত মানাহ হৈ পৰিছিল চোৰাং  
চিকাৰীৰ ভূ-স্বৰ্গ। সৌভাগ্যৰ কথা  
আছিল যে ইন্দিৰাগান্ধীয়েভাৰতৰ  
প্ৰধানমন্ত্ৰীৰ দায়িত্ব লোৱাৰ পিছৰ  
পৰাই ভাৰতৰ বন আৰু বন্য-প্ৰাণী  
ৰক্ষাৰ বহুতো অভিলাষী আঁচনি গ্ৰহণ  
কৰে। তাৰ ভিতৰত বিপদাপন্ন হোৱা  
ভাৰতৰ ঢেকীয়াপতীয়া বাঘ (টাইগাৰ)  
ৰক্ষাৰ বাবে লোৱা 'প্ৰজেক্ট-টাইগাৰ'  
কথা উল্লেখযোগ্য। তেতিয়া ভাৰত

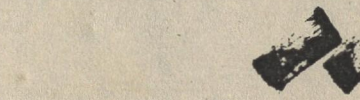
চৰকাৰৰ বন্যপ্ৰাণী পৰিষদৰো  
সভানেত্ৰী শ্ৰীমতী গান্ধী। তেওঁৰ  
উদ্যোগতে ১৯৭৩ চনৰ পহিলা  
এপ্ৰিলত ভাৰতৰ এঘাৰখন বনাঞ্চলক  
অন্তৰ্ভুক্ত কৰি 'প্ৰজেক্ট-টাইগাৰ'  
ঘোষণা কৰে। প্ৰথম পৰ্যায়তে

মানাহক উক্ত ব্যাপ্ত-যোজনাতে সামৰি  
মানাহ অভয়াৰণ্যক (৩৯১ বৰ্গ কিঃ  
মিঃ) অন্তঃখল হিছাপে লৈ পশ্চিমে  
ধনশিৰী নদীৰ পৰা পূবে সোণকোষ  
নদীলৈকে সৰ্বমুঠ ২৮৩৭ বৰ্গ কিঃ  
মিঃ সামৰি 'মানাহ-টাইগাৰ-ৰিজাৰ্ভ'  
গঠন কৰা হয়। মানাহৰ প্ৰথম ক্ষেত্ৰ  
সঞ্চালক শ্ৰী সঞ্জয় দেবৰয়,  
বাঁহাবাৰীৰ ৰেঞ্জাৰ শ্ৰী শ্ৰীকান্ত শৰ্মা  
আৰু মানাহ টাইগাৰ ৰিজাৰ্ভত  
নিয়োজিত সকলো শ্ৰেণীৰ কৰ্মচাৰীয়ে  
আত্মোৎসৰ্গৰ ভাবেৰে আগবঢ়োৱা  
সেৱা আৰু ইন্দিৰা গান্ধীৰ নেতৃত্বত  
কেন্দ্ৰীয় চৰকাৰে যোগোৱা সহায় আৰু  
উৎসাহতে মানাহৰ আৰণ্যক পৰিবেশে  
কম সময়ৰ ভিতৰতে ঠন ধৰি উঠে।  
বিশ্বৰ লুপ্ত হ'ব ওলোৱা আৰু প্ৰথম  
তালিকাভুক্ত ওঠৰ বিধ আপুৰুগীয়া  
বন্য-প্ৰাণীকে প্ৰমুখ্য কৰি মানাহৰ  
বিবিধ বন্য প্ৰাণীৰ পৰ্যোভবে মানাহক  
সম্ভ্ৰান্ত কৰি তোলে।

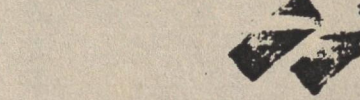
১৯৮১ চনত অসমত বিদেশী  
বিতাৰণৰ দাবীত চলা গণ আন্দোলনৰ  
গুৰুত্বপূৰ্ণ সময়তে কেন্দ্ৰই অতি  
গোপনে অসমৰ লগতে মানাহৰ এক  
বিনাশী আঁচনি প্ৰস্তুত কৰি  
উলিয়াইছিল। কেন্দ্ৰৰ উক্ত আঁচনি  
অনুসৰি মানাহৰ মঠৰগুৰিৰ পৰা  
আৰম্ভ কৰি ভূটান পাহাৰৰ নামনিৰে

যমদুৱাবলৈ আৰু তাৰ পৰা সোণকোষ  
নদীৰে পানী বোৱাই পদ্মা নদীত  
পেলাব পৰাকৈ এটা বৃহৎ বান্ধ  
নিৰ্মাণ কৰাৰ কথা। কামটোৰ বাবে  
গোপনে ব্ৰহ্মপুত্ৰ বান-নিয়ন্ত্ৰণ বিভাগৰ  
পৰা 'আপত্তি নথকা' সম্পৰ্কীয়  
চাৰ্টাফিকেটো সৰ্বকাইছিল। জৰিপ  
কাৰ্য্যৰ বাবে কেন্দ্ৰীয় জল-আয়োগৰ  
দল আহি মঠৰগুৰীত বাহৰ পতাৰ  
পিছতহে কথাটো সদৰি হয়। মুখ্যত  
ভাৰত-বাংলাদেশৰ জনসম্পৰ্কীয়  
বিবাদৰ ওৰ পেলাবলৈ, আৰু  
দ্বিতীয়তে কলিকতা বন্দৰৰ গভীৰতা  
ৰক্ষা কৰিবলৈ অসমৰ পানী শোষণৰ

ইন্দিৰা গান্ধীয়ে ৰক্ষা কৰি থৈ যোৱা  
মানাহ ৰাষ্ট্ৰীয় উদ্যান সৰ্বাঙ্গে ধ্বংস  
কাৰ্য্য চলোৱা দুৰ্ভুক্তিকাৰী সকলৰ প্ৰতি  
আৰু দুৰ্নীতি পৰায়ণ বিষয়াৰ প্ৰতি  
যে উদাৰ নীতি লয় তাৰ বিস্তৃত বৰ্ণনা  
এই কাকততে ধাৰাবাহিক ভাবে  
প্ৰকাশ পাইছে। শেহতীয়কৈ যোৱা  
আগষ্ট মাহৰ শেষৰ পিনে ভূঞাপাৰা  
বনাঞ্চলিক কাৰ্যালয়ৰ চৌহদত বন্ধা  
অৱস্থাৰ পৰা অপহৰণ কৰি নি  
মানাহৰ অন্যতম বিভাগীয় দঁতাল-



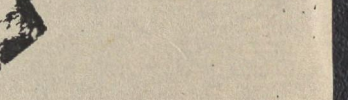
## শ্ৰীমতী গান্ধীয়ে মানাহত গছ কটাকে ধৰি সকলো প্ৰকাৰৰ মহল আৰণ্টন দিয়া বন্ধ কৰিবলৈ অসমৰ মুখ্যমন্ত্ৰী স্বৰ্গীয় বিষ্ণুৰাম মেধীলৈ অনুৰোধ কৰি লেখা চিঠিৰ মৰ্মে অসম চৰকাৰে মানাহত খয়ৰ-মহল বা আন মহলৰ আৰণ্টন দিয়া প্ৰথা ৰহিত কৰে।



হাতী বীৰ সিঙক গুলীয়াই হত্যা কৰি  
দুৰ্বৃত্তই তাৰ দাঁত দুটা কাটি নিয়াৰ  
কেবাদিন পিছতহে মানাহৰ বিভাগীয়  
লোকে সন্তোষ পায়। মানাহ কৰ্তৃপক্ষৰ  
লজ্জাজনক ব্যৰ্থতাৰ এই ঘটনাটোৱে  
মানাহত বনবীয়া প্ৰাণীক নিৰাপত্তা  
দিয়া কথা বাদেই বিভাগীয় প্ৰশিক্ষণ  
প্ৰাপ্ত জন্তু আৰু পহৰাদাৰ সৰু সৰু  
কৰ্মচাৰী সকলকো নিৰাপত্তা যে দিব  
পৰা নাই সেই কথা স্পষ্ট হৈছে।  
আমি আগতেই দৃঢ়তাৰে লিখিছো যে  
হাতীৰ 'ক'ৰিড'ৰ মানাহ টাইগাৰ  
ৰিজাৰ্ভত 'চাৰিল'কৈ ধৰি সৰু-ডাঙৰ  
সকলোবোৰ দঁতাল হাতীক বধ কৰি  
দাঁতবোৰ লুটিছে। গোষ্ঠীগত সংঘৰ্ষৰ  
পূৰ্বে এই কাকততে বাতৰি প্ৰকাশ  
পাইছিল যে এশৰ পৰা সংখ্যা টুটি

নহয়। সকলোতকৈ গুৰুত্বপূৰ্ণ কথাটো  
হ'ল ৰাজনৈতিক নেতাৰ প্ৰবেচনাতে  
কুকলুং-পানবাৰী, ভালাগুৰী,  
নাৰায়ণগুৰী অঞ্চলকে ধৰি মানাহৰ  
হাজাৰ হাজাৰ বিঘা মাটি  
বেদখল হৈছে।

১৯৯০ চনৰ আগলৈ মানাহ টাইগাৰ  
ৰিজাৰ্ভ বেদখল মুক্ত আছিল। আনকি  
স্বৰ্গীয়া গান্ধীয়ে ককিলাবাৰী কেন্দ্ৰীয়  
কৃষি ফাৰ্মক মানাহৰ ক্ষতি হ'ব বুলি



পূৰ্বৰ সিদ্ধান্ত অনুসৰি সমুদায় মাটি  
এৰি দিব নুখজিলে। যি সকলে  
এনেকৈ অবঞ্চিত লোকক মানাহত  
বেদখল কৰিবলৈ, জীৱ-জন্তুৰ বিনাশ  
ঘটিবলৈ আৰু মূল্যবান গছ-গছনি  
তহিলং কৰিবলৈ এৰি দিছে, সেই  
সকল ক্ষমতাৰ গাদীত থকা লোকে  
গুৱাহাটী-দিছপুৰত বন্যপ্ৰাণী সপ্তাহ  
পালন কৰি 'ইন্দিৰা গান্ধীৰ আদৰ্শক'  
উপলুঙা কৰা দেখি ইন্দিৰা গান্ধীৰ  
আত্মাই তেওঁলোকক শাও দিব নে  
আশীৰ্বাদ দিব, কব নোৱাৰো।

শব্দ

ব

হ'নজনা কথা জানিবলৈ  
হ' কবিলে আৰু লগে লগে  
আশা প্ৰকাশ কবিলে যে  
চিন মোকাম নাইকিয়া হৈ  
টত জয়ন্তীৰ উপলক্ষতে  
গ্ৰন্থ হ'ব। বাস্তৱ্যটৰ  
খৰ মৰ্যাদা বক্ষাব বহু কথা  
লিখি কবি গুৰুত্ব প্ৰদান  
হ'ব।

খান দূশ বহুৰীয়া জয়ন্তীৰ  
হৈ পৰাত আৰু কোনো  
ক প্ৰস্তুতিৰ দৰে উখল-  
এতিয়া পুনৰাবৃত্তি নঘটাত  
বহুটত দূশ বহুৰীয়া জয়ন্তী  
হ'বনে সেয়াও এতিয়া  
পৰিল।

তিয়াও সময় অতীত হোৱা  
লা প্ৰশাসনে এতিয়া  
ক হ'লেও যোৰহাটৰ  
য়টোৰ প্ৰতি দৃষ্টি ৰাখি দূশ  
কী উদ্যাপনৰ বিষয়টোও  
প্ৰয়োজন।

**কৰ্মশালা—** যোৰহাটৰ  
অৱস্থিত 'প্ৰেৰণা' নামৰ  
শিশু বিকাশ কেন্দ্ৰত  
কাৰ্য্যসূচীৰে এক প্ৰশিক্ষণ  
শালা অনুষ্ঠিত হয়। উক্ত  
কৰ্মশালাত কলিকতাৰ  
হুচাইটি অৱ ইষ্টাৰ্ণ ইণ্ডিয়া'ৰ  
নী, অৰুন্ধতী বেনাজী আৰু  
ভাগ লয়।

শালাত আৰু প্ৰশিক্ষণ শিবিৰ  
ক্ষয়িত্ৰীৰ লগতে অক্ষম  
অভিভাৱকৰ বাবেও মুকলি  
ল। ইয়াৰ উপৰি শাৰীৰিক  
নকভাবে বাধাগ্ৰস্ত ছাত্ৰ-ছাত্ৰীৰ  
হ' দিশ পৰীক্ষা কৰে। পিতৃ-  
বত কেনেকৈ এনে ধৰণৰ  
কা দিব লাগে তাৰ বিষয়েও  
অনুষ্ঠিত হয়।

যাগ্য যে স্পাচটিক হুচাইটি  
ইণ্ডিয়াৰ অন্তৰ্ভুক্ত অনুষ্ঠান  
ই প্ৰাৰ্থনা প্ৰতিস্থাপিত

বি • বি • ধ



□ প্ৰাকৃতিক সৌন্দৰ্য্যত অনুপম মানাহৰ মঠৰগুৰী

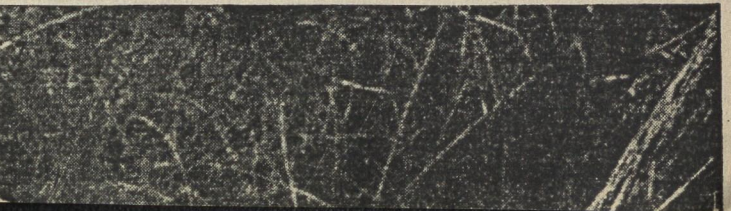
উক্ত আঁচনিৰ ফলত মানাহ টাইগাৰ  
বিজাৰ্ভৰ পৰিবেশৰো যে বিনাশ ঘটিব  
সেই সম্বন্ধে প্ৰধানমন্ত্ৰী শ্ৰীমতী গান্ধীৰ  
দৃষ্টিগোচৰ কৰাত তেওঁ ক্ষেত্ৰ সঞ্চালক  
শ্ৰী দেববৰয়ক দিল্লীলৈ মাতি পঠায়  
আৰু ভাৰতৰ বন্য প্ৰাণী পৰিষদৰ  
জৰুৰী সভা পাতি বিষয়টো আলোচনা  
কৰে। উক্ত 'বান্ধ' নিৰ্মাণৰ আঁচনি  
কাৰ্য্যকৰি কৰা হ'লে মানাহৰ যে ক্ষতি  
হ'ব সেই কথাত পতিয়ন গৈ শ্ৰীমতী  
গান্ধীয়ে অসমৰ নদী সমূহৰ পানী  
তেনেকৈ ওপৰে ওপৰে নিয়া  
সম্পৰ্কত পুনৰ পৰীক্ষা-নিৰীক্ষা কৰাৰ  
বাবে বন্য প্ৰাণী বিশেষজ্ঞকো সদস্য  
ৰাখি এখনি পৰ্যালোচনা সমিতি গঠন  
কৰি কেন্দ্ৰৰ সেই আঁচনি শ্ৰীমতী  
গান্ধীয়ে তেনেকৈ গাপ দি নৰখা  
হ'লে, মানাহৰ কি যে সৰ্বনাশ  
হ'লহেঁতেন সেই কথা ভাবিবই  
নোৱাৰি। মানাহে ১৯৮৭ চনলৈ দ্ৰুত  
গতিত উন্নত ৰূপ লৈ আন্তৰ্জাতিক  
মৰ্য্যাদা লাভ কৰিবলৈ সমৰ্থ হয়।  
১৯৮৭ চনত মানাহ অভয়াৰণ্যৰ  
নাম 'ৱৰ্ল্ড হেৰিটেজ চাইট'ত  
অন্তৰ্ভুক্ত হোৱাৰ লগে লগে বিশ্বত  
অসমৰো সুখ্যাতি বাঢ়ে।

**দু**খৰ কথা যি গৰাকী মহান  
নেত্ৰীৰ নাম আগত ৰাখি  
আজিৰ শাসকীয় কংগ্ৰেছী  
সকলে ইন্দিৰা কংগ্ৰেছী বুলি দিয়া  
পৰিচয়ৰ জহত আধিপত্য বজাই ৰাখি  
আছে,— সেই ইন্দিৰা কংগ্ৰেছী  
সকলে কি স্বৰ্গীয়া ইন্দিৰা গান্ধীৰ  
অৰণ্য আৰু অৰণ্য প্ৰাণী সংৰক্ষণৰ  
আদৰ্শ তিলাৰ্দ্ধও অনুসৰণ কৰা নাই।  
যোৱা তিনিটা বছৰত ইন্দিৰা কংগ্ৰেছী  
দলৰ ধ্বজাবাহী অসমৰ হিতেশ্বৰ  
শইকীয়া নেতৃত্বাধীন চৰকাৰখনেই

মানাহত যোৱা জুলাইত মাত্ৰ দুটা গঁড়  
কোনোমতে বৰ্ত্তি আছিল। সেই দুটা  
এতিয়ালৈ বাচি আছে বুলি মনে  
নধৰে। ইতিমধ্যে দল হৰিণ, ফুটুকী  
হৰিণকে ধৰি মানাহৰ আপুৰুগীয়া  
বিবিধ জীৱ-জন্তু সম্পূৰ্ণৰূপে লুপ্ত  
হোৱাৰ উপক্ৰম কৰিছে। বিশ্বৰ  
ভিতৰত বৈশিষ্ট্যপূৰ্ণ বুলি প্ৰাণীবিদে  
মন্তব্য কৰা মানাহৰ বনৰীয়া মই আৰু  
মেথনেও ৰক্ষা পোৱা নাই। মানাহৰ  
বিস্তীৰ্ণ এলেকাৰ গছ কাটি বনভূমি

উদং কৰিছে। পুলি-পোখাই খয়ৰ গছ  
কাটি খাস্তাং কৰিছে। ইন্দিৰা গান্ধীৰ  
সদিচ্ছাৰ ফলত সুস্থ পৰিবেশ গঢ়ি  
উঠা মানাহৰ এনেকৈ ঘটোৱা  
অভূতপূৰ্ব ধ্বংস কাৰ্য্যত বৰ্তমান  
শাসকীয় ইন্দিৰা কংগ্ৰেছ দলৰ হাত  
থকা বুলি আমি কবলৈ বাধ্য হৈছো  
এই কাৰণতে যে,— (১) যোৱা  
তিনিটা বছতে শ্ৰী শইকীয়া মন্ত্ৰীসভাৰ  
দিনত মানাহৰ ধ্বংস কাৰ্য্যৰ কথা  
পুংখানুপুংখভাবে বাতৰি কাকত,  
আলোচনীত প্ৰকাশ পোৱাৰ পিছতো

চৰকাৰখনে সামান্যও অনুকম্পা  
প্ৰকাশ কৰা নাই। বিভাগীয় অভিযুক্ত  
বিষয়াৰ বিভাগীয় বদলিৰ নিৰ্দেশ  
ৰাজনৈতিক প্ৰভাৱেৰে কং-ই নেতাই  
স্থগিত কৰাইছে; (২) বাট পথত  
চোৰাং কাঠ ধৰ-পাকৰ কৰিলে,  
নেতাই হস্তক্ষেপ কৰি মোকোলাই  
দিয়া নজিৰ প্ৰচুৰ; (৩) বেল,  
মটৰকে ধৰি চৰকাৰী পৰিবহন সংস্থা  
সমূহেও অবিস্থাস্য পৰিমাণে বে-  
আইনী কাঠৰ চালান পঠোৱাৰ  
গুৰিতে যে ৰাজনৈতিক নেতাৰ  
অনুগ্ৰহ সেই কথা কাৰো অবিদিত





WWF

World Wide Fund For Nature-India

विश्व प्रकृति निधि, भारत

WWF - INDIA  
Secretariat (Delhi)  
P. O. Box 3058  
172-B, Lodi Estate  
New Delhi - 110 003

20 September 1994  
CON/NCC/36-B

Dear Mr. Deb Roy,

Sub : National Conservation Congress (NCC)

In 1994, WWF India completes 25 years of service to the cause of promoting harmony between humankind and nature. The finale to the anniversary celebrations in November 1994 will be the first WWF India National Conservation Congress. This forum will discuss critical environmental issues facing the country today with particular reference to WWF India's Mission and Programmes.

The National Conservation Congress of WWF India will be held in New Delhi during 21-23 November 1994. The programme of the Congress has now been nearly finalised, and we shall shortly be sending you the details in this regard. Four concurrent seminars on "Biodiversity Conservation", "Education and Awareness", "Population, Development and Environment", and "Industry and Environment" will be held during the Congress starting at 4 pm on 21 November 1994 at the Ashok Hotel, New Delhi.

The Biodiversity Seminar will be divided into four concurrent sub-groups on 22 November 1994 to discuss issues relating to NGO Support Programmes, Local Community Participation Efforts, Information Needs, and the National Biodiversity Alliance. We would request you to deliver a talk of 15 minutes on the "Manas National Park" during the deliberations of the sub-group on the National Biodiversity Alliance. We have selected this topic to highlight the priority action points identified for the protection and biodiversity conservation of the Manas National Park.

We also propose to bring out Proceedings of the Congress that would include the papers presented during various sessions. As the time available for the presentations is rather limited, details of the topic could be covered in the paper. I would, therefore, request you to also prepare a paper on the subject for publication in the Proceedings. In the meanwhile, kindly send us the abstract of your paper so that we have a fair indication of the issues to be covered during your talk.

Contd....2

TRUSTEES

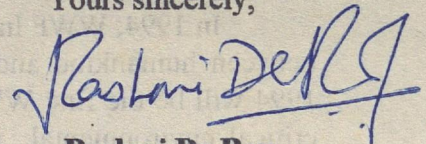
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Dr Ashok Khosla  
Dr Amrita Patel  
Mr S.S. Ramachandra Raja  
Mr G.M.S. Mann

Lt Gen Baljit Singh, AVSM, VSM (Retd)  
Dr Dhrubajyoti Ghosh  
Mr D.M. Sukthankar  
Mr R. Rajamani  
Justice Leila Seth  
Mr A.K. Mahindra

I look forward to your early response.

With regards,

Yours sincerely,



**Rashmi De Roy**  
Bio-diversity Seminar Coordinator

**Mr. S. Deb Roy**  
**24/4 Type V**  
**Lodi Complex**  
**New Delhi 110 003**

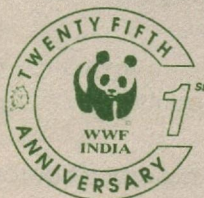


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INDIA

FIRST WWF-INDIA  
NATIONAL CONSERVATION  
CONGRESS

21-23 November, 1994

New Delhi



NATIONAL  
CONSERVATION  
CONGRESS



FIRST ANNOUNCEMENT

## About WWF-India

The World Wide Fund for Nature-India (WWF-India), formerly known as the World Wildlife Fund-India, was established in 1969 as a charitable trust under the Bombay Public Trusts Act of 1950. Today, WWF-India is a premier conservation NGO of the country with a network of State and Divisional Offices spread across the country. Its Secretariat is in New Delhi. The organisation is part of the WWF family worldwide, consisting of 28 National Organisations. A coordinating International Secretariat, the WWF-International, is located at Gland in Switzerland.

Over the years, WWF-India's perspective has broadened — from protecting particular species of wild fauna to encompass conservation of habitats and eco-systems and nature conservation and environmental protection in general.

In 1989, the WWF family worldwide articulated a new Mission and Strategy statement in recognition of the increased complexity of the contemporary conservation challenges facing the world. WWF-India adopted and broadened this Mission statement to suit India's specific ecological and socio-cultural circumstances.

### THE MISSION STATEMENT

**"The promotion of nature conservation and environmental protection as the basis for sustainable and equitable development."**

WWF-India has five broad programme areas, which together address the goal of "ecologically sustainable development."

- Promoting India's ecological security
- Conserving biological diversity
- Ensuring sustainable use of the natural resource base
- Minimizing pollution and wasteful consumption
- Promoting sustainable lifestyles

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**FIRST WWF - INDIA**  
**NATIONAL CONSERVATION CONGRESS**  
**1994**

**Objectives**

The main purpose of the Congress is to provide a forum for all those concerned to deliberate on the environmental situation in the country and the conservation programme of WWF-India in relation to its Mission. It would also take up critical issues like Population, Education and Awareness, and the Role of Industry, which by their very nature impinge on the area of "ecologically sustainable development." This will enable WWF-India to develop its priorities for the next decade and give it a strong sense of direction.

WWF-India is holding its first National Conservation Congress on 21-23 November, 1994, in its 25th anniversary year, as a major event. It will mean the involvement of all agencies and individuals who are seriously concerned with conservation. Besides the benefit to WWF-India and other conservation agencies, the event is likely to attract substantial media attention, and thereby bring to the forefront the issues which require urgent public debate.

**Programme**

The Congress will be inaugurated by the President of India and the valedictory function will be addressed by HRH Prince Philip, President, WWF-International.

The main themes to be addressed during the Congress are:

- Biodiversity Conservation
- Education and Awareness
- Population, Development and Environment
- Industry and Environment

Also scheduled for the occasion is the formal dedication of the IGCMC (Indira Gandhi Conservation Monitoring Centre), to be developed as a national data centre and facility on the biological diversity of India.

## Participation

**Participation will be by invitation.** About 500 delegates from India and overseas are expected. They will represent a wide cross-section of persons concerned with environmental protection and nature conservation. Besides WWF-India Trustees (past and present), officials and eminent conservationists, representatives of political parties, industry, trade unions, the farming community, scientists, educationists, research institutions, NGOs, government agencies and departments are expected to attend.

## VENUE AND DATE

*Ashok Hotel, New Delhi*

- ~~INDIA HABITAT CENTRE (conference facility)  
Lodi Estate, New Delhi - 110 003~~
  
- 21, 22, 23 November, 1994

**For more information please contact:**

**Secretary General / Coordinator (NCC)**

**WWF-India Secretariat, 172-B, Lodi Estate,  
New Delhi-110003**

**Phones: 4691761, 4616532, 4691762  
4691770, 4691764, 4693744**

**Fax: 91(11)4626837**



ARIN GHOSH

DIRECTOR, PROJECT TIGER

*By hand*

भारत सरकार

पर्यावरण एवं वन मंत्रालय

GOVERNMENT OF INDIA  
MINISTRY OF ENVIRONMENT & FORESTS  
ANNEXE NO. 5, BIKANER HOUSE,  
SHAH JAHAN ROAD, NEW DELHI-110011

तार:

Telegram: PARYAVARAN, NEW DELHI

दूरभाष:

Telephone: 384428

टेलिक्स:

Telex: W-66185 DOE IN FAX: 4360678

D.O.No. 1(20)-2/94-PT(Pt.) dated, the 12th Jan., 1995

Dear Shri Deb Roy,

Kindly refer to the letter of the M.E.F. NO. 1-19/93-PT regarding monitoring and updating of information about Manas for information of UNESCO.

An early action is requested.

Regards,

Yours sincerely,

(ARIN GHOSH)

Shri S. Deb Roy  
Member,  
Steering Committee, Project Tiger,  
Type V, B-4/24,  
Lodi Road Complex,  
New Delhi.

INDIA - Assam

NAME Manas Sanctuary

IUCN MANAGEMENT CATEGORY IV (Managed Nature Reserve)  
X (World Heritage Site; Criteria ii, iii, iv)

BIOGEOGRAPHICAL PROVINCE 4.09.01 (Burma Monsoon Forest)

GEOGRAPHICAL LOCATION The sanctuary lies in the districts of Barpeta and Kokrajhar, 41km north of Barpeta Road township. It spans the Manas River and is bounded to the north by the international border with Bhutan, to the south by the populated regions of North Kamrup and to the east and west by forest reserves. The sanctuary, which includes part of Manas Reserve Forest and all of North Kamrup Reserve Forest, constitutes the core of Manas Tiger Reserve which lies in the forest divisions of Kachugaon, Haltugaon, Western Assam Wildlife and North Kamrup. 26°37'-26°50'N, 90°45'-91°15'E

DATE AND HISTORY OF ESTABLISHMENT Manas (previously also known as North Kamrup) was declared a sanctuary on 1 October 1928, parts of it having been notified as reserved forests in 1907 and 1927. It was established as the core of the Manas Tiger Reserve with effect from April 1973. Designated a World Heritage site in December 1985. Upgrading of the sanctuary to national park status is being considered (Deb Roy, n.d.).

AREA The sanctuary comprises 39,100ha of the 283,712ha Manas Tiger Reserve. In 1971, 809ha from the sanctuary was allocated for a seed farm. Manas Sanctuary is contiguous with Royal Manas National Park (65,800ha) in Bhutan.

LAND TENURE State

ALTITUDE Ranges from 40m to 150m (Deb Roy, n.d.).

PHYSICAL FEATURES Lying in the foothills of the Outer Himalaya, the area is low-lying and flat. The Manas River flows through the western portion of the sanctuary, where it splits into three separate rivers, and joins the Brahmaputra some 64km further south. These and other rivers running through the tiger reserve carry an enormous amount of silt and rock debris from the foothills, resulting from the heavy rainfall, fragile nature of the rock and steep gradients of the catchments. This leads to the formation of alluvial terraces, comprising deep layers of deposited rock and detritus overlain with sand and soil of varying depth, shifting river channels and swamps. The northern portion is represented by the 'Bhabar' formation, which is very

13

porous due to the deep deposits of coarse detritus overlain by sandy loam and then a thin layer of humus. The 'Terai' tract in the south consists of fine alluvial deposits with underlying pans. Here, the water table lies very near to the surface. The area of the Boki basin, in the west of the sanctuary, is sometimes inundated during the monsoon but never for very long due to the sloping relief. Mortality to wildlife is negligible as animals are able to stake refuge on islands of high ground (Anon., 1974; Deb Roy, n.d.).

**CLIMATE** The climate is warm and humid (up to 76% relative humidity) with most rain falling during the monsoon season (May-September). The mean maximum summer temperature is 37°C and the mean minimum winter temperature is 11°C. Mean annual rainfall ranges from 3332mm at Batabari to 4489mm at Kachugaon, based on 11 and 17 years of records, respectively (Anon., 1974; Deb Roy, n.d.).

**VEGETATION** The three main types of vegetation are:- (a) Tropical semi-evergreen forests in the northern part of sanctuary, with common trees including Aphanamixis polystachya, Anthocephalus chinensis, Syzygium cumini, S. formosum, S. oblatum, Bauhinia purpurea, Mallotus philippensis, Cinnamomum tamala, Actinodaphne obvata; (b) tropical moist and dry deciduous forests (the most common type), characterised by trees such as Bombax ceiba, Sterculia villosa, Dillenia indica, D. pentagyna, Careya arborea, Lagerstroemia parviflora, L. speciosa, Terminalia bellirica, T. chebula, Trewia polycarpa, Gmelina arborea, Oroxylum indicum, Bridelia spp.; and (c) extensive alluvial grasslands in the western part of the sanctuary, comprising many different grass species together with a variety of tree and shrub species (e.g. Dillenia pentagyna, Phyllanthus emblica, Bombax ceiba, and species of Clerodendrum, Leea, Grewia, Premna and Mussaenda). The grasslands can be subdivided into wet alluvial and highland savanna types. There is also a considerable variety of aquatic flora along river banks and in the numerous pools (Jain and Sastry, 1983). Dry deciduous forests represent early stages in succession and are replaced by moist deciduous forests away from water courses, which, in turn, are succeeded by tropical semi-evergreen climax forest. Grasslands cover about 50% of the sanctuary. Some 393 species of dicotyledons, including 197 trees, and 98 species of monocotyledons have been identified (Jain and Hajra, 1975; S. Deb. Roy, pers. comm.).

**FAUNA** A total of 55 mammals, 36 reptiles and 3 amphibians has been recorded (Project Tiger, n.d.). Manas harbours by far the greatest number (21) of India's Schedule I mammals of any protected area in the country. Many are typical of South-east Asian rain forest and have their westernmost distribution here. Mammals include golden langur Presbytis geei (R), a recently discovered endemic restricted to Manas and adjoining areas in Bhutan and numbering approximately 305 in 1980, capped langur P.

50 =  
14 35

pileata, Hoolock gibbon Hylobates hoolock, clouded leopard Neofelis nebulosa (V), tiger Panthera tigris (E), second largest population in India with 123 recorded in 1984, leopard P. pardus (V), golden cat Felis temmincki (I), fishing cat F. viverrinus, leopard cat F. bengalensis, marbled cat F. marmorata (I), binturong Arctictis binturong, sloth bear Melursus ursinus (I), wild dog Cuon alpinus (V), Ganges dolphin Platanista gangetica, Indian elephant Elephas maximus (E), with up to 2,000 in the tiger reserve and more than 1,000 moving freely between Indian and Bhutan Manas reserves, Indian rhinoceros Rhinoceros unicornis (E), with about 75 individuals in 1980, pygmy hog Sus salvanius (E), swamp deer C. duvauceli (V), sambar Cervus unicolor, hog deer C. porcinus, Indian muntjac Muntiacus muntjak, water buffalo Bubalus arnee (V), probably representing the only pure strain of this species in India, gaur Bos gaurus (V), giant squirrel Ratufa indica, hispid hare Caprolagus hispidus (E) and Indian pangolin Manis crassicaudata.

Over 300 species of birds have been recorded including the threatened Bengal florican Houbaropsis bengalensis (E), great pied hornbill Buceros bicornis, wreathed hornbill Rhyticeros undulatus and other hornbills. The Bengal florican population was estimated at 34 for the whole tiger reserve in 1984 (Ali *et al.*, 1985) and 24 male territories were identified within the wildlife sanctuary during 1988 (Narayan *et al.*, 1989). Pied harrier Circus melanoleucos nested during 1988 and 1989, the first confirmed record for India (Narayan *et al.*, 1989). Uncommon waterfowl species include spot-billed pelican Pelecanus philippinensis, lesser adjutant stork Leptoptilos javanicus and greater adjutant stork L. dubius (Scott, 1989).

Reptiles include a variety of snakes (e.g. vine snake Ahaetulla nasutas, flying snake Chrysopelea ornata, Assam trinket snake Elaphe frenata and banded krait Banqarus fasciatus), gharial Gavialis gangeticus (E) (possibly introduced from neighbouring Bhutan or as a result of a captive breeding programme), and monitor lizard Varanus sp. Assam roofed turtle Kachuga sylhetensis (K) has recently been recorded (Sarma, 1988).

**CULTURAL HERITAGE** Manas takes its name after the Goddess Manasa. The surrounding area is inhabited predominantly by tribal people (Deb Roy, n.d.).

**LOCAL HUMAN POPULATION** There is one forest village in the south-east of the sanctuary, which it is proposed to dereserve and enlist as a revenue village along with other contiguous revenue villages (Deb Roy, n.d.). Some 54,000 people are distributed among 144 villages in the buffer zone of the tiger reserve (Anon., 1974); no relocation of these villages is contemplated (Deb Roy, n.d.).

**VISITORS AND VISITOR FACILITIES** A forest bungalow at Mothanguri,

within the sanctuary, provides dormitory style accommodation for 48 persons. A number of rest houses and camp sites are also available. The Tourist Department of Assam conducts tours, including boat trips down the river and elephant rides. Angling is permitted. Foreign visitors need a special permit to enter the sanctuary. Some 32,860 people visited the area in 1983-1984.

**SCIENTIFIC RESEARCH AND FACILITIES** The vegetation has been surveyed by the Botanical Survey of India (Jain and Hajra, 1975). Censuses of tiger and elephant populations are regularly undertaken by Project Tiger. The status of Bengal florican was investigated in May 1984 (Ali *et al.*, 1985). Students have received lectures on the behaviour and ecology of wildlife.

**CONSERVATION VALUE** Manas is noted for its spectacular scenery, with a variety of habitat types that support a diverse fauna, making it the richest of all Indian wildlife areas. The sanctuary represents the core of an extensive tiger reserve that protects an important migratory wildlife resource along the West Bengal to Arunachal Pradesh and Bhutan borders (Rodgers and Panwar, 1988). Its wetlands are of international importance (Scott, 1989). It is also the single most important site for the future survival of pygmy hog and hispid hare (Oliver, 1980).

**CONSERVATION MANAGEMENT** The sanctuary is essentially a wilderness zone and forms the core of the tiger reserve. The rest of the tiger reserve is classified as reserve forest. Normal forestry operations were carried out in the core area prior to its designation as a sanctuary, but these were confined mostly to the southern belt. Traditional hunting practices persisted but without any noticeable adverse effects on wildlife populations. Hunting ceased with the establishment of the area as a sanctuary and very little logging has been permitted since 1950. The last timber operation took place in 1964. Much stone was extracted from the area during the construction of the National Highway in 1963-1964. Plantations were established along the southern border to provide a buffer against agricultural encroachment but this work ceased in 1977. Grazing by livestock was phased out from 1963 to 1965. No exploitation is allowed in the sanctuary but tourists may visit the Mothanguri-Bansbari area. Such restrictions do not apply to the surrounding buffer zone of the tiger reserve, which is managed on a multiple-use basis. Here residents are allowed to selectively remove timber, collect firewood, cultivate land and graze their domestic livestock. They benefit from inoculation of their cattle, to prevent diseases being transmitted to the wildlife, but this is offset by damage to their crops by elephants, wild boar and deer (Anon., 1974; Deb Roy, n.d.).

There is a management plan for the tiger reserve (Anon., 1973) but this is being revised. International cooperative efforts have been made by the governments of India and Bhutan to manage

... work carried out by Project  
ger in 1982 included: provision of 12 barracks to accommodate staff; development of roads and a wireless network to improve the efficiency of administration and anti-poaching operations; and intensified and reorganised patrolling, with three new ranges defined to facilitate administration and the protection of both the core and buffer zones. Boundaries have been clearly marked and the staff are more vigilant than previously, leading to several successful prosecutions being brought against poachers. Following recent successful breeding in captivity of gharial, there are plans to restock all the water channels in the area.

The extent and status of the present sanctuary are considered inadequate to meet long-term conservation requirements. It has been recommended that it be extended to 109,700ha and upgraded to a national park (Rodgers and Panwar, 1988). This is under consideration (Deb Roy, n.d.).

**MANAGEMENT CONSTRAINTS** The wildlife sanctuary remains intact, although the buffer zone has suffered an unspecified number of encroachments, especially between Sankosh and Manas rivers. This has led to haphazard fragmentation of the forest. Of particular concern is Amtika Village in the midst of the buffer zone and in the area occupied by golden langur. As there is no buffer zone to the south there has been increasing pressure from cultivation, settlement, collection of forest products and some poaching, as well as increasing contact between local people and wildlife. Crop-raids by elephant and hog-deer are increasingly common, leading to ill-feeling amongst local residents (Rahmani *et al.*, 1989). In 1984 the government attempted to close Kokla Bari Seed Farm, but this was vigorously opposed by Plains tribes, such as Borokacharis, who have been employed there (Choudhury, 1986). The main problems of rhinoceros poaching and encroachment have largely been controlled under 'Operation Tiger'. However, burning in the dry season, hunting and extraction of timber and firewood are practised at non-sustainable levels in the buffer zone. There was public concern over proposals to build two dams in the upper reaches of the Manas and Sankosh rivers in neighbouring Bhutan. The plans, which would have had a severe impact on the integrity of the whole Manas ecosystem, have since been cancelled by the Indian and Bhutanese governments.

In February 1989 the sanctuary was occupied by members of the local Bodo Students' Union, which is campaigning for autonomy for its people, who form about one-third of Assam's population (Jackson, 1989). Armed attacks, in which more than a dozen wildlife guards were killed, have led to most of the sanctuary being abandoned by official staff. In addition to the Bodo, poachers and timber smugglers have opportunistically entered the sanctuary and a number of animals including rhinoceros, elephant and valuable prey species such as deer have been killed (Hussain, 1989; Rahmani *et al.*, 1989). A popular account of the incursion

(Gavron, 1989) reports that staff have been attacked, resulting in one fatality, and that 30 of the 44 range posts have had to be abandoned. At least six, but almost certainly more, Indian rhinoceros, and at least four tigers, have been killed. In addition, the corpses of two large male elephants have been found. A large number of trees have been felled and the habitat of species, such as golden langur, hispid hare and pygmy hog, has been put at risk. Intervention to protect the sanctuary by either the Assam State Government or Central Government has been delayed by a lack of available manpower and by political difficulties.

**STAFF** Four forest rangers, two deputy rangers, 29 foresters, 12 head game watchers, 49 forest guards, 46 game watchers and 104 other staff administer the sanctuary (1986). Overall administration of the tiger reserve is the responsibility of the field director.

**BUDGET** Rs 2,545,000 was allocated in 1989-1990 by the Government of India under its rhino conservation scheme.

**LOCAL ADDRESSES** The Assam Forest Department is responsible for the administration of the sanctuary.  
Field Director, Project Tiger, PO Barpetta Road, District Barpetta, Assam 778 315

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WWF/IUCN Project 1002. Operation Tiger - Manas Tiger Reserve, Assam.

DATE October 1985, reviewed July 1988, updated March 1990

DOCUMENT 0900V



WWF World Wide Fund For Nature-India  
विश्व प्रकृति निधि, भारत

WWF - INDIA  
Secretariat (Delhi)  
P. O. Box 3058  
172-B, Lodi Estate  
New Delhi - 110 003

Mr.S.Deb Roy  
24/4 Type V  
Lodi Complex  
New Delhi 110 003

4 October 1994 /565

Sub : National Conservation Congress (NCC)

We are delighted to receive your consent to making a presentation at the Biodiversity Seminar. I know your aversion to "papers". But please, Mr.Deb Roy, a 100 words abstract will hardly take any time. We will be circulating all abstracts among participants. And we will be bringing out proceedings. How will we do without your full paper?

Any how, I am extremely pleased you will be delivering a talk. Please do try and do the write-ups (abstract and full paper) too, for the sake of Manas!

With warm regards and thanks in anticipation.

Sincerely,

**Rashmi De Roy**  
Bio-diversity Seminar Coordinator

TRUSTEES  
Dr M.S. Swaminathan, President  
Mr S.P. Godrej, Vice President  
Dr Ashok Khosla  
Dr Amrita Patel

Lt Gen Baljit Singh, AVSM, VSM  
Dr Dhrubajyoti Ghosh  
Dr Prakash Amte  
Mr D.M. Sukthankar  
Mr R. Rajamani



NEW DELHI TELEVISION

17th January, 1997

Dear Mr. Debroy,

I am sorry for the delay in returning your report on Manas, I suddenly went on leave and have been out of station till this week.

I trust your visit to the North-east was fruitful, I can only imagine what a formidable task it must be to deal with the very intense and weighty pressures on Manas.

I would love to visit there someday, to do a story and would be grateful if you would let me know of any such possibility.

It was such a pleasure to meet and talk with you, and I hope we shall meet again soon.

With many thanks and best wishes for the New Year to you and your family,

*Anisha*

Anisha Kumar Dang



WWF

**World Wide Fund For Nature—India**

172-B, Lodi Estate, New Delhi-110003

Tel : 69 37 44, 61 65 32 Fax : 462 68 37

Mr. S. Deb Roy  
24/4 Type I  
Lodi Complex  
N Delhi 110 003

Dear Sir,

kindly find attached the  
photocopied material as desired  
by you.

Warm regards.

Sh

*With Best Compliments*

PRELIMINARY BIODIVERSITY ASSESSMENT  
OF  
MANAS NATIONAL PARK  
and  
Proposed BLACK MOUNTAINS NATURE RESERVE

*Combining Reports from  
Rapid Biological Inventories, and Avi-fauna Surveys*

*January - June 1993*

RGBOB-WWF 6421, 9659

Conducted by  
Nature Conservation Division,  
Department of Forests,  
Royal Government of Bhutan

in collaboration  
with  
WWF Bhutan Programme

Thimphu  
August 1993

#### PREFACE

Enclosed is a preliminary report on rapid biological assessments of Manas National Park, the proposed link area in Shemgang, and the proposed Black Mountains Nature Reserve, Bhutan.

A rapid assessment of biological inventory was conducted as part of RGoB-WWF Project #6421, Survey & Identification of Conservation Areas & Critical Habitats, and #9659, Protected Area Planning using GIS, in the period between January - June, 1993. Project activities were funded by WWF and implemented by the Nature Conservation Division, Department of Forests. The data collected on flora and fauna will provide baseline information for the preparation of management plans for Manas National Park and the Black Mountains Nature Reserve. These rapid assessments will be continued in other priority areas in Bhutan to develop protected area management in the country.

The opinions expressed in this report are those of the authors' and do not necessarily reflect the views of WWF and Department of Forests. Queries, requests for detailed information, and requests for single copies may be addressed to the Head, Nature Conservation Division, Department of Forests.

Sangay Thinley

Director General  
Department of Forests  
Royal Government of Bhutan.

Mingma N. Sherpa

Country Representative  
WWF Bhutan Programme.

**PART ONE**

**An Assessment of Biodiversity in the Proposed  
Royal Manas-Black Mountains National Park Complex**

**Eric D. Wikramanayake, Ph.D.**  
Consultant  
WWF-Bhutan Program

and

**Sonam Wangchuk**  
Nature Conservation Division  
Department of Forests  
Bhutan

Prepared for

**Nature Conservation Division  
Department of Forests  
ROYAL GOVERNMENT OF BHUTAN**

**WWF Bhutan Programme**

**July 1993**

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## EXECUTIVE SUMMARY

Bhutan has an extensive protected areas system; but it is not representative of the diverse ecosystems in the country; it fails to include critical habitat, from national, regional and global perspectives; and most reserves are not gazetted. Recognizing these shortfalls, proposals to revise the existing system are now under consideration, and an application for notification and gazettelement of a revised protected areas system has been made.

With the anticipated gazettelement of this new protected areas system, the Department of Forests of the Royal Government of Bhutan, is looking towards preparing conservation management plans, which are necessary to ensure that the reserves will be properly managed to perpetuate biological diversity and habitat integrity. However, information on species occurrences and distributions in these protected areas, and of the socio-economic status of the human communities in and around them, is limited. Thus, ecological and socio-economic surveys have been initiated to collect the necessary baseline information.

Here, we review the rapid ecological surveys conducted in the Royal Manas National Park, the proposed Black Mountains National Park, and the proposed Manas-Black Mountains Link (together, the Manas-Black Mountain reserve complex). The primary objectives of the survey were to, a) rapidly assess species-richness and habitat diversity in the reserve complex and evaluate its conservation value to justify gazettelement and, b) facilitate subsequent detailed surveys for management plan preparation by providing preliminary patterns of species distributions and occurrences. Since travel and access to remote areas in Bhutan is difficult and time consuming, these rapid surveys will help optimize resource allocation during the extensive surveys.

The rapid surveys were conducted between February and May 1993. They focussed on woody plants, birds, and large mammals. Despite being rapid, and thus relatively cursory, 594 species of woody plants, 332 species of birds, and 25 species of large to mid-sized mammals were recorded from the reserve complex. The trends in species-richness curves, however, indicate that the counts will increase with more detailed surveys.

Several habitat types, related to altitude, are represented in the reserve complex. There is considerable species turn-over along the altitude gradient among both plant and bird species. Few species of either taxa were shared between the different altitude categories, (7 categories at 500 m intervals from <501 to >3000 m), considered in the analysis.

The link area has a mix of mammal species from the Palearctic and Oriental zoogeographic realms, contributing to the richness of the fauna. Several mammals species found throughout the reserve complex are listed in the IUCN Red Data Book.

## 1 INTRODUCTION

Bhutan is centered in an area designated as a global "Hotspot" for biodiversity (Myers 1988). Straddling the ecotone of the Palearctic and Oriental zoogeographic realms, Bhutan's fauna includes northern species such as the snow leopard, blue sheep, takin, Himalayan bear, and wolf, as well as the Indo-Malayan species in the south, among which are elephant, Indian rhinoceros, tiger, leopard, sloth bear, water buffalo, gaur, and several species of deer and primates.

The flora, distributed across a topography with dramatic variation in altitude, ranging from less than 200 m in the south to over 4,000 m in the north, is also inordinately rich. Over 5,000 species of vascular plants are found in the country. These also comprise of temperate and tropical species, and include several hundred species of medicinal and horticultural value (Grierson and Long, 1983).

With approximately 57% of the country under natural vegetation, Bhutan thus provides the best opportunity for long-term conservation of the fauna and flora in this eastern Himalayan "Hotspot". The cultural and religious traditions of the Bhutanese people and the Royal Government's policies advocate conservation of nature and natural resources, enhancing these opportunities. However, with development, (albeit restrained to allow for conservation of natural resources), and a growing human population, demands on Bhutan's natural resources will inevitably increase.

Although over 20% of the country is presently under a system of national parks, sanctuaries, wildlife and forest reserves, the system is not representative of the ecosystems and forest types in Bhutan; does not include the most critical forest types urgently in need of conservation from a national and regional perspective; and the protected areas are not gazetted. Fortunately Bhutan is still in a good position to adopt a long-term conservation strategy by re-designing the protected areas system to include large areas of forests in an ecologically rational manner, and not have to perform a salvage operation as in several other countries in Asia. Proposals to revise the present system to make it more representative are being reviewed. As part of this review process, baseline biodiversity and socio-economic surveys are being conducted to evaluate the conservation values of the proposed areas.

Overall, the reserve complex is rich in species composition and has a wide array of habitat types ranging from tropical grassland/savanna and broadleaf forest, to temperate broadleaf, mixed, and coniferous forests. The high peaks of the Black Mountain range could not be surveyed due to time and logistical constraints, but they are known to contain alpine habitats and permanent ice fields. The reserve complex includes the rich eastern Himalayan subtropical and temperate broadleaf forests, which are highly threatened elsewhere in the region.

This survey indicates that the conservation value of the proposed reserve complex is immense. The protected status of the complex will not stop at the Bhutan-India border, but will continue southward into India with the Manas Sanctuary in Assam. This transfrontier reserve has the potential to be among the more significant protected areas on Earth.

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#### TERMS OF REFERENCE

The WWF consultant, Dr. Eric D. Wikramanayake, was required to:

- \* conduct a biological inventory in the Royal Manas National Park and the proposed Black Mountain Nature Reserve.
- \* provide field guidance to two survey teams and coordinate activities in the field, train national counterparts and assistants in different inventory techniques and methods of data collection.
- \* compile and process acquired field data into a database for management purposes.
- \* compile the findings of the two survey teams into a report for presentation at a workshop following the field surveys.
- \* prepare and submit to WWF and the Royal Government of Bhutan a draft technical report including the results of the biological inventory, summary of training course, and any other findings of his activities in the field.

## 2 BACKGROUND

### 2.1 Geography

A mountainous kingdom of 46,590 sq km in the southern slopes of the eastern Himalayas, Bhutan is bordered in the north by China, and by India to the east, west, and south. The topography is rugged, with mountains rising from less than 200 m msl in the southern duars, to over 7,000 m in the north; all within a north-south distance of only 180 km. Six major north-south directed mountain ranges alternate with seven river valleys -- Ammo Chu/Torsa, Wong Chu, Mo Chu/Sankosh, Mangde Chu, Bumthang Chu, Kuru Chu, and Kulong Chu, which flow southward into the Bramhaputra River in Assam.

The mountains are geologically recent, steep-sided, and consist largely of Pre-Cambrian and early Paleozoic quartzite and gneiss. Some sedimentary areas of limestone, dolomite, sandstone, and shales are also found, especially in the Manas basin. Soils are generally clay and loam, with good permeability and moderate moisture retention. (see MacKinnon 1991 for more details).

### 2.2 Climate

The climate is varied and greatly influenced by the topography. The southern duars are tropical, whereas the north consists of permanent ice fields and tundra. Although there is no significant east-west gradient in rainfall on a country-wide scale, there is a localized gradient due to the rain-shadows imposed by the high mountain ranges on the monsoons. South-west monsoonal rains from June to September contribute to most of the annual rainfall.

### 2.3 Demography and Socio-Economic Trends

The population of Bhutan, estimated to be 600,000 for a density of 13 persons per sq km, is growing at a rate of 2% per year (NES 1992). Forty percent of the population is below 15 years of age (MacKinnon 1991). Better health care facilities, which will reduce infant/child mortality and increase life expectancy, are expected to increase the population growth rate unless population control measures are implemented (NES 1992).

Over 90% of the population is rural, and is engaged in agriculture and animal husbandry (NES 1992). Because almost all arable land is now under cultivation and livestock herds are increasing in size and number (NES 1992), new agricultural lands and pasture will have to come from forest lands, most of which are steep and unsuited for such practices. The problem is especially acute because tseri, a form of shifting agriculture, is widely practiced, and livestock are allowed free-range grazing.

## 2.4 Biogeography

### 2.4.1 Ecosystems

Several classifications of Bhutan's ecosystems and forests exist. Blower (1989) presents five eco-floristic zones based on Negi (1983). These zones are primarily classified according to distributions of vegetation types. MacKinnon (1991) proposed nine biounits based on natural dispersal barriers, primarily to animals (Fig. 1). The barriers consist of east-west directed, altitude-determined, habitat belts (which largely coincide with Negi's floristic zone boundaries). These are further divided along north-south directed barriers in the form of three mountain ridges in central Bhutan and two rivers in the south.

The biounits are as follows:

- HIM = West-central Himalayan zone
- HIB = Eastern Himalayan zone (delineated from HIM by the Kuru Chu).
- BHA = West temperate zone
- BHB = Sankosh temperate zone
- BHC = Mangde temperate zone
- BHD = East temperate zone
- BRA = West subtropical/tropical zone
- BRB = Central subtropical/tropical zone
- BRC = East subtropical/tropical zone

MacKinnon (1991) also identified 15 habitat categories as follows:

- Permanent Snow (GLA)
- Barren exposed rock (ALX)
- Alpine pasture (ALP)
- Alpine scrub (ALS)
- Fir forest (FIR)
- Mixed coniferous forest (MCF)
- Chir pine forest (CPF)
- Blue pine forest (BPF)
- Temperate scrub (SCR)
- Broadleaf/Conifer forest (BCF)
- Upper hardwood forest (BCF)
- Lower hill forest (LHF)
- Tropical lowland forest (TLF)
- Forest on limestone (LIM)
- Savanna/grassland (GRA)

### 2.4.2 Fauna

Because Bhutan straddles the ecotone of the Palearctic and Oriental zoogeographic realms, the country has extremely rich mammalian and bird faunas. Over 160 species of mammals are expected to occur in Bhutan (MacKinnon 1991). These include several large mammal representatives from the Palearctic fauna, such as the snow leopard, blue sheep, takin, Himalayan bear, and wolf to the Indo-Malayan species such as the elephant, rhinoceros, tiger, leopard, sloth bear, water buffalo, gaur,

several species of deer and primates.

About 800 birds are expected to occur in Bhutan (MacKinnon 1991). As with the mammals, the birds also consist of Palearctic and Oriental elements. Several of the resident species are altitudinal migrants, moving up and down the mountains within Bhutan depending on the season. Bhutan also provides important nesting and wintering grounds for regional migrants, most noteworthy being the endangered Black-necked crane which winters in Phobjika and Bumdaling.

Among the other vertebrate taxa, the reptiles, amphibians, and fishes are poorly documented. Since the mountain ranges present formidable dispersal barriers and extreme, varied, habitat types, detailed surveys may well reveal new endemic species.

Of the invertebrate groups, the butterfly fauna is extremely rich, but needs to be inventoried in detail. Butterflies can also be used as an indicator taxa for subsequent biodiversity surveys.

#### **2.4.3 Flora**

The flora, distributed across a topography with dramatic altitudinal variation is also extremely rich. Over 5,000 species of vascular plants have been recorded in the country. These comprise mostly of Southeast Asian-Malaysian and Himalayan-Chinese-Japanese elements, with contributions from other diverse sources such as the Deccan, Tibetan, Euro-Siberian, and Arctic-Alpine elements, (Grierson and Long 1983); all of which add to species-richness and diversity. Several hundreds of these plant species are of medicinal and horticultural value.

### **3 CONSERVATION**

#### **3.1 National Policy**

The Royal Government of Bhutan places high priority on conserving its forests, wildlife, and other natural resources. As part of this policy, development is cautious and deliberately slow-paced so as to not compromise environmental integrity. Moreover, the religious and cultural traditions of the Bhutanese people also prescribe a conservation ethic. However, trends in other Asian countries with similar religious and cultural traditions have shown that in the face of necessity and limiting resources it is extremely difficult to prevent over-exploitation and abusive use of natural resources. Although Bhutan is still a long way from such a situation, it is not too early to reinforce the conservation policy with a system of effective protected areas representative of the country's diverse ecosystems.

### 3.2 Forest Cover

Almost 57% of the country is still under natural forest cover. Of this, about 13% consists of eastern Himalayan temperate broadleaf forest, (MPFD 1991), which is threatened elsewhere in the region. Bhutan presents the best, and possibly the only, chance to conserve ecologically viable tracts of this, species-rich forest unique to the eastern Himalayas.

### 3.3 Protected Areas System

Although Bhutan has designated approximately 20% of the country for conservation, as national parks, sanctuaries, wildlife reserves and reserved forests (Fig. 2), there is no provision for a protected area with status other than a Reserved Forest under the Bhutan Forest Act of 1969. Therefore most of the protected areas gain their status in name only. However, the new draft of the Forest and Nature Conservation Act (1993) will include a provision for gazetting other IUCN designated protected area categories.

Furthermore, the present system of protected areas, though extensive, is not representative of Bhutan's major ecosystems. As the system now stands, the forests in the extensive temperate zone spanning the central region of the country (i.e; BHA, BHB, BHC, and BHD; Fig 1) remain unprotected.

Several proposals have been made to amend the present system by including reserves across the central part of the country, (Blower 1989; MacKinnon 1991), complete with east-west representation (MacKinnon 1993). The proposals include establishing and linking the Black Mountain National Park with Manas National Park in the south to create a large reserve complex. This reserve complex is designed to protect a continuous gradation of habitats ranging from savanna and tropical broadleaf forest in the southern duars, to alpine and permanent ice fields in the high peaks of the Black Mountain range. The reserve complex will include a large area of temperate broadleaf forest, and will offer protection to the many altitudinal migrant species in this habitat. The global significance of this protected area is emphasized by the suggestion that it may even merit World Heritage Site status under the UNESCO World Heritage Programme (MacKinnon 1993).

Bhutan is classified as a high conservation potential-low conservation threat country (Dinerstein and Wikramanayake 1993) because of the large extent of intact forest cover still remaining and the low threat from anthropogenic sources. Therefore, a well-planned, ecologically viable protected areas system is still a feasible concept. Such a system would not only be of national significance, but of regional and even global importance as well.

## 4 BIODIVERSITY SURVEYS

The surveys were conducted from February to May 1993 in the Royal Manas National Park/Mountains National Park complex, extending across the Shemgang and Tongsa Districts. Socio-economic surveys of enclaves and villages in and around the reserve complex were also conducted concurrently.

### 4.1 Objectives

The primary objectives of the surveys were:

- \* to assess species-richness and habitat diversity in the reserve complex to evaluate its conservation value and facilitate the notification/gazettelement process.
- \* to collect baseline information on biodiversity and species distributions within the reserve complex to facilitate detailed surveys which are to follow. Since travel and access to remote areas in Bhutan are difficult and time consuming, these rapid surveys will help optimize resource allocation. The detailed surveys will be designed to prepare management plans for the reserves.

### 4.2 Survey areas

The survey areas included Manas National Park, the area extending from Edi (Dalim) to Nobji, via Tshobrang, Pongchela, Zurphey and Tingtibi, and Phobjika to Tarana via Gangphey, Gele La, Lawa, and Ada (Fig. 3). The transects covered several different habitats and vegetation types found in the reserve complex (Table 1). Some transects had to be established outside the proposed boundaries due to logistical constraints. But the vegetation types within the park boundaries extend outside the boundaries to the survey area. Therefore, species compositions in the respective vegetation types are expected to be similar within the boundaries, and can be determined by proxy.

#### 4.2.1 Manas National Park

The park is located in the Central and East Subtropical Biounits (BRC, BRB), and is a transfrontier reserve with the adjacent Manas sanctuary in Assam, India. Habitat consists of grassland/savanna, tropical lowland forest, upper/lower hill forest, and limestone forest (MacKinnon 1991). The park contains numerous large mammal species, including elephant, rhino (probably now extinct from the park), sloth bear, tiger, leopard, gaur, buffalo, sambar, hog deer, barking deer, and the endemic golden langur. Over 360 species of bird species have been confirmed from the park (MacKinnon 1993).

#### 4.2.2 Black Mountain National Park

The Black Mountains range is the largest of the six north-south directed mountain ranges in Bhutan. The proposed reserve will

incorporate a wide array of habitats found there, from permanent ice fields, alpine lakes and vegetation, to coniferous and temperate broadleaved forests.

#### **4.2.3 Manas-Black Mountain Link**

The link area connects the proposed Black Mountains National Park with Manas National Park (Fig. 2) to protect a continuous habitat gradient from tropical forest/savanna in the southern Duars, (which extends into the Indian Manas Sanctuary), to permanent ice fields in the high peaks of the Black Mountains range. It is also expected to protect a large extent of eastern Himalayan temperate broadleaf forest.

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### **4.3 Taxonomic Categories Chosen for the Survey**

#### **4.3.1 Plants**

Woody plants were chosen as indicators of biodiversity because, a) they are easy to inventory and identify, b) plant distributions are influenced by altitude, which is a key environmental variable in the reserve complex, and c) vegetation will serve to classify the several habitat types expected to occur within the reserve.

##### **4.3.1.1 Field Methods**

The methodology employed for the vegetation surveys was adapted from the "GRADSECT" (gradient-directed transect) method. This method is primarily designed to determine floral diversity in a systematic manner, allowing for correlations between plant communities and physical parameters which may contribute to species-richness, species-turnover, and distributions. The transects are established to include strong environmental gradients to increase variation between plots per transect within a region, thus maximizing the information gained relative to expenditure of time and effort.

The method consists of establishing line-transects oriented along the environmental gradient which contributes most towards diversity and species-turnover -- in Bhutan this would be elevation. Sampling plots are spaced out at regular intervals along the transects. Ideally, transects should be selected using topographical and land-use maps, satellite imagery, etc. These would aid in locating and orienting the transects to ensure that all forest/vegetation types are included.

Transects need not follow a straight line, but can change direction to maximize variability between plots and to accommodate accessibility. Changes or direction modifications can be made even during 'on the ground' surveys, because the primary objective is not to conduct a census, (which requires a random or stratified/random site selection to avoid bias), but an inventory seeking to maximize species records.

The choice of plot size and shape can depend on the terrain, species diversity, species size, and other logistical and biological considerations; we chose to use circular plots, 500 sq m in area, spaced at either 250 m or 500 m along the line transects. Choice of inter-plot distance depended on the slope and species-richness; i.e., on steep slopes where species-turnover is expected to be high, or in species-rich habitats, we used an interplot distance of 250 m. However, in depauperate forests the inter-plot distance was extended to 500 m.

All trees >10 cm DBH in each plot were identified and counted. Smaller plants were recorded as being present if encountered in a plot. Samples of species which could not be identified in the field were brought back to Thimphu for subsequent identification. The physical location of each plot was geo-referenced with a GPS unit (Geo-Positional System). Several physical parameters pertaining to each plot, including altitude, aspect, slope, and ground cover type and percentage were also recorded (Appendix I).

Since time was a constraining factor, some transects were established along trails; however, most trails were narrow, with relatively little disturbance to the adjacent vegetation.

#### 4.3.1.2 Data Analysis

Because altitude is an important environmental variable determining species and habitat distributions in Bhutan, the distribution of plant species was analyzed by altitudinal categories. We chose increments of 500 meters to categorize the altitudes as follows:

Altitude Category 1 (AC1)	=	< 501 m
Altitude Category 2 (AC2)	=	501-1000 m
Altitude Category 3 (AC3)	=	1001-1500 m
Altitude Category 4 (AC4)	=	1501-2000 m
Altitude Category 5 (AC5)	=	2001-2500 m
Altitude Category 6 (AC6)	=	2501-3000 m
Altitude Category 7 (AC7)	=	> 3000 m

The plots were distributed among the seven altitude categories regardless of transect number and the number of plant species per altitude category was plotted. Species-richness curves, (i.e., the cumulative number of new species recorded from each successive plot vs. the number of plots) were made for each altitude category. The cumulative number of new plant species per plot was also graphed with plot altitude for Transect 9.

Similarity matrices were constructed to determine the extent to which plant species are shared by altitude categories. Similarity indices were calculated for both total number of plant species shared between altitude category pairs, and for the percent species shared.

The number of shared species was calculated by simply determining

how many plant species from AC<sub>j</sub> are found in AC<sub>i</sub>, where AC<sub>j</sub> is altitude category 'j', and AC<sub>i</sub> is altitude category 'i'.

The percent of shared species was calculated as;

$$\frac{SP_{ij}}{(SP_i + SP_j)} * 100$$

where SP<sub>ij</sub> is number of species shared by AC<sub>i</sub> and AC<sub>j</sub>, and (SP<sub>i</sub>+SP<sub>j</sub>) is the total number of species identified from AC<sub>i</sub> and AC<sub>j</sub>.

#### 4.3.1.3 Results

A total of 15 transects were sampled (Table 1). The transects covered several habitat types, including grassland/savanna, tropical broadleaf forest, subtropical broadleaf forest, temperate broadleaf forest, and coniferous forests. The alpine habitat on the peaks of the Black Mountain range could not be sampled because of inaccessibility.

A total of 447 species of trees, 147 species of smaller woody plants, and several other species including herbs, lianas, epiphytes, etc. were recorded (Appendix II). Of these, 36% of tree species were found in plots <501 m (AC 1), 27-31% were found in the three categories spanning 501-2,000 m (AC 2,3,4), 24% between 2,001-2,500 m (AC 5), and 9-6% species >2,500 m (AC 6,7; Fig. 4; Table 2). Shrubs showed a similar overall trend, with fewer species in the higher elevations. The greater number of non-tree species in the lower elevations, suggest that the forests below 2,000 m are more stratified and complex, with an understory, epiphytes, and lianas.

Of the 447 tree species, 256 were confined to a single altitude category, 144 were distributed in two categories, 32 across three, 12 in four, and 3 were found in five categories. No species were distributed across more than five categories. Thus, most species had restricted distributions along the altitude gradient.

Some of the commonest tree species in the respective altitude categories were:

AC 1 -- Polyalthia sp, Macaranga denticulata, Mallotus philippensis, Albizia sp., Lagerstroemia parviflora, Amoora wallichii, Duabanga grandiflora, Pterospermum acerifolium, Semicarpus anacardium, Sterculia villosa, Dillenia pentagyna, Bombax ceiba, Cofea bengalensis, Rhamnus sp.

AC 2 -- Macaranga denticulata, Duabanga grandiflora, Pterospermum acerifolium, Polyalthia sp, Ostodes paniculata, Castanopsis tribuloides, Pinus roxburgii, Albizia procera, Lithocarpus elegans, Carya arborea, Dillenia indica, Amoora wallichii, Bombax ceiba, Calamus sp., Musa sp., Cofea bengalensis,

Murraya exotica, Rosa sp., bamboo.

- AC 3 -- Ostodes paniculata, Pinus roxburgii, Lyonia ovalifolia, Macaranga sp, Quercus griffithii, Maesa chisia, Schima wallachii, Alnus nepalensis, Castanopsis indica, Quercus lanata, Rhododendron arboreum, Rubus ellipticus, Musa sp., Laportea sp.
- AC 4 -- Castanopsis tribuloides, Pinus roxburgii, Lyonia ovalifolia, Quercus griffithii, Maesa chisa, Schima wallachii, Quercus glauca, Quercus lanata, Englehardia spicata, Eurya cerasifolia, Rhododendron arboreum, Inula cappa, Musa sp., bamboo.
- AC 5 -- Castanopsis tribuloides, Pinus roxburgii, Lyonia ovalifolia, Quercus lanata, Quercus lamellosa, Rhododendron arboreum, Brassiopsis sp., Gaultheria griffithiana, bamboo.
- AC 6 -- Betula utilis, Juniperus recurva, Pinus wallichiana, Tsuga dumosa, Acer campbelli, Rhododendron arboreum, Rhododendron virgatum, Rosa serica, Berberis aristata, Berberis griffithiana.
- AC 7 -- Rhododendron falconeri, Rhododendron hodgsonii, Rhododendron lepidotum, Abies densa, Betula utilis, Berberis aristata, Sarcococca hookeriana.

The species compositions of altitude categories indicate that the distribution of habitat types, (after MacKinnon 1991), within them as follows: TLF in AC 1,2  
LHF in AC 3  
UHF in AC 4,5  
BPF in AC 6  
FIR in AC 6,7.

Furthermore, savanna/grassland (GRA) was also present in AC1. There was mixing of conifers and temperate oaks (BCF) in AC 5. Patches of Chir pine forest (CPF) and Mixed Coniferous Forest (MCF) were found in AC 3,4,5, and in AC 6,7, respectively.

Sixty-one plots from eight transects were located in AC 1. The number of plots in altitude categories 2,3, and 4 were similar, (44, 40, and 44, respectively), but the number of plots for AC 5 (25 plots), AC 6 (19 plots), and AC 7 (11 plots) were much less. The decrease in survey effort in the higher elevations is partly a function of lesser land area above 2,500 m to be surveyed; however, the disparity in survey effort across the altitude categories must be borne in mind when interpreting the results.

The species-richness graph for AC 1 indicates that even though

the percentage of new species added in the last few plots was less than 5% of the running total, new species were consistently being added to the tally (Fig. 5). The number of new tree species added with each new plot fell below the rate of addition of all woody plants. Thus, towards the latter, the new species being added consisted mostly of shrubs, epiphytes, and other smaller plants. For the other altitude categories, the species-richness curves were steep during the initial plots, with a trend to asymptote quickly. This was especially apparent among the higher altitude categories. However, with each new transect there was an initial rapid increase in the number of new species recorded (Fig. 5). Therefore, we recommend that during subsequent surveys the transects can be made shorter, but should be widely spaced and stratified by altitude and vegetation type.

The similarity matrices indicate that very few species are shared among the different altitude categories. The highest percentage of shared species is between AC 1 and 2 with 18% (Table 3). Altitude categories 2,3,4, share between 11-12% of species amongst them. Only 2% of the species are found in both AC 1 and AC 7. Because the tree species were better sampled during the first few plots, this to a certain extent is a more suitable index to evaluate the overlap among the altitude categories. But the similarity indices for trees show a similar trend to the indices for all woody plants. Thus, despite the disparity in survey effort, the overall trend in similarity indices can be used to indicate that there is considerable turn-over in species with altitude. Moreover, increased survey effort in the higher elevations would likely add the less common, specialized species, which would tend to be more localized in distribution; thus the present similarity matrix can be considered to be a conservative comparison.

The relationship between the cumulative number of new species added per successive plot in Transect 9 and plot altitude indicates that there is a consistent addition of new species along the transect, even though the number of species per plot did not keep increasing (Fig. 6). This relationship suggests species-turnover with altitude. The continuation of the trend on the opposite side of the 2,400 m peak (above Pongchela), suggests species-turnover due to a change in aspect.

#### **4.3.2 Birds**

Birds were chosen as indicator species because they are easier to detect and identify in the field than most other vertebrate taxa. Moreover, several species are habitat specialists, and provide some indication of undisturbed habitats, allowing for a quick assessment of biodiversity in different forest types.

**4.3.2.1 Field methods** (adapted from Inskipp and Inskipp 1993). Surveys were conducted from 17 April to 2 May by Tim and Carol Inskipp, and their national counterparts Kado Tschering and Pem

Gyeltshen. Survey areas were; the HQ area of Manas National Park; along the trail from Manas to Panbang; in Sukunjan and Kanamakra within the national park; along the trail from Kanamakra to Tingtibi, via Edi (Dalim), Tshobrang, Pongchela, Subrang, Zurphey, and Tshanglajong; and along the Phobjika-Tarana trail via Ganphey, Gelela, Lawa, Nangshina, and Ada (Fig. 3). These survey areas correspond to the plant survey transects.

Species-richness counts were made by counting the number of new species at each site until a list of 20 species were recorded. A new list was then started until another 20 species were recorded. Any one species was recorded only once on a list, but was recorded on subsequent lists; however, individual birds which were recorded on a previous list were not recorded again. Depending on the availability of time, successive lists were made until no new species were recorded. The final aggregate thus represents an estimate of species-richness. However, note that some secretive and nocturnal species will be missed by this method.

Locality was recorded. The vegetation type was broadly classified as tropical and subtropical broadleaf forests, temperate broadleaf and mixed forests, and coniferous forest.

#### 4.3.2.2 Data Analysis

Species-richness counts, stratified by locality and vegetation category, were graphed against the list number (data from Table 1 of Inskipp and Inskipp 1993). Species counts for Manas NP were combined and graphed against the respective lists. The locality/vegetation categories for other lists were; Manas-Tingtibi Tropical Zone, Manas-Tingtibi Subtropical Zone, Phobjika Subtropical Broadleaved Forest, Phobjika Temperate Broadleaved Forest, Phobjika Temperate Mixed Forest, Phobjika Coniferous Forest.

We then categorized the lists according to the altitude categories used for the plant analysis. Because some locations could only be approximated in terms of 'real-world spatial distributions', altitude readings are not usually precise, and since birds are vagile, some lists were included in more than one altitude category for a conservative analysis.

The percentage of birds in each altitude category was graphed, and similarity matrices (numbers and percentages) were constructed to determine the extent to which species are shared across altitude categories.

#### 4.3.2.3 Results

A total of 332 bird species were recorded from the study area during this survey (Table 4, Appendix III). This includes 13 new records for Bhutan and four globally threatened species (Inskipp and Inskipp, 1993). As with the plants, there was a general

trend for fewer bird species at higher elevations; however, the zone between 501-2,000 m was as rich in bird species as was the tropical zone below 501 m (Fig. 7). A large extent of savanna/grassland in the altitude category below 500 m, which would not be as rich in bird species as the complex forests between 501-2,000 m, could be a contributing factor. Moreover, human-modified habitats had fewer species of birds, compared to the intact forests (Inskipp and Inskipp 199).

The species richness curve for Manas National Park indicates that new species were being added even after 46 lists (Fig. 8). The species-richness curve for subtropical broadleaf forest habitat during the Phobjika transect seemed to asymptote by about 25 lists. However, more surveys are necessary in other habitats, because the trends indicate that new species will be added with more sampling effort.

More bird species are shared between altitude categories than are plants (Table 5). This can be largely attributed to the vagility of birds, which can move across altitude categories, but partly to the analytical method which included some species lists in more than one altitude category. However, despite the conservative approach, the similarity matrix shows that not many birds range broadly across altitude categories. Most species were shared by altitude categories 2,3 and 4, (31-43%), which consist of broadleaf forests. Again, the trend was for fewer shared species between altitude categories which are further apart. This implies that despite their vagility, bird distributions are restricted along the altitudinal gradient. But the proximal cause limiting bird distribution is likely the distribution of habitat types along the altitudinal gradient.

#### 4.3.3 Mammals

Mammals are not as amenable as birds are, to a rapid biodiversity survey since a comprehensive mammal survey requires time. However, because conservation management plans for protected areas tend to focus on the habitat, food, and range requirements of large mammal species, they were included in the survey.

##### 4.3.3.1 Methods

Information was gleaned from several sources, which included direct and indirect observations (tracks, scat, rubbings, beds, vocalizations, etc.) and interviewing villagers. The reliability of information from villagers was assessed by asking judicious questions about the physical description and behavior of the animals and by showing pictures from a field guide. Published and unpublished works of previous surveys and observations were also used to determine the distribution of large mammals.

##### 4.3.3.2 Results

Twenty-five species of mammals were recorded during this survey

(Table 6). Evidence of tiger (pugmarks, scat, villager reports) was widespread throughout the Manas National Park and in the link area. Elephants range to the northern boundary of Manas National Park, but apparently not any further. A herd of about 25 gaur were sighted in the Doimari area of Manas NP. Presence of gaur was also found in other areas of Manas (Sukunjan, Kanamakra). Water buffalo was sighted in Manas National Park. Sambar and muntjak are common in Manas National Park and in the link area. Wild dogs were reported from the Panbang area by the Forest Beat Officer, and have been seen recently in Kanamakra. Several troops of golden langur were seen in Manas National Park, and also elsewhere in the Tongsa district. One troop was seen near Nimshong, in Tongsa District. Sloth bear was reported from the Manas area, and the Himalayan black bear from the link and Black Mountain reserve area. Musk deer was reported from the Black Mountain and Phobjika areas. Evidence of otter was seen along most rivers in the survey area, and three animals were sighted in the river at Panbang.

Evidence of tiger, leopard, musk-deer, barking deer, wild pig, rhesus macaque, black bear, yellow-throated marten, porcupine, common otter, golden langur, Assamese macaque, and Malayan giant squirrel in the Tingtibi Valley, along the Mangde Chu basin, has been reported by Yonzon, (1991). The proposed link area incorporates part this valley.

Appendices IV, V, and VI (derived from the MASS database deposited at WWF-Bhutan Program), present lists of mammals either confirmed or expected to occur in the reserve complex. A total of 43 mammal species have been confirmed from Manas National Park and 19 species confirmed from the Black Mountain National Park. These include 20 species listed in the IUCN Red Data Book.

An additional 43 species are expected to occur in Manas National Park, 15 species expected to occur in the link, and 21 species from the Black Mountain National Park. Detailed mammal surveys, including a trapping program for small mammals, is therefore recommended.

## 5 CONCLUSIONS AND RECOMMENDATIONS

This rapid survey indicates that several habitat types ranging from grassland/savanna (GRA) and tropical lowland forest (TLF) to subtropical and temperate broadleaf forests (LHF, UHF), and various coniferous forests (FIR, MCF, CPF, BPF, BCF) are represented in the reserve complex, which spans three biounits (BRC, BRB, BHC; Figs 1&2). Altitude-related species-turnover is high, with little overlap in species compositions among the altitude categories considered. Even the highly vagile birds show considerable species-turnover throughout the reserve complex. Thus, new species assemblages and vegetation associations are encountered when traversing from the southern

boundary of Manas National Park to the high elevations of the Black Mountain range.

The broadleaf forests are especially rich in species. The forests are stratified and complex, with several shrubs, herbs, ferns, orchids, etc. Several of these plant species are used as indigenous medicines (Johari 1993). Others have value as horticultural plants, cultivars, and other non-timber products (e.g., bamboo used for house construction). Birds and mammals are also most rich in these broadleaf forests. Several threatened (IUCN listed) species of mammals (MacKinnon 1991, Yonzon 1991, this survey) and birds (Inskipp and Inskipp 1993) were recorded, or are expected, from these habitats.

Overall trends in the data also indicate that further, more intensive surveys of plants, vertebrates, and invertebrates will no doubt add to the species-richness counts.

Therefore, on the basis of this survey, we make the following recommendations:

- \* The reserve complex should be given high priority during the notification and gazettelement process. It has a highly diverse species composition, and contains a threatened (nationally, regionally and globally) eastern Himalayan flora and fauna.
- \* The broadleaf forests are the most species-rich, and as much of it as possible should be included within the reserve. This includes extending the reserve boundaries to accommodate inclusion of additional broadleaf forests. The possibility of linking Trumsing La reserve and Manas National Park, with the habitat corridor between Bumthang Chu and Kuru-Mangde Chu (Fig. 2) should be considered in this respect. This link will include additional broadleaf forests within the protected areas system. Zoning within the protected area complex can accommodate villages and settlements, which may be included within the boundary extensions. Buffer-zones should be established along the reserve boundaries.
- \* This rapid survey suggests that the vegetation composition within a given forest or habitat type may not be the same over the entire range distribution of the respective forest type. Therefore, detailed surveys should be undertaken to make the inventory more comprehensive. Surveys should be planned using recent land-use maps, satellite imagery, aerial photographs, etc. The species-richness curves indicate that shorter transects can be used, but they should be dispersed

over a wider area. These surveys are essential for designing a management plan for the reserve complex.

- \* A major constraint during the survey was lack of resource personnel. We suggest that a 'core' survey team(s) be assembled, comprising of a botanist/plant taxonomist, ornithologist, and an entomologist (able to identify butterflies -- Bhutan's rich butterfly fauna will act as a good indicator of biodiversity), and 1-2 forest rangers. All members should also be able to identify mammals and evidence of mammal species. Permanent field assistants should also be assigned to the team(s) to assist with field logistics.
- \* A socio-economic survey should attempt to relate the resource needs of enclaves and villages in and around the reserve complex with demographic trends. This will allow for some forecasting of land-use patterns and forest-resource needs of people, and provide some indication of how these needs will affect the protected area in the future. These needs should be addressed in the management plan.
- \* A management plan should be prepared and implemented to ensure that a long-term conservation program is in place.
- \* The adjacent Manas Sanctuary in Assam is an IUCN-designated World Heritage Site. Following the gazettelement process, Bhutan should apply for World Heritage Site status, as suggested by MacKinnon (1993), for the Manas/Black Mountain complex.

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Table 1. Biodiversity transects in Manas National Park and the Manas-Black Mountains Link.

TRANSECT	NO OF PLOTS	LOCATION	HABITAT
1	10	Doimari	grassland, tropical broadleaf
2	06	Rabang	grassland, tropical broadleaf
3	07	Gaylon Khola	tropical broadleaf
4	10	Chengazam	tropical broadleaf
5	06	Panbang->Manas	tropical broadleaf
6	16	Sukunjan	grassland, tropical broadleaf
7	10	Kanamakra	grassland, tropical broadleaf
8	11	Edi	tropical/subtropical brdlv
9	52	Edi->Zurphey	tropical/subtropical brdlv cool temperate, pine
10	08	Birti	tropical/subtropical brdlv
11	27	Birti->Nimshong	tropical/subtropical brdlv
12	10	Nobji	subtropical brdlv
13	30	Gangphey->Lawa	oak/rhododendron, pine/juniper/hemlock subtropical brdlv
14	22	Lawa->Ada	pine, subtrop brdlv
15	23	Ada->Tarana	subtropical brdlv, oak/rhododendron, pine/juniper/hemlock

Table 2. Number of woody plant species recorded from the seven altitude categories. Altitude Category codes are as follows: AC1 = <501 m, AC2 = 501-1000 m, AC3 = 1001-1500 m, AC4 = 1501-2000 m, AC5 = 2001-2500 m, AC6 = 2501-3000 m, AC7 = >3000 m

	Altitude Category							Total
	AC1	AC2	AC3	AC4	AC5	AC6	AC7	
No of shrubs	55	46	52	36	16	8	5	147
No of trees	160	123	122	137	98	38	25	447
Percent shrubs	37	31	35	24	11	5	3	
Percent trees	36	28	27	31	22	9	6	

Table 3. Similarity matrices for plant species in the seven altitude categories.

Matrix A presents all woody plants (trees, shrubs, epiphytes, twiners, etc).

Matrix B presents trees only.

Matrix C presents percent of species shared; upper half = all woody plants, lower half = trees only

(e.g.: of 215 species in Altitude Category 1, 68 are also shared with Altitude Category 2).

Altitude category codes are: AC1 = <501 m,

AC2 = 501-1000 m, AC3 = 1001-1500 m,

AC4 = 1501-2000 m, AC5 = 2001-2500 m,

AC6 = 2501-3000 m, AC7 = >3000 m

Matrix A

	AC1	AC2	AC3	AC4	AC5	AC6	AC7
AC1	215	68	46	41	19	7	6
AC2		169	41	41	14	7	4
AC3			174	45	17	5	4
AC4				173	26	4	6
AC5					114	15	7
AC6						46	8

Matrix B

	AC1	AC2	AC3	AC4	AC5	AC6	AC7
AC1	160	48	34	34	17	7	6
AC2		123	26	36	11	7	4
AC3			122	31	12	5	4
AC4				137	20	4	6
AC5					98	15	7
AC6						38	8

Matrix C

	AC1	AC2	AC3	AC4	AC5	AC6	AC7
AC1	100	18	12	11	6	3	2
AC2	17	100	12	12	5	3	2
AC3	12	11	100	13	6	2	2
AC4	11	14	12	100	9	2	3
AC5	7	5	5	9	100	9	5
AC6	4	4	3	2	11	100	11
AC7	3	3	3	4	6	13	100

Table 4. Number of bird species recorded from the seven altitude categories.

ALTITUDE CATEGORY	NUMBER OF BIRD SPP.	PERCENT
<501 m	174	52
501-1000 m	116	35
1001-1500 m	186	56
1501-2000 m	159	48
2001-2500 m	93	28
2501-3000 m	91	27
>3000 m	64	19
TOTAL NUMBER OF BIRDS OBS.	332	

Table 5. Similarity matrices for bird species in the seven altitude categories. Matrix A presents numbers shared, and Matrix B presents percent shared.

Altitude category codes are: AC1 = <501 m, AC2 = 501-1000 m, AC3 = 1001-1500 m, AC4 = 1501-2000 m, AC5 = 2001-2500 m, AC6 = 2501-3000 m, AC7 = >3000 m

Matrix A							
	AC1	AC2	AC3	AC4	AC5	AC6	AC7
AC1	174	82	90	78	29	15	8
AC2		116	98	84	35	21	13
AC3			186	150	70	46	31
AC4				159	72	45	29
AC5					93	58	39
AC6						91	64
AC7							64

Matrix B							
	AC1	AC2	AC3	AC4	AC5	AC6	AC7
AC1	100	28	25	23	11	6	3
AC2		100	32	31	17	10	7
AC3			100	43	25	17	12
AC4				100	29	18	13
AC5					100	32	25
AC6						100	41
AC7							100

Table 6. List of large and mid-sized mammals recorded during rapid surveys of the Manas-Black Mountain National Park complex area.

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CERCOPITHICIDAE	
<u>Presbytis geeyi</u>	Golden langur
<u>Presbytis entellus</u>	Grey langur
<u>Macaca mulatta</u>	Macaque
<u>Macaca assamensis</u>	Assamese macaque
FELIDAE	
<u>Panthera tigris</u>	Tiger
<u>Panthera pardus</u>	Leopard
<u>Felis chaus</u>	Jungle cat
PROBOSCIDEA	
<u>Elephas maximus</u>	Elephant
CERVIDAE	
<u>Cervus unicolor</u>	Sambar
<u>Axis porcinus</u>	Hog deer
<u>Moschus moschiferus</u>	Musk deer
<u>Muntiacus muntjak</u>	Barking deer/muntjak
URSIDAE	
<u>Melursus ursinus</u>	Sloth bear
<u>Selenarctos thibetanus</u>	Black bear
BOVIDAE	
<u>Bubalus bubalis</u>	Buffalo
<u>Bos gaurus</u>	Gaur
SUIDAE	
<u>Sus scrofa</u>	Wild pig
SQUIRIDAE	
<u>Ratufa bicolor</u>	Malayan giant squirrel
HYSTRICIDAE	
<u>Hystrix indica</u>	Indian porcupine
MUSTILIDAE	
<u>Martes flavigula</u>	Yellow throated marten
<u>Lutra sp.</u>	Otter
VIVERRIDAE	
<u>Paguma larvata</u>	Himalayan palm civet
CANIDAE	
<u>Canis aureus</u>	Jackal
<u>Cuon alpinus</u>	Dhole/wild dog

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Fig 1. Biounits of Bhutan. (from Mackinnon 1991)

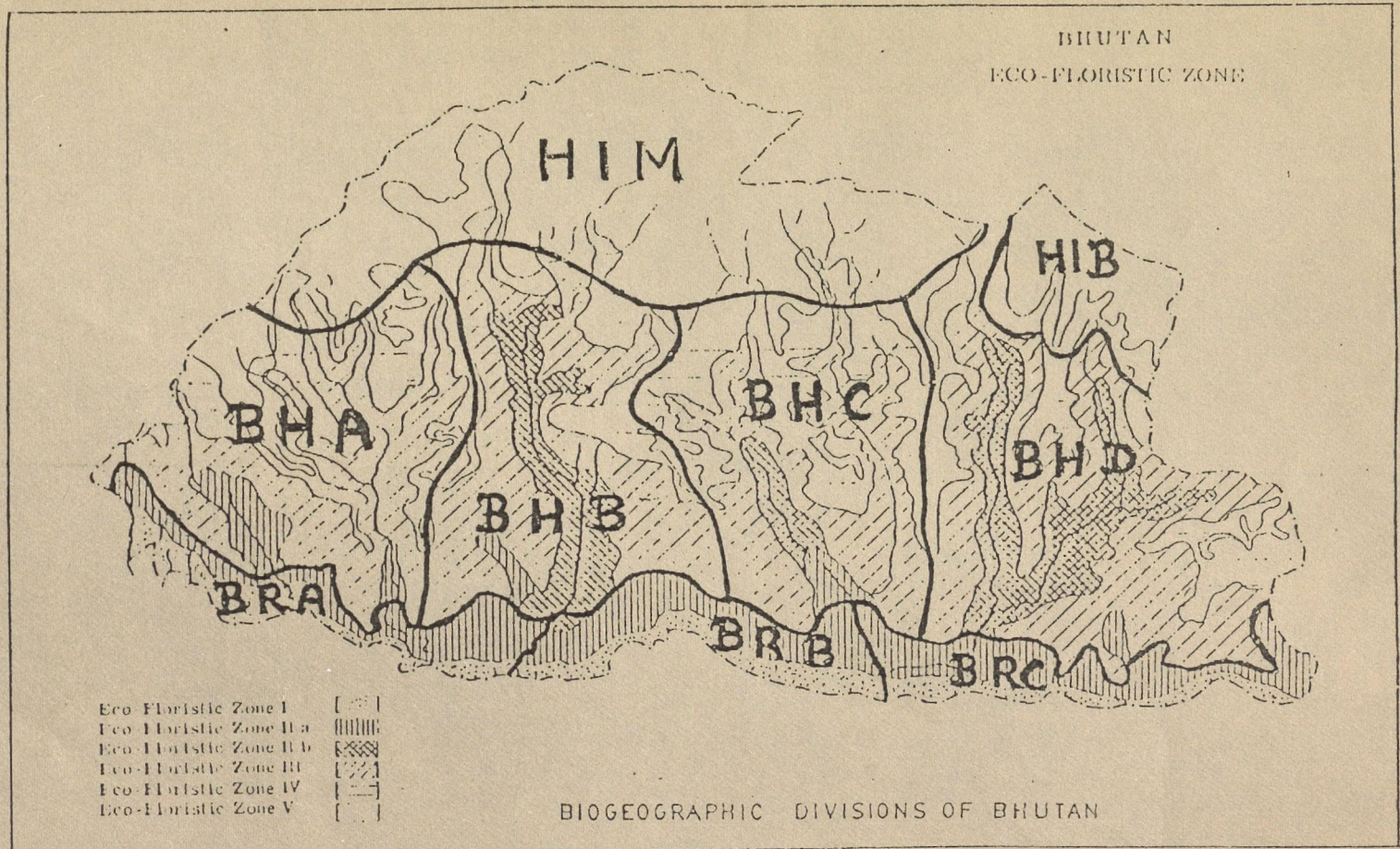
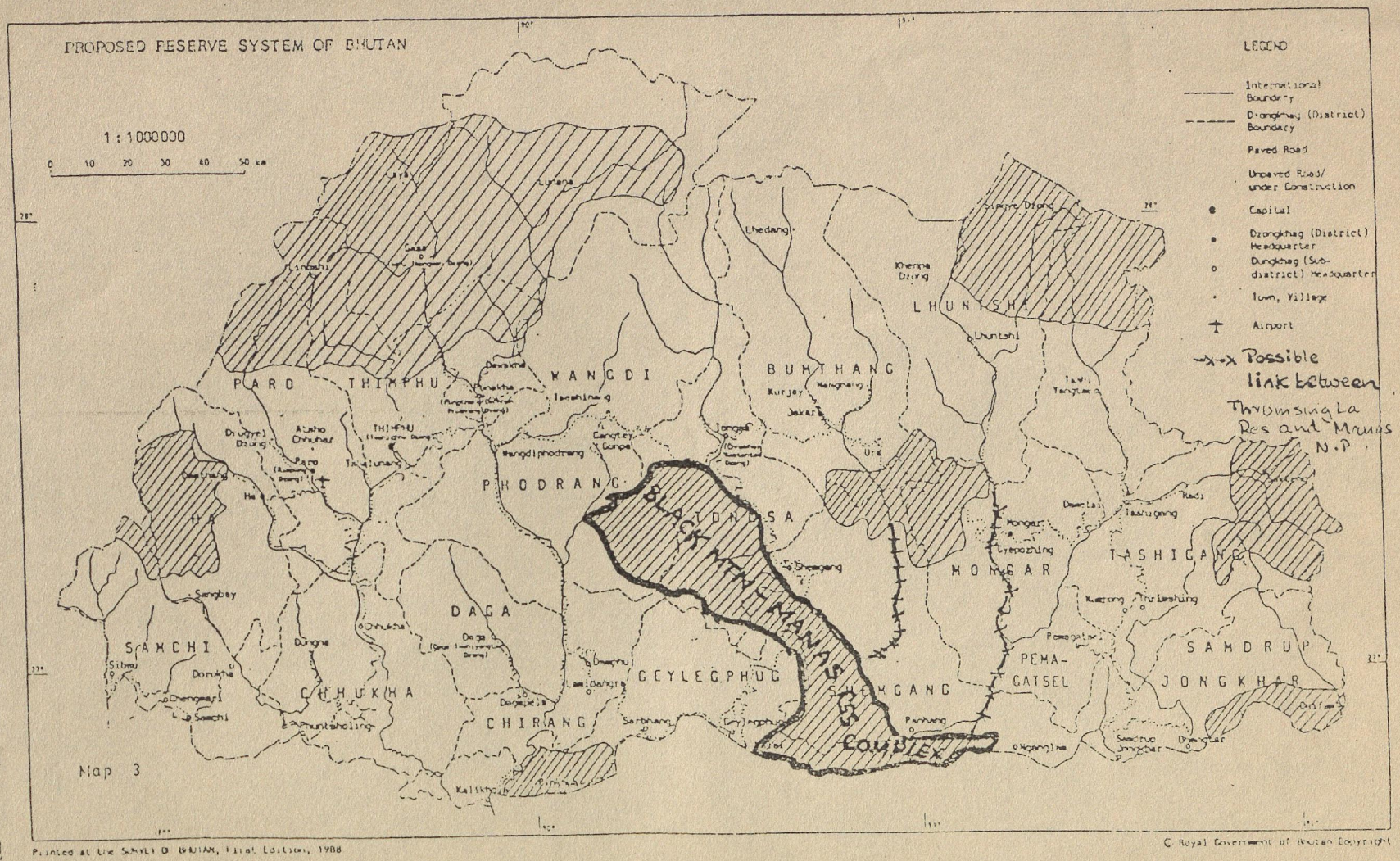


Fig 2. The proposed protected areas system of Bhutan. The possible link between Trumsing La and Manas National Park is indicated by -x-x-.



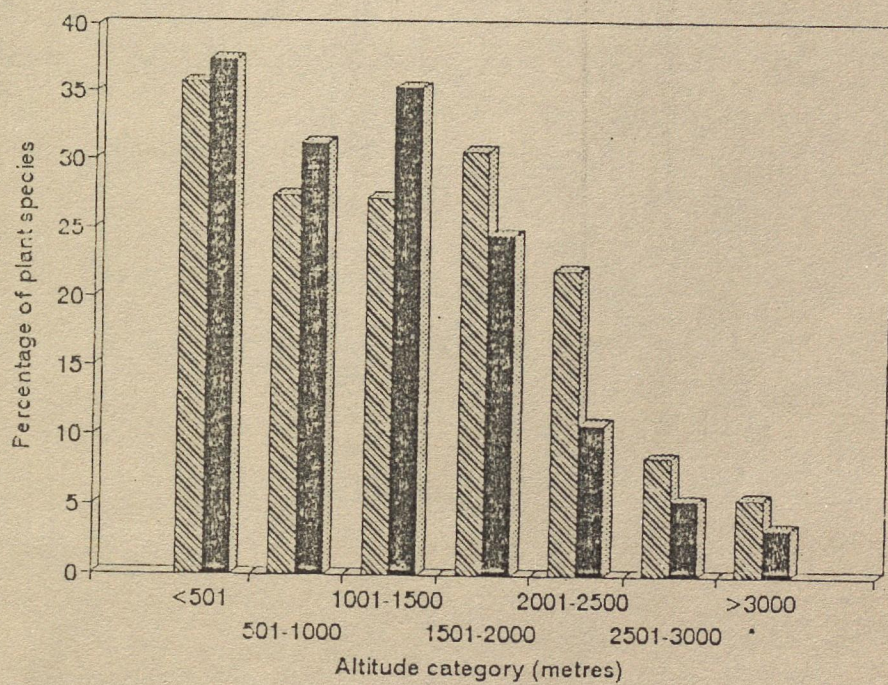


Fig 4. Distribution of plant species by altitude categories. Hatched bars represent tree species only, and solid bars all smaller woody plants (i.e., shrubs, epiphytes, lianas, bamboo)

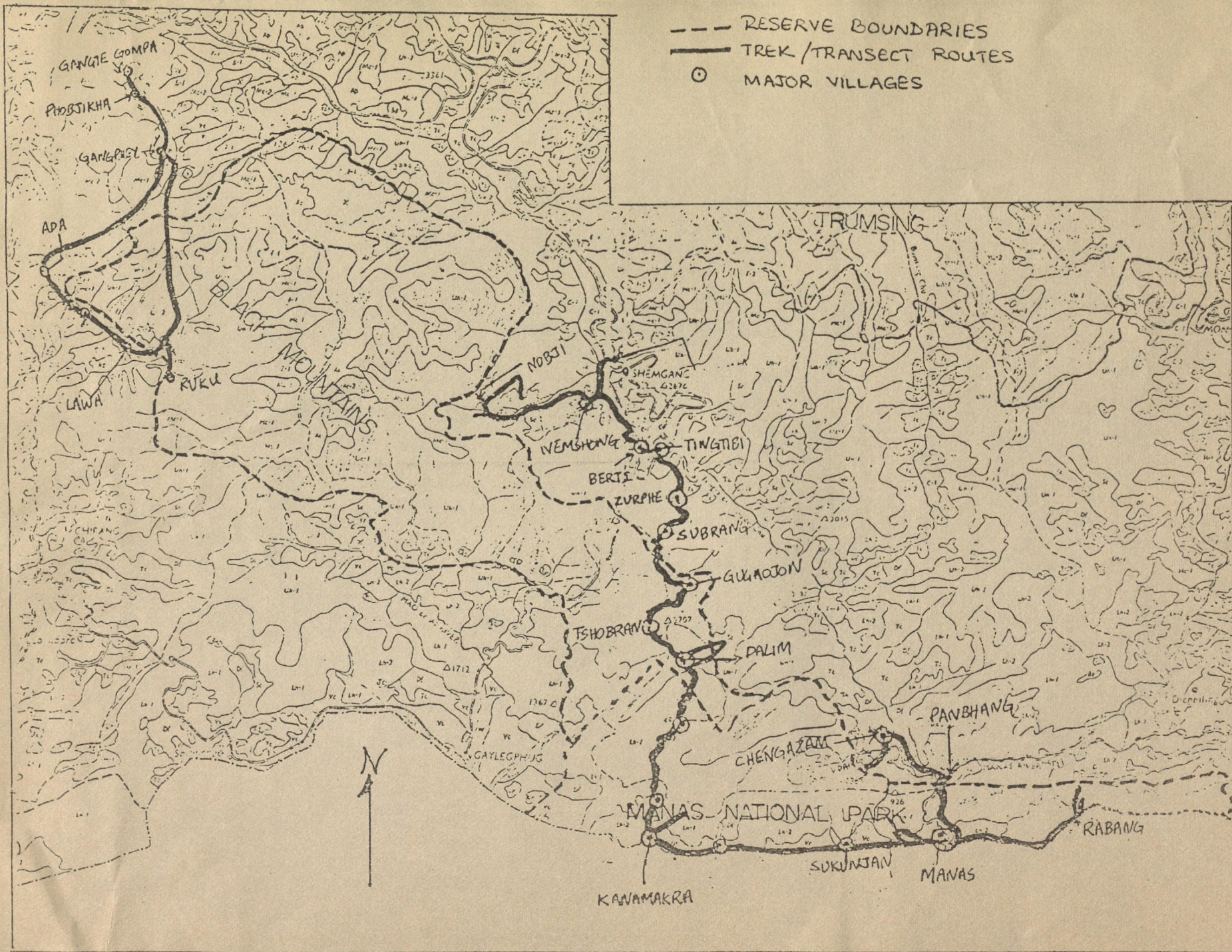


Fig 3. Locations of survey transects and trek routes.

Fig 5 (pp 28-31). Plant species-richness curves in the seven altitude categories.

- = cumulative addition of all woody plant species.
- + = cumulative addition of tree species only.
- \* = percent new species represented in plot.
- = new transect.

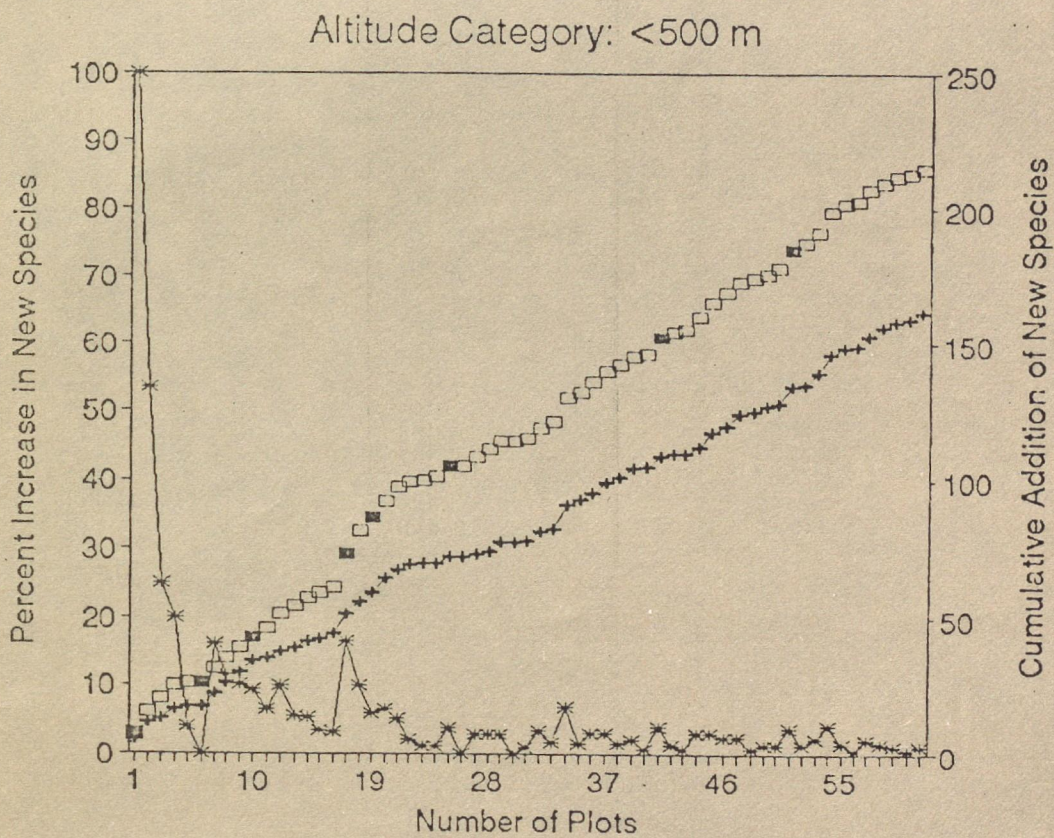


Fig 5 (Cont)

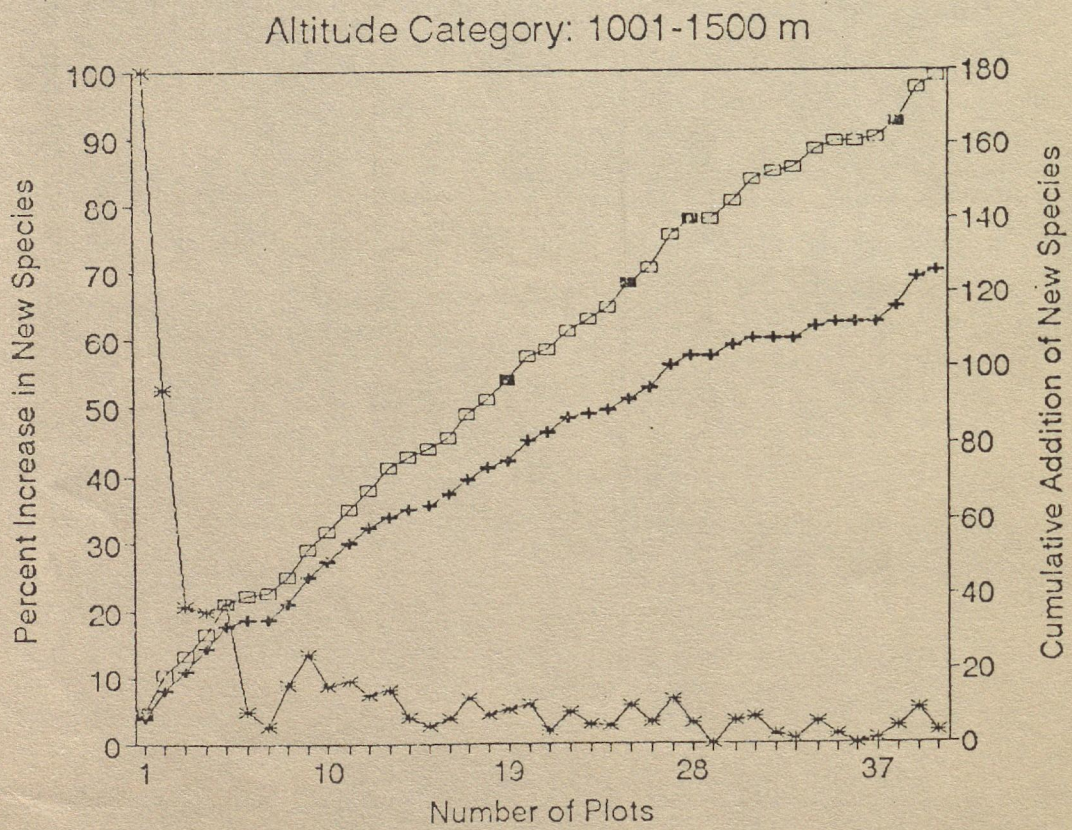
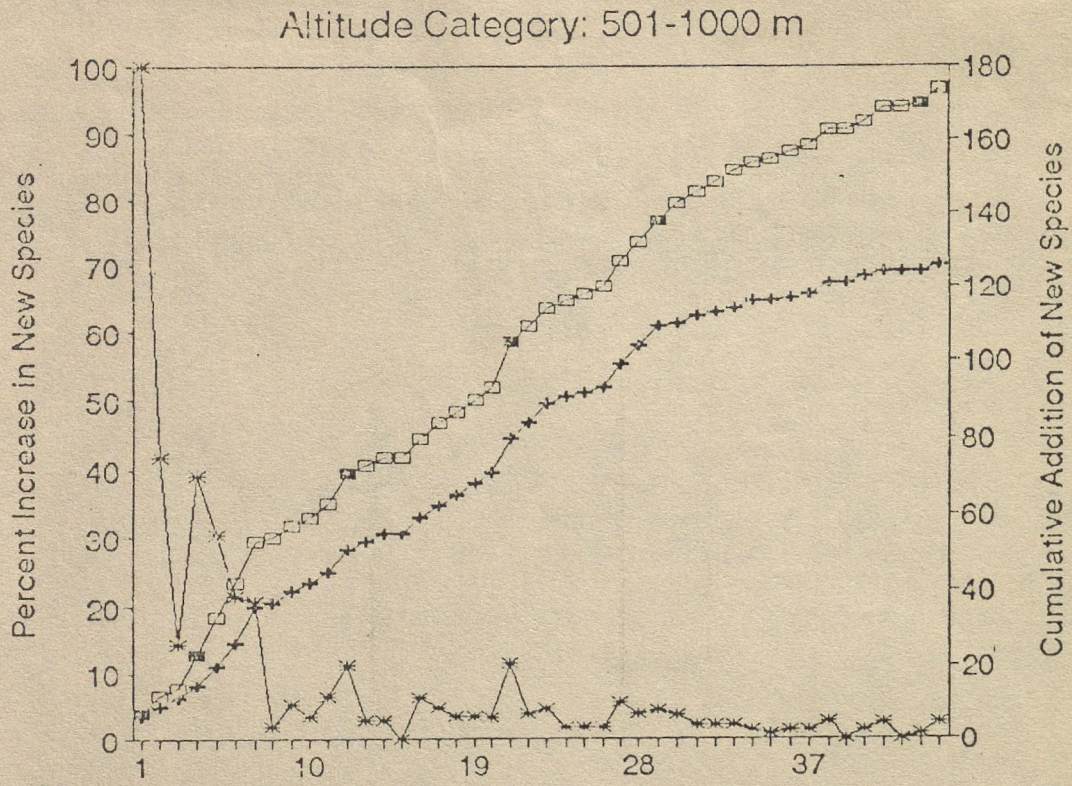


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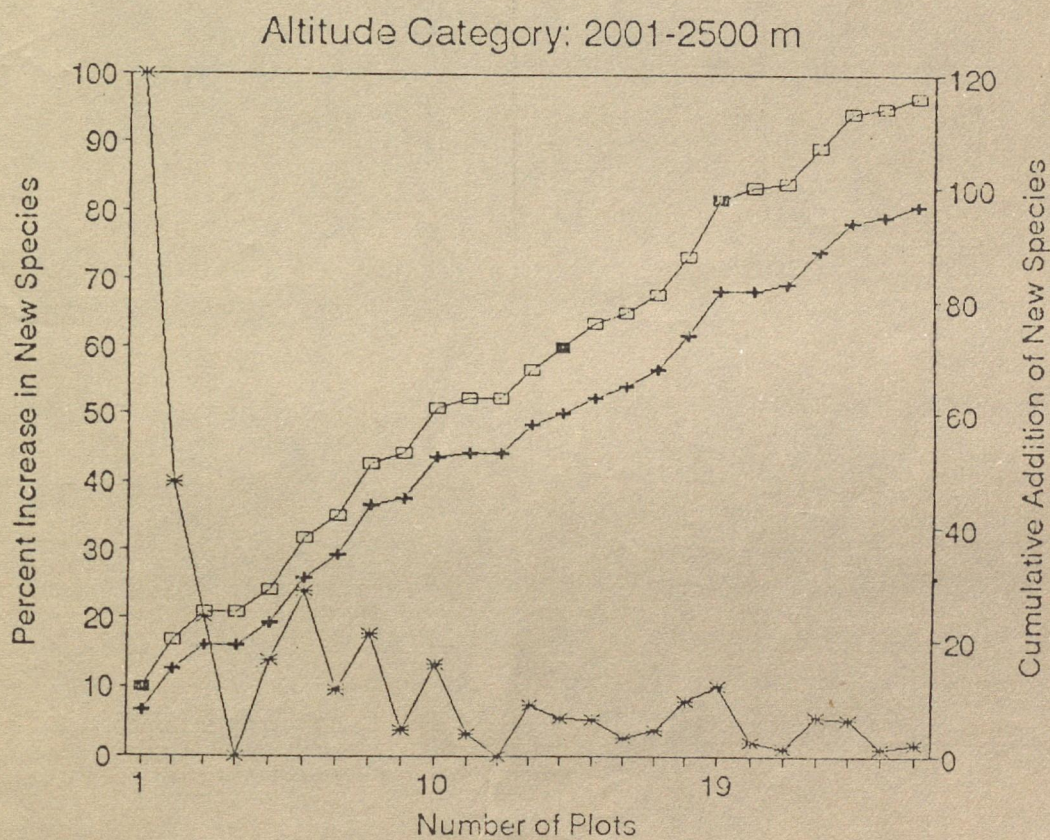
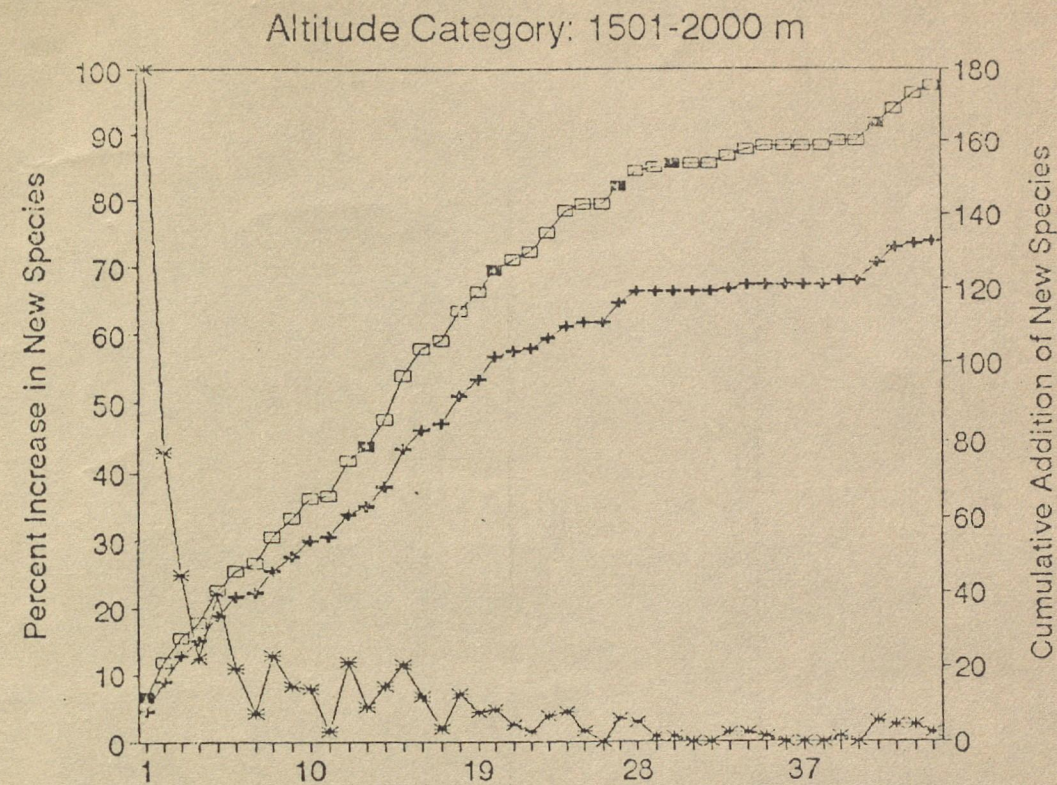
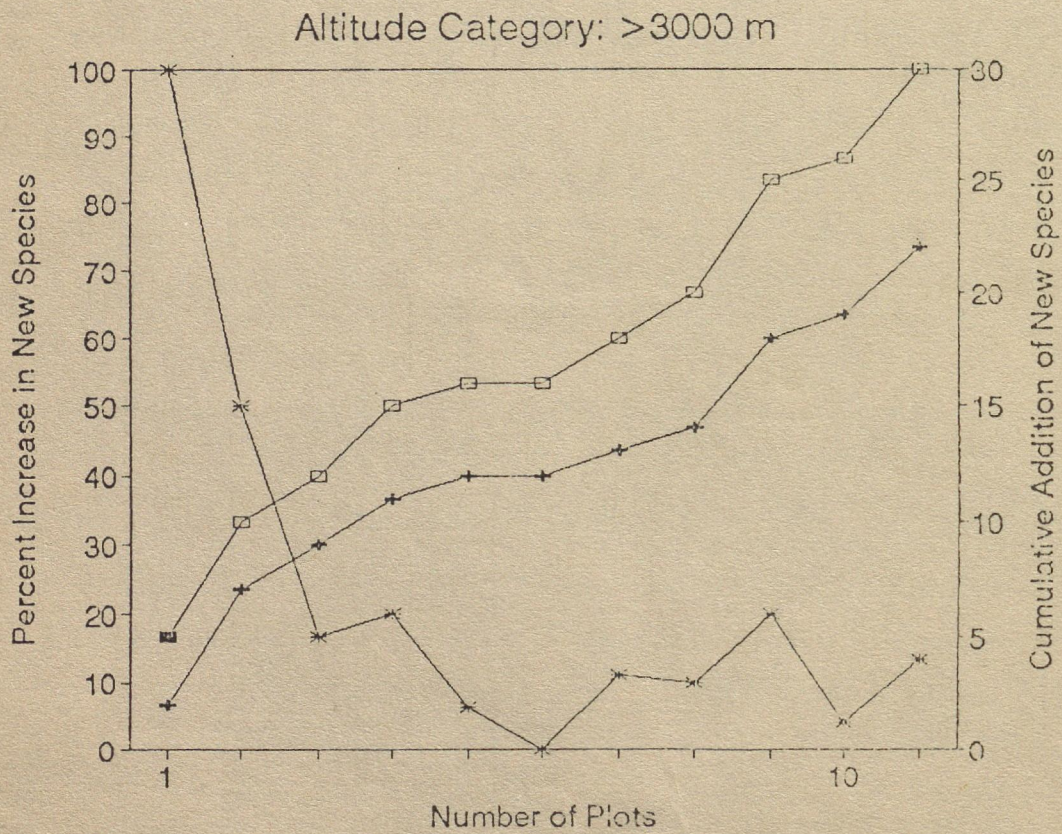
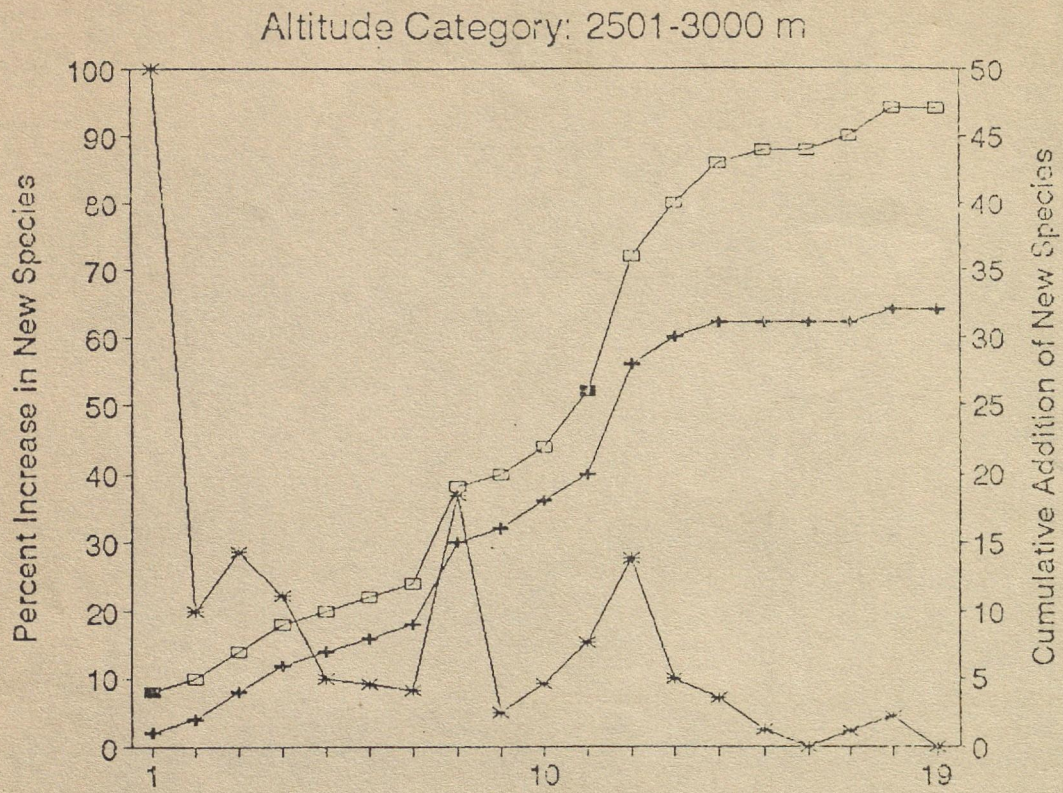


Fig 5 (Cont)



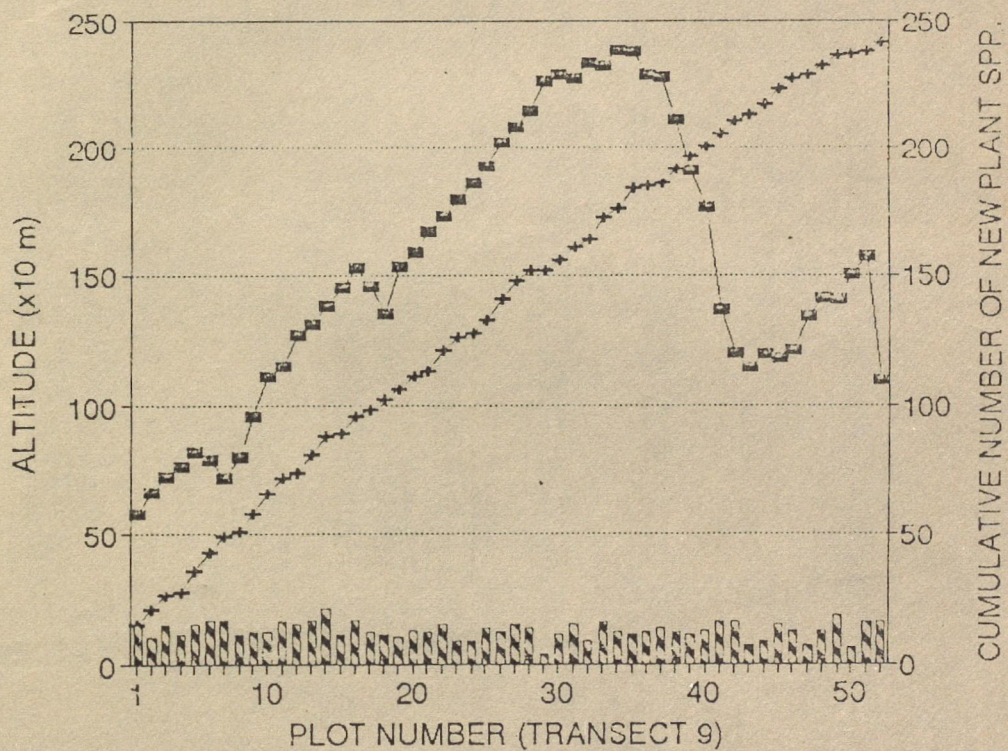


Fig 6. Relationship between altitude (■) and cumulative addition of new plant species (+) along Transect 9 (Edi->Tshobrang->Pongchela->Sobrang->Zurphey). The bars indicate the number of plant species recorded per plot.

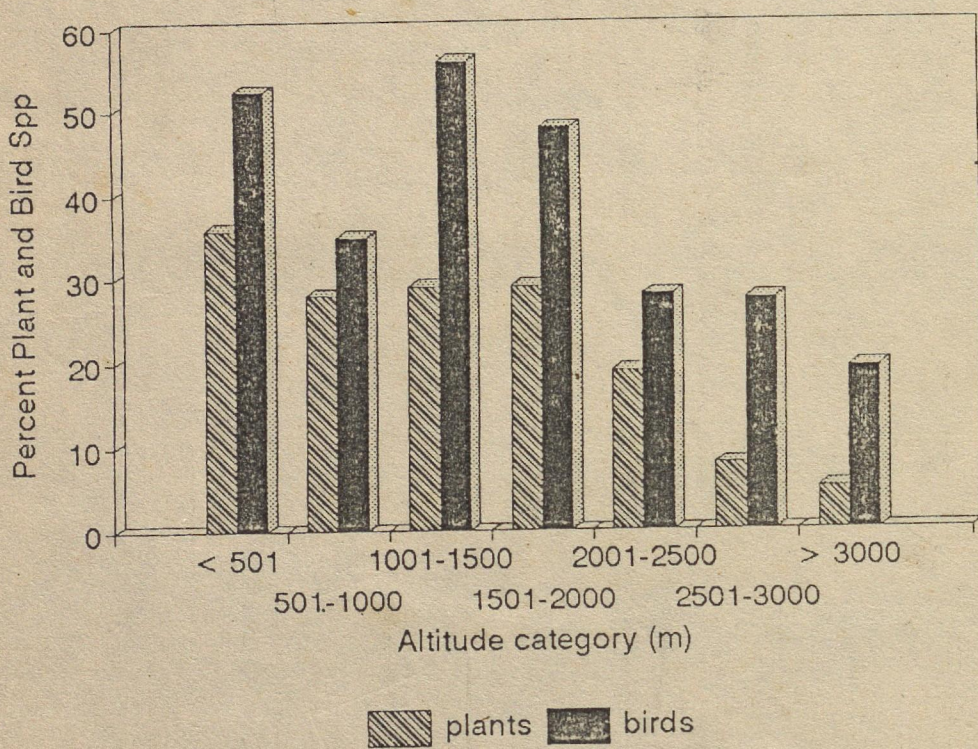


Fig 7. Distribution of bird and plant species across the seven altitude categories.